IEA IMPLEMENTING AGREEMENT FOR A CO-OPERATIVE
PROGRAMME ON SMART GRIDS (ISGAN)

SMART GRID PROJECT CATALOGUE: PART 2, BY CONTRIBUTION TO POLICY GOAL

ISGAN Inventory Report

ANNEX 1, Task 2

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Verification: _____________ Korea Smart Grid Institute (Operating Agent)
Approval: _______________ ISGAN Executive Committee Chair or Vice Chair

From the ISGAN Annex 1 *Programme of Work*, Issue 3.1, revised August 2012: *"Summary report providing a picture of the smart grid landscape in ISGAN countries and informing the contours of collaboration in ISGAN"*

ABSTRACT

The objective of the ISGAN global smart grid inventory is to help depict a global view of smart grid activities and investments to allow identification of remaining gaps along with opportunities for targeted collaboration or further investment by ISGAN Participants. Development of the inventory followed the ISGAN framework of assessment, during which smart grid drivers and technologies were assessed by each ISGAN Participant based on their respective national-level priorities. Information on ongoing and planned smart grid projects that respond to national-level priorities was then collected from each Participant as input to the inventory. The inventory, constructed in Microsoft Access and Excel, adopted the data fields and their organization used by the European Commission Joint Research Centre-Institute for Energy and Transport (JRC-IET) survey of smart grid projects with slight modifications. Harmonization of database content between the JRC-IET database and the inventory is readily achieved, while the inventory allows each ISGAN Participant to independently conduct query and analysis of smart grid projects.

Cataloguing of the projects in the inventory is presented in a two-part report. Part 1 organizes smart grid projects by each main application; whereas, Part 2 organizes the inventory projects by their contribution to policy goals. The “project main applications” and “policy goals” in the inventory are in close association with the “smart grid technologies” and the “smart grid drivers,” respectively, in the assessment framework. The latter two categories are more granular than their respective former categories; in other words, a main project application and a policy goal could encompass, respectively, a group of smart grid technologies and drivers. Project information presented in the two-part report was drawn from data call responses by the national experts and representatives of the ISGAN Participants, without any changes. This report presents 98 smart grid projects from 17 ISGAN Participants in the inventory, dated 28 March 2013. As the inventory is being continuously updated, the content of this report will necessarily change to reflect the current status of the inventory.

CONTENTS

1.0 INTRODUCTION

The International Smart Grid Action Network (ISGAN) was launched at the first Clean Energy Ministerial (CEM) in 2010 and was subsequently organized as a task-shared International Energy Agency (IEA) Implementing Agreement for a Co-operative Programme on Smart Grids in 2011. The task-shared projects undertaken with ISGAN Participants' contributions are aimed toward multilateral government-to-government collaboration to advance the development and deployment of smarter electric grid technologies, practices, and systems. To date, ISGAN has established six multilateral collaborative projects (or Annexes) to address the principal areas of smart grids that government collaborations can impact the most.

Annex 1, the Global Smart Grid Inventory project, has the objectives of: (1) identifying countries' specific motivating drivers for pursuing smart grids, (2) cataloguing the wide range of smart grid activities underway, and (3) collecting and organizing the wealth of experience currently being generated into a resource available first to ISGAN Participants and then to a broader, global audience. These objectives and the associated scope of activities are described in the ISGAN Annex 1 *Programme of Work*, Issue 3.1 (revised August 2012).

Work on objective 1 above was documented in the ISGAN *Framework of Assessment Report* (December 2012), which summarizes smart grid drivers and technologies by country, economies, and continent. The national-level drivers and technologies identified were then used by each ISGAN Participant as a criterion for selecting smart grid projects as candidates for the ISGAN Global Smart Grid Inventory (hereafter referred to as the inventory). The inventory is constructed as a database that hosts smart grid projects selected by all ISGAN Participants, with each project responding to its national-level smart grid driver and technology priorities while meeting all other project selection criteria. These other criteria include: demonstration and/or deployment project; government or regulator-supported project; project scope addressing the ISGAN principal areas of focus; and near-term project duration with a cost/benefit analysis done by 2017.

Project information for the inventory was collected from the national experts and representatives of ISGAN Participants in response to data call requests using the inventory template developed with consensus input by ISGAN Participants. The template contains data fields organized in separate forms; both the data fields and form compositions were largely adopted from the smart grid project survey used by the European Commission Joint Research Centre-Institute for Energy and Transport (JRC-IET). Only minor changes to the JRC-IET survey were made to reflect its use by ISGAN Participants (as opposed to use by European countries), as well as to reflect smart grid demonstration and deployment projects only (that is, exclusion of smart grid R&D projects). The selection of the JRC-IET survey as the basis for the inventory template was attributed to the completeness and comprehensiveness of data/information collection fields in the survey that correspond well with the drivers and technologies used in the ISGAN assessment framework, in addition to meeting the interest of ISGAN Participants.

Both the template for the inventory and the inventory are constructed using Microsoft Excel and Access software programs. The use of Microsoft software is based on its common availability. The template and inventory are provided in both software programs so each ISGAN Participant has the flexibility of using either one for project inputting/analysis.

A data call request was first made to the JRC for information content in the JRC-IET smart grid project database on some smart grid projects that were selected by ISGAN Participants in Europe and met the inventory project selection criteria. The data output from the JRC-IET database on these select projects was then imported to the inventory files to assure harmonization between the inventory and the JRC-IET database. Next, monthly data request calls were sent to all ISGAN Participants. The inventory comprises input received from the JRC-IET database and two rounds of data collection from the national experts and representatives of ISGAN Participants. Except for formatting changes and minor edits, no other changes were made on input from these information/data resources before incorporation into the inventory. As of 28 March 2013, the inventory has a total of 98 smart grid projects from 17 ISGAN Participants, as shown in Table 1.

Table 1. Status of Projects in the ISGAN Inventory, as of 28 March 2013

Number of Smart Grid Projects	ISGAN Participants
11 Each	India, United Kingdom
10 Each	France, Ireland, United States
8	Germany
6	Sweden
5 Each	Belgium, Canada, Korea
4	Japan
3 Each	Austria, Mexico
2 Each	Italy, The Netherlands, Switzerland
1	Spain

The inventory is thus serving the purpose of meeting objectives 2 & 3 mentioned above; that is, cataloguing the wide range of smart grid activities underway, and collecting and organizing the wealth of experience currently being generated into a resource. Cataloguing of projects in the inventory is provided in two companion reports. The Part 1 report organizes smart grid projects by each main application; the Part 2 report organizes smart grid projects by project contribution to policy goals.

The inventory will continue to be updated at an as-needed interval to be determined by ISGAN Participants. The two catalogues will thus need to be updated to reflect the then-current status of the inventory.

PROJECT CATALOGUING IN RELATION TO SMART GRID TECHNOLOGY PRIORITIES

The inventory template includes a data field, Project Main Application, which was used to catalogue the projects in the Part 1 report. This data field comprises a drop-down list of seven smart grid applications:

- Smart Network Management
- Integration of DER (Distributed Energy Resources)
- Integration of Large Scale RES (Renewable Energy Systems)
- Aggregation (Demand Response [DR], VPP [Virtual Power Plant])
- Smart Customer and Smart Home
- Electric Vehicles (EV) and Vehicle2Grid (V2G) Applications
- Smart Metering

Each project was requested to select one of the seven listed applications as its Project Main Application. A separate data field was set up for inputting any other project applications that are either on or outside of this list.[1] Some projects received have more than one application selected as the "Project Main Application"; these projects are then counted and listed under each of the Application headings selected. Further, under each Application heading, projects are further organized by Distribution (D) Level, Transmission (T) Level, and T&D Interface, pertaining to their physical application domains (or shown as the "Smart Grid Area of Focus" in the template). The Part 1 report provides a list of project summaries in the inventory, with the projects first filtered by Project Main Application and then listed in order of the three physical application domains.

The seven "Project Main Application" categories relate to the smart grid technologies listed in the survey in the ISGAN *Framework of Assessment Report*. A few Application categories comprise a group of smart grid technologies in the survey. For example, the Application category "Smart Energy Management" embodies a group of smart grid technologies used in the survey, namely, information and communications technology, distribution management systems and outage management systems, and system wide monitoring, measurement, and control. Also, the Application category "Integration of Large Scale RES" comprises both smart grid technologies of large scale variable RES integration and wind. The breakdown of smart grid

[1] Project applications outside of the drop-down list that were inputted by ISGAN Participants include: Transformer monitoring units, Condition based monitoring, Agriculture DSM, AMI for remote connect/disconnect of customers, Monitoring of the consumption pattern, Tamper detection, Contract load monitoring, Load curtailment program, Time of use and dynamic and real time pricing, Demand forecasting, Load forecasting, Asset management, Peak power management and outage management, Renewable energy integration and roof top installations, Exploration of the future energy system, and Regional energy marketplace. Although these applications can be grouped into the seven "Project Main Application" categories, this report did not do so, leaving that decision to the ISGAN Participant who inputted the data set.

projects in the inventory by Project Main Application is shown in Figure 1a; while Figure 1b shows the top-ranked smart grid technologies (Figure 4 in the ISGAN *Framework of Assessment Report),* with changes made to show that smart grid technologies and the corresponding Smart Grid Application have the same color coding.

Figure 1. Smart Grid Projects in the Inventory Relating to the Top 5 Ranked Technologies from the *Framework of Assessment Report*

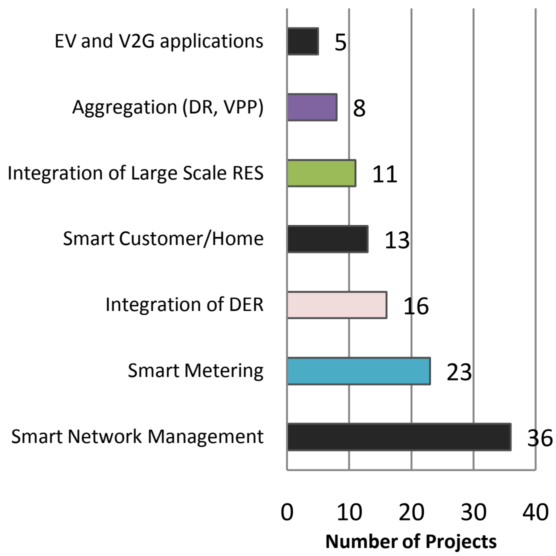

Figure 1a. Breakdown of Projects by Project Main Application

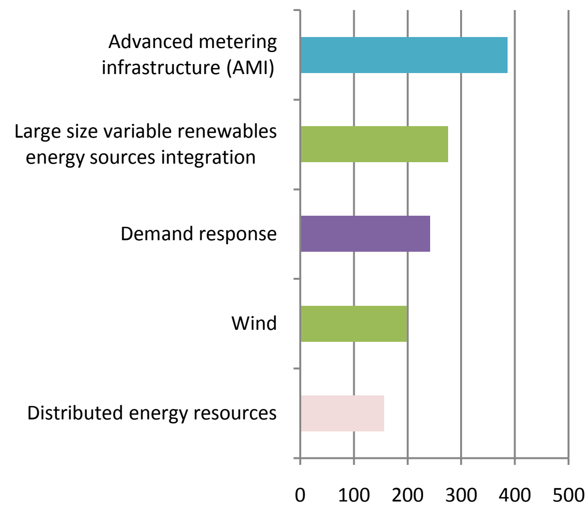

Figure 1b. Top-5 Ranked Smart Grid Technologies of 19 ISGAN Participants

Figure 1 shows that all of the top-5 ranked smart grid technologies are represented in smart grid projects in the inventory. Projects in three Project Main Application categories with color coding in black do not correspond with the top-5 ranked smart grid technologies. In the case of Smart Energy Network, it addresses three smart grid technologies that are ranked top-7 (information and communications technology), -8 (distribution management systems and outage management systems), and -11 (system wide monitoring, measurement, and control), among a total of 50 technologies used in the survey. If one were to combine all of the three smart grid technologies into one Smart Energy Network for ranking analysis, it would become the new #1 ranked smart grid technology, overtaking AMI in that spot. In the case of Smart Customer and Smart Home, the corresponding smart grid technology—Residential consumer energy management—was ranked top-9. Thus, both the "Smart Energy Network" and the "Smart Customer and Smart Home" categories have projects representing smart grid technologies of high priorities to ISGAN Participants. The only application category that does not address any ranked smart grid technologies is "EV and V2G applications." The corresponding smart grid technology for this application is "Electric vehicles and associated supply equipment," which didn't reach the ranking list due to a combination of low selection rates and low priorities by ISGAN Participants. Thus, it can be concluded that smart grid projects in the inventory address smart grid technology priorities identified in the ISGAN *Framework of Assessment Report.*

PROJECT CATALOGUING IN RELATION TO SMART GRID DRIVER PRIORITIES

The Part 2 report uses the four data fields under the "project contribution to policy goals" form (in Access) or tab (in Excel) in the inventory to catalogue smart grid projects. Each data field has a heading of a main policy goal, under which a drop-down list of specific policy goals was provided for selection of any or all of them that apply. The headings (in bold and color) and associated drop-down lists of policy goals for selection (in bullets) are provided as follows:

Sustainability and Integration

- Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES)
- Additional RES hosting power in the grid /maximum power load
- Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load
- Additional Demand Side Management power managed in the grid/maximum power load
- Increased number of consumers participating in electricity markets and in energy efficiency measures

Security and Quality of Supply

- Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.)

Energy Efficiency and Savings

- Energy savings
- Percentage reduction of electricity losses
- Reduced peak load

Coordination and Interconnection

- Additional interconnection capacity (specify HVDC and HVAC)
- Increased internal transfer capacity between TSOs or DSOs

In addition, separate data fields accompanying each main data field above were provided in the template for manually inputting other policy goals that are in addition to bulleted goals above.[2]

[2] Other policy goals inputted by ISGAN Participants include: Avoid using diesel backup generation, Establishment of a low-carbon transportation system, Provision of incentives to encourage consumer movement toward a low-carbon society, Establishment of regional nano-grids, Establishment of EV charging networks, Promotion of consumer-oriented energy saving/control systems (smart stores, smart schools, smart houses, energy saving street lights, etc.), Establishment of a community energy management system through the promotion of regional energy saving stations, Development of environmental learning systems, e-learning systems, etc., Voltage quality: voltage magnitude within regulatory voltage limits, reduced phase imbalance, Grid protection and monitoring tasks in general, Ensuring more ancillary service resources with V2G, Ensuring energy security besides fossil fuels, Reinforcing system resilience by increasing demand response capability, Coordination by local renewable energy company involving prosumers, and Energy efficiency by transparency of energy consumption. Although these goals can be grouped under the provided drop-down lists, this report did not do so, leaving that decision to the ISGAN Participant who inputted the data set.

The Part 2 report presents smart grid projects first filtered by the bulleted policy goals shown above; under each policy goal, projects are listed in order of their physical application domains, i.e., D, T, and T&D Interface, in the same order as that used in Part 1.

The policy goals in the inventory relate to the smart grid drivers in the ISGAN *Framework of Assessment Report*. Figure 2 shows the breakdown of smart grid projects by the four major policy goal headings (in Figure 2a) as relating to the top 6 ranked drivers of 19 ISGAN Participants (in Figure 2b). Again, the same color coding was used to show the corresponding policy goals and drivers. The use of the four policy goal headings, as opposed to the 11 bulleted policy goals, in Figure 2a is for mapping clarity.

Figure 2. Smart Grid Projects in the Inventory Relating to the Top 6 Ranked Drivers from the *Framework of Assessment Report*

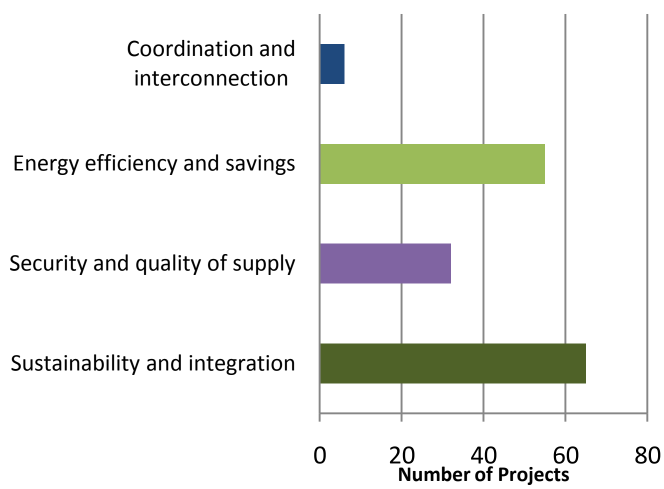

Figure 2a. Breakdown of Projects by Policy Goal Heading

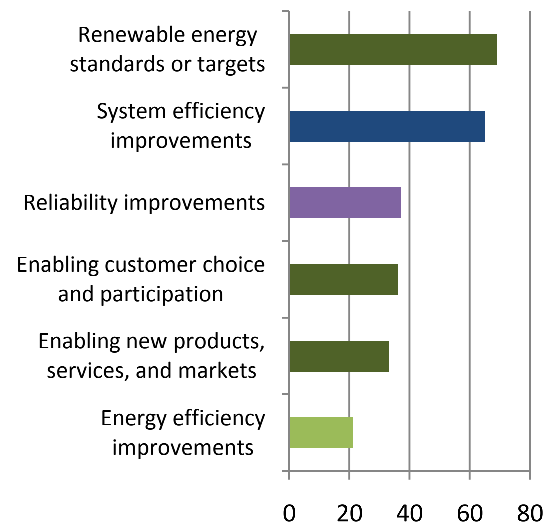

Figure 2b. Top-6 Ranked Smart Grid Drivers of 19 ISGAN Participants

Figure 2 shows that all of the top 6 ranked smart grid drivers are represented in the four policy goal headings. For example, the "Sustainability and integration" policy goal heading encompasses smart grid drivers of "Renewable energy standards or targets," "Enabling customer choice and participation," and "Enabling new products, services, and markets." The "Coordination and interconnection" heading includes the policy goals of enhanced interconnection and internal transfer capacities, both of which deal with the driver of "System efficiency improvements." Thus, it can be concluded that smart grid projects in the inventory address both the smart grid driver priorities (herewith in Part 2) and the smart grid technology priorities (in Part 1), as identified in the ISGAN *Framework of Assessment Report.*

How to Use this Catalogue

The INTRODUCTION section for Parts 1 & 2 is the same. Readers are encouraged to read through this section to gain a general knowledge of the ISGAN, its Annex 1, and the inventory building process, including the project selection criterion as responding to smart grid driver and technology priorities identified in the ISGAN *Framework of Assessment Report*.

Next, if readers' interest is in exploring smart grid projects as pertaining to their main applications or smart grid technologies, Part 1 should be used. Alternatively, Part 2 should be used for viewing projects according to their contribution to policy goals or smart grid drivers.

The Table of Content (TOC) in both Parts shows how project summaries are organized and grouped. Readers may click on the Section or Subsection heading to navigate to the corresponding content. Each Subsection then provides an overview list of project IDs for those applicable smart grid projects, followed by their project summaries. These project IDs are the same as those used to identify individual smart grid projects in the inventory. The project ID begins with a three-letter code assigned to a country by the International Olympic Committee followed by a numeric sequence of projects in that country. For example, smart grid projects in the United States are shown as USA1 to USA10.

2.0 PROJECT CONTRIBUTION TO POLICY GOAL

Table 2 beginning on the following page maps all of the smart grid projects in the inventory to project applications ("● " denoting the main application and "⁘" denoting other application) and contribution to policy goals (marked with "√"). Project application to different physical domains (Distribution, Transmission, T&D Interface, and Crosscut) is indicated by the column colors shown in Table 2. The ensuing sections in the Part-1 Catalogue present project summaries under each "Project Application" in the order listed in Table 2. That order reflects the decreasing number of smart grid projects, by which each "Project Application" was selected as the main application (or marked with "● "). Under each Project Application section, summaries of projects are presented in alphanumeric order by project unique ID and include only those for the projects marked with "● " in the corresponding row in Table 2. Thus, Table 2 can also be used as a guide for readers to locate a project summary in its project main application section. Similarly, in the Part-2 Catalogue, the ensuing sections present project summaries under each "Contribution to Policy Goal" in the order listed in Table 2. That order reflects the decreasing number of smart grid projects, by which the Policy Goal was selected. Under each Contribution to Policy Goal section, summaries of projects are presented in alphanumeric order by project unique ID and include those marked with "√" in Table 2.

Table 2. Mapping Results of Smart Grid Projects with Project Main Applications and Contribution to Policy Goals, as well as with Physical Application Domains. [Note: For ease of use, the table has been split into four sections, with included countries identified for each.]

Section 1: Austria (AUT), Belgium (BEL), Canada (CAN), France (FRA), United Kingdom 1-4 (GBR)

Project Application	AUT1	AUT2	AUT3	BEL1	BEL2	BEL3	BEL4	BEL5	CAN1	CAN2	CAN3	CAN4	CAN5	FRA1	FRA2	FRA3	FRA4	FRA5	FRA6	FRA7	FRA8	FRA9	FRA10	GBR1	GBR2	GBR3	GBR4
Smart Network Management	●	●	⁘			●			⁘		⁘	⁘		●	●	⁘			●								
Smart Metering			⁘	●			●			⁘			●			●											
Integration of DER	●	⁘	●			●			⁘		●	●						●	●	●			●	●		⁘	⁘
Smart Customer/Home		⁘			●												●		●			●	●				
Integration of Large Scale RES						●			⁘															⁘	●	●	●
Aggregation									●					⁘				●			●						
EV and V2G Applications	●	⁘						●		●																	
Contribution to Policy Goal																											
Peak Load Reduction											✓		✓					✓	✓	✓							
Energy Saving		✓	✓							✓				✓			✓	✓	✓								
CO2 Reduction									✓	✓			✓					✓	✓								
Electricity Loss Reduction										✓										✓							
Reliability Improvement										✓	✓	✓			✓					✓							
Increased Consumer Participation													✓				✓		✓								
Additional Demand Side Management																		✓	✓								
Additional DER		✓	✓							✓	✓	✓		✓				✓	✓	✓							
Additional RES						✓			✓									✓	✓								
Transfer Capacity Btw DSO and TSO										✓																	
Interconnection Capacity																											

Section 2: United Kingdom 5-10 (GBR), Germany (GER), India (IND)

Project Application	GBR5	GBR6	GBR7	GBR8	GBR9	GBR10	GBR11	GER1	GER2	GER3	GER4	GER5	GER6	GER7	GER8	IND1	IND2	IND3	IND4	IND5	IND6	IND7	IND8	IND9	IND10	IND11
Smart Network Management	●	●	●			⁘	●	●	●		●			⁘	●		●	●		●	●				●	
Smart Metering											⁘	⁘	●			●	⁘	⁘	●	⁘	⁘	●	●	●	⁘	●
Integration of DER	⁘			⁘							⁘						⁘	⁘		⁘						
Smart Customer/Home										⁘	⁘	●	●					⁘								
Integration of Large Scale RES		⁘	⁘	●	●	●				●																
Aggregation	⁘										⁘		●	●			⁘	⁘	⁘		⁘	⁘	⁘	⁘		
EV and V2G Applications																										
Contribution to Policy Goal																										
Peak Load Reduction									✓	✓		✓	✓	✓		✓	✓	✓	✓	✓	✓	✓		✓	✓	
Energy Saving									✓	✓	✓		✓	✓		✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
CO2 Reduction									✓	✓			✓				✓	✓								
Electricity Loss Reduction									✓							✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
Reliability Improvement								✓	✓		✓						✓	✓	✓							✓
Increased Consumer Participation									✓		✓	✓	✓			✓	✓	✓	✓	✓	✓	✓		✓	✓	
Additional Demand Side Management												✓	✓	✓		✓	✓	✓	✓	✓	✓	✓		✓	✓	
Additional DER								✓																		
Additional RES									✓			✓		✓	✓		✓									
Transfer Capacity Btw DSO and TSO										✓																
Interconnection Capacity																										

● : Main application
⁘: Other application
√: Contribution to policy goal

Transmission
T&D Interface
Distribution
Crosscut (Apply to more than one physical domain)

Table 2 (continued). Mapping Results of Smart Grid Projects with Project Main Applications and Contribution to Policy Goals, as well as with Physical Application Domains. [Note: For ease of use, the table has been split into four sections, with included countries identified for each.]

Section 3: Ireland (IRL), Italy (ITA), Japan (JPN), Korea (KOR), Mexico (MEX)

Project Application	IRL1	IRL2	IRL3	IRL4	IRL5	IRL6	IRL7	IRL8	IRL9	IRL10	ITA1	ITA2	JPN1	JPN2	JPN3	JPN4	KOR1	KOR2	KOR3	KOR4	KOR5	MEX1	MEX2	MEX3
Smart Network Management		●	●	⁘	⁘	⁘	●	●				●	⁘							⁘	●	●	●	
Smart Metering	●									●	●						⁘							●
Integration of DER		⁘	⁘	⁘	⁘	●			●			●	⁘	⁘	⁘	⁘			●					
Smart Customer/Home	⁘												●	⁘	●	●	●							
Integration of Large Scale RES		⁘		●	●				⁘				⁘	⁘	⁘	⁘								
Aggregation					⁘											⁘				●				
EV and V2G Applications													⁘	●	⁘	⁘		●						
Contribution to Policy Goal																								
Peak Load Reduction	✓				✓												✓			✓				
Energy Saving	✓																	✓	✓					
CO2 Reduction	✓		✓		✓				✓		✓		✓	✓	✓	✓					✓			
Electricity Loss Reduction		✓	✓	✓	✓						✓										✓			✓
Reliability Improvement		✓			✓												✓					✓		
Increased Consumer Participation	✓																			✓				
Additional Demand Side Management					✓												✓					✓		
Additional DER					✓							✓						✓						
Additional RES		✓	✓		✓	✓			✓			✓							✓					
Transfer Capacity Btw DSO and TSO						✓																		
Interconnection Capacity					✓																			

Section 4: The Netherlands (NED), Spain (SPA), Switzerland (SUI), Sweden (SWE), United States (USA)

Project Application	NED1	NED2	SPA1	SUI1	SUI2	SWE1	SWE2	SWE3	SWE4	SWE5	SWE6	USA1	USA2	USA3	USA4	USA5	USA6	USA7	USA8	USA9	USA10
Smart Network Management	●			●	●	●	●			●		●	●	⁘	⁘	⁘	⁘	⁘	⁘	●	⁘
Smart Metering						●	⁘					⁘	⁘	●	●	●	●	●	●		●
Integration of DER		●		⁘	⁘	●	⁘					⁘	⁘								
Smart Customer/Home	⁘	⁘					⁘	●	●		⁘	⁘	⁘	⁘	⁘	⁘	⁘	⁘	⁘		⁘
Integration of Large Scale RES			●				⁘						⁘								
Aggregation						●					●	⁘	⁘	⁘	⁘	⁘	⁘	⁘	⁘		
EV and V2G Applications												⁘						⁘			
Contribution to Policy Goal																					
Peak Load Reduction	✓	✓		✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓
Energy Saving	✓	✓					✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓
CO2 Reduction	✓	✓					✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Electricity Loss Reduction						✓	✓		✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓
Reliability Improvement	✓	✓				✓	✓		✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Increased Consumer Participation	✓	✓					✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Additional Demand Side Management					✓		✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓
Additional DER				✓		✓			✓	✓	✓	✓	✓				✓	✓			
Additional RES						✓	✓		✓	✓	✓		✓								
Transfer Capacity Btw DSO and TSO					✓															✓	
Interconnection Capacity																					

● : Main application
⁘: Other application
√: Contribution to policy goal

Transmission
T&D Interface
Distribution
Crosscut (Apply to more than one physical domain)

2.1 Reduced Peak Load (Energy Efficiency and Savings)

Summaries of projects in the inventory selected as contributing to the policy goal of “Reduced Peak Load (Energy Efficiency and Savings)” are presented in order of their physical application domains: Distribution Level, Transmission Level, and T&D Interface. Within each domain, project summaries are presented in alphanumerical order of their unique Project IDs.

2.1.1 Distribution Level

ID	Name
CAN3	Energy storage for improved reliability in an outage-prone community
CAN5	Ontario Smart Meter Initiative
FRA5	PREMIO-(‘Production Répartie, Enr et MDE, Intégrées et Optimisées’, or, in English, ‘Integration and Optimization of DG, DSM and Renewable Energies’)
FRA6	Greenlys
FRA7	VENTEEA
GER2	Smart Area Aachen
GER3	MeRegio
GER5	E-DeMa
GER6	Smart Watts
GER7	Model City Mannheim
IND1	Puducherry
IND2	UGVCL, Gujarat
IND3	CESC, Mysore
IND4	KSEB, Kerala
IND5	APDCL, Assam
IND6	APCPDCL, Andhra Pradesh
IND7	UHBVN, Haryana
IND9	TSECL, Tripura
IND10	HPSEB, Himachal Pradesh
IRL1	CER National Smart Metering Plan
KOR1	Jeju Test Bed_Smart Place
KOR4	Jeju Test Bed_Smart Electricity Service
NED1	Smart Grid Nieuweveens Landen Meppel

NED2	Smart Grid Nieuweveens Landen Meppel
SUI1	Swiss2G
SUI2	GridBox
SWE1	Grid4EU
SWE2	Smart Grid Gotland
SWE4	Stockholm Royal seaport Active House Pilot
SWE5	Stockholm Royal seaport demonstration phase
SWE6	Smart Grid Hyllie
USA1	gridSMART(SM) Demonstration Project
USA2	Pacific Northwest Division Smart Grid Demonstration Project
USA3	Smart Grid Deployment
USA4	Smart Grid Project
USA5	Energy Smart Florida
USA6	Enhanced Demand and Distribution Management Regional Demonstration
USA7	SmartSacramento
USA8	Positive Energy Smart Grid Integration Program
USA10	SmartGrid Program

CAN3

Energy storage for improved reliability in an outage-prone community

Leading organization

British Columbia Hydro (BC Hydro)

Total budget

$13,490,000

Description

The purpose of the project is to demonstrate the use of energy storage technology to offset power during times of peak load and to act as the sole energy source in a scenario in which the community is islanded from the grid. BC Hydro plans to install a 1MW battery energy storage system on its Golden distribution network. The unit will be installed close to the community of Field approximately 55km from Golden.

Main application

Integration of DER

Other applications

Smart Network Management

Scenario for estimated costs and benefits

Estimated benefits come from two sources: (A) reduce the risk of Golden substation exceeding maximum load - at peak load battery will discharge to offset load at Golden substation - immediate benefit is to defer capital cost; and (B) mitigate impact of feeder outages for the community of Field - in the event of a feeder outage, the battery will supply power to the community of Field for a period of 6 to 7 hours at maximum load - immediate benefit is to remove the need to supply a diesel generator back-up, saving cost and GHG emissions.

Policy goals

Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Reduced peak load

CAN5

Ontario Smart Meter Initiative

Leading organization

Ministry of Energy - sets the policy framework; Ontario Energy Board – provides regulatory guidance; Independent Electricity System Operator - Development and operation centralized Meter Data Management system; Local Distribution Companies - Purchasing, owni

Total budget

$1 Billion

Description

Ontario has introduced smart meters — along with a “time-of-use” electricity price structure — to help you manage customer electricity costs, while helping Ontario to build a more efficient, more environmentally sound electricity system. Smart meters have been installed in residences and small businesses across Ontario. A smart meter system opens up the opportunity for new kinds of conservation and demand management programs. In the future, smart meters could allow the introduction of different timebased incentive programs, or the opportunity to control energy use through energy management devices or smart appliances. Smart meter data also provides comprehensive, detailed information for electricity system planning, allowing us to identify where future generation, transmission and distribution investments are required. Time-of-use pricing encourages Ontarians to shift some electricity use to offpeak hours. By reducing peak demand, the province can reduce its use of the less environmentally attractive resources that are called on when demand is high. In the long run, lower peak demand will mean less need for new generating facilities and transmission and distribution infrastructure, lowering costs for all Ontarians.

Main application

Smart Metering

Scenario for estimated costs and benefits

LDC Operating Cost Reduction; Energy Cost Savings (societal benefits); Energy Cost Savings (societal benefits); Generation Capacity Avoidance; T&D Capacity Avoidance

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Reduced peak load

FRA5

PREMIO-('Production Répartie, Enr et MDE, Intégrées et Optimisées', or, in English, 'Integration and Optimization of DG, DSM and Renewable Energies')

Leading organization

CAPENERGIE – France

Description

PREMIO is primarily a technical proposal created to address the following goals: – to develop a dynamic demand-response specifically for peak shaving purposes, – to increase the flexibility of the power system, – to promote a new energy culture which encourages energy efficiency, – to integrate distributed generation and particularly renewable energies, – to reduce greenhouse gas emissions from polluting power plants, especially during peak load times, and – to manage regional electrical energy from a wide range of local actors. PREMIO combines the control of installed distributed resources for optimal use with an awareness campaign promoting demand side management (DSM). The PREMIO platform includes a virtual power plant (VPP) which integrates approximately fifty distributed resources, all of which are distributed generation, storage technologies and customers' curtailable loads. The limited number of installations suggests that project results will be qualitative rather than quantitative.

Main application

Integration of DER; Aggregation

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Energy savings; Reduced peak load

FRA6
GreenLys

Leading organization
ERDF

Description
GreenLys is a systemic smart grid project which includes: - DER - Consumption - Networks (DSO & TSO). Main Goals: - decrease of greenhouse gases - control of energy bill - introduction and control of DER on LV networks - behavior of consumers, with incentive and innovative new offers - aggregator functions. Innovations: - Smart management of grid (seal-healing, smart metering using Linky infrastructure,...) - Demand side management, demand/response, energy saving and new offers (using boxes linked to Linky Infrastructure, tariffs, dynamic prices policy...) – Investments; Impact on studies and development of networks (especially for DSOs)

Main application
Smart Network Management; Integration of DER; Smart Customer and Smart Home

Policy goals
Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Reduced peak load

FRA7
VENTEEA

Leading organization
ERDF

Description
In 2011, ERDF submitted the demonstrator as part of an ADEME program called “smart grid electric network” (AMI). Early 2012, the French Commissioner General for Investment (CGI) approved the project. The demonstrator is focused on the integration of large wind energy in distribution networks. More precisely the project will study observability and controllability of wind-farms, voltage regulation and centralized local protection plan and power quality. If the costs benefits analysis is validated by all involved stakeholders, a battery storage system offering a full service package would be implemented on 20 kV level.

Main application
Integration of DER

Policy goals

Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Percentage reduction of electricity losses; Reduced peak load

GER2

Smart Area Aachen

Leading organization

Stadtwerke Aachen Aktiengesellschaft

Total budget

$9,152,280

Description

Smart Area Aachen aims at developing new holistic concepts and methods based on new equipment for future smart grid solutions. In this context, innovative technical solutions are identified, optimized and eventually verified in pilot trials. Moreover, new business models are developed for the different stakeholders and harmonization aspects are addressed in accompanying standardization activities.

Main application

Smart grid applications in general: equipment, planning, operation

Scenario for estimated costs and benefits

Smart grid infrastructure

Policy goals

Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.) Energy savings; Percentage reduction of electricity losses; Reduced peak load

GER3

MeRegio

Leading organization

EnBW Energie Baden-Wuerttemberg AG

Total budget

24 Mio. EUR

Description

Around 1,000 private and industrial customers have been equipped with smart meters and a dynamic price signal. The goal of the project was to evaluate whether and how customers react on dynamic prices which have been calculated according to the availability of renewable energy.

Main application

Integration of Large Scale RES

Other applications

Smart Customer and Smart Home

Scenario for estimated costs and benefits

The project was for research/demonstration. Up to now there is no business case behind.

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Energy savings; Reduced peak load; Increased internal transfer capacity between TSOs or DSOs

GER5

E-DeMa

Leading organization

RWE Deutschland AG

Total budget

22 Mio. €

Description

Field test with 700 households in the Rhine/Ruhr region in Germany (Mülheim and Krefeld). The infrastructure comprises smart meters, and a regional energy market place which acts as a data platform for the involved parties of the energy system including consumers, energy suppliers, DSOs, aggregators and service providers. An infrastructure to exploit the flexibilities of residential consumers has been implemented. Control of white goods is done automatically via a home energy controller, which receives price signals from the regional energy market place. A part of the consumers is equipped with an in-house display for pricing information.

Main application

Regional Energy Marketplace; Smart Metering; Active Demand in residential environment; Aggregation of Flexibilities from residential consumers

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals

Active demand for residential consumers, supporting integration of renewables, peak shaving, increased number of consumers participating in energy markets; Energy efficiency by transparency of energy consumption, reduction of peak load

GER6

Smart Watts

Leading organization

utilicount GmbH & Co. KG

Total budget

up to ca. 20 Million EUR

Description

Central idea of the project, "Smart Watts," is to compensate the increased volatility of energy supply, due to the increased integration of renewable energy, by load balancing on the demand side and rises in energy efficiency - focused on private households. The market players gain access to current actual data by a dynamic information exchange of supply and demand information. This enables the generation of additional data such as dynamic purchasing conditions, which then can be offered to private households. The dynamic purchasing information (e.g., prices) are meant to motivate private households to shift their load. Therefore the households use an visualization, controlling and steering tablet pc App.

Main application

Smart Customer and Smart Home; Smart Metering; Aggregation (Demand Response, VPP)

Other applications

Aggregation (Demand Response, VPP)

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Additional Demand Side Management power managed in the grid/maximum power load; Reduced peak load; Energy savings

GER7

Model City Mannheim

Leading organization

MVV Energie AG

Total budget

20,800,000€

Description

(1) Better integration of renewable energy sources via balancing volatile generation and usage, (2) Demand side response via variable tariffs as inventive for load shifting, (3)Increase of connection capacity of renewable energy sources in distribution grids and management of bi-directional energy flows via cellular grid operation

Main application

Aggregation (Demand Response, VPP)

Other applications

Smart Network Management

Scenario for estimated costs and benefits

Distribution automation systems

Policy goals

Additional Demand Side Management power managed in the grid/maximum power load; Additional RES hosting power in the grid /maximum power load; Energy savings; Reduced peak load

IND1

Puducherry

Leading organization

Puducherry Electricity Department

Total budget

$8,700,000

Description

Pilot covers 87,031 no. of consumers with dominant being domestic consumers. The module of automated metering infrastructure (AMI) for residential consumers and industrial consumers is proposed to be implemented to assist with consumer issues like event management & prioritizing, billing cycle review and revenue collection efficiency for energy auditing and AT&C loss reduction. The AMI system shall aid in knowing real time energy input from DT as well as energy consumption by consumers that can instantly help to know losses in the system. Common Meter Data Management System is proposed that shall take data from MDMS of different meter manufacturer/solution provider and integrate the information for use. The pilot project also proposes developing a mature model of “time of use tariff and net metering.”

Main application

AMI for Industrial and Residential Consumers

Scenario for estimated costs and benefits

The proposed Cost Benefit Analysis for the pilot is based on the assumption of reducing Distribution Losses from 14% resulting in savings of about 25.5 MUs, reducing cost of billing by up to 50% and Increasing revenue collection efficiency from 90% to 98%. The payback period is likely to be around 6 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND2

UGVCL, Gujarat

Leading organization

UGVCL

Total budget

$9,200,000

Description

UGVCL has proposed the pilot project in Naroda of Sabarmati circle which is an industrial and residential area and Deesa of Palanpur circle which is an agricultural area covering 20,524 consumers in Naroda and 18,898 agricultural unmetered consumers in Deesa-II division and accounting for input energy of around 1700 MU (Naroda : 374.52 MU & Deesa : 1321.27 MU for 2010-11). The functionalities of peak load management, outage management, power quality management are proposed by implementing automated metering infrastructure (AMI) for industrial, commercial and residential consumers. Committee also observed that some additional functionalities like load forecasting and asset management are also proposed and functionalities of load forecasting, peak power management and outage management are also considered at utility level which will impact all consumers of utility (i.e., 27 lac consumers) indirectly. Renewable energy integration has been proposed to be carried out at Patan Solar Park and few roof top installations at some of the universities. The pilot project proposes to introduce TOU tariff with approvals from GERC. Renewable energy integration is proposed through proper and accurate load forecast by real time monitoring of substations, feeders and RES generation.

Main application

Peak load management, outage management, and power quality management are proposed by implementing automated metering infrastructure (AMI) for industrial, commercial and residential consumers.

Other applications

Load forecasting and asset management are proposed. Load forecasting, peak power management and outage management are considered at utility level. Renewable energy integration at Patan Solar Park and few roof top installations are also envisaged.

Scenario for estimated costs and benefits

The ROI is proposed to be realized through benefits on account of reduction in AT&C losses from 12.44% to around 8.44% in Naroda and from 21.69% to 15% in Deesa; savings in peak power purchase cost by reduction of peak load by up to 5% in both areas; reduction in transformer failure rate from 16.52% to 8% in Deesa area; and reduction in number of outages, meter reading cost, cost of payment collection, etc. Based on projected savings the payback period is likely to be around 2 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND3

CESC, Mysore

Leading organization

CESC, Mysore

Total budget

$6,150,000

Description

CESC, Mysore has proposed the pilot project in Additional City Area Division (ACAD), Mysore involving 21,824 consumers with a good mix of residential, commercial, industrial and agricultural consumers including 512 irrigation pump sets covering over 14 feeders and 473 distribution transformers and accounting for input energy of 151.89 MU. The functionalities of peak load management, outage management are proposed by implementing automated metering infrastructure (AMI) for residential consumers and industrial consumers and integration of distributed generation / micro grid integration. Some additional functionality like agriculture DSM with community portal, consumer portal to support DSM/DR, employee portal for knowledge sharing and benefit realization, KPI based MIS and data analytics for decision support are also proposed. The pilot project proposes to introduce real time pricing signal by interfacing at SLDC level to get UI/ABT prices subject to regulatory consent. Implementation of Fault Location Isolation and System Restoration (FLISR) at feeders where alternate feeding arrangements are available is also proposed.

Main application

Peak load management, outage management by implementing automated metering infrastructure (AMI) for residential consumers and industrial consumers; Integration of distributed generation/micro grid integration

Other applications

Agriculture DSM with community portal

Scenario for estimated costs and benefits

ROI is proposed to be realized through benefits on account of reduction in AT&C losses from 10.6% to 5.7% in 3 years, shifting of load of up to 80% in industrial feeders and up to 20% for domestic consumer during peak hours, reduction in number of transformer failure, meter reading cost, reduction in unforeseen outages and also recovery time for unforeseen outages by 20% and 50%. Based on projected savings the payback period is likely to be less than 3 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND4

KSEB, Kerala

Leading organization

KSEB, Kerala

Total budget

$5,200,000

Description

KSEB Smart Grid Pilot covers around 25078 LT Industrial consumers of selected distribution section offices spread over the geographical area of Kerala State. The input energy for the total scheme area is 2108 MUs and for the LT Industrial consumers is 376 MUs. Automated metering infrastructure (AMI) is proposed to provide quality service, prevent tampering and unauthorised usage of load, accurate and timely metering and billing, avoiding costly field visits of Sub Engineers for meter reading, reducing supply restoration time, peak load management through load restriction for Remote Disconnection/Reconnection and Time of Day tariff.

Main application

Automated metering infrastructure (AMI); Peak load management

Scenario for estimated costs and benefits

ROI is proposed to be realized through benefits on account of Reduction in AT&C losses of about 1.17% (24.82 MUs) through reduction in loss due to manual error, tampers, thefts, short assessment, etc., savings on employee and travel cost for meter reading and introducing incremental tariff for peak hours through ToD Tariff. Based on above savings the payback period is estimated to be around 2.5 years

Policy goals

Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND5

APDCL, Assam

Leading organization

APDCL, Assam

Total budget

$5,500,000

Description

APDCL, Assam has proposed a Smart Grid Pilot in Guwahati distribution region, covering 15,000 consumers and involving 90MUs of input energy. APDCL is in the process IT Implementation under R-APDRP and SCADA/DMS implementation is also to be taken up shortly. APDCL has proposed the functionality of peak load management using industrial and residential AMI, integration of distributed generation (solar and available back-up DG set) and outage management system. The utility has envisaged that power quality monitoring will be a by-product of the deployment. In the smart grid pilot project Integration of the 100kW solar farm into the distribution network via a bidirectional inverter and use of battery storage, possibly Vanadium redox battery, in conjunction with the solar farm is proposed. In addition R&D works are proposed for: Forecasting of load based on the weather, social events, festivals, etc. and developing various “if-then” scenarios to find optimal course of action for each scenario; Developing controllers for the bidirectional inverter and battery integration; Development of filters for reduction of harmonics injected into the grid and integrating it into the smart meters; and Development of messaging systems (for display in house and on mobile) for power consumption information and methods to reduce energy consumption. Study of the Guwahati’s distribution grid to identify the locations and sizes of the Vanadium redox batteries for peak shaving and valley filling is also proposed.

Main application

Peak load management; Outage management by implementing automated metering infrastructure (AMI) for residential consumers and industrial consumers; Power quality management; Integration of distributed generation

Scenario for estimated costs and benefits

The cost benefit analysis for the pilot is based on increased available energy of 55,602.5 kWh during peak time resulting in a saving of Rs. 3 Cr per year, revenue increase through power quality measurements and power factor penalty (assuming a 5% variation in power factor across 20% of the customers, paying an average 2% penalty); Reduction in AT&C losses from 16.7% to 12.55%; Reduction in interest payments due to deferred capital investment in sub-transmission networks, improvement of availability (reduction of customer minutes lost) and improved management of power procurement options; Unscheduled interchange using short term load forecasts. Based on above savings the payback period is estimated to be around 5 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND6

APCPDCL, Andhra Pradesh

Leading organization

APCPDCL, Andhra Pradesh

Total budget

$7,900,000

Description

The design proposes a Smart Grid Control Center housing the IT systems, a two way communication system for AMI. The number of customers in the project area is 38,303. However over 11,904 are covered under AMI implementation and smart meters will be for these numbers of customers. The functionalities of peak load management, power quality and outage management are proposed by implementing automated metering infrastructure (AMI) for residential consumers and industrial consumers. DAS, IT and SCADA shall be implemented. The CBM for DTR is proposed as an early warning of health of assets. The customer web portal would provide all customer related information and to seek their participation.

Main application

Peak load management; Outage management; Power quality management are proposed by implementing automated metering infrastructure (AMI) for industrial and residential consumers

Other applications

Condition based monitoring for DTR and customer web portal

Scenario for estimated costs and benefits

The proposed cost benefit analysis for the pilot is based on the assumption of reducing AT&C loss from present 9.48% to 7.48% and energy saving during peak times by shifting about 35.68 MUs from peak periods and thereby reduced purchase of high cost power at peak hours. Based on above savings the payback period is estimated to be around 2.5 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND7

UHBVN, Haryana

Leading organization

UHBVN, Haryana

Total budget

$3,200,000

Description

UHBVN, Haryana has proposed a Smart Grid Pilot in Panipat City Subdivision (Haryana State) covering 30,544 consumers and distribution system of 531 DTs. The area has around 131.8 MU input energy consumption. IT implementation and system strengthening is likely to be completed in 2013. The functionality of peak load management is proposed by implementing automated metering infrastructure (AMI) for residential consumers and industrial consumers. Utility has also envisaged using data of energy input from DT as well as energy consumption by consumers for detecting pilferage in the system, increasing collection efficiency, reducing AT&C losses, outage management, tamper event detection, and power quality management and enabling operator to take informed business decision. The pilot project proposes evolving a model of "time of use tariff incentives and disincentive and net metering for Renewable Energy" and process of demand response and demand management for peak load management and to do research and development for developing a mature model of the same for deploying at other towns.

Main application

Peak load management by implementing automated metering infrastructure (AMI) for residential and industrial consumers

Scenario for estimated costs and benefits

The proposed Cost Benefit Analysis for the pilot is based on the assumption of reducing distribution losses (including pilferage) from 30.10% to 16.50%; reducing peak load consumption by up to 9,000 units through shifting of peak load demand to a non-peak time and thereby saving differential UI charges for peak and non-peak which is about □ . 5 /unit for the utility; and by reducing cost of billing by up to 20%. Based on above savings the payback period is estimated to be around 4 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND9

TSECL, Tripura

Leading organization

TSECL, Tripura

Total budget

$4,500,000

Description

TSECL has proposed the pilot project in the Electrical Division No.1, of Agartala town covering 46,071 no. of consumers. IT implementation and system strengthening is likely to be completed in 2013. The functionality of peak load management is proposed by implementing automated metering infrastructure (AMI) for residential consumers and industrial consumers. The pilot project proposes developing a mature model of “time of use tariff and net metering.”

Main application

Peak load management by implementing automated metering infrastructure (AMI) for residential and industrial consumers

Scenario for estimated costs and benefits

The proposed cost benefit analysis for the pilot is based on the assumption of reducing distribution losses (including pilferage) resulting in proposed savings of up to 10.95 MUs of energy, reducing Peak load consumption by up to 2,604 units through shifting of peak load demand to a non-peak time and thereby saving differential UI charges for peak and non-peak which is about □ . 5 /unit for the utility and by reducing cost of billing by up to 50%. Based on above savings the payback period is estimated to be around 6 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND10

HPSEB, Himachal Pradesh

Leading organization

HPSEB, Himachal Pradesh

Total budget

$3,400,000

Description

HPSEB, Himachal Pradesh has proposed a Smart Grid Pilot in industrial town of KalaAmb covering 650 consumers and having annual input energy of 533 MUs. The functionality of peak load management and outage management is proposed by implementing automated metering infrastructure (AMI) for industrial consumers, distribution automation and substation automation and power quality management by deploying power quality meters at HT consumers.

Main application

Peak load management, outage management, and power quality management are proposed by implementing automated metering infrastructure (AMI) for industrial consumers

Other applications

Transformer Monitoring Units proposed to be installed for condition based monitoring.

Scenario for estimated costs and benefits

The proposed cost benefit analysis for the pilot is based on the assumption of savings by shifting 10% peak load, reduction in penalties by 40% and reduction in outages by 60%. Based on above savings the payback period is estimated to be around 2 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Percentage reduction of electricity losses; Reduced peak load

IRL1

CER National Smart Metering Plan

Leading organization

Electricity Supply Board - Networks (IE)

Description

The project assessed: the impact of Time of Use pricing and billing/information stimuli on the customer behaviour; and the available technologies for AMI roll out in an Irish context. The outcomes of both were factored into the cost benefit analysis for the full roll out of AMI in Ireland.

Main application

Smart Metering

Other applications

Smart Customer and Smart Home

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES), Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Reduced peak load

KOR1

Jeju Test Bed_Smart Place

Leading organization

KEPCO, KT, SKT, LG

Total budget

$96.4M

Description

AMI implementation for optimizing supply and demand with bidirectional communication technology between power suppliers and consumers

Main application

Smart Customer and Smart Home

Other applications

Smart Metering

Scenario for estimated costs and benefits

Deployment costs and benefits from energy cost savings

Policy goals

Additional demand side management power managed in the grid/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Reduced peak load

KOR4

Jeju Test Bed_Smart Electricity Service

Leading organization

KPX, KEPCO

Total budget

$18.0M

Description

Operating power grid system with Total Operation Center(TOC) and information management based on real time rates

Main application

Aggregation (Demand Response, VPP)

Other applications

Smart Network Management

Scenario for estimated costs and benefits

Deployment costs and benefits from energy cost savings

Policy goals

Increased number of consumers participating in electricity markets and in energy efficiency measures; Reduced peak load

NED1

Smart Grid Nieuweveens Landen Meppel

Leading organization

DNVKEMA

Total budget

5 million euros

Description

With the large scale introduction of renewable energy sources towards a sustainable energy system a number of challenges are imposed on the energy system. The intermittent character of renewable energy sources sets the need for more flexibility as well as backup power. To cope with these challenges, smart grid technology is being developed. Gas applications like (micro) cogeneration units and hybrid heat pump systems as well as the gas infrastructure play an essential role in smart grids and form a cost efficient cornerstone in balancing our networks, reduce (local) peak load on the electricity grid and prevent congestion. For the large scale implementation of a sustainable system, it is necessary to build experience in field tests. This is why DNV KEMA, together with TNO, ICT Automatisering, RWE Essent, Enexis and Gasunie started a living lab demonstration in Hoogkerk near Groningen in the Netherlands. PowerMatching City consists of 40-50 interconnected regular households of which 25 are already online since the beginning of 2010. These households are equipped with micro-cogeneration units, hybrid heat pumps, PV-solar panels, smart appliances and electric vehicles. Additional power is produced by a wind farm and a gas turbine.

Main application

Smart Network Management

Other applications

Smart Customer and Smart Home

Policy goals

Increased number of consumers participating in electricity markets and in energy efficiency measures; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Reduced peak load; Energy savings

NED2

Smart Grid Nieuweveens Landen Meppel

Leading organization

Municipality of Meppel and Rendo Energy company

Description

- Realising energy supplying neighborhood of over 3,000 households.
- Formation of a local sustainable energy company with participation of residents.
- Combining electricity, (bio)gas, heating and cooling in order to achieve a local energy balance.

Demonstrate technical and economical feasibility

Main application

Integration of DER

Other applications

Smart Customer and Smart Home

Scenario for estimated costs and benefits

Local sustainable energy company

Policy goals

Increased number of consumers participating in electricity markets and in energy efficiency measures; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Reduced peak load; Energy savings

SUI1

Swiss2G

Leading organization

SUPSI, Switzerland

Description

The overall goal of this pilot and demonstration project is the investigation of the technical feasibility of secure decentralized energy production, storage and consumption by combining available and new ICT and energy technologies in an intelligent, distributed, self-organizing system. The specific goal of the project is the optimization of the low voltage grid by algorithms based on decentralized decision at the home and appliance level with limited grid state knowledge at the individual 400V plugs, implemented in developed household appliance controllers. Swiss2G intends to analyse to which extent two-way communication can be avoided at the same time guaranteed high quality and availability of electricity.

Main application

Smart Network Management

Other applications

Integration of DER

Policy goals

Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Reduced peak load

SUI2

GridBox

Leading organization

SCS AG, Switzerland

Description

A monitoring and control infrastructure for the future electricity grids will be defined and tested. It consists of intelligent low-cost “GridBoxes.” The goal is high operational grid stability with masses of decentralized electricity infeeds and flexible consumer equipment in an automated end-consumer market considering minimization of costs. The concept foresees communication between the GridBoxes with the goal to detect the regional grid state including all information of elements within the regional grid.

Main application

Smart Network Management

Other applications

Integration of DER

Policy goals

Additional demand side management power managed in the grid/maximum power load; Reduced peak load Increased internal transfer capacity between TSOs or DSOs

SWE1

Grid4EU

Leading organization

ERDF

Description

Grid4EU is led by a group of European DSOs and aims at testing in real size some innovative system concepts and technologies in order to highlight and help to remove some of the barriers to the smart grids deployment (technical, economic, societal, environmental or regulatory). It focuses on how DSOs can dynamically manage electricity supply and demand, which is crucial for integration of large amounts of renewable energy and empowers consumers to become active participants in their energy choices.

Main application

Smart Network Management; Integration of DER; Aggregation; Smart Metering-Pilot

Policy goals

Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Percentage reduction of electricity losses; Reduced peak load

SWE2

Smart Grid Gotland

Leading organization

GEAB

Total budget
28 MEUR (242 MSEK)

Description
The Smart Grid Gotland R&D demonstration project intends to develop strategies for the planning, construction and operation of a fully developed, large-scale smart grid, including a large share of intermittent production, primarily from wind power in the distribution network. New market models and services will be developed to pave the way for new market players.

Main application
Smart Network Management

Other applications
Integration of DER; Integration of Large Scale RES; Smart Customer and Smart Home; Smart Metering

Scenario for estimated costs and benefits
No net present value calculation is yet available.

Policy goals
Additional demand side management power managed in the grid/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE4
Stockholm Royal seaport Active House Pilot

Leading organization
Fortum Distribution AB

Total budget
20 msek

Description
The long-term outcome will be a test apartment, based in Stockholm Royal Seaport, which is part of the solution from the pre-study in the area's housing. The plausibility and attraction of solutions have been deemed to create conditions to expand the number of participating construction companies in next phase. Part solution was to work together with the results from other projects that also have Stockholm Royal Seaport as the test bed. The apartment, which is included in the test installations, will have access to leading technology

in smart grids, appliances, information technology and design. They will also be active specifier and designers of new services and products being developed continuously. The results of this project make it possible for companies to develop products and services based on the technology that the project contributed. Researchers and entrepreneurs will be able to assimilate the results from this test apartment to develop their ideas and innovations.

Scenario for estimated costs and benefits

Customer participation in load shift to optimize load factors, impact climate effects and distribution automation systems to increase reliability and reduce losses. Hosting of DER at LV levels.

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE5

Stockholm Royal seaport demonstration phase

Leading organization

Fortum Distribution AB

Total budget

140 msek

Description

The program will specify, develop, test and evaluate both business and market models, new technical solutions and concepts, information and communications technology (ICT) as well as aspects of data security. As described in the pre-study, a set of scenario tests will be the cohesive factor in this work. In order to make it happen, an R&D platform needs to be developed and implemented as enablement for overall system tests, which will also include aspects of behavioural science. The first phase of the program and this application will focus on scenarios related to active end-customers and reliability of the future grid, where the urban smart grid in a new way creates opportunities for interaction with the end customer in order to, e.g., reduce CO_2 emissions. Also, scenarios for increased reliability and availability in a future urban smart grid will be tested.

Scenario for estimated costs and benefits

Customer participation in load shift to optimize load factors, impact climate effects and distribution automation systems to increase reliability and reduce losses. Hosting of DER at LV levels.

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE6

Smart Grid Hyllie

Leading organization

E.ON

Total budget

200 MSEK for 2011 through 2014. Additional years to follow.

Description

Hyllie - A test bed for developing solutions for a future transformed energy in the city of Malmö. The project includes: (a) Customer control of heat and electricity consumption, (b) Smart home and Smart building solutions, (c) Distributed generation – electricity and heat, (d) Smart grid solutions – DH and electricity, (e) Sustainable mobility solutions – gas and emobility, (f) CO_2 and resource efficient energy supply, and (g) Distributed energy storage.

Main application

Aggregation (Demand Response, VPP)

Other applications

Smart Customer and Smart Home

Scenario for estimated costs and benefits

Costs for 2011-2014 estimated to 200 MSEK (basically more or less all investments are to be seen as consumables); Analyses regarding benefits to be done in evaluation phase

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand

side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA1

gridSMART(SM) Demonstration Project

Leading organization

AEP Ohio

Total budget

$148,821,823

Description

This project is to build a secure, interoperable, and integrated Smart Grid infrastructure that demonstrates the ability to maximize distribution system efficiency and reliability, and consumer use of demand response programs to reduce energy consumption, peak demand costs, and fossil fuel emissions. The demonstration area includes 150 square miles including approximately 110,000 meters and 70 distribution circuits. AEP Ohio will implement Smart Grid technology over 58 13kV circuits from 10 distribution stations and 12 34.5kV circuits from six distribution stations. Included in this project is a redistribution management system, integrated volt-VAR control, distribution automation, advanced meter infrastructure, home area networks, community energy storage, sodium sulfur battery storage, and renewable generation sources. These technologies will be combined with two-way consumer communication and information sharing, demand response, dynamic pricing, and consumer products, such as plug-in hybrid vehicles.

Main application

Smart Network Management

Other applications

Smart Customer and Smart Home; Integration of DER; Smart Metering; Aggregation (Demand Response, VPP); Electric Vehicles and Vehicle2Grid Applications

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency

measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Reduced peak load

USA2

Pacific Northwest Division Smart Grid Demonstration Project

Leading organization

Battelle Memorial Institute

Total budget

$177,642,503

Description

This demonstration will validate new technologies; provide two-way communication between distributed generation, storage and demand assets, and the existing grid infrastructure; quantify Smart Grid costs and benefits; advance interoperability standards and cyber security approaches; and validate new business models. More than 20 types of responsive Smart Grid assets will be tested across six regional and utility operational objectives at 15 unique distribution sites operated by 12 utilities across five states and three climatic regions. A base of Smart Grid technology serving more than 60,000 customers will be installed, validated, and operated. All use classes are represented in the demonstration including residential, commercial, industrial, and irrigation customers. The demonstration will develop a single integrated Smart Grid incentive-signaling approach and will test and validate its ability to continuously coordinate the responses of Smart Grid assets to meet a wide range of operational objectives. It will also engage distributed control so that wind integration problems are mitigated. Micro-grid islanding will also be evaluated for its potential to enhance reliability for customers and relieve energy demand.

Main application

Smart Network Management

Other applications

Integration of DER; Integration of Large Scale RES; Aggregation (Demand Response, VPP); Smart Customer and Smart Home; Smart Metering

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration

and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA3

Smart Grid Deployment

Leading organization

Duke Energy Carolinas, LLC

Total budget

$555,706,307

Description

This project includes advanced metering infrastructure (AMI) and distribution automation systems in five states. The project involves large-scale deployments of AMI and distribution automation in Ohio and Indiana, a pilot deployment of AMI and distribution automation in Kentucky, and deployment of distribution automation in North and South Carolina. The project includes pilot programs for electricity pricing including time-of-use rates, peak-time rebates, and critical-peak pricing. Customers in these pilot programs use home area networks, web portals, and direct load control devices to reduce their electricity consumption and peak demand. Distribution automation equipment will be installed on 1,926 out of 4,741 circuits, which includes: distribution automation communications network; SCADA communications network; automated distribution circuit switches; automated capacitors; and equipment condition monitors.

Main application

Smart Metering

Other applications

Smart Customer and Smart Home; Aggregation (Demand Response, VPP); Smart Network Management

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals

Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA4

Smart Grid Project

Leading organization

EPB

Total budget

$226,707,562

Description

This project involves the installation of advanced metering systems and communications infrastructure. The project installs automated distribution grid equipment expected to enhance the reliability and quality of electric service delivery. The project implements two-way communications and metering expected to: (1) enable customers to view their energy consumption at their convenience through systems such as web portals, (2) provide timebased rate programs to customers, (3) provide information and tools to improve outage management, and (4) reduce operations and maintenance costs.

Main application

Smart Metering

Other applications

Smart Customer and Smart Home; Aggregation (Demand Response, VPP); Smart Network Management

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals

Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA5

Energy Smart Florida

Leading organization

Florida Power & Light Company

Total budget

$578,963,325

Description

This project is deploying advanced metering infrastructure (AMI), distribution automation, new electricity pricing programs, and advanced monitoring equipment for the transmission system. AMI supports two-way communication between FPL and its 3 million consumers receiving smart meters, providing detailed information about electricity usage and the ability to implement new electricity pricing programs. New distribution automation devices expand the functionality of FPL's distribution system to increase reliability, reduce energy losses, and reduce operations and maintenance costs. Synchrophasor and line monitoring devices help increase the reliability and security of the transmission system.

Main application

Smart Metering

Other applications

Smart Customer and Smart Home; Aggregation (Demand Response, VPP); Smart Network Management

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI), distribution automation systems, and wide-area transmission monitoring

Policy goals

Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA6

Enhanced Demand and Distribution Management Regional Demonstration

Leading organization

National Rural Electric Cooperative Association

Total budget

$67,864,292

Description

This project is demonstrating Smart Grid technologies with 27 cooperatives in 11 states across multiple utilities, geographies, climates, and applications including low density areas, low consumer income areas, and service areas prone to natural disasters. NRECA will conduct studies in advanced volt/volt-ampere reactive for total demand; generation and transmission-wide (G&T) demand response over advanced metering infrastructure (AMI); critical peak pricing over AMI; water heater and air conditioning load control over AMI;

advanced water heater control and thermal storage; consumer Internet energy usage portal pilots; consumer in-home energy display pilots; time-sensitive rates pilots; multiple AMI integration at G&T co-ops; distribution co-op meter data management system applications; and self-healing feeders for improved reliability.

Main application
Smart Metering

Other applications
Smart Network Management; Aggregation (Demand Response, VPP); Smart Customer and Smart Home

Scenario for estimated costs and benefits
Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals
Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA7
SmartSacramento

Leading organization
Sacramento Municipal Utility District

Total budget
$307,697,792

Description
This project involves system-wide deployment of an advanced metering system integrated with existing enterprise and information technology systems as well as a partial deployment of advanced distribution grid assets that equip SMUD's distribution circuits with automated control and operation capabilities. The project also involves customer systems that provide usage and cost information to customers that educate and enable more control over their consumption. These systems enable more informed participation by customers and more effective management by SMUD to improve reliability and efficiency of grid operations and better optimize the use of assets. The project includes a field test of plug-in electric vehicle charging stations to assess their technical performance, vehicle charging patterns, and effects on electric distribution system operations.

Main application
Smart Metering

Other applications
Smart Network Management; Aggregation (Demand Response, VPP); Smart Customer and Smart Home; Electric Vehicles and Vehicle2Grid Applications

Scenario for estimated costs and benefits
Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals
Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA8
Positive Energy Smart Grid Integration Program

Leading organization
Oklahoma Gas and Electric

Total budget
$293,201,332

Description
This project involves system-wide deployment of a fully integrated advanced metering system, distribution of in-home devices to almost 6,000 customers, and installation of advanced distribution automation systems. The program aims at reducing peak loads, overall electricity use, and operations and maintenance costs while increasing distribution system efficiency, reliability, and power quality. The program implements secure wireless communications to: (1) allow smart meter customers to view their electricity consumption data through a personalized web site, and (2) allow OG&E to manage, measure, and verify targeted demand reductions during peak periods. New systems capture meter information for billing and implement new customer pricing programs and service offerings. The project deploys a more dynamic distribution management system, automated switching, and integrated voltage and reactive power control (IVVC) that reduces line losses, reduces operational costs, and improves service reliability. The program also includes a study of consumer behavior in response to different forms of dynamic pricing on an opt-in basis. Finally, the program includes collaboration with University of Oklahoma faculty and students to deploy technologies within 46 buildings on the campus and to take advantage of opportunities for education and training.

Main application
Smart Metering

Other applications
Smart Network Management; Aggregation (Demand Response, VPP); Smart Customer and Smart Home

Scenario for estimated costs and benefits
Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals
Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA10
SmartGrid Program

Leading organization
Talquin Electric Cooperative

Total budget
$16,200,000

Description
This project involves the installation of advanced metering, communications infrastructure, distribution automation equipment, load control devices, and other customer systems. The project implements two-way communications to: (1) enable customers to view their energy consumption at their convenience through customer systems and web portals, (2) provide time-based rate programs to customers, (3) provide information and tools to improve outage management, and (4) reduce operations and maintenance costs. The project also installs automated distribution grid equipment expected to: (1) enhance the reliability and quality of electric delivery, and (2) reduce operations and maintenance costs.

Main application
Smart Metering

Other applications
Smart Network Management, Smart Customer and Smart Home

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals

Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

2.1.2 Transmission Level

ID	Name
FRA5	PREMIO-('Production Répartie, Enr et MDE, Intégrées et Optimisées', or, in English, 'Integration and Optimization of DG, DSM and Renewable Energies')
FRA6	Greenlys
FRA7	VENTEEA
GER3	MeRegio
IRL5	DS3
SWE2	Smart Grid Gotland
SWE4	Stockholm Royal seaport Active House Pilot
SWE5	Stockholm Royal seaport demonstration phase
SWE6	Smart Grid Hyllie
USA5	Energy Smart Florida

FRA5

PREMIO-('Production Répartie, Enr et MDE, Intégrées et Optimisées', or, in English, 'Integration and Optimization of DG, DSM and Renewable Energies')

Leading organization

CAPENERGIE – France

Description

PREMIO is primarily a technical proposal created to address the following goals: – to develop a dynamic demand-response specifically for peak shaving purposes, – to increase the flexibility of the power system, – to promote a new energy culture which encourages energy efficiency, – to integrate distributed generation and particularly renewable energies, – to reduce greenhouse gas emissions from polluting power plants, especially during peak load times, and – to manage regional electrical energy from a wide range of local actors.

PREMIO combines the control of installed distributed resources for optimal use with an awareness campaign promoting demand side management (DSM). The PREMIO platform includes a virtual power plant (VPP) which integrates approximately fifty distributed resources, all of which are distributed generation, storage technologies and customers' curtailable loads. The limited number of installations suggests that project results will be qualitative rather than quantitative.

Main application

Integration of DER; Aggregation

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Energy savings; Reduced peak load

FRA6

GreenLys

Leading organization

ERDF

Description

GreenLys is a systemic smart grid project which includes: - DER - Consumption - Networks (DSO & TSO). Main Goals: - decrease of greenhouse gases - control of energy bill - introduction and control of DER on LV networks - behavior of consumers, with incentive and innovative new offers - aggregator functions. Innovations: - Smart management of grid (seal-healing, smart metering using Linky infrastructure,...) - Demand side management, demand/response, energy saving and new offers (using boxes linked to Linky Infrastructure, tariffs, dynamic prices policy...) – Investments; Impact on studies and development of networks (especially for DSOs)

Main application

Smart Network Management; Integration of DER; Smart Customer and Smart Home

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Reduced peak load

FRA7
VENTEEA

Leading organization
ERDF

Description
In 2011, ERDF submitted the demonstrator as part of an ADEME program called “smart grid electric network” (AMI). Early 2012, the French Commissioner General for Investment (CGI) approved the project. The demonstrator is focused on the integration of large wind energy in distribution networks. More precisely the project will study observability and controllability of wind-farms, voltage regulation and centralized local protection plan and power quality. If the costs benefits analysis is validated by all involved stakeholders, a battery storage system offering a full service package would be implemented on 20 kV level.

Main application
Integration of DER

Policy goals
Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Percentage reduction of electricity losses; Reduced peak load

GER3
MeRegio

Leading organization
EnBW Energie Baden-Wuerttemberg AG

Total budget
24 Mio. EUR

Description
Around 1,000 private and industrial customers have been equipped with smart meters and a dynamic price signal. The goal of the project was to evaluate whether and how customers react on dynamic prices which have been calculated according to the availability of renewable energy.

Main application
Integration of Large Scale RES

Other applications
Smart Customer and Smart Home

Scenario for estimated costs and benefits
The project was for research/demonstration. Up to now there is no business case behind.

Policy goals
Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Energy savings; Reduced peak load; Increased internal transfer capacity between TSOs or DSOs

IRL5
DS3

Leading organization
Eirgrid

Description
EirGrid's DS3 programme is developing solutions to the challenges associated with increasing levels of renewable generation, particularly with regard to secure power system operation, as we work to achieve the 2020 renewable targets. The combination of the All island Grid Studies, EirGrid's Grid 25, the facilitation of renewables studies, and a comprehensive analysis of the long-term needs of the power system conducted in 2011, form the backbone of our plans to facilitate the 40% target by 2020. The main operational areas that need to be addressed are the management of the system frequency, balancing the system in real time, managing system voltage and ensuring the compliance of plant with the Grid Code requirements. The work programme includes enhancing the portfolio performance, developing new operational policies and system tools to efficiently use the plant portfolio to the best of its capabilities, and regularly reviewing the needs of the system as the portfolio capability evolves.

Main application
Integration of Large Scale RES

Other applications
Smart Network Management; Aggregation (Demand Response, VPP); Integration of DER

Policy goals
Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES; Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Percentage reduction of electricity losses; Reduced peak load; Additional interconnection capacity (specify HVDC and HVAC)

SWE2

Smart Grid Gotland

Leading organization

GEAB

Total budget

28 MEUR (242 MSEK)

Description

The Smart Grid Gotland R&D demonstration project intends to develop strategies for the planning, construction and operation of a fully developed, large-scale smart grid, including a large share of intermittent production, primarily from wind power in the distribution network. New market models and services will be developed to pave the way for new market players.

Main application

Smart Network Management

Other applications

Integration of DER; Integration of Large Scale RES; Smart Customer and Smart Home; Smart Metering

Scenario for estimated costs and benefits

No net present value calculation is yet available.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE4

Stockholm Royal seaport Active House Pilot

Leading organization

Fortum Distribution AB

Total budget

20 msek

Description

The long-term outcome will be a test apartment, based in Stockholm Royal Seaport, which is part of the solution from the pre-study in the area's housing. The plausibility and attraction of solutions have been deemed to create conditions to expand the number of participating construction companies in next phase. Part solution was to work together with the results from other projects that also have Stockholm Royal Seaport as the test bed. The apartment, which is included in the test installations, will have access to leading technology in smart grids, appliances, information technology and design. They will also be active specifier and designers of new services and products being developed continuously. The results of this project make it possible for companies to develop products and services based on the technology that the project contributed. Researchers and entrepreneurs will be able to assimilate the results from this test apartment to develop their ideas and innovations.

Scenario for estimated costs and benefits

Customer participation in load shift to optimize load factors, impact climate effects and distribution automation systems to increase reliability and reduce losses. Hosting of DER at LV levels.

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE5

Stockholm Royal seaport demonstration phase

Leading organization

Fortum Distribution AB

Total budget

140 msek

Description

The program will specify, develop, test and evaluate both business and market models, new technical solutions and concepts, information and communications technology (ICT) as well as aspects of data security. As described in the pre-study, a set of scenario tests will be the cohesive factor in this work. In order to make it happen, an R&D platform needs to be developed and implemented as enablement for overall system tests, which will also include aspects of behavioural science. The first phase of the program and this application will focus

on scenarios related to active end-customers and reliability of the future grid, where the urban smart grid in a new way creates opportunities for interaction with the end customer in order to, e.g., reduce CO_2 emissions. Also, scenarios for increased reliability and availability in a future urban smart grid will be tested.

Scenario for estimated costs and benefits

Customer participation in load shift to optimize load factors, impact climate effects and distribution automation systems to increase reliability and reduce losses. Hosting of DER at LV levels.

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE6

Smart Grid Hyllie

Leading organization

E.ON

Total budget

200 MSEK for 2011 through 2014. Additional years to follow.

Description

Hyllie - A test bed for developing solutions for a future transformed energy in the city of Malmö. The project includes: (a) Customer control of heat and electricity consumption, (b) Smart home and Smart building solutions, (c) Distributed generation – electricity and heat, (d) Smart grid solutions – DH and electricity, (e) Sustainable mobility solutions – gas and emobility, (f) CO_2 and resource efficient energy supply, and (g) Distributed energy storage.

Main application

Aggregation (Demand Response, VPP)

Other applications

Smart Customer and Smart Home

Scenario for estimated costs and benefits

Costs for 2011-2014 estimated to 200 MSEK (basically more or less all investments are to be seen as consumables); Analyses regarding benefits to be done in evaluation phase

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA5

Energy Smart Florida

Leading organization

Florida Power & Light Company

Total budget

$578,963,325

Description

This project is deploying advanced metering infrastructure (AMI), distribution automation, new electricity pricing programs, and advanced monitoring equipment for the transmission system. AMI supports two-way communication between FPL and its 3 million consumers receiving smart meters, providing detailed information about electricity usage and the ability to implement new electricity pricing programs. New distribution automation devices expand the functionality of FPL's distribution system to increase reliability, reduce energy losses, and reduce operations and maintenance costs. Synchrophasor and line monitoring devices help increase the reliability and security of the transmission system.

Main application

Smart Metering

Other applications

Smart Customer and Smart Home; Aggregation (Demand Response, VPP); Smart Network Management

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI), distribution automation systems, and wide-area transmission monitoring

Policy goals

Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

2.1.3 T&D Interface

ID	Name
FRA6	Greenlys
GER3	MeRegio
IND2	UGVCL, Gujarat
IND3	CESC, Mysore
IND4	KSEB, Kerala
IRL5	DS3
SWE1	Grid4EU
SWE2	Smart Grid Gotland
SWE6	Smart Grid Hyllie
USA2	Pacific Northwest Division Smart Grid Demonstration Project
USA5	Energy Smart Florida

FRA6

GreenLys

Leading organization

ERDF

Description

GreenLys is a systemic smart grid project which includes: - DER - Consumption - Networks (DSO & TSO). Main Goals: - decrease of greenhouse gases - control of energy bill - introduction and control of DER on LV networks - behavior of consumers, with incentive and innovative new offers - aggregator functions. Innovations: - Smart management of grid (seal-healing, smart metering using Linky infrastructure,...) - Demand side management, demand/response, energy saving and new offers (using boxes linked to Linky Infrastructure, tariffs, dynamic prices policy...) – Investments; Impact on studies and development of networks (especially for DSOs)

Main application
Smart Network Management; Integration of DER; Smart Customer and Smart Home

Policy goals
Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Reduced peak load

GER3
MeRegio

Leading organization
EnBW Energie Baden-Wuerttemberg AG

Total budget
24 Mio. EUR

Description
Around 1,000 private and industrial customers have been equipped with smart meters and a dynamic price signal. The goal of the project was to evaluate whether and how customers react on dynamic prices which have been calculated according to the availability of renewable energy.

Main application
Integration of Large Scale RES

Other applications
Smart Customer and Smart Home

Scenario for estimated costs and benefits
The project was for research/demonstration. Up to now there is no business case behind.

Policy goals
Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Energy savings; Reduced peak load; Increased internal transfer capacity between TSOs or DSOs

IND2

UGVCL, Gujarat

Leading organization

UGVCL

Total budget

$9,200,000

Description

UGVCL has proposed the pilot project in Naroda of Sabarmati circle which is an industrial and residential area and Deesa of Palanpur circle which is an agricultural area covering 20,524 consumers in Naroda and 18,898 agricultural unmetered consumers in Deesa-II division and accounting for input energy of around 1700 MU (Naroda : 374.52 MU & Deesa : 1321.27 MU for 2010-11). The functionalities of peak load management, outage management, power quality management are proposed by implementing automated metering infrastructure (AMI) for industrial, commercial and residential consumers. Committee also observed that some additional functionalities like load forecasting and asset management are also proposed and functionalities of load forecasting, peak power management and outage management are also considered at utility level which will impact all consumers of utility (i.e., 27 lac consumers) indirectly. Renewable energy integration has been proposed to be carried out at Patan Solar Park and few roof top installations at some of the universities. The pilot project proposes to introduce TOU tariff with approvals from GERC. Renewable energy integration is proposed through proper and accurate load forecast by real time monitoring of substations, feeders and RES generation.

Main application

Peak load management, outage management, and power quality management are proposed by implementing automated metering infrastructure (AMI) for industrial, commercial and residential consumers.

Other applications

Load forecasting and asset management are proposed. Load forecasting, peak power management and outage management are considered at utility level. Renewable energy integration at Patan Solar Park and few roof top installations are also envisaged.

Scenario for estimated costs and benefits

The ROI is proposed to be realized through benefits on account of reduction in AT&C losses from 12.44% to around 8.44% in Naroda and from 21.69% to 15% in Deesa; savings in peak power purchase cost by reduction of peak load by up to 5% in both areas; reduction in transformer failure rate from 16.52% to 8% in Deesa area; and reduction in number of outages, meter reading cost, cost of payment collection, etc. Based on projected savings the payback period is likely to be around 2 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND3

CESC, Mysore

Leading organization

CESC, Mysore

Total budget

$6,150,000

Description

CESC, Mysore has proposed the pilot project in Additional City Area Division (ACAD), Mysore involving 21,824 consumers with a good mix of residential, commercial, industrial and agricultural consumers including 512 irrigation pump sets covering over 14 feeders and 473 distribution transformers and accounting for input energy of 151.89 MU. The functionalities of peak load management, outage management are proposed by implementing automated metering infrastructure (AMI) for residential consumers and industrial consumers and integration of distributed generation / micro grid integration. Some additional functionality like agriculture DSM with community portal, consumer portal to support DSM/DR, employee portal for knowledge sharing and benefit realization, KPI based MIS and data analytics for decision support are also proposed. The pilot project proposes to introduce real time pricing signal by interfacing at SLDC level to get UI/ABT prices subject to regulatory consent. Implementation of Fault Location Isolation and System Restoration (FLISR) at feeders where alternate feeding arrangements are available is also proposed.

Main application

Peak load management, outage management by implementing automated metering infrastructure (AMI) for residential consumers and industrial consumers; Integration of distributed generation/micro grid integration

Other applications

Agriculture DSM with community portal

Scenario for estimated costs and benefits

ROI is proposed to be realized through benefits on account of reduction in AT&C losses from 10.6% to 5.7% in 3 years, shifting of load of up to 80% in industrial feeders and up to 20% for domestic consumer during peak hours, reduction in number of transformer failure, meter reading cost, reduction in unforeseen outages and also recovery time for unforeseen outages by 20% and 50%. Based on projected savings the payback period is likely to be less than 3 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND4

KSEB, Kerala

Leading organization

KSEB, Kerala

Total budget

$5,200,000

Description

KSEB Smart Grid Pilot covers around 25078 LT Industrial consumers of selected distribution section offices spread over the geographical area of Kerala State. The input energy for the total scheme area is 2108 MUs and for the LT Industrial consumers is 376 MUs. Automated metering infrastructure (AMI) is proposed to provide quality service, prevent tampering and unauthorised usage of load, accurate and timely metering and billing, avoiding costly field visits of Sub Engineers for meter reading, reducing supply restoration time, peak load management through load restriction for Remote Disconnection/Reconnection and Time of Day tariff.

Main application

Automated metering infrastructure (AMI); Peak load management

Scenario for estimated costs and benefits

ROI is proposed to be realized through benefits on account of Reduction in AT&C losses of about 1.17% (24.82 MUs) through reduction in loss due to manual error, tampers, thefts, short assessment, etc., savings on employee and travel cost for meter reading and introducing incremental tariff for peak hours through ToD Tariff. Based on above savings the payback period is estimated to be around 2.5 years

Policy goals

Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency

measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

IRL5

DS3

Leading organization

Eirgrid

Description

EirGrid's DS3 programme is developing solutions to the challenges associated with increasing levels of renewable generation, particularly with regard to secure power system operation, as we work to achieve the 2020 renewable targets. The combination of the All island Grid Studies, EirGrid's Grid 25, the facilitation of renewables studies, and a comprehensive analysis of the long-term needs of the power system conducted in 2011, form the backbone of our plans to facilitate the 40% target by 2020. The main operational areas that need to be addressed are the management of the system frequency, balancing the system in real time, managing system voltage and ensuring the compliance of plant with the Grid Code requirements. The work programme includes enhancing the portfolio performance, developing new operational policies and system tools to efficiently use the plant portfolio to the best of its capabilities, and regularly reviewing the needs of the system as the portfolio capability evolves.

Main application

Integration of Large Scale RES

Other applications

Smart Network Management; Aggregation (Demand Response, VPP); Integration of DER

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES; Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Percentage reduction of electricity losses; Reduced peak load; Additional interconnection capacity (specify HVDC and HVAC)

SWE1

Grid4EU

Leading organization

ERDF

Description

Grid4EU is led by a group of European DSOs and aims at testing in real size some innovative system concepts and technologies in order to highlight and help to remove some of the barriers to the smart grids deployment (technical, economic, societal, environmental or regulatory). It focuses on how DSOs can dynamically manage electricity supply and demand, which is crucial for integration of large amounts of renewable energy and empowers consumers to become active participants in their energy choices.

Main application

Smart Network Management; Integration of DER; Aggregation; Smart Metering-Pilot

Policy goals

Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Percentage reduction of electricity losses; Reduced peak load

SWE2

Smart Grid Gotland

Leading organization

GEAB

Total budget

28 MEUR (242 MSEK)

Description

The Smart Grid Gotland R&D demonstration project intends to develop strategies for the planning, construction and operation of a fully developed, large-scale smart grid, including a large share of intermittent production, primarily from wind power in the distribution network. New market models and services will be developed to pave the way for new market players.

Main application

Smart Network Management

Other applications

Integration of DER; Integration of Large Scale RES; Smart Customer and Smart Home; Smart Metering

Scenario for estimated costs and benefits

No net present value calculation is yet available.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE6

Smart Grid Hyllie

Leading organization

E.ON

Total budget

200 MSEK for 2011 through 2014. Additional years to follow.

Description

Hyllie - A test bed for developing solutions for a future transformed energy in the city of Malmö. The project includes: (a) Customer control of heat and electricity consumption, (b) Smart home and Smart building solutions, (c) Distributed generation – electricity and heat, (d) Smart grid solutions – DH and electricity, (e) Sustainable mobility solutions – gas and emobility, (f) CO_2 and resource efficient energy supply, and (g) Distributed energy storage.

Main application

Aggregation (Demand Response, VPP)

Other applications

Smart Customer and Smart Home

Scenario for estimated costs and benefits

Costs for 2011-2014 estimated to 200 MSEK (basically more or less all investments are to be seen as consumables); Analyses regarding benefits to be done in evaluation phase

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA2

Pacific Northwest Division Smart Grid Demonstration Project

Leading organization

Battelle Memorial Institute

Total budget

$177,642,503

Description

This demonstration will validate new technologies; provide two-way communication between distributed generation, storage and demand assets, and the existing grid infrastructure; quantify Smart Grid costs and benefits; advance interoperability standards and cyber security approaches; and validate new business models. More than 20 types of responsive Smart Grid assets will be tested across six regional and utility operational objectives at 15 unique distribution sites operated by 12 utilities across five states and three climatic regions. A base of Smart Grid technology serving more than 60,000 customers will be installed, validated, and operated. All use classes are represented in the demonstration including residential, commercial, industrial, and irrigation customers. The demonstration will develop a single integrated Smart Grid incentive-signaling approach and will test and validate its ability to continuously coordinate the responses of Smart Grid assets to meet a wide range of operational objectives. It will also engage distributed control so that wind integration problems are mitigated. Micro-grid islanding will also be evaluated for its potential to enhance reliability for customers and relieve energy demand.

Main application

Smart Network Management

Other applications

Integration of DER; Integration of Large Scale RES; Aggregation (Demand Response, VPP); Smart Customer and Smart Home; Smart Metering

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA5
Energy Smart Florida

Leading organization
Florida Power & Light Company

Total budget
$578,963,325

Description
This project is deploying advanced metering infrastructure (AMI), distribution automation, new electricity pricing programs, and advanced monitoring equipment for the transmission system. AMI supports two-way communication between FPL and its 3 million consumers receiving smart meters, providing detailed information about electricity usage and the ability to implement new electricity pricing programs. New distribution automation devices expand the functionality of FPL's distribution system to increase reliability, reduce energy losses, and reduce operations and maintenance costs. Synchrophasor and line monitoring devices help increase the reliability and security of the transmission system.

Main application
Smart Metering

Other applications
Smart Customer and Smart Home; Aggregation (Demand Response, VPP); Smart Network Management

Scenario for estimated costs and benefits
Advanced metering infrastructure (AMI), distribution automation systems, and wide-area transmission monitoring

Policy goals
Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

2.2 Energy Savings (Energy Efficiency and Savings)

Summaries of projects in the inventory selected as contributing to the policy goal of "Energy Savings (Energy Efficiency and Savings)" are presented in order of their physical application domains: Distribution Level, Transmission Level, and T&D Interface. Within each domain, project summaries are presented in alphanumerical order of their unique Project IDs.

2.2.1 Distribution Level

ID	Name
AUT2	SG Showcase Region Salzburg
AUT3	SG Pioneer Region Upper Austria
CAN2	Zone de réseau interatif
FRA1	Smart Grid Vendée
FRA4	Smart Electric Lyon
FRA5	PREMIO-('Production Répartie, Enr et MDE, Intégrées et Optimisées', or, in English, 'Integration and Optimization of DG, DSM and Renewable Energies')
FRA6	Greenlys
GER2	Smart Area Aachen
GER3	MeRegio
GER4	eTelligence
GER6	Smart Watts
GER7	Model City Mannheim
IND1	Puducherry
IND2	UGVCL, Gujarat
IND3	CESC, Mysore
IND4	KSEB, Kerala
IND5	APDCL, Assam
IND6	APCPDCL, Andhra Pradesh
IND7	UHBVN, Haryana
IND9	TSECL, Tripura
IND10	HPSEB, Himachal Pradesh
IND11	MSEDCL, Maharashtra
IRL1	CER National Smart Metering Plan
KOR2	Jeju Test Bed_Smart Transportation
KOR3	Jeju Test Bed_Smart Renewable
NED1	Smart Grid Nieuweveens Landen Meppel
NED2	Smart Grid Nieuweveens Landen Meppel
SWE2	Smart Grid Gotland
SWE4	Stockholm Royal seaport Active House Pilot

SWE5	Stockholm Royal seaport demonstration phase
SWE6	Smart Grid Hyllie
USA1	gridSMART(SM) Demonstration Project
USA2	Pacific Northwest Division Smart Grid Demonstration Project
USA3	Smart Grid Deployment
USA4	Smart Grid Project
USA5	Energy Smart Florida
USA6	Enhanced Demand and Distribution Management Regional Demonstration
USA7	SmartSacramento
USA8	Positive Energy Smart Grid Integration Program
USA10	SmartGrid Program

AUT2

SG Showcase Region Salzburg

Leading organization

Salzburg AG

Total budget

EUR 7.7m

Description

SGMS consists of several research activities and lies the focus on:

- Active operation of middle and low voltage networks (Projects ZUQDE and DG DemoNet Validation)
- Load shifting and demand side management: especially the role of the buildings as active power grid components in a Smart Grid are investigated (Building2Grid, Consumer2Grid, HiT: Rosa Zukunft)
- Field testing and pilot project with Smart Metering considering the sectors electricity, gas, water and district heating
- Integration of e-mobility (Vehicle2Grid Strategies)
- Currently (2012-2014) field tests in the community Köstendorf and in the medium voltage grid in the region Lungau are undertaken to validate simulation results and so far the concept has proven successful

Main application

Smart Network Management

Other applications

Integration of DER; Electric Vehicles and Vehicle2Grid applications; Smart Customer and

Smart Home

Policy goals

Additional DER hosting power input in the grid (incl. EV and storage)/ maximum power load; Energy savings

AUT3

SG Pioneer Region Upper Austria

Leading organization

Energie AG

Total budget

EUR 3.8m

Description

The project aims to enable an efficient and cost effective use of existing grid infrastructures based on a three-step concept: intelligent planning, on-line monitoring, and active grid management. Communication-based systems for automatic control concepts for low voltage networks will be developed and evaluated by putting them into practice. Smart Meters are used as monitoring device for the grid. Smart Meter communication infrastructure is used for network control purposes.

Main application

Integration of DER

Other applications

Smart Network Management, Smart Metering

Policy goals

Additional DER hosting power input in the grid (incl. EV and storage)/ maximum power
Load Energy savings

CAN2

Zone de réseau interatif

Leading organization

Hydro-Québec Distribution

Total budget

$25,585,000

Description

Hydro-Québec has a distribution grid evolution plan which includes progressive smart grid technology implementation. To ensure successful implementation, Hydro-Québec decided to create a smart zone where the technologies will be deployed in order to improve energy efficiency and grid performance. The first smart grid technology to be deployed in the zone will be a DMS (Distribution Management System) with integrated voltage and reactive power control linked to the current distribution grid control system. In 2008, Hydro-Québec introduced a simple voltage regulation and reactive power control system to the Pierre-Boucher substation to reduce energy use, grid losses and greenhouse gases (GHGs). Hydro-Québec estimates that a VVO (Volt Var Optimization) type smart system would allow it to increase energy efficiency compared to a VVC (Volt Var Control) type system. The second smart grid technology involves charging stations with and without intelligence for electric vehicles, scheduled for installation between 2010 and 2012. The agreement between Hydro-Québec and Mitsubishi calls for testing of up to 30 all-electric iMiEV type vehicles. The goal of the project is to better understand charging and driving behaviors, as well as charging infrastructure needs at 120V/15A, 240V/15-30A, and direct current charging (50kW).

Main application

Electric Vehicles and Vehicle2Grid Applications

Other applications

Smart Metering

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Increased internal transfer capacity between TSOs or DSOs

FRA1

Smart Grid Vendée

Leading organization

SyDEV

Total budget

To be made public 1st quarter 2013.

Description

To be made public 1st quarter 2013.

Main application

Smart Network Management

Other applications
Aggregation (Demand Response, VPP)

Policy goals
Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Energy savings

FRA4
Smart Electric Lyon

Leading organization
EDF

Total budget
To be made public 1st quarter 2013.

Description
To be made public 1st quarter 2013.

Main application
Smart Customer and Smart Home

Policy goals
Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings

FRA5
PREMIO-('Production Répartie, Enr et MDE, Intégrées et Optimisées', or, in English, 'Integration and Optimization of DG, DSM and Renewable Energies')

Leading organization
CAPENERGIE – France

Description
PREMIO is primarily a technical proposal created to address the following goals: – to develop a dynamic demand-response specifically for peak shaving purposes, – to increase the flexibility of the power system, – to promote a new energy culture which encourages energy efficiency, – to integrate distributed generation and particularly renewable energies, – to reduce greenhouse gas emissions from polluting power plants, especially during peak load times, and – to manage regional electrical energy from a wide range of local actors. PREMIO combines the control of installed distributed resources for optimal use with an awareness campaign promoting demand side management (DSM). The PREMIO platform includes a virtual power plant (VPP) which integrates approximately fifty distributed

resources, all of which are distributed generation, storage technologies and customers' curtailable loads. The limited number of installations suggests that project results will be qualitative rather than quantitative.

Main application

Integration of DER; Aggregation

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Energy savings; Reduced peak load

FRA6

GreenLys

Leading organization

ERDF

Description

GreenLys is a systemic smart grid project which includes: - DER - Consumption - Networks (DSO & TSO). Main Goals: - decrease of greenhouse gases - control of energy bill - introduction and control of DER on LV networks - behavior of consumers, with incentive and innovative new offers - aggregator functions. Innovations: - Smart management of grid (seal-healing, smart metering using Linky infrastructure,...) - Demand side management, demand/response, energy saving and new offers (using boxes linked to Linky Infrastructure, tariffs, dynamic prices policy...) – Investments; Impact on studies and development of networks (especially for DSOs)

Main application

Smart Network Management; Integration of DER; Smart Customer and Smart Home

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Reduced peak load

GER2

Smart Area Aachen

Leading organization
Stadtwerke Aachen Aktiengesellschaft

Total budget
$9,152,280

Description

Smart Area Aachen aims at developing new holistic concepts and methods based on new equipment for future smart grid solutions. In this context, innovative technical solutions are identified, optimized and eventually verified in pilot trials. Moreover, new business models are developed for the different stakeholders and harmonization aspects are addressed in accompanying standardization activities.

Main application

Smart grid applications in general: equipment, planning, operation

Scenario for estimated costs and benefits

Smart grid infrastructure

Policy goals

Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.) Energy savings; Percentage reduction of electricity losses; Reduced peak load

GER3

MeRegio

Leading organization

EnBW Energie Baden-Wuerttemberg AG

Total budget

24 Mio. EUR

Description

Around 1,000 private and industrial customers have been equipped with smart meters and a dynamic price signal. The goal of the project was to evaluate whether and how customers react on dynamic prices which have been calculated according to the availability of renewable energy.

Main application

Integration of Large Scale RES

Other applications

Smart Customer and Smart Home

Scenario for estimated costs and benefits

The project was for research/demonstration. Up to now there is no business case behind.

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Energy savings; Reduced peak load; Increased internal transfer capacity between TSOs or DSOs

GER4

eTelligence

Leading organization

EWE AG

Total budget

27.039.630,91 USD(1 USD = 0,739655 EUR)

Description

The main goal of eTelligence was to develop, build and test the integrated future smart energy system with a secure, interoperable ICT infrastructure. Parts of this overall system were tested in the field: 650 households including smart meter with new feedback systems and new electricity tariffs; an electronic market place; VPP including cold stores whose load was used to optimize the VPP. In addition, the project installed measurement equipment to optimize the grid management. To ensure the overall use, the project developed a power plant model which mapped the flexibilities and units of renewable energy in scenarios for 2020 and 2030 based on the results from the project.

Main application

Exploration of the future energy system

Other applications

Integration of DER, Aggregation (Demand Response, VPP); Smart Customer and Smart Home; Smart Metering

Policy goals

Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings

GER6

Smart Watts

Leading organization

utilicount GmbH & Co. KG

Total budget

up to ca. 20 Million EUR

Description

Central idea of the project, "Smart Watts," is to compensate the increased volatility of energy supply, due to the increased integration of renewable energy, by load balancing on the demand side and rises in energy efficiency - focused on private households. The market players gain access to current actual data by a dynamic information exchange of supply and demand information. This enables the generation of additional data such as dynamic purchasing conditions, which then can be offered to private households. The dynamic purchasing information (e.g., prices) are meant to motivate private households to shift their load. Therefore the households use an visualization, controlling and steering tablet pc App.

Main application

Smart Customer and Smart Home; Smart Metering; Aggregation (Demand Response, VPP)

Other applications

Aggregation (Demand Response, VPP)

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Additional Demand Side Management power managed in the grid/maximum power load; Reduced peak load; Energy savings

GER7

Model City Mannheim

Leading organization

MVV Energie AG

Total budget

20,800,000€

Description

(1) Better integration of renewable energy sources via balancing volatile generation and usage, (2) Demand side response via variable tariffs as inventive for load shifting, (3)Increase of connection capacity of renewable energy sources in distribution grids and management of bi-directional energy flows via cellular grid operation

Main application

Aggregation (Demand Response, VPP)

Other applications

Smart Network Management

Scenario for estimated costs and benefits

Distribution automation systems

Policy goals

Additional Demand Side Management power managed in the grid/maximum power load; Additional RES hosting power in the grid /maximum power load; Energy savings; Reduced peak load

IND1

Puducherry

Leading organization

Puducherry Electricity Department

Total budget

$8,700,000

Description

Pilot covers 87,031 no. of consumers with dominant being domestic consumers. The module of automated metering infrastructure (AMI) for residential consumers and industrial consumers is proposed to be implemented to assist with consumer issues like event management & prioritizing, billing cycle review and revenue collection efficiency for energy auditing and AT&C loss reduction. The AMI system shall aid in knowing real time energy input from DT as well as energy consumption by consumers that can instantly help to know losses in the system. Common Meter Data Management System is proposed that shall take data from MDMS of different meter manufacturer/solution provider and integrate the information for use. The pilot project also proposes developing a mature model of “time of use tariff and net metering.”

Main application

AMI for Industrial and Residential Consumers

Scenario for estimated costs and benefits

The proposed Cost Benefit Analysis for the pilot is based on the assumption of reducing Distribution Losses from 14% resulting in savings of about 25.5 MUs, reducing cost of billing by up to 50% and Increasing revenue collection efficiency from 90% to 98%. The payback period is likely to be around 6 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND2

UGVCL, Gujarat

Leading organization

UGVCL

Total budget

$9,200,000

Description

UGVCL has proposed the pilot project in Naroda of Sabarmati circle which is an industrial and residential area and Deesa of Palanpur circle which is an agricultural area covering 20,524 consumers in Naroda and 18,898 agricultural unmetered consumers in Deesa-II division and accounting for input energy of around 1700 MU (Naroda : 374.52 MU & Deesa : 1321.27 MU for 2010-11). The functionalities of peak load management, outage management, power quality management are proposed by implementing automated metering infrastructure (AMI) for industrial, commercial and residential consumers. Committee also observed that some additional functionalities like load forecasting and asset management are also proposed and functionalities of load forecasting, peak power management and outage management are also considered at utility level which will impact all consumers of utility (i.e., 27 lac consumers) indirectly. Renewable energy integration has been proposed to be carried out at Patan Solar Park and few roof top installations at some of the universities. The pilot project proposes to introduce TOU tariff with approvals from GERC. Renewable energy integration is proposed through proper and accurate load forecast by real time monitoring of substations, feeders and RES generation.

Main application

Peak load management, outage management, and power quality management are proposed by implementing automated metering infrastructure (AMI) for industrial, commercial and residential consumers.

Other applications

Load forecasting and asset management are proposed. Load forecasting, peak power management and outage management are considered at utility level. Renewable energy integration at Patan Solar Park and few roof top installations are also envisaged.

Scenario for estimated costs and benefits

The ROI is proposed to be realized through benefits on account of reduction in AT&C losses from 12.44% to around 8.44% in Naroda and from 21.69% to 15% in Deesa; savings in peak power purchase cost by reduction of peak load by up to 5% in both areas; reduction in transformer failure rate from 16.52% to 8% in Deesa area; and reduction in number of outages, meter reading cost, cost of payment collection, etc. Based on projected savings the payback period is likely to be around 2 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND3

CESC, Mysore

Leading organization

CESC, Mysore

Total budget

$6,150,000

Description

CESC, Mysore has proposed the pilot project in Additional City Area Division (ACAD), Mysore involving 21,824 consumers with a good mix of residential, commercial, industrial and agricultural consumers including 512 irrigation pump sets covering over 14 feeders and 473 distribution transformers and accounting for input energy of 151.89 MU. The functionalities of peak load management, outage management are proposed by implementing automated metering infrastructure (AMI) for residential consumers and industrial consumers and integration of distributed generation / micro grid integration. Some additional functionality like agriculture DSM with community portal, consumer portal to support DSM/DR, employee portal for knowledge sharing and benefit realization, KPI based MIS and data analytics for decision support are also proposed. The pilot project proposes to introduce real time pricing signal by interfacing at SLDC level to get UI/ABT prices subject to regulatory consent. Implementation of Fault Location Isolation and System Restoration (FLISR) at feeders where alternate feeding arrangements are available is also proposed.

Main application

Peak load management, outage management by implementing automated metering infrastructure (AMI) for residential consumers and industrial consumers; Integration of distributed generation/micro grid integration

Other applications

Agriculture DSM with community portal

Scenario for estimated costs and benefits

ROI is proposed to be realized through benefits on account of reduction in AT&C losses from 10.6% to 5.7% in 3 years, shifting of load of up to 80% in industrial feeders and up to 20% for domestic consumer during peak hours, reduction in number of transformer failure, meter reading cost, reduction in unforeseen outages and also recovery time for unforeseen outages by 20% and 50%. Based on projected savings the payback period is likely to be less than 3 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND4

KSEB, Kerala

Leading organization

KSEB, Kerala

Total budget

$5,200,000

Description

KSEB Smart Grid Pilot covers around 25078 LT Industrial consumers of selected distribution section offices spread over the geographical area of Kerala State. The input energy for the total scheme area is 2108 MUs and for the LT Industrial consumers is 376 MUs. Automated metering infrastructure (AMI) is proposed to provide quality service, prevent tampering and unauthorised usage of load, accurate and timely metering and billing, avoiding costly field visits of Sub Engineers for meter reading, reducing supply restoration time, peak load management through load restriction for Remote Disconnection/Reconnection and Time of Day tariff.

Main application

Automated metering infrastructure (AMI); Peak load management

Scenario for estimated costs and benefits

ROI is proposed to be realized through benefits on account of Reduction in AT&C losses of about 1.17% (24.82 MUs) through reduction in loss due to manual error, tampers, thefts, short assessment, etc., savings on employee and travel cost for meter reading and introducing incremental tariff for peak hours through ToD Tariff. Based on above savings the payback period is estimated to be around 2.5 years

Policy goals

Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency

measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND5

APDCL, Assam

Leading organization

APDCL, Assam

Total budget

$5,500,000

Description

APDCL, Assam has proposed a Smart Grid Pilot in Guwahati distribution region, covering 15,000 consumers and involving 90MUs of input energy. APDCL is in the process IT Implementation under R-APDRP and SCADA/DMS implementation is also to be taken up shortly. APDCL has proposed the functionality of peak load management using industrial and residential AMI, integration of distributed generation (solar and available back-up DG set) and outage management system. The utility has envisaged that power quality monitoring will be a by-product of the deployment. In the smart grid pilot project Integration of the 100kW solar farm into the distribution network via a bidirectional inverter and use of battery storage, possibly Vanadium redox battery, in conjunction with the solar farm is proposed. In addition R&D works are proposed for: Forecasting of load based on the weather, social events, festivals, etc. and developing various "if-then" scenarios to find optimal course of action for each scenario; Developing controllers for the bidirectional inverter and battery integration; Development of filters for reduction of harmonics injected into the grid and integrating it into the smart meters; and Development of messaging systems (for display in house and on mobile) for power consumption information and methods to reduce energy consumption. Study of the Guwahati's distribution grid to identify the locations and sizes of the Vanadium redox batteries for peak shaving and valley filling is also proposed.

Main application

Peak load management; Outage management by implementing automated metering infrastructure (AMI) for residential consumers and industrial consumers; Power quality management; Integration of distributed generation

Scenario for estimated costs and benefits

The cost benefit analysis for the pilot is based on increased available energy of 55,602.5 kWh during peak time resulting in a saving of Rs. 3 Cr per year, revenue increase through power quality measurements and power factor penalty (assuming a 5% variation in power factor across 20% of the customers, paying an average 2% penalty); Reduction in AT&C losses from 16.7% to 12.55%; Reduction in interest payments due to deferred capital investment in sub-transmission networks, improvement of availability (reduction of customer minutes lost) and improved management of power procurement options; Unscheduled interchange using short term load forecasts. Based on above savings the payback period is estimated to be around 5 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND6

APCPDCL, Andhra Pradesh

Leading organization

APCPDCL, Andhra Pradesh

Total budget

$7,900,000

Description

The design proposes a Smart Grid Control Center housing the IT systems, a two way communication system for AMI. The number of customers in the project area is 38,303. However over 11,904 are covered under AMI implementation and smart meters will be for these numbers of customers. The functionalities of peak load management, power quality and outage management are proposed by implementing automated metering infrastructure (AMI) for residential consumers and industrial consumers. DAS, IT and SCADA shall be implemented. The CBM for DTR is proposed as an early warning of health of assets. The customer web portal would provide all customer related information and to seek their participation.

Main application

Peak load management; Outage management; Power quality management are proposed by implementing automated metering infrastructure (AMI) for industrial and residential consumers

Other applications

Condition based monitoring for DTR and customer web portal

Scenario for estimated costs and benefits

The proposed cost benefit analysis for the pilot is based on the assumption of reducing AT&C loss from present 9.48% to 7.48% and energy saving during peak times by shifting about 35.68 MUs from peak periods and thereby reduced purchase of high cost power at peak hours. Based on above savings the payback period is estimated to be around 2.5 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND7

UHBVN, Haryana

Leading organization

UHBVN, Haryana

Total budget

$3,200,000

Description

UHBVN, Haryana has proposed a Smart Grid Pilot in Panipat City Subdivision (Haryana State) covering 30,544 consumers and distribution system of 531 DTs. The area has around 131.8 MU input energy consumption. IT implementation and system strengthening is likely to be completed in 2013. The functionality of peak load management is proposed by implementing automated metering infrastructure (AMI) for residential consumers and industrial consumers. Utility has also envisaged using data of energy input from DT as well as energy consumption by consumers for detecting pilferage in the system, increasing collection efficiency, reducing AT&C losses, outage management, tamper event detection, and power quality management and enabling operator to take informed business decision. The pilot project proposes evolving a model of “time of use tariff incentives and disincentive and net metering for Renewable Energy” and process of demand response and demand management for peak load management and to do research and development for developing a mature model of the same for deploying at other towns.

Main application

Peak load management by implementing automated metering infrastructure (AMI) for residential and industrial consumers

Scenario for estimated costs and benefits

The proposed Cost Benefit Analysis for the pilot is based on the assumption of reducing distribution losses (including pilferage) from 30.10% to 16.50%; reducing peak load consumption by up to 9,000 units through shifting of peak load demand to a non-peak time and thereby saving differential UI charges for peak and non-peak which is about □ . 5 /unit for the utility; and by reducing cost of billing by up to 20%. Based on above savings the payback period is estimated to be around 4 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND9

TSECL, Tripura

Leading organization

TSECL, Tripura

Total budget

$4,500,000

Description

TSECL has proposed the pilot project in the Electrical Division No.1, of Agartala town covering 46,071 no. of consumers. IT implementation and system strengthening is likely to be completed in 2013. The functionality of peak load management is proposed by implementing automated metering infrastructure (AMI) for residential consumers and industrial consumers. The pilot project proposes developing a mature model of “time of use tariff and net metering.”

Main application

Peak load management by implementing automated metering infrastructure (AMI) for residential and industrial consumers

Scenario for estimated costs and benefits

The proposed cost benefit analysis for the pilot is based on the assumption of reducing distribution losses (including pilferage) resulting in proposed savings of up to 10.95 MUs of energy, reducing Peak load consumption by up to 2,604 units through shifting of peak load demand to a non-peak time and thereby saving differential UI charges for peak and non-peak which is about . 5 /urti for the utility and by reducing cost of billing by up to 50%. Based on above savings the payback period is estimated to be around 6 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND10

HPSEB, Himachal Pradesh

Leading organization

HPSEB, Himachal Pradesh

Total budget
$3,400,000

Description
HPSEB, Himachal Pradesh has proposed a Smart Grid Pilot in industrial town of KalaAmb covering 650 consumers and having annual input energy of 533 MUs. The functionality of peak load management and outage management is proposed by implementing automated metering infrastructure (AMI) for industrial consumers, distribution automation and substation automation and power quality management by deploying power quality meters at HT consumers.

Main application
Peak load management, outage management, and power quality management are proposed by implementing automated metering infrastructure (AMI) for industrial consumers

Other applications
Transformer Monitoring Units proposed to be installed for condition based monitoring.

Scenario for estimated costs and benefits
The proposed cost benefit analysis for the pilot is based on the assumption of savings by shifting 10% peak load, reduction in penalties by 40% and reduction in outages by 60%. Based on above savings the payback period is estimated to be around 2 years.

Policy goals
Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND11
MSEDCL, Maharashtra

Leading organization
MSEDCL (Maharashtra State Electricity Distribution Company Ltd.)

Total budget
$4,000,000

Description
Pilot covers 25,629 consumers with a mix of residential, commercial and industrial consumers and input energy of 261.6 MU. The functionality of outage management is proposed by implementing automated metering infrastructure (AMI) for residential consumers and industrial consumers. AMI is also to be leveraged for remote connect/disconnect of customers, monitoring the consumption pattern, tamper detection,

contract load monitoring, load curtailment program, i.e., reduced power supply instead of no power scenario, Time of Use metering and dynamic and real time pricing, demand forecasting, etc. Project proposes to introduce communication technologies like GPRS/CDMA/RF in metering environment with common protocol and near real time analytics technologies for meter analytics as well as near real time event insights coming from SCADA systems.

Main application

Outage management; Automated metering infrastructure (AMI) for residential consumers and industrial consumers

Other applications

AMI to be leveraged for remote connect/disconnect of customers; Monitoring the consumption pattern; Tamper detection; Contract load monitoring; Load curtailment program; Time of Use metering and dynamic and real time pricing; Demand forecasting; etc.

Scenario for estimated costs and benefits

ROI is proposed to be realized through benefits on account of Reduction in AT&C losses from 21.41% to 12%, reduction in requirement of field staff through proper management of unforeseen outages, improvement in reliability parameters like SAIFI, SAIDI, CAIDI, etc., reduction in meter reading cost, bringing efficiency in meter reading, etc. Payback period is likely to be less than 5 years.

Policy goals

Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses

IRL1

CER National Smart Metering Plan

Leading organization

Electricity Supply Board - Networks (IE)

Description

The project assessed: the impact of Time of Use pricing and billing/information stimuli on the customer behaviour; and the available technologies for AMI roll out in an Irish context. The outcomes of both were factored into the cost benefit analysis for the full roll out of AMI in Ireland.

Main application

Smart Metering

Other applications

Smart Customer and Smart Home

Policy goals
Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES), Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Reduced peak load

KOR2
Jeju Test Bed_Smart Transportation

Leading organization
KEPCO, SK Energy, GS Cartex

Total budget
$48.7M

Description
Element technology development for commercializing EVs and new business model development by testing various charging infrastructure

Main application
Electric Vehicles and Vehicle2Grid Applications

Scenario for estimated costs and benefits
Deployment costs and benefits from energy cost savings

Policy goals
Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Energy savings

KOR3
Jeju Test Bed_Smart Renewable

Leading organization
KEPCO, Hyundai Heavy Industries, POSCO ICT

Total budget
$41.2M

Description
Integrating RES for stable system and testing system efficiency with RES and ESS under virtual real-time tariff

Main application
Integration of DER

Scenario for estimated costs and benefits

Deployment costs and benefits from energy cost savings

Policy goals

Additional RES hosting power in the grid/maximum power load; Energy savings

NED1

Smart Grid Nieuweveens Landen Meppel

Leading organization

DNVKEMA

Total budget

5 million euros

Description

With the large scale introduction of renewable energy sources towards a sustainable energy system a number of challenges are imposed on the energy system. The intermittent character of renewable energy sources sets the need for more flexibility as well as backup power. To cope with these challenges, smart grid technology is being developed. Gas applications like (micro) cogeneration units and hybrid heat pump systems as well as the gas infrastructure play an essential role in smart grids and form a cost efficient cornerstone in balancing our networks, reduce (local) peak load on the electricity grid and prevent congestion. For the large scale implementation of a sustainable system, it is necessary to build experience in field tests. This is why DNV KEMA, together with TNO, ICT Automatisering, RWE Essent, Enexis and Gasunie started a living lab demonstration in Hoogkerk near Groningen in the Netherlands. PowerMatching City consists of 40-50 interconnected regular households of which 25 are already online since the beginning of 2010. These households are equipped with micro-cogeneration units, hybrid heat pumps, PV-solar panels, smart appliances and electric vehicles. Additional power is produced by a wind farm and a gas turbine.

Main application

Smart Network Management

Other applications

Smart Customer and Smart Home

Policy goals

Increased number of consumers participating in electricity markets and in energy efficiency measures; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Reduced peak load; Energy savings

NED2

Smart Grid Nieuweveens Landen Meppel

Leading organization

Municipality of Meppel and Rendo Energy company

Description

- Realising energy supplying neighborhood of over 3,000 households.
- Formation of a local sustainable energy company with participation of residents.
- Combining electricity, (bio)gas, heating and cooling in order to achieve a local energy balance.

Demonstrate technical and economical feasibility

Main application

Integration of DER

Other applications

Smart Customer and Smart Home

Scenario for estimated costs and benefits

Local sustainable energy company

Policy goals

Increased number of consumers participating in electricity markets and in energy efficiency measures; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Reduced peak load; Energy savings

Other applications

Integration of DER

Policy goals

Additional demand side management power managed in the grid/maximum power load; Reduced peak load Increased internal transfer capacity between TSOs or DSOs

SWE2

Smart Grid Gotland

Leading organization

GEAB

Total budget

28 MEUR (242 MSEK)

Description

The Smart Grid Gotland R&D demonstration project intends to develop strategies for the planning, construction and operation of a fully developed, large-scale smart grid, including a large share of intermittent production, primarily from wind power in the distribution network. New market models and services will be developed to pave the way for new market players.

Main application

Smart Network Management

Other applications

Integration of DER; Integration of Large Scale RES; Smart Customer and Smart Home; Smart Metering

Scenario for estimated costs and benefits

No net present value calculation is yet available.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE4

Stockholm Royal seaport Active House Pilot

Leading organization

Fortum Distribution AB

Total budget

20 msek

Description

The long-term outcome will be a test apartment, based in Stockholm Royal Seaport, which is part of the solution from the pre-study in the area's housing. The plausibility and attraction of solutions have been deemed to create conditions to expand the number of participating construction companies in next phase. Part solution was to work together with the results from other projects that also have Stockholm Royal Seaport as the test bed. The apartment, which is included in the test installations, will have access to leading technology in smart grids, appliances, information technology and design. They will also be active specifier and designers of new services and products being developed continuously. The results of this project make it possible for companies to develop products and services based on the technology that the project contributed. Researchers and entrepreneurs will be able to assimilate the results from this test apartment to develop their ideas and innovations.

Scenario for estimated costs and benefits

Customer participation in load shift to optimize load factors, impact climate effects and distribution automation systems to increase reliability and reduce losses. Hosting of DER at LV levels.

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE5

Stockholm Royal seaport demonstration phase

Leading organization

Fortum Distribution AB

Total budget

140 msek

Description

The program will specify, develop, test and evaluate both business and market models, new technical solutions and concepts, information and communications technology (ICT) as well as aspects of data security. As described in the pre-study, a set of scenario tests will be the cohesive factor in this work. In order to make it happen, an R&D platform needs to be developed and implemented as enablement for overall system tests, which will also include aspects of behavioural science. The first phase of the program and this application will focus on scenarios related to active end-customers and reliability of the future grid, where the urban smart grid in a new way creates opportunities for interaction with the end customer in order to, e.g., reduce CO_2 emissions. Also, scenarios for increased reliability and availability in a future urban smart grid will be tested.

Scenario for estimated costs and benefits

Customer participation in load shift to optimize load factors, impact climate effects and distribution automation systems to increase reliability and reduce losses. Hosting of DER at LV levels.

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE6

Smart Grid Hyllie

Leading organization

E.ON

Total budget

200 MSEK for 2011 through 2014. Additional years to follow.

Description

Hyllie - A test bed for developing solutions for a future transformed energy in the city of Malmö. The project includes: (a) Customer control of heat and electricity consumption, (b) Smart home and Smart building solutions, (c) Distributed generation – electricity and heat, (d) Smart grid solutions – DH and electricity, (e) Sustainable mobility solutions – gas and emobility, (f) CO_2 and resource efficient energy supply, and (g) Distributed energy storage.

Main application

Aggregation (Demand Response, VPP)

Other applications

Smart Customer and Smart Home

Scenario for estimated costs and benefits

Costs for 2011-2014 estimated to 200 MSEK (basically more or less all investments are to be seen as consumables); Analyses regarding benefits to be done in evaluation phase

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA1

gridSMART(SM) Demonstration Project

Leading organization

AEP Ohio

Total budget

$148,821,823

Description

This project is to build a secure, interoperable, and integrated Smart Grid infrastructure that demonstrates the ability to maximize distribution system efficiency and reliability, and consumer use of demand response programs to reduce energy consumption, peak demand costs, and fossil fuel emissions. The demonstration area includes 150 square miles including approximately 110,000 meters and 70 distribution circuits. AEP Ohio will implement Smart Grid technology over 58 13kV circuits from 10 distribution stations and 12 34.5kV circuits from six distribution stations. Included in this project is a redistribution management system, integrated volt-VAR control, distribution automation, advanced meter infrastructure, home area networks, community energy storage, sodium sulfur battery storage, and renewable generation sources. These technologies will be combined with two-way consumer communication and information sharing, demand response, dynamic pricing, and consumer products, such as plug-in hybrid vehicles.

Main application

Smart Network Management

Other applications

Smart Customer and Smart Home; Integration of DER; Smart Metering; Aggregation (Demand Response, VPP); Electric Vehicles and Vehicle2Grid Applications

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Reduced peak load

USA2

Pacific Northwest Division Smart Grid Demonstration Project

Leading organization

Battelle Memorial Institute

Total budget

$177,642,503

Description

This demonstration will validate new technologies; provide two-way communication between distributed generation, storage and demand assets, and the existing grid infrastructure; quantify Smart Grid costs and benefits; advance interoperability standards and cyber security approaches; and validate new business models. More than 20 types of responsive Smart Grid assets will be tested across six regional and utility operational objectives at 15 unique distribution sites operated by 12 utilities across five states and three climatic regions. A base of Smart Grid technology serving more than 60,000 customers will be installed, validated, and operated. All use classes are represented in the demonstration including residential, commercial, industrial, and irrigation customers. The demonstration will develop a single integrated Smart Grid incentive-signaling approach and will test and validate its ability to continuously coordinate the responses of Smart Grid assets to meet a wide range of operational objectives. It will also engage distributed control so that wind integration problems are mitigated. Micro-grid islanding will also be evaluated for its potential to enhance reliability for customers and relieve energy demand.

Main application

Smart Network Management

Other applications

Integration of DER; Integration of Large Scale RES; Aggregation (Demand Response, VPP); Smart Customer and Smart Home; Smart Metering

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA3

Smart Grid Deployment

Leading organization

Duke Energy Carolinas, LLC

Total budget

$555,706,307

Description

This project includes advanced metering infrastructure (AMI) and distribution automation systems in five states. The project involves large-scale deployments of AMI and distribution automation in Ohio and Indiana, a pilot deployment of AMI and distribution automation in Kentucky, and deployment of distribution automation in North and South Carolina. The project includes pilot programs for electricity pricing including time-of-use rates, peak-time rebates, and critical-peak pricing. Customers in these pilot programs use home area networks, web portals, and direct load control devices to reduce their electricity consumption and peak demand. Distribution automation equipment will be installed on 1,926 out of 4,741 circuits, which includes: distribution automation communications network; SCADA communications network; automated distribution circuit switches; automated capacitors; and equipment condition monitors.

Main application

Smart Metering

Other applications

Smart Customer and Smart Home; Aggregation (Demand Response, VPP); Smart Network Management

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals

Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA4

Smart Grid Project

Leading organization

EPB

Total budget
$226,707,562

Description
This project involves the installation of advanced metering systems and communications infrastructure. The project installs automated distribution grid equipment expected to enhance the reliability and quality of electric service delivery. The project implements two-way communications and metering expected to: (1) enable customers to view their energy consumption at their convenience through systems such as web portals, (2) provide timebased rate programs to customers, (3) provide information and tools to improve outage management, and (4) reduce operations and maintenance costs.

Main application
Smart Metering

Other applications
Smart Customer and Smart Home; Aggregation (Demand Response, VPP); Smart Network Management

Scenario for estimated costs and benefits
Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals
Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA5
Energy Smart Florida

Leading organization
Florida Power & Light Company

Total budget
$578,963,325

Description
This project is deploying advanced metering infrastructure (AMI), distribution automation, new electricity pricing programs, and advanced monitoring equipment for the transmission system. AMI supports two-way communication between FPL and its 3 million consumers receiving smart meters, providing detailed information about electricity usage and the ability to implement new electricity pricing programs. New distribution automation devices

expand the functionality of FPL's distribution system to increase reliability, reduce energy losses, and reduce operations and maintenance costs. Synchrophasor and line monitoring devices help increase the reliability and security of the transmission system.

Main application
Smart Metering

Other applications
Smart Customer and Smart Home; Aggregation (Demand Response, VPP); Smart Network Management

Scenario for estimated costs and benefits
Advanced metering infrastructure (AMI), distribution automation systems, and wide-area transmission monitoring

Policy goals
Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA6
Enhanced Demand and Distribution Management Regional Demonstration

Leading organization
National Rural Electric Cooperative Association

Total budget
$67,864,292

Description
This project is demonstrating Smart Grid technologies with 27 cooperatives in 11 states across multiple utilities, geographies, climates, and applications including low density areas, low consumer income areas, and service areas prone to natural disasters. NRECA will conduct studies in advanced volt/volt-ampere reactive for total demand; generation and transmission-wide (G&T) demand response over advanced metering infrastructure (AMI); critical peak pricing over AMI; water heater and air conditioning load control over AMI; advanced water heater control and thermal storage; consumer Internet energy usage portal pilots; consumer in-home energy display pilots; time-sensitive rates pilots; multiple AMI integration at G&T co-ops; distribution co-op meter data management system applications; and self-healing feeders for improved reliability.

Main application
Smart Metering

Other applications
Smart Network Management; Aggregation (Demand Response, VPP); Smart Customer and Smart Home

Scenario for estimated costs and benefits
Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals
Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA7
SmartSacramento

Leading organization
Sacramento Municipal Utility District

Total budget
$307,697,792

Description
This project involves system-wide deployment of an advanced metering system integrated with existing enterprise and information technology systems as well as a partial deployment of advanced distribution grid assets that equip SMUD’s distribution circuits with automated control and operation capabilities. The project also involves customer systems that provide usage and cost information to customers that educate and enable more control over their consumption. These systems enable more informed participation by customers and more effective management by SMUD to improve reliability and efficiency of grid operations and better optimize the use of assets. The project includes a field test of plug-in electric vehicle charging stations to assess their technical performance, vehicle charging patterns, and effects on electric distribution system operations.

Main application
Smart Metering

Other applications
Smart Network Management; Aggregation (Demand Response, VPP); Smart Customer and Smart Home; Electric Vehicles and Vehicle2Grid Applications

Scenario for estimated costs and benefits
Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals
Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA8
Positive Energy Smart Grid Integration Program

Leading organization
Oklahoma Gas and Electric

Total budget
$293,201,332

Description
This project involves system-wide deployment of a fully integrated advanced metering system, distribution of in-home devices to almost 6,000 customers, and installation of advanced distribution automation systems. The program aims at reducing peak loads, overall electricity use, and operations and maintenance costs while increasing distribution system efficiency, reliability, and power quality. The program implements secure wireless communications to: (1) allow smart meter customers to view their electricity consumption data through a personalized web site, and (2) allow OG&E to manage, measure, and verify targeted demand reductions during peak periods. New systems capture meter information for billing and implement new customer pricing programs and service offerings. The project deploys a more dynamic distribution management system, automated switching, and integrated voltage and reactive power control (IVVC) that reduces line losses, reduces operational costs, and improves service reliability. The program also includes a study of consumer behavior in response to different forms of dynamic pricing on an opt-in basis. Finally, the program includes collaboration with University of Oklahoma faculty and students to deploy technologies within 46 buildings on the campus and to take advantage of opportunities for education and training.

Main application
Smart Metering

Other applications

Smart Network Management; Aggregation (Demand Response, VPP); Smart Customer and Smart Home

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals

Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA10

SmartGrid Program

Leading organization

Talquin Electric Cooperative

Total budget

$16,200,000

Description

This project involves the installation of advanced metering, communications infrastructure, distribution automation equipment, load control devices, and other customer systems. The project implements two-way communications to: (1) enable customers to view their energy consumption at their convenience through customer systems and web portals, (2) provide time-based rate programs to customers, (3) provide information and tools to improve outage management, and (4) reduce operations and maintenance costs. The project also installs automated distribution grid equipment expected to: (1) enhance the reliability and quality of electric delivery, and (2) reduce operations and maintenance costs.

Main application

Smart Metering

Other applications

Smart Network Management, Smart Customer and Smart Home

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals

Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

2.2.2 Transmission Level

ID	Name
CAN2	Zone de réseau interatif
FRA1	Smart Grid Vendée
FRA5	PREMIO-('Production Répartie, Enr et MDE, Intégrées et Optimisées', or, in English, 'Integration and Optimization of DG, DSM and Renewable Energies')
FRA6	Greenlys
GER3	MeRegio
SWE2	Smart Grid Gotland
SWE4	Stockholm Royal seaport Active House Pilot
SWE5	Stockholm Royal seaport demonstration phase
SWE6	Smart Grid Hyllie
USA5	Energy Smart Florida

CAN2

Zone de réseau interatif

Leading organization

Hydro-Québec Distribution

Total budget

$25,585,000

Description

Hydro-Québec has a distribution grid evolution plan which includes progressive smart grid technology implementation. To ensure successful implementation, Hydro-Québec decided to create a smart zone where the technologies will be deployed in order to improve energy efficiency and grid performance. The first smart grid technology to be deployed in the zone will be a DMS (Distribution Management System) with integrated voltage and reactive power control linked to the current distribution grid control system. In 2008, Hydro-Québec introduced a simple voltage regulation and reactive power control system to the Pierre-

Boucher substation to reduce energy use, grid losses and greenhouse gases (GHGs). Hydro-Québec estimates that a VVO (Volt Var Optimization) type smart system would allow it to increase energy efficiency compared to a VVC (Volt Var Control) type system. The second smart grid technology involves charging stations with and without intelligence for electric vehicles, scheduled for installation between 2010 and 2012. The agreement between Hydro-Québec and Mitsubishi calls for testing of up to 30 all-electric iMiEV type vehicles. The goal of the project is to better understand charging and driving behaviors, as well as charging infrastructure needs at 120V/15A, 240V/15-30A, and direct current charging (50kW).

Main application
Electric Vehicles and Vehicle2Grid Applications

Other applications
Smart Metering

Policy goals
Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Increased internal transfer capacity between TSOs or DSOs

FRA1
Smart Grid Vendée

Leading organization
SyDEV

Total budget
To be made public 1st quarter 2013.

Description
To be made public 1st quarter 2013.

Main application
Smart Network Management

Other applications
Aggregation (Demand Response, VPP)

Policy goals
Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Energy savings

FRA5

PREMIO-('Production Répartie, Enr et MDE, Intégrées et Optimisées', or, in English, 'Integration and Optimization of DG, DSM and Renewable Energies')

Leading organization

CAPENERGIE – France

Description

PREMIO is primarily a technical proposal created to address the following goals: – to develop a dynamic demand-response specifically for peak shaving purposes, – to increase the flexibility of the power system, – to promote a new energy culture which encourages energy efficiency, – to integrate distributed generation and particularly renewable energies, – to reduce greenhouse gas emissions from polluting power plants, especially during peak load times, and – to manage regional electrical energy from a wide range of local actors. PREMIO combines the control of installed distributed resources for optimal use with an awareness campaign promoting demand side management (DSM). The PREMIO platform includes a virtual power plant (VPP) which integrates approximately fifty distributed resources, all of which are distributed generation, storage technologies and customers' curtailable loads. The limited number of installations suggests that project results will be qualitative rather than quantitative.

Main application

Integration of DER; Aggregation

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Energy savings; Reduced peak load

FRA6

GreenLys

Leading organization

ERDF

Description

GreenLys is a systemic smart grid project which includes: - DER - Consumption - Networks (DSO & TSO). Main Goals: - decrease of greenhouse gases - control of energy bill - introduction and control of DER on LV networks - behavior of consumers, with incentive and innovative new offers - aggregator functions. Innovations: - Smart management of grid (seal-healing, smart metering using Linky infrastructure,...) - Demand side management, demand/response, energy saving and new offers (using boxes linked to Linky Infrastructure, tariffs, dynamic prices policy...) – Investments; Impact on studies and development of networks (especially for DSOs)

Main application

Smart Network Management; Integration of DER; Smart Customer and Smart Home

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Reduced peak load

GER3

MeRegio

Leading organization

EnBW Energie Baden-Wuerttemberg AG

Total budget

24 Mio. EUR

Description

Around 1,000 private and industrial customers have been equipped with smart meters and a dynamic price signal. The goal of the project was to evaluate whether and how customers react on dynamic prices which have been calculated according to the availability of renewable energy.

Main application

Integration of Large Scale RES

Other applications

Smart Customer and Smart Home

Scenario for estimated costs and benefits

The project was for research/demonstration. Up to now there is no business case behind.

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Energy savings; Reduced peak load; Increased internal transfer capacity between TSOs or DSOs

SWE2

Smart Grid Gotland

Leading organization

GEAB

Total budget

28 MEUR (242 MSEK)

Description

The Smart Grid Gotland R&D demonstration project intends to develop strategies for the planning, construction and operation of a fully developed, large-scale smart grid, including a large share of intermittent production, primarily from wind power in the distribution network. New market models and services will be developed to pave the way for new market players.

Main application

Smart Network Management

Other applications

Integration of DER; Integration of Large Scale RES; Smart Customer and Smart Home; Smart Metering

Scenario for estimated costs and benefits

No net present value calculation is yet available.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE4

Stockholm Royal seaport Active House Pilot

Leading organization

Fortum Distribution AB

Total budget

20 msek

Description

The long-term outcome will be a test apartment, based in Stockholm Royal Seaport, which is part of the solution from the pre-study in the area's housing. The plausibility and attraction of solutions have been deemed to create conditions to expand the number of participating construction companies in next phase. Part solution was to work together with the results from other projects that also have Stockholm Royal Seaport as the test bed. The apartment, which is included in the test installations, will have access to leading technology in smart grids, appliances, information technology and design. They will also be active specifier and designers of new services and products being developed continuously. The results of this project make it possible for companies to develop products and services based on the technology that the project contributed. Researchers and entrepreneurs will be able to assimilate the results from this test apartment to develop their ideas and innovations.

Scenario for estimated costs and benefits

Customer participation in load shift to optimize load factors, impact climate effects and distribution automation systems to increase reliability and reduce losses. Hosting of DER at LV levels.

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE5

Stockholm Royal seaport demonstration phase

Leading organization

Fortum Distribution AB

Total budget

140 msek

Description

The program will specify, develop, test and evaluate both business and market models, new technical solutions and concepts, information and communications technology (ICT) as well as aspects of data security. As described in the pre-study, a set of scenario tests will be the cohesive factor in this work. In order to make it happen, an R&D platform needs to be developed and implemented as enablement for overall system tests, which will also include aspects of behavioural science. The first phase of the program and this application will focus

on scenarios related to active end-customers and reliability of the future grid, where the urban smart grid in a new way creates opportunities for interaction with the end customer in order to, e.g., reduce CO_2 emissions. Also, scenarios for increased reliability and availability in a future urban smart grid will be tested.

Scenario for estimated costs and benefits

Customer participation in load shift to optimize load factors, impact climate effects and distribution automation systems to increase reliability and reduce losses. Hosting of DER at LV levels.

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE6

Smart Grid Hyllie

Leading organization

E.ON

Total budget

200 MSEK for 2011 through 2014. Additional years to follow.

Description

Hyllie - A test bed for developing solutions for a future transformed energy in the city of Malmö. The project includes: (a) Customer control of heat and electricity consumption, (b) Smart home and Smart building solutions, (c) Distributed generation – electricity and heat, (d) Smart grid solutions – DH and electricity, (e) Sustainable mobility solutions – gas and emobility, (f) CO_2 and resource efficient energy supply, and (g) Distributed energy storage.

Main application

Aggregation (Demand Response, VPP)

Other applications

Smart Customer and Smart Home

Scenario for estimated costs and benefits

Costs for 2011-2014 estimated to 200 MSEK (basically more or less all investments are to be seen as consumables); Analyses regarding benefits to be done in evaluation phase

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA5

Energy Smart Florida

Leading organization

Florida Power & Light Company

Total budget

$578,963,325

Description

This project is deploying advanced metering infrastructure (AMI), distribution automation, new electricity pricing programs, and advanced monitoring equipment for the transmission system. AMI supports two-way communication between FPL and its 3 million consumers receiving smart meters, providing detailed information about electricity usage and the ability to implement new electricity pricing programs. New distribution automation devices expand the functionality of FPL's distribution system to increase reliability, reduce energy losses, and reduce operations and maintenance costs. Synchrophasor and line monitoring devices help increase the reliability and security of the transmission system.

Main application

Smart Metering

Other applications

Smart Customer and Smart Home; Aggregation (Demand Response, VPP); Smart Network Management

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI), distribution automation systems, and wide-area transmission monitoring

Policy goals

Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

2.2.3 T&D Interface

ID	Name
CAN2	Zone de réseau interatif
FRA1	Smart Grid Vendée
FRA6	Greenlys
GER3	MeRegio
IND2	UGVCL, Gujarat
IND3	CESC, Mysore
IND4	KSEB, Kerala
SWE2	Smart Grid Gotland
SWE6	Smart Grid Hyllie
USA2	Pacific Northwest Division Smart Grid Demonstration Project
USA5	Energy Smart Florida

CAN2
Zone de réseau interatif

Leading organization

Hydro-Québec Distribution

Total budget

$25,585,000

Description

Hydro-Québec has a distribution grid evolution plan which includes progressive smart grid technology implementation. To ensure successful implementation, Hydro-Québec decided to create a smart zone where the technologies will be deployed in order to improve energy efficiency and grid performance. The first smart grid technology to be deployed in the zone will be a DMS (Distribution Management System) with integrated voltage and reactive power control linked to the current distribution grid control system. In 2008, Hydro-Québec introduced a simple voltage regulation and reactive power control system to the Pierre-Boucher substation to reduce energy use, grid losses and greenhouse gases (GHGs). Hydro-Québec estimates that a VVO (Volt Var Optimization) type smart system would allow it to increase energy efficiency compared to a VVC (Volt Var Control) type system. The second smart grid technology involves charging stations with and without intelligence for electric vehicles, scheduled for installation between 2010 and 2012. The agreement between Hydro-Québec and Mitsubishi calls for testing of up to 30 all-electric iMiEV type vehicles. The goal of the project is to better understand charging and driving behaviors, as well as charging infrastructure needs at 120V/15A, 240V/15-30A, and direct current charging (50kW).

Main application

Electric Vehicles and Vehicle2Grid Applications

Other applications

Smart Metering

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Increased internal transfer capacity between TSOs or DSOs

FRA1

Smart Grid Vendée

Leading organization

SyDEV

Total budget

To be made public 1st quarter 2013.

Description

To be made public 1st quarter 2013.

Main application

Smart Network Management

Other applications

Aggregation (Demand Response, VPP)

Policy goals

Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Energy savings

FRA6

GreenLys

Leading organization

ERDF

Description

GreenLys is a systemic smart grid project which includes: - DER - Consumption - Networks (DSO & TSO). Main Goals: - decrease of greenhouse gases - control of energy bill - introduction and control of DER on LV networks - behavior of consumers, with incentive and innovative new offers - aggregator functions. Innovations: - Smart management of grid (seal-healing, smart metering using Linky infrastructure,...) - Demand side management, demand/response, energy saving and new offers (using boxes linked to Linky Infrastructure, tariffs, dynamic prices policy...) – Investments; Impact on studies and development of networks (especially for DSOs)

Main application

Smart Network Management; Integration of DER; Smart Customer and Smart Home

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Reduced peak load

GER3

MeRegio

Leading organization

EnBW Energie Baden-Wuerttemberg AG

Total budget

24 Mio. EUR

Description

Around 1,000 private and industrial customers have been equipped with smart meters and a dynamic price signal. The goal of the project was to evaluate whether and how customers react on dynamic prices which have been calculated according to the availability of renewable energy.

Main application

Integration of Large Scale RES

Other applications

Smart Customer and Smart Home

Scenario for estimated costs and benefits

The project was for research/demonstration. Up to now there is no business case behind.

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Energy savings; Reduced peak load; Increased internal transfer capacity between TSOs or DSOs

IND2

UGVCL, Gujarat

Leading organization

UGVCL

Total budget

$9,200,000

Description

UGVCL has proposed the pilot project in Naroda of Sabarmati circle which is an industrial and residential area and Deesa of Palanpur circle which is an agricultural area covering 20,524 consumers in Naroda and 18,898 agricultural unmetered consumers in Deesa-II division and accounting for input energy of around 1700 MU (Naroda : 374.52 MU & Deesa : 1321.27 MU for 2010-11). The functionalities of peak load management, outage management, power quality management are proposed by implementing automated metering infrastructure (AMI) for industrial, commercial and residential consumers. Committee also observed that some additional functionalities like load forecasting and asset management are also proposed and functionalities of load forecasting, peak power management and outage management are also considered at utility level which will impact all consumers of utility (i.e., 27 lac consumers) indirectly. Renewable energy integration has been proposed to be carried out at Patan Solar Park and few roof top installations at some of the universities. The pilot project proposes to introduce TOU tariff with approvals from

GERC. Renewable energy integration is proposed through proper and accurate load forecast by real time monitoring of substations, feeders and RES generation.

Main application

Peak load management, outage management, and power quality management are proposed by implementing automated metering infrastructure (AMI) for industrial, commercial and residential consumers.

Other applications

Load forecasting and asset management are proposed. Load forecasting, peak power management and outage management are considered at utility level. Renewable energy integration at Patan Solar Park and few roof top installations are also envisaged.

Scenario for estimated costs and benefits

The ROI is proposed to be realized through benefits on account of reduction in AT&C losses from 12.44% to around 8.44% in Naroda and from 21.69% to 15% in Deesa; savings in peak power purchase cost by reduction of peak load by up to 5% in both areas; reduction in transformer failure rate from 16.52% to 8% in Deesa area; and reduction in number of outages, meter reading cost, cost of payment collection, etc. Based on projected savings the payback period is likely to be around 2 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND3

CESC, Mysore

Leading organization

CESC, Mysore

Total budget

$6,150,000

Description

CESC, Mysore has proposed the pilot project in Additional City Area Division (ACAD), Mysore involving 21,824 consumers with a good mix of residential, commercial, industrial and agricultural consumers including 512 irrigation pump sets covering over 14 feeders and 473 distribution transformers and accounting for input energy of 151.89 MU. The functionalities of peak load management, outage management are proposed by implementing automated metering infrastructure (AMI) for residential consumers and industrial consumers and integration of distributed generation / micro grid integration. Some additional functionality like agriculture DSM with community portal, consumer portal to support DSM/DR, employee portal for knowledge sharing and benefit realization, KPI based MIS and data analytics for decision support are also proposed. The pilot project proposes to introduce real time pricing signal by interfacing at SLDC level to get UI/ABT prices subject to regulatory consent. Implementation of Fault Location Isolation and System Restoration (FLISR) at feeders where alternate feeding arrangements are available is also proposed.

Main application

Peak load management, outage management by implementing automated metering infrastructure (AMI) for residential consumers and industrial consumers; Integration of distributed generation/micro grid integration

Other applications

Agriculture DSM with community portal

Scenario for estimated costs and benefits

ROI is proposed to be realized through benefits on account of reduction in AT&C losses from 10.6% to 5.7% in 3 years, shifting of load of up to 80% in industrial feeders and up to 20% for domestic consumer during peak hours, reduction in number of transformer failure, meter reading cost, reduction in unforeseen outages and also recovery time for unforeseen outages by 20% and 50%. Based on projected savings the payback period is likely to be less than 3 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND4

KSEB, Kerala

Leading organization

KSEB, Kerala

Total budget

$5,200,000

Description

KSEB Smart Grid Pilot covers around 25078 LT Industrial consumers of selected distribution section offices spread over the geographical area of Kerala State. The input energy for the total scheme area is 2108 MUs and for the LT Industrial consumers is 376 MUs. Automated metering infrastructure (AMI) is proposed to provide quality service, prevent tampering and unauthorised usage of load, accurate and timely metering and billing, avoiding costly field visits of Sub Engineers for meter reading, reducing supply restoration time, peak load management through load restriction for Remote Disconnection/Reconnection and Time of Day tariff.

Main application

Automated metering infrastructure (AMI); Peak load management

Scenario for estimated costs and benefits

ROI is proposed to be realized through benefits on account of Reduction in AT&C losses of about 1.17% (24.82 MUs) through reduction in loss due to manual error, tampers, thefts, short assessment, etc., savings on employee and travel cost for meter reading and introducing incremental tariff for peak hours through ToD Tariff. Based on above savings the payback period is estimated to be around 2.5 years

Policy goals

Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE2

Smart Grid Gotland

Leading organization

GEAB

Total budget

28 MEUR (242 MSEK)

Description

The Smart Grid Gotland R&D demonstration project intends to develop strategies for the planning, construction and operation of a fully developed, large-scale smart grid, including a large share of intermittent production, primarily from wind power in the distribution network. New market models and services will be developed to pave the way for new market players.

Main application

Smart Network Management

Other applications

Integration of DER; Integration of Large Scale RES; Smart Customer and Smart Home; Smart Metering

Scenario for estimated costs and benefits

No net present value calculation is yet available.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE6

Smart Grid Hyllie

Leading organization

E.ON

Total budget

200 MSEK for 2011 through 2014. Additional years to follow.

Description

Hyllie - A test bed for developing solutions for a future transformed energy in the city of Malmö. The project includes: (a) Customer control of heat and electricity consumption, (b) Smart home and Smart building solutions, (c) Distributed generation – electricity and heat, (d) Smart grid solutions – DH and electricity, (e) Sustainable mobility solutions – gas and emobility, (f) CO_2 and resource efficient energy supply, and (g) Distributed energy storage.

Main application

Aggregation (Demand Response, VPP)

Other applications

Smart Customer and Smart Home

Scenario for estimated costs and benefits

Costs for 2011-2014 estimated to 200 MSEK (basically more or less all investments are to be seen as consumables); Analyses regarding benefits to be done in evaluation phase

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA2

Pacific Northwest Division Smart Grid Demonstration Project

Leading organization

Battelle Memorial Institute

Total budget

$177,642,503

Description

This demonstration will validate new technologies; provide two-way communication between distributed generation, storage and demand assets, and the existing grid infrastructure; quantify Smart Grid costs and benefits; advance interoperability standards and cyber security approaches; and validate new business models. More than 20 types of responsive Smart Grid assets will be tested across six regional and utility operational objectives at 15 unique distribution sites operated by 12 utilities across five states and three climatic regions. A base of Smart Grid technology serving more than 60,000 customers will be installed, validated, and operated. All use classes are represented in the demonstration including residential, commercial, industrial, and irrigation customers. The demonstration will develop a single integrated Smart Grid incentive-signaling approach and will test and validate its ability to continuously coordinate the responses of Smart Grid assets to meet a wide range of operational objectives. It will also engage distributed control so that wind integration problems are mitigated. Micro-grid islanding will also be evaluated for its potential to enhance reliability for customers and relieve energy demand.

Main application

Smart Network Management

Other applications

Integration of DER; Integration of Large Scale RES; Aggregation (Demand Response, VPP); Smart Customer and Smart Home; Smart Metering

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA5

Energy Smart Florida

Leading organization

Florida Power & Light Company

Total budget

$578,963,325

Description

This project is deploying advanced metering infrastructure (AMI), distribution automation, new electricity pricing programs, and advanced monitoring equipment for the transmission system. AMI supports two-way communication between FPL and its 3 million consumers receiving smart meters, providing detailed information about electricity usage and the ability to implement new electricity pricing programs. New distribution automation devices expand the functionality of FPL's distribution system to increase reliability, reduce energy losses, and reduce operations and maintenance costs. Synchrophasor and line monitoring devices help increase the reliability and security of the transmission system.

Main application

Smart Metering

Other applications

Smart Customer and Smart Home; Aggregation (Demand Response, VPP); Smart Network Management

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI), distribution automation systems, and wide-area transmission monitoring

Policy goals

Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

2.3 Estimated reductions of CO_2, via Reduced Energy Losses, Energy Savings, and Integration of RES (Sustainability and Integration)

Summaries of projects in the inventory selected as contributing to the policy goal of "Estimated reductions of CO_2, via Reduced Energy Losses, Energy Savings, and Integration of RES (Sustainability and Integration)" are presented in order of their physical application domains: Distribution Level, Transmission Level, and T&D Interface. Within each domain, project summaries are presented in alphanumerical order of their unique Project IDs.

2.3.1 Distribution Level

ID	Name
CAN1	PowerShift Atlantic
CAN2	Zone de réseau interatif
CAN5	Ontario Smart Meter Initiative
FRA5	PREMIO-('Production Répartie, Enr et MDE, Intégrées et Optimisées', or, in English, 'Integration and Optimization of DG, DSM and Renewable Energies')
FRA6	Greenlys
GER2	Smart Area Aachen
GER3	MeRegio
GER6	Smart Watts
IND2	UGVCL, Gujarat
IND3	CESC, Mysore
IRL1	CER National Smart Metering Plan
IRL3	Smart Networks Communications
ITA1	Telegestore
JPN1	Yokohama

JPN2	toyota
JPN3	Keihanna
JPN4	Kitakyushu
KOR5	Jeju Test Bed_Smart Power Grid
NED1	Smart Grid Nieuweveens Landen Meppel
NED2	Smart Grid Nieuweveens Landen Meppel
SWE2	Smart Grid Gotland
SWE4	Stockholm Royal seaport Active House Pilot
SWE5	Stockholm Royal seaport demonstration phase
SWE6	Smart Grid Hyllie
USA1	gridSMART(SM) Demonstration Project
USA2	Pacific Northwest Division Smart Grid Demonstration Project
USA3	Smart Grid Deployment
USA4	Smart Grid Project
USA5	Energy Smart Florida
USA6	Enhanced Demand and Distribution Management Regional Demonstration
USA7	SmartSacramento
USA8	Positive Energy Smart Grid Integration Program
USA9	Smart Grid Project
USA10	SmartGrid Program

CAN1

PowerShift Atlantic

Leading organization

New Brunswick Power

Total budget

$32,053,000

Description

PowerShift Atlantic is a collaborative research project led in partnership by Natural Resources Canada through the Clean Energy Fund, New Brunswick Power, Saint John Energy, Maritime Electric, Nova Scotia Power, New Brunswick System Operator, the Universi

Main application

Aggregation (Demand Response, VPP)

Other applications

Smart Network Management; Integration of DER; Integration of Large Scale RES

Scenario for estimated costs and benefits

The impact of the Virtual Power Plant (VPP) solution is established by comparing the differences in generation utilization and the associated production costs by evaluating the system with, and without, the VPP. This will be used to determine:-Peak reduc

Policy goals

Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES)

CAN2

Zone de réseau interatif

Leading organization

Hydro-Québec Distribution

Total budget

$25,585,000

Description

Hydro-Québec has a distribution grid evolution plan which includes progressive smart grid technology implementation. To ensure successful implementation, Hydro-Québec decided to create a smart zone where the technologies will be deployed in order to improve energy efficiency and grid performance. The first smart grid technology to be deployed in the zone will be a DMS (Distribution Management System) with integrated voltage and reactive power control linked to the current distribution grid control system. In 2008, Hydro-Québec introduced a simple voltage regulation and reactive power control system to the Pierre-Boucher substation to reduce energy use, grid losses and greenhouse gases (GHGs). Hydro-Québec estimates that a VVO (Volt Var Optimization) type smart system would allow it to increase energy efficiency compared to a VVC (Volt Var Control) type system. The second smart grid technology involves charging stations with and without intelligence for electric vehicles, scheduled for installation between 2010 and 2012. The agreement between Hydro-Québec and Mitsubishi calls for testing of up to 30 all-electric iMiEV type vehicles. The goal of the project is to better understand charging and driving behaviors, as well as charging infrastructure needs at 120V/15A, 240V/15-30A, and direct current charging (50kW).

Main application

Electric Vehicles and Vehicle2Grid Applications

Other applications
Smart Metering

Policy goals
Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Increased internal transfer capacity between TSOs or DSOs

CAN5
Ontario Smart Meter Initiative

Leading organization
Ministry of Energy - sets the policy framework; Ontario Energy Board – provides regulatory guidance; Independent Electricity System Operator - Development and operation centralized Meter Data Management system; Local Distribution Companies - Purchasing, owni

Total budget
$1 Billion

Description
Ontario has introduced smart meters — along with a “time-of-use” electricity price structure — to help you manage customer electricity costs, while helping Ontario to build a more efficient, more environmentally sound electricity system. Smart meters have been installed in residences and small businesses across Ontario. A smart meter system opens up the opportunity for new kinds of conservation and demand management programs. In the future, smart meters could allow the introduction of different timebased incentive programs, or the opportunity to control energy use through energy management devices or smart appliances. Smart meter data also provides comprehensive, detailed information for electricity system planning, allowing us to identify where future generation, transmission and distribution investments are required. Time-of-use pricing encourages Ontarians to shift some electricity use to offpeak hours. By reducing peak demand, the province can reduce its use of the less environmentally attractive resources that are called on when demand is high. In the long run, lower peak demand will mean less need for new generating facilities and transmission and distribution infrastructure, lowering costs for all Ontarians.

Main application
Smart Metering

Scenario for estimated costs and benefits
LDC Operating Cost Reduction; Energy Cost Savings (societal benefits); Energy Cost Savings (societal benefits); Generation Capacity Avoidance; T&D Capacity Avoidance

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Reduced peak load

FRA5

PREMIO-('Production Répartie, Enr et MDE, Intégrées et Optimisées', or, in English, 'Integration and Optimization of DG, DSM and Renewable Energies')

Leading organization

CAPENERGIE – France

Description

PREMIO is primarily a technical proposal created to address the following goals: – to develop a dynamic demand-response specifically for peak shaving purposes, – to increase the flexibility of the power system, – to promote a new energy culture which encourages energy efficiency, – to integrate distributed generation and particularly renewable energies, – to reduce greenhouse gas emissions from polluting power plants, especially during peak load times, and – to manage regional electrical energy from a wide range of local actors. PREMIO combines the control of installed distributed resources for optimal use with an awareness campaign promoting demand side management (DSM). The PREMIO platform includes a virtual power plant (VPP) which integrates approximately fifty distributed resources, all of which are distributed generation, storage technologies and customers' curtailable loads. The limited number of installations suggests that project results will be qualitative rather than quantitative.

Main application

Integration of DER; Aggregation

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Energy savings; Reduced peak load

FRA6

GreenLys

Leading organization

ERDF

Description
GreenLys is a systemic smart grid project which includes: - DER - Consumption - Networks (DSO & TSO). Main Goals: - decrease of greenhouse gases - control of energy bill - introduction and control of DER on LV networks - behavior of consumers, with incentive and innovative new offers - aggregator functions. Innovations: - Smart management of grid (seal-healing, smart metering using Linky infrastructure,...) - Demand side management, demand/response, energy saving and new offers (using boxes linked to Linky Infrastructure, tariffs, dynamic prices policy...) – Investments; Impact on studies and development of networks (especially for DSOs)

Main application
Smart Network Management; Integration of DER; Smart Customer and Smart Home

Policy goals
Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Reduced peak load

GER2
Smart Area Aachen

Leading organization
Stadtwerke Aachen Aktiengesellschaft

Total budget
$9,152,280

Description
Smart Area Aachen aims at developing new holistic concepts and methods based on new equipment for future smart grid solutions. In this context, innovative technical solutions are identified, optimized and eventually verified in pilot trials. Moreover, new business models are developed for the different stakeholders and harmonization aspects are addressed in accompanying standardization activities.

Main application
Smart grid applications in general: equipment, planning, operation

Scenario for estimated costs and benefits
Smart grid infrastructure

Policy goals
Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.) Energy savings; Percentage reduction of electricity losses; Reduced peak load

GER3
MeRegio

Leading organization
EnBW Energie Baden-Wuerttemberg AG

Total budget
24 Mio. EUR

Description
Around 1,000 private and industrial customers have been equipped with smart meters and a dynamic price signal. The goal of the project was to evaluate whether and how customers react on dynamic prices which have been calculated according to the availability of renewable energy.

Main application
Integration of Large Scale RES

Other applications
Smart Customer and Smart Home

Scenario for estimated costs and benefits
The project was for research/demonstration. Up to now there is no business case behind.

Policy goals
Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Energy savings; Reduced peak load; Increased internal transfer capacity between TSOs or DSOs

GER6
Smart Watts

Leading organization
utilicount GmbH & Co. KG

Total budget
up to ca. 20 Million EUR

Description

Central idea of the project, “Smart Watts,” is to compensate the increased volatility of energy supply, due to the increased integration of renewable energy, by load balancing on the demand side and rises in energy efficiency - focused on private households. The market players gain access to current actual data by a dynamic information exchange of supply and demand information. This enables the generation of additional data such as dynamic purchasing conditions, which then can be offered to private households. The dynamic purchasing information (e.g., prices) are meant to motivate private households to shift their load. Therefore the households use an visualization, controlling and steering tablet pc App.

Main application

Smart Customer and Smart Home; Smart Metering; Aggregation (Demand Response, VPP)

Other applications

Aggregation (Demand Response, VPP)

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Additional Demand Side Management power managed in the grid/maximum power load; Reduced peak load; Energy savings

IND2

UGVCL, Gujarat

Leading organization

UGVCL

Total budget

$9,200,000

Description

UGVCL has proposed the pilot project in Naroda of Sabarmati circle which is an industrial and residential area and Deesa of Palanpur circle which is an agricultural area covering 20,524 consumers in Naroda and 18,898 agricultural unmetered consumers in Deesa-II division and accounting for input energy of around 1700 MU (Naroda : 374.52 MU & Deesa : 1321.27 MU for 2010-11). The functionalities of peak load management, outage management, power quality management are proposed by implementing automated metering infrastructure (AMI) for industrial, commercial and residential consumers. Committee also observed that some additional functionalities like load forecasting and asset management are also proposed and functionalities of load forecasting, peak power management and outage management are also considered at utility level which will impact all consumers of utility (i.e., 27 lac consumers) indirectly. Renewable energy integration has been proposed to be carried out at Patan Solar Park and few roof top installations at some of the universities. The pilot project proposes to introduce TOU tariff with approvals from GERC. Renewable energy integration is proposed through proper and accurate load forecast by real time monitoring of substations, feeders and RES generation.

Main application

Peak load management, outage management, and power quality management are proposed by implementing automated metering infrastructure (AMI) for industrial, commercial and residential consumers.

Other applications

Load forecasting and asset management are proposed. Load forecasting, peak power management and outage management are considered at utility level. Renewable energy integration at Patan Solar Park and few roof top installations are also envisaged.

Scenario for estimated costs and benefits

The ROI is proposed to be realized through benefits on account of reduction in AT&C losses from 12.44% to around 8.44% in Naroda and from 21.69% to 15% in Deesa; savings in peak power purchase cost by reduction of peak load by up to 5% in both areas; reduction in transformer failure rate from 16.52% to 8% in Deesa area; and reduction in number of outages, meter reading cost, cost of payment collection, etc. Based on projected savings the payback period is likely to be around 2 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND3

CESC, Mysore

Leading organization

CESC, Mysore

Total budget

$6,150,000

Description

CESC, Mysore has proposed the pilot project in Additional City Area Division (ACAD), Mysore involving 21,824 consumers with a good mix of residential, commercial, industrial and agricultural consumers including 512 irrigation pump sets covering over 14 feeders and 473 distribution transformers and accounting for input energy of 151.89 MU. The functionalities of peak load management, outage management are proposed by implementing automated metering infrastructure (AMI) for residential consumers and industrial consumers and integration of distributed generation / micro grid integration. Some additional functionality like agriculture DSM with community portal, consumer portal to support DSM/DR, employee portal for knowledge sharing and benefit realization, KPI based MIS and data analytics for decision support are also proposed. The pilot project proposes to introduce real time pricing signal by interfacing at SLDC level to get UI/ABT prices subject to regulatory consent. Implementation of Fault Location Isolation and System Restoration (FLISR) at feeders where alternate feeding arrangements are available is also proposed.

Main application

Peak load management, outage management by implementing automated metering infrastructure (AMI) for residential consumers and industrial consumers; Integration of distributed generation/micro grid integration

Other applications

Agriculture DSM with community portal

Scenario for estimated costs and benefits

ROI is proposed to be realized through benefits on account of reduction in AT&C losses from 10.6% to 5.7% in 3 years, shifting of load of up to 80% in industrial feeders and up to 20% for domestic consumer during peak hours, reduction in number of transformer failure, meter reading cost, reduction in unforeseen outages and also recovery time for unforeseen outages by 20% and 50%. Based on projected savings the payback period is likely to be less than 3 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

IRL1

CER National Smart Metering Plan

Leading organization

Electricity Supply Board - Networks (IE)

Description

The project assessed: the impact of Time of Use pricing and billing/information stimuli on the customer behaviour; and the available technologies for AMI roll out in an Irish context. The outcomes of both were factored into the cost benefit analysis for the full roll out of AMI in Ireland.

Main application
Smart Metering

Other applications
Smart Customer and Smart Home

Policy goals
Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES), Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Reduced peak load

IRL3
Smart Networks Communications

Leading organization
ESB Networks

Description
There is a need for a reliable, high speed, always available communications infrastructure to connect medium voltage control and monitoring points to the ESB backbone communications infrastructure. Current distribution automation and MV control of ESB Networks is using GPRS communications. However the limitations of GPRS in terms of cost and reliability have been encountered and a clear need for a DSO operated communications solution has been identified. ESB Networks is currently deploying a 4G (WiMax technology which also has LTE capability either as an alternative or complementary system) test network in Galway. This is connecting downline reclosers and voltage regulators initially for monitoring purposes and if proving suitable reliable and secure, for control purposes. A base station (covering 2 quadrants) and multiple consumer premises devices (4G modems at connected devices) are being deployed to establish whether the intended coverage is delivered. The project is addressing whether the data capacity, speed and latency needs of network management are met using this technology in addition to the cyber security implications. Additionally, other “final mile” radio technology solutions are being trialled to connect remote devices to the 4G network where they are beyond its reach.

Main application
Smart Network Management

Other applications
Integration of DER

Policy goals
Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid maximum power load; Percentage reduction of electricity losses

ITA1
Telegestore

Leading organization
Enel Distribuzione

Description
Enel's Telegestore Project provides the installation of more than 32 million smart meters. These smart meters allow Enel to periodically collect data on voltage quality and interruptions, daily consumptions, active and reactive energy measurements, and remotely manage contractual activities. Meters are able to transmit data regarding consumptions, receive updates of the contractual parameters and remotely manage the supply connectivity.

Main application
Smart Metering

Policy goals
Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Percentage reduction of electricity losses

JPN1
Yokohama

Leading organization
Yokohama City

Total budget
925,000,000

Description
Demonstration project in a large city with a population of over 3.7 million (voluntary participation: 4,000 households). Building a network among 3 separate areas and exploring new energy management systems for an established city. As a leading smart city model, deploying Yokohama's vision, experience and expertise overseas.

Main application
Smart Customer and Smart Home

Other applications
Smart Network Management; Integration of DER; Integration of Large Scale RES; Electric Vehicles and Vehicle2Grid Applications

Policy goals
Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES)

JPN2
Toyota

Leading organization
Toyota City

Total budget
284,000,000

Description
Focus on the household sector and conduct activities based on a vision of the communal environment ten years in the future. Aim to establish a community-based low-carbon social system while limiting social costs. Study the difference between regional and national issues/needs in the hope of leveraging project outcomes on a global basis.

Main application
Electric Vehicles and Vehicle2Grid Application

Other applications
Integration of DER; Integration of Large Scale RES; Smart Customer and Smart Home

Policy goals
Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES)

JPN3
Keihanna

Leading organization
Kansai Science City (“Keihanna”) /Kyoto Pref.

Total budget
169,660,000

Description
Improve energy efficiency and maximize the use of renewable energy throughout the entire district by exchanging data among houses, buildings, EVs and power grids, controlling storage batteries and using demand response mechanisms Aim to demonstrate an “on-demand power management system” and “power coloring” to be developed in this project.

Main application
Smart Customer and Smart Home

Other applications
Integration of DER; Integration of Large Scale RES; Electric Vehicles and Vehicle2Grid Applications

Policy goals
Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES)

JPN4
Kitakyushu

Leading organization
Kitakyushu City

Total budget
204,175,000

Description
Active implementation of low-carbon measures and establishment of an energy management system through promotion of regional energy saving stations in a designated district (Higashida); Deployment of project outcomes overseas, including Asian countries, through the Kitakyushu Asian Center for Low Carbon Society.

Main application
Smart Customer and Smart Home

Other applications
Integration of DER; Integration of Large Scale RES; Aggregation (Demand Response, VPP); Electric Vehicles and Vehicle2Grid Applications

Policy goals
Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES)

KOR5
Jeju Test Bed_Smart Power Grid

Leading organization
KEPCO

Total budget
$31.9M

Description
Platform construction of demonstration project with digital substation and automated distribution system

Main application
Smart Network Management

Scenario for estimated costs and benefits
Deployment costs and benefits from energy cost savings

Policy goals
Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Percentage reduction of electricity losses

NED1
Smart Grid Nieuweveens Landen Meppel

Leading organization
DNVKEMA

Total budget
5 million euros

Description
With the large scale introduction of renewable energy sources towards a sustainable energy system a number of challenges are imposed on the energy system. The intermittent character of renewable energy sources sets the need for more flexibility as well as backup power. To cope with these challenges, smart grid technology is being developed. Gas applications like (micro) cogeneration units and hybrid heat pump systems as well as the gas infrastructure play an essential role in smart grids and form a cost efficient cornerstone in balancing our networks, reduce (local) peak load on the electricity grid and prevent congestion. For the large scale implementation of a sustainable system, it is necessary to build experience in field tests. This is why DNV KEMA, together with TNO, ICT Automatisering, RWE Essent, Enexis and Gasunie started a living lab demonstration in Hoogkerk near Groningen in the Netherlands. PowerMatching City consists of 40-50 interconnected regular households of which 25 are already online since the beginning of 2010. These households are equipped with micro-cogeneration units, hybrid heat pumps, PV-solar panels, smart appliances and electric vehicles. Additional power is produced by a wind farm and a gas turbine.

Main application
Smart Network Management

Other applications
Smart Customer and Smart Home

Policy goals

Increased number of consumers participating in electricity markets and in energy efficiency measures; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Reduced peak load; Energy savings

NED2

Smart Grid Nieuweveens Landen Meppel

Leading organization

Municipality of Meppel and Rendo Energy company

Description

- Realising energy supplying neighborhood of over 3,000 households.
- Formation of a local sustainable energy company with participation of residents.
- Combining electricity, (bio)gas, heating and cooling in order to achieve a local energy balance.

Demonstrate technical and economical feasibility

Main application

Integration of DER

Other applications

Smart Customer and Smart Home

Scenario for estimated costs and benefits

Local sustainable energy company

Policy goals

Increased number of consumers participating in electricity markets and in energy efficiency measures; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Reduced peak load; Energy savings

SWE2

Smart Grid Gotland

Leading organization

GEAB

Total budget

28 MEUR (242 MSEK)

Description

The Smart Grid Gotland R&D demonstration project intends to develop strategies for the planning, construction and operation of a fully developed, large-scale smart grid, including a large share of intermittent production, primarily from wind power in the distribution network. New market models and services will be developed to pave the way for new market players.

Main application

Smart Network Management

Other applications

Integration of DER; Integration of Large Scale RES; Smart Customer and Smart Home; Smart Metering

Scenario for estimated costs and benefits

No net present value calculation is yet available.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE4

Stockholm Royal seaport Active House Pilot

Leading organization

Fortum Distribution AB

Total budget

20 msek

Description

The long-term outcome will be a test apartment, based in Stockholm Royal Seaport, which is part of the solution from the pre-study in the area's housing. The plausibility and attraction of solutions have been deemed to create conditions to expand the number of participating construction companies in next phase. Part solution was to work together with the results from other projects that also have Stockholm Royal Seaport as the test bed. The apartment, which is included in the test installations, will have access to leading technology in smart grids, appliances, information technology and design. They will also be active specifier and designers of new services and products being developed continuously. The results of this project make it possible for companies to develop products and services based on the technology that the project contributed. Researchers and entrepreneurs will be able to assimilate the results from this test apartment to develop their ideas and innovations.

Scenario for estimated costs and benefits

Customer participation in load shift to optimize load factors, impact climate effects and distribution automation systems to increase reliability and reduce losses. Hosting of DER at LV levels.

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE5

Stockholm Royal seaport demonstration phase

Leading organization

Fortum Distribution AB

Total budget

140 msek

Description

The program will specify, develop, test and evaluate both business and market models, new technical solutions and concepts, information and communications technology (ICT) as well as aspects of data security. As described in the pre-study, a set of scenario tests will be the cohesive factor in this work. In order to make it happen, an R&D platform needs to be developed and implemented as enablement for overall system tests, which will also include aspects of behavioural science. The first phase of the program and this application will focus on scenarios related to active end-customers and reliability of the future grid, where the urban smart grid in a new way creates opportunities for interaction with the end customer in order to, e.g., reduce CO_2 emissions. Also, scenarios for increased reliability and availability in a future urban smart grid will be tested.

Scenario for estimated costs and benefits

Customer participation in load shift to optimize load factors, impact climate effects and distribution automation systems to increase reliability and reduce losses. Hosting of DER at LV levels.

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE6

Smart Grid Hyllie

Leading organization

E.ON

Total budget

200 MSEK for 2011 through 2014. Additional years to follow.

Description

Hyllie - A test bed for developing solutions for a future transformed energy in the city of Malmö. The project includes: (a) Customer control of heat and electricity consumption, (b) Smart home and Smart building solutions, (c) Distributed generation – electricity and heat, (d) Smart grid solutions – DH and electricity, (e) Sustainable mobility solutions – gas and emobility, (f) CO_2 and resource efficient energy supply, and (g) Distributed energy storage.

Main application

Aggregation (Demand Response, VPP)

Other applications

Smart Customer and Smart Home

Scenario for estimated costs and benefits

Costs for 2011-2014 estimated to 200 MSEK (basically more or less all investments are to be seen as consumables); Analyses regarding benefits to be done in evaluation phase

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA1
gridSMART(SM) Demonstration Project

Leading organization
AEP Ohio

Total budget
$148,821,823

Description
This project is to build a secure, interoperable, and integrated Smart Grid infrastructure that demonstrates the ability to maximize distribution system efficiency and reliability, and consumer use of demand response programs to reduce energy consumption, peak demand costs, and fossil fuel emissions. The demonstration area includes 150 square miles including approximately 110,000 meters and 70 distribution circuits. AEP Ohio will implement Smart Grid technology over 58 13kV circuits from 10 distribution stations and 12 34.5kV circuits from six distribution stations. Included in this project is a redistribution management system, integrated volt-VAR control, distribution automation, advanced meter infrastructure, home area networks, community energy storage, sodium sulfur battery storage, and renewable generation sources. These technologies will be combined with two-way consumer communication and information sharing, demand response, dynamic pricing, and consumer products, such as plug-in hybrid vehicles.

Main application
Smart Network Management

Other applications
Smart Customer and Smart Home; Integration of DER; Smart Metering; Aggregation (Demand Response, VPP); Electric Vehicles and Vehicle2Grid Applications

Scenario for estimated costs and benefits
Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals
Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Reduced peak load

USA2

Pacific Northwest Division Smart Grid Demonstration Project

Leading organization

Battelle Memorial Institute

Total budget

$177,642,503

Description

This demonstration will validate new technologies; provide two-way communication between distributed generation, storage and demand assets, and the existing grid infrastructure; quantify Smart Grid costs and benefits; advance interoperability standards and cyber security approaches; and validate new business models. More than 20 types of responsive Smart Grid assets will be tested across six regional and utility operational objectives at 15 unique distribution sites operated by 12 utilities across five states and three climatic regions. A base of Smart Grid technology serving more than 60,000 customers will be installed, validated, and operated. All use classes are represented in the demonstration including residential, commercial, industrial, and irrigation customers. The demonstration will develop a single integrated Smart Grid incentive-signaling approach and will test and validate its ability to continuously coordinate the responses of Smart Grid assets to meet a wide range of operational objectives. It will also engage distributed control so that wind integration problems are mitigated. Micro-grid islanding will also be evaluated for its potential to enhance reliability for customers and relieve energy demand.

Main application

Smart Network Management

Other applications

Integration of DER; Integration of Large Scale RES; Aggregation (Demand Response, VPP); Smart Customer and Smart Home; Smart Metering

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA3

Smart Grid Deployment

Leading organization

Duke Energy Carolinas, LLC

Total budget

$555,706,307

Description

This project includes advanced metering infrastructure (AMI) and distribution automation systems in five states. The project involves large-scale deployments of AMI and distribution automation in Ohio and Indiana, a pilot deployment of AMI and distribution automation in Kentucky, and deployment of distribution automation in North and South Carolina. The project includes pilot programs for electricity pricing including time-of-use rates, peak-time rebates, and critical-peak pricing. Customers in these pilot programs use home area networks, web portals, and direct load control devices to reduce their electricity consumption and peak demand. Distribution automation equipment will be installed on 1,926 out of 4,741 circuits, which includes: distribution automation communications network; SCADA communications network; automated distribution circuit switches; automated capacitors; and equipment condition monitors.

Main application

Smart Metering

Other applications

Smart Customer and Smart Home; Aggregation (Demand Response, VPP); Smart Network Management

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals

Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA4

Smart Grid Project

Leading organization

EPB

Total budget
$226,707,562

Description
This project involves the installation of advanced metering systems and communications infrastructure. The project installs automated distribution grid equipment expected to enhance the reliability and quality of electric service delivery. The project implements two-way communications and metering expected to: (1) enable customers to view their energy consumption at their convenience through systems such as web portals, (2) provide timebased rate programs to customers, (3) provide information and tools to improve outage management, and (4) reduce operations and maintenance costs.

Main application
Smart Metering

Other applications
Smart Customer and Smart Home; Aggregation (Demand Response, VPP); Smart Network Management

Scenario for estimated costs and benefits
Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals
Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA5
Energy Smart Florida

Leading organization
Florida Power & Light Company

Total budget
$578,963,325

Description
This project is deploying advanced metering infrastructure (AMI), distribution automation, new electricity pricing programs, and advanced monitoring equipment for the transmission system. AMI supports two-way communication between FPL and its 3 million consumers receiving smart meters, providing detailed information about electricity usage and the ability to implement new electricity pricing programs. New distribution automation devices

expand the functionality of FPL's distribution system to increase reliability, reduce energy losses, and reduce operations and maintenance costs. Synchrophasor and line monitoring devices help increase the reliability and security of the transmission system.

Main application

Smart Metering

Other applications

Smart Customer and Smart Home; Aggregation (Demand Response, VPP); Smart Network Management

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI), distribution automation systems, and wide-area transmission monitoring

Policy goals

Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA6

Enhanced Demand and Distribution Management Regional Demonstration

Leading organization

National Rural Electric Cooperative Association

Total budget

$67,864,292

Description

This project is demonstrating Smart Grid technologies with 27 cooperatives in 11 states across multiple utilities, geographies, climates, and applications including low density areas, low consumer income areas, and service areas prone to natural disasters. NRECA will conduct studies in advanced volt/volt-ampere reactive for total demand; generation and transmission-wide (G&T) demand response over advanced metering infrastructure (AMI); critical peak pricing over AMI; water heater and air conditioning load control over AMI; advanced water heater control and thermal storage; consumer Internet energy usage portal pilots; consumer in-home energy display pilots; time-sensitive rates pilots; multiple AMI integration at G&T co-ops; distribution co-op meter data management system applications; and self-healing feeders for improved reliability.

Main application
Smart Metering

Other applications
Smart Network Management; Aggregation (Demand Response, VPP); Smart Customer and Smart Home

Scenario for estimated costs and benefits
Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals
Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA7
SmartSacramento

Leading organization
Sacramento Municipal Utility District

Total budget
$307,697,792

Description
This project involves system-wide deployment of an advanced metering system integrated with existing enterprise and information technology systems as well as a partial deployment of advanced distribution grid assets that equip SMUD's distribution circuits with automated control and operation capabilities. The project also involves customer systems that provide usage and cost information to customers that educate and enable more control over their consumption. These systems enable more informed participation by customers and more effective management by SMUD to improve reliability and efficiency of grid operations and better optimize the use of assets. The project includes a field test of plug-in electric vehicle charging stations to assess their technical performance, vehicle charging patterns, and effects on electric distribution system operations.

Main application
Smart Metering

Other applications

Smart Network Management; Aggregation (Demand Response, VPP); Smart Customer and Smart Home; Electric Vehicles and Vehicle2Grid Applications

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA8

Positive Energy Smart Grid Integration Program

Leading organization

Oklahoma Gas and Electric

Total budget

$293,201,332

Description

This project involves system-wide deployment of a fully integrated advanced metering system, distribution of in-home devices to almost 6,000 customers, and installation of advanced distribution automation systems. The program aims at reducing peak loads, overall electricity use, and operations and maintenance costs while increasing distribution system efficiency, reliability, and power quality. The program implements secure wireless communications to: (1) allow smart meter customers to view their electricity consumption data through a personalized web site, and (2) allow OG&E to manage, measure, and verify targeted demand reductions during peak periods. New systems capture meter information for billing and implement new customer pricing programs and service offerings. The project deploys a more dynamic distribution management system, automated switching, and integrated voltage and reactive power control (IVVC) that reduces line losses, reduces operational costs, and improves service reliability. The program also includes a study of consumer behavior in response to different forms of dynamic pricing on an opt-in basis. Finally, the program includes collaboration with University of Oklahoma faculty and students to deploy technologies within 46 buildings on the campus and to take advantage of opportunities for education and training.

Main application

Smart Metering

Other applications
Smart Network Management; Aggregation (Demand Response, VPP); Smart Customer and Smart Home

Scenario for estimated costs and benefits
Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals
Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA9
Smart Grid Project

Leading organization
Southern Company Services, Inc.

Total budget
$330,130,482

Description
This project involves integrated upgrades of the distribution, transmission, and grid management systems. Major efforts include automation of major parts of the distribution system, automation of selected transmission lines, and new equipment for many substations.

Main application
Smart Network Management

Scenario for estimated costs and benefits
Distribution and substation automation

Policy goals
Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Percentage reduction of electricity losses; Increased internal transfer capacity between TSOs or DSOs

USA10

SmartGrid Program

Leading organization

Talquin Electric Cooperative

Total budget

$16,200,000

Description

This project involves the installation of advanced metering, communications infrastructure, distribution automation equipment, load control devices, and other customer systems. The project implements two-way communications to: (1) enable customers to view their energy consumption at their convenience through customer systems and web portals, (2) provide time-based rate programs to customers, (3) provide information and tools to improve outage management, and (4) reduce operations and maintenance costs. The project also installs automated distribution grid equipment expected to: (1) enhance the reliability and quality of electric delivery, and (2) reduce operations and maintenance costs.

Main application

Smart Metering

Other applications

Smart Network Management, Smart Customer and Smart Home

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals

Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

2.3.2 Transmission Level

ID	Name
CAN2	Zone de réseau interatif
FRA5	PREMIO-('Production Répartie, Enr et MDE, Intégrées et Optimisées', or, in English, 'Integration and Optimization of DG, DSM and Renewable Energies')
FRA6	Greenlys

GER3	MeRegio
IRL5	DS3
IRL9	Wind Security Assessment Tool
SWE2	Smart Grid Gotland
SWE4	Stockholm Royal seaport Active House Pilot
SWE5	Stockholm Royal seaport demonstration phase
SWE6	Smart Grid Hyllie
USA5	Energy Smart Florida
USA9	Smart Grid Project

CAN2

Zone de réseau interatif

Leading organization

Hydro-Québec Distribution

Total budget

$25,585,000

Description

Hydro-Québec has a distribution grid evolution plan which includes progressive smart grid technology implementation. To ensure successful implementation, Hydro-Québec decided to create a smart zone where the technologies will be deployed in order to improve energy efficiency and grid performance. The first smart grid technology to be deployed in the zone will be a DMS (Distribution Management System) with integrated voltage and reactive power control linked to the current distribution grid control system. In 2008, Hydro-Québec introduced a simple voltage regulation and reactive power control system to the Pierre-Boucher substation to reduce energy use, grid losses and greenhouse gases (GHGs). Hydro-Québec estimates that a VVO (Volt Var Optimization) type smart system would allow it to increase energy efficiency compared to a VVC (Volt Var Control) type system. The second smart grid technology involves charging stations with and without intelligence for electric vehicles, scheduled for installation between 2010 and 2012. The agreement between Hydro-Québec and Mitsubishi calls for testing of up to 30 all-electric iMiEV type vehicles. The goal of the project is to better understand charging and driving behaviors, as well as charging infrastructure needs at 120V/15A, 240V/15-30A, and direct current charging (50kW).

Main application

Electric Vehicles and Vehicle2Grid Applications

Other applications
Smart Metering

Policy goals
Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Increased internal transfer capacity between TSOs or DSOs

FRA5
PREMIO-('Production Répartie, Enr et MDE, Intégrées et Optimisées', or, in English, 'Integration and Optimization of DG, DSM and Renewable Energies')

Leading organization
CAPENERGIE – France

Description
PREMIO is primarily a technical proposal created to address the following goals: – to develop a dynamic demand-response specifically for peak shaving purposes, – to increase the flexibility of the power system, – to promote a new energy culture which encourages energy efficiency, – to integrate distributed generation and particularly renewable energies, – to reduce greenhouse gas emissions from polluting power plants, especially during peak load times, and – to manage regional electrical energy from a wide range of local actors. PREMIO combines the control of installed distributed resources for optimal use with an awareness campaign promoting demand side management (DSM). The PREMIO platform includes a virtual power plant (VPP) which integrates approximately fifty distributed resources, all of which are distributed generation, storage technologies and customers' curtailable loads. The limited number of installations suggests that project results will be qualitative rather than quantitative.

Main application
Integration of DER; Aggregation

Policy goals
Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Energy savings; Reduced peak load

FRA6

GreenLys

Leading organization

ERDF

Description

GreenLys is a systemic smart grid project which includes: - DER - Consumption - Networks (DSO & TSO). Main Goals: - decrease of greenhouse gases - control of energy bill - introduction and control of DER on LV networks - behavior of consumers, with incentive and innovative new offers - aggregator functions. Innovations: - Smart management of grid (seal-healing, smart metering using Linky infrastructure,...) - Demand side management, demand/response, energy saving and new offers (using boxes linked to Linky Infrastructure, tariffs, dynamic prices policy...) – Investments; Impact on studies and development of networks (especially for DSOs)

Main application

Smart Network Management; Integration of DER; Smart Customer and Smart Home

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Reduced peak load

GER3

MeRegio

Leading organization

EnBW Energie Baden-Wuerttemberg AG

Total budget

24 Mio. EUR

Description

Around 1,000 private and industrial customers have been equipped with smart meters and a dynamic price signal. The goal of the project was to evaluate whether and how customers react on dynamic prices which have been calculated according to the availability of renewable energy.

Main application

Integration of Large Scale RES

Other applications
Smart Customer and Smart Home

Scenario for estimated costs and benefits
The project was for research/demonstration. Up to now there is no business case behind.

Policy goals
Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Energy savings; Reduced peak load; Increased internal transfer capacity between TSOs or DSOs

IRL5
DS3

Leading organization
Eirgrid

Description
EirGrid's DS3 programme is developing solutions to the challenges associated with increasing levels of renewable generation, particularly with regard to secure power system operation, as we work to achieve the 2020 renewable targets. The combination of the All island Grid Studies, EirGrid's Grid 25, the facilitation of renewables studies, and a comprehensive analysis of the long-term needs of the power system conducted in 2011, form the backbone of our plans to facilitate the 40% target by 2020. The main operational areas that need to be addressed are the management of the system frequency, balancing the system in real time, managing system voltage and ensuring the compliance of plant with the Grid Code requirements. The work programme includes enhancing the portfolio performance, developing new operational policies and system tools to efficiently use the plant portfolio to the best of its capabilities, and regularly reviewing the needs of the system as the portfolio capability evolves.

Main application
Integration of Large Scale RES

Other applications
Smart Network Management; Aggregation (Demand Response, VPP); Integration of DER

Policy goals
Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES; Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Percentage reduction of electricity losses; Reduced peak load; Additional interconnection capacity (specify HVDC and HVAC)

IRL9

Wind Security Assessment Tool

Leading organization

Eirgrid

Description

WSAT. Wind Security Assessment Tool. One of the most critical tools used in the ControlCentres is the wind forecast tool. This tool collates data from several different third-party wind forecasters to provide an estimate of how much wind generation will be available over the coming hours and days. When there are very high wind generation levels, particularly during times of low electrical demand, wind generation may need to be curtailed. This is done using the wind dispatch tool, which sends out instructions to the wind farms electronically, taking into account various market rules and priorities. The stability of the power system is affected by wind generation, and so to study this in realtime, a Wind Security Assessment Tool (WSAT) was introduced into the Dublin Control Centre in 2010. WSAT provides a real-time transient stability and voltage stability assessment of the current state of the power system. This allows the Grid Controllers to monitor system stability in real-time and take corrective actions as appropriate.

Main application

Integration of DER

Other applications

Integration of Large Scale RES

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load

SWE2

Smart Grid Gotland

Leading organization

GEAB

Total budget

28 MEUR (242 MSEK)

Description

The Smart Grid Gotland R&D demonstration project intends to develop strategies for the planning, construction and operation of a fully developed, large-scale smart grid, including a large share of intermittent production, primarily from wind power in the distribution network. New market models and services will be developed to pave the way for new market players.

Main application

Smart Network Management

Other applications

Integration of DER; Integration of Large Scale RES; Smart Customer and Smart Home; Smart Metering

Scenario for estimated costs and benefits

No net present value calculation is yet available.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE4

Stockholm Royal seaport Active House Pilot

Leading organization

Fortum Distribution AB

Total budget

20 msek

Description

The long-term outcome will be a test apartment, based in Stockholm Royal Seaport, which is part of the solution from the pre-study in the area's housing. The plausibility and attraction of solutions have been deemed to create conditions to expand the number of participating construction companies in next phase. Part solution was to work together with the results from other projects that also have Stockholm Royal Seaport as the test bed. The apartment, which is included in the test installations, will have access to leading technology in smart grids, appliances, information technology and design. They will also be active specifier and designers of new services and products being developed continuously. The results of this project make it possible for companies to develop products and services based on the technology that the project contributed. Researchers and entrepreneurs will be able to assimilate the results from this test apartment to develop their ideas and innovations.

Scenario for estimated costs and benefits

Customer participation in load shift to optimize load factors, impact climate effects and distribution automation systems to increase reliability and reduce losses. Hosting of DER at LV levels.

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE5

Stockholm Royal seaport demonstration phase

Leading organization

Fortum Distribution AB

Total budget

140 msek

Description

The program will specify, develop, test and evaluate both business and market models, new technical solutions and concepts, information and communications technology (ICT) as well as aspects of data security. As described in the pre-study, a set of scenario tests will be the cohesive factor in this work. In order to make it happen, an R&D platform needs to be developed and implemented as enablement for overall system tests, which will also include aspects of behavioural science. The first phase of the program and this application will focus on scenarios related to active end-customers and reliability of the future grid, where the urban smart grid in a new way creates opportunities for interaction with the end customer in order to, e.g., reduce CO_2 emissions. Also, scenarios for increased reliability and availability in a future urban smart grid will be tested.

Scenario for estimated costs and benefits

Customer participation in load shift to optimize load factors, impact climate effects and distribution automation systems to increase reliability and reduce losses. Hosting of DER at LV levels.

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand

side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE6

Smart Grid Hyllie

Leading organization

E.ON

Total budget

200 MSEK for 2011 through 2014. Additional years to follow.

Description

Hyllie - A test bed for developing solutions for a future transformed energy in the city of Malmö. The project includes: (a) Customer control of heat and electricity consumption, (b) Smart home and Smart building solutions, (c) Distributed generation – electricity and heat, (d) Smart grid solutions – DH and electricity, (e) Sustainable mobility solutions – gas and emobility, (f) CO_2 and resource efficient energy supply, and (g) Distributed energy storage.

Main application

Aggregation (Demand Response, VPP)

Other applications

Smart Customer and Smart Home

Scenario for estimated costs and benefits

Costs for 2011-2014 estimated to 200 MSEK (basically more or less all investments are to be seen as consumables); Analyses regarding benefits to be done in evaluation phase

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA5

Energy Smart Florida

Leading organization

Florida Power & Light Company

Total budget

$578,963,325

Description

This project is deploying advanced metering infrastructure (AMI), distribution automation, new electricity pricing programs, and advanced monitoring equipment for the transmission system. AMI supports two-way communication between FPL and its 3 million consumers receiving smart meters, providing detailed information about electricity usage and the ability to implement new electricity pricing programs. New distribution automation devices expand the functionality of FPL's distribution system to increase reliability, reduce energy losses, and reduce operations and maintenance costs. Synchrophasor and line monitoring devices help increase the reliability and security of the transmission system.

Main application

Smart Metering

Other applications

Smart Customer and Smart Home; Aggregation (Demand Response, VPP); Smart Network Management

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI), distribution automation systems, and wide-area transmission monitoring

Policy goals

Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA9

Smart Grid Project

Leading organization

Southern Company Services, Inc.

Total budget
$330,130,482

Description
This project involves integrated upgrades of the distribution, transmission, and grid management systems. Major efforts include automation of major parts of the distribution system, automation of selected transmission lines, and new equipment for many substations.

Main application
Smart Network Management

Scenario for estimated costs and benefits
Distribution and substation automation

Policy goals
Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Percentage reduction of electricity losses; Increased internal transfer capacity between TSOs or DSOs

2.3.3 T&D Interface

ID	Name
CAN1	PowerShift Atlantic
CAN2	Zone de réseau interatif
FRA6	Greenlys
GER3	MeRegio
IND2	UGVCL, Gujarat
IND3	CESC, Mysore
IRL5	DS3
SWE2	Smart Grid Gotland
SWE6	Smart Grid Hyllie
USA2	Pacific Northwest Division Smart Grid Demonstration Project
USA5	Energy Smart Florida
USA9	Smart Grid Project

CAN1
PowerShift Atlantic

Leading organization
New Brunswick Power

Total budget
$32,053,000

Description
PowerShift Atlantic is a collaborative research project led in partnership by Natural Resources Canada through the Clean Energy Fund, New Brunswick Power, Saint John Energy, Maritime Electric, Nova Scotia Power, New Brunswick System Operator, the Universi

Main application
Aggregation (Demand Response, VPP)

Other applications
Smart Network Management; Integration of DER; Integration of Large Scale RES

Scenario for estimated costs and benefits
The impact of the Virtual Power Plant (VPP) solution is established by comparing the differences in generation utilization and the associated production costs by evaluating the system with, and without, the VPP. This will be used to determine:-Peak reduc

Policy goals
Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES)

CAN2
Zone de réseau interatif

Leading organization
Hydro-Québec Distribution

Total budget
$25,585,000

Description
Hydro-Québec has a distribution grid evolution plan which includes progressive smart grid technology implementation. To ensure successful implementation, Hydro-Québec decided to create a smart zone where the technologies will be deployed in order to improve energy efficiency and grid performance. The first smart grid technology to be deployed in the zone will be a DMS (Distribution Management System) with integrated voltage and reactive

power control linked to the current distribution grid control system. In 2008, Hydro-Québec introduced a simple voltage regulation and reactive power control system to the Pierre-Boucher substation to reduce energy use, grid losses and greenhouse gases (GHGs). Hydro-Québec estimates that a VVO (Volt Var Optimization) type smart system would allow it to increase energy efficiency compared to a VVC (Volt Var Control) type system. The second smart grid technology involves charging stations with and without intelligence for electric vehicles, scheduled for installation between 2010 and 2012. The agreement between Hydro-Québec and Mitsubishi calls for testing of up to 30 all-electric iMiEV type vehicles. The goal of the project is to better understand charging and driving behaviors, as well as charging infrastructure needs at 120V/15A, 240V/15-30A, and direct current charging (50kW).

Main application

Electric Vehicles and Vehicle2Grid Applications

Other applications

Smart Metering

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Increased internal transfer capacity between TSOs or DSOs

FRA6

GreenLys

Leading organization

ERDF

Description

GreenLys is a systemic smart grid project which includes: - DER - Consumption - Networks (DSO & TSO). Main Goals: - decrease of greenhouse gases - control of energy bill - introduction and control of DER on LV networks - behavior of consumers, with incentive and innovative new offers - aggregator functions. Innovations: - Smart management of grid (seal-healing, smart metering using Linky infrastructure,...) - Demand side management, demand/response, energy saving and new offers (using boxes linked to Linky Infrastructure, tariffs, dynamic prices policy...) – Investments; Impact on studies and development of networks (especially for DSOs)

Main application

Smart Network Management; Integration of DER; Smart Customer and Smart Home

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Reduced peak load

GER3

MeRegio

Leading organization

EnBW Energie Baden-Wuerttemberg AG

Total budget

24 Mio. EUR

Description

Around 1,000 private and industrial customers have been equipped with smart meters and a dynamic price signal. The goal of the project was to evaluate whether and how customers react on dynamic prices which have been calculated according to the availability of renewable energy.

Main application

Integration of Large Scale RES

Other applications

Smart Customer and Smart Home

Scenario for estimated costs and benefits

The project was for research/demonstration. Up to now there is no business case behind.

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Energy savings; Reduced peak load; Increased internal transfer capacity between TSOs or DSOs

IND2

UGVCL, Gujarat

Leading organization

UGVCL

Total budget

$9,200,000

Description

UGVCL has proposed the pilot project in Naroda of Sabarmati circle which is an industrial and residential area and Deesa of Palanpur circle which is an agricultural area covering 20,524 consumers in Naroda and 18,898 agricultural unmetered consumers in Deesa-II division and accounting for input energy of around 1700 MU (Naroda : 374.52 MU & Deesa : 1321.27 MU for 2010-11). The functionalities of peak load management, outage management, power quality management are proposed by implementing automated metering infrastructure (AMI) for industrial, commercial and residential consumers. Committee also observed that some additional functionalities like load forecasting and asset management are also proposed and functionalities of load forecasting, peak power management and outage management are also considered at utility level which will impact all consumers of utility (i.e., 27 lac consumers) indirectly. Renewable energy integration has been proposed to be carried out at Patan Solar Park and few roof top installations at some of the universities. The pilot project proposes to introduce TOU tariff with approvals from GERC. Renewable energy integration is proposed through proper and accurate load forecast by real time monitoring of substations, feeders and RES generation.

Main application

Peak load management, outage management, and power quality management are proposed by implementing automated metering infrastructure (AMI) for industrial, commercial and residential consumers.

Other applications

Load forecasting and asset management are proposed. Load forecasting, peak power management and outage management are considered at utility level. Renewable energy integration at Patan Solar Park and few roof top installations are also envisaged.

Scenario for estimated costs and benefits

The ROI is proposed to be realized through benefits on account of reduction in AT&C losses from 12.44% to around 8.44% in Naroda and from 21.69% to 15% in Deesa; savings in peak power purchase cost by reduction of peak load by up to 5% in both areas; reduction in transformer failure rate from 16.52% to 8% in Deesa area; and reduction in number of outages, meter reading cost, cost of payment collection, etc. Based on projected savings the payback period is likely to be around 2 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND3

CESC, Mysore

Leading organization

CESC, Mysore

Total budget

$6,150,000

Description

CESC, Mysore has proposed the pilot project in Additional City Area Division (ACAD), Mysore involving 21,824 consumers with a good mix of residential, commercial, industrial and agricultural consumers including 512 irrigation pump sets covering over 14 feeders and 473 distribution transformers and accounting for input energy of 151.89 MU. The functionalities of peak load management, outage management are proposed by implementing automated metering infrastructure (AMI) for residential consumers and industrial consumers and integration of distributed generation / micro grid integration. Some additional functionality like agriculture DSM with community portal, consumer portal to support DSM/DR, employee portal for knowledge sharing and benefit realization, KPI based MIS and data analytics for decision support are also proposed. The pilot project proposes to introduce real time pricing signal by interfacing at SLDC level to get UI/ABT prices subject to regulatory consent. Implementation of Fault Location Isolation and System Restoration (FLISR) at feeders where alternate feeding arrangements are available is also proposed.

Main application

Peak load management, outage management by implementing automated metering infrastructure (AMI) for residential consumers and industrial consumers; Integration of distributed generation/micro grid integration

Other applications

Agriculture DSM with community portal

Scenario for estimated costs and benefits

ROI is proposed to be realized through benefits on account of reduction in AT&C losses from 10.6% to 5.7% in 3 years, shifting of load of up to 80% in industrial feeders and up to 20% for domestic consumer during peak hours, reduction in number of transformer failure, meter reading cost, reduction in unforeseen outages and also recovery time for unforeseen outages by 20% and 50%. Based on projected savings the payback period is likely to be less than 3 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

IRL5

DS3

Leading organization

Eirgrid

Description

EirGrid's DS3 programme is developing solutions to the challenges associated with increasing levels of renewable generation, particularly with regard to secure power system operation, as we work to achieve the 2020 renewable targets. The combination of the All island Grid Studies, EirGrid's Grid 25, the facilitation of renewables studies, and a comprehensive analysis of the long-term needs of the power system conducted in 2011, form the backbone of our plans to facilitate the 40% target by 2020. The main operational areas that need to be addressed are the management of the system frequency, balancing the system in real time, managing system voltage and ensuring the compliance of plant with the Grid Code requirements. The work programme includes enhancing the portfolio performance, developing new operational policies and system tools to efficiently use the plant portfolio to the best of its capabilities, and regularly reviewing the needs of the system as the portfolio capability evolves.

Main application

Integration of Large Scale RES

Other applications

Smart Network Management; Aggregation (Demand Response, VPP); Integration of DER

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES; Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Percentage reduction of electricity losses; Reduced peak load; Additional interconnection capacity (specify HVDC and HVAC)

SWE2

Smart Grid Gotland

Leading organization

GEAB

Total budget

28 MEUR (242 MSEK)

Description

The Smart Grid Gotland R&D demonstration project intends to develop strategies for the planning, construction and operation of a fully developed, large-scale smart grid, including a large share of intermittent production, primarily from wind power in the distribution network. New market models and services will be developed to pave the way for new market players.

Main application

Smart Network Management

Other applications

Integration of DER; Integration of Large Scale RES; Smart Customer and Smart Home; Smart Metering

Scenario for estimated costs and benefits

No net present value calculation is yet available.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE6

Smart Grid Hyllie

Leading organization

E.ON

Total budget

200 MSEK for 2011 through 2014. Additional years to follow.

Description
Hyllie - A test bed for developing solutions for a future transformed energy in the city of Malmö. The project includes: (a) Customer control of heat and electricity consumption, (b) Smart home and Smart building solutions, (c) Distributed generation – electricity and heat, (d) Smart grid solutions – DH and electricity, (e) Sustainable mobility solutions – gas and emobility, (f) CO_2 and resource efficient energy supply, and (g) Distributed energy storage.

Main application
Aggregation (Demand Response, VPP)

Other applications
Smart Customer and Smart Home

Scenario for estimated costs and benefits
Costs for 2011-2014 estimated to 200 MSEK (basically more or less all investments are to be seen as consumables); Analyses regarding benefits to be done in evaluation phase

Policy goals
Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA2
Pacific Northwest Division Smart Grid Demonstration Project

Leading organization
Battelle Memorial Institute

Total budget
$177,642,503

Description
This demonstration will validate new technologies; provide two-way communication between distributed generation, storage and demand assets, and the existing grid infrastructure; quantify Smart Grid costs and benefits; advance interoperability standards and cyber security approaches; and validate new business models. More than 20 types of responsive Smart Grid assets will be tested across six regional and utility operational objectives at 15 unique distribution sites operated by 12 utilities across five states and three climatic regions. A base of Smart Grid technology serving more than 60,000 customers will

be installed, validated, and operated. All use classes are represented in the demonstration including residential, commercial, industrial, and irrigation customers. The demonstration will develop a single integrated Smart Grid incentive-signaling approach and will test and validate its ability to continuously coordinate the responses of Smart Grid assets to meet a wide range of operational objectives. It will also engage distributed control so that wind integration problems are mitigated. Micro-grid islanding will also be evaluated for its potential to enhance reliability for customers and relieve energy demand.

Main application

Smart Network Management

Other applications

Integration of DER; Integration of Large Scale RES; Aggregation (Demand Response, VPP); Smart Customer and Smart Home; Smart Metering

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA5

Energy Smart Florida

Leading organization

Florida Power & Light Company

Total budget

$578,963,325

Description

This project is deploying advanced metering infrastructure (AMI), distribution automation, new electricity pricing programs, and advanced monitoring equipment for the transmission system. AMI supports two-way communication between FPL and its 3 million consumers receiving smart meters, providing detailed information about electricity usage and the ability to implement new electricity pricing programs. New distribution automation devices expand the functionality of FPL’s distribution system to increase reliability, reduce energy

losses, and reduce operations and maintenance costs. Synchrophasor and line monitoring devices help increase the reliability and security of the transmission system.

Main application
Smart Metering

Other applications
Smart Customer and Smart Home; Aggregation (Demand Response, VPP); Smart Network Management

Scenario for estimated costs and benefits
Advanced metering infrastructure (AMI), distribution automation systems, and wide-area transmission monitoring

Policy goals
Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA9
Smart Grid Project

Leading organization
Southern Company Services, Inc.

Total budget
$330,130,482

Description
This project involves integrated upgrades of the distribution, transmission, and grid management systems. Major efforts include automation of major parts of the distribution system, automation of selected transmission lines, and new equipment for many substations.

Main application
Smart Network Management

Scenario for estimated costs and benefits
Distribution and substation automation

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Percentage reduction of electricity losses; Increased internal transfer capacity between TSOs or DSOs

2.4 Percentage Reduction of Electricity Losses (Energy Efficiency and Savings)

Summaries of projects in the inventory selected as contributing to the policy goal of "Percentage Reduction of Electricity Losses (Energy Efficiency and Savings)" are presented in order of their physical application domains: Distribution Level, Transmission Level, and T&D Interface. Within each domain, project summaries are presented in alphanumerical order of their unique Project IDs.

2.4.1 Distribution Level

ID	Name
CAN2	Zone de réseau interatif
FRA7	VENTEEA
GER2	Smart Area Aachen
IND1	Puducherry
IND2	UGVCL, Gujarat
IND3	CESC, Mysore
IND4	KSEB, Kerala
IND5	APDCL, Assam
IND6	APCPDCL, Andhra Pradesh
IND7	UHBVN, Haryana
IND9	TSECL, Tripura
IND10	HPSEB, Himachal Pradesh
IND11	MSEDCL, Maharashtra
IRL2	Smart green circuits. ESB Networks - Smart grid demonstration project
IRL3	Smart Networks Communications
IRL4	Informed system planning incorporating new energy sources

ITA1	Telegestore
KOR5	Jeju Test Bed_Smart Power Grid
MEX3	Advanced Metering Infrastructure (AMI)
SWE1	Grid4EU
SWE2	Smart Grid Gotland
SWE4	Stockholm Royal seaport Active House Pilot
SWE5	Stockholm Royal seaport demonstration phase
SWE6	Smart Grid Hyllie
USA2	Pacific Northwest Division Smart Grid Demonstration Project
USA3	Smart Grid Deployment
USA4	Smart Grid Project
USA5	Energy Smart Florida
USA6	Enhanced Demand and Distribution Management Regional Demonstration
USA7	SmartSacramento
USA8	Positive Energy Smart Grid Integration Program
USA9	Smart Grid Project
USA10	SmartGrid Program

CAN2

Zone de réseau interatif

Leading organization

Hydro-Québec Distribution

Total budget

$25,585,000

Description

Hydro-Québec has a distribution grid evolution plan which includes progressive smart grid technology implementation. To ensure successful implementation, Hydro-Québec decided to create a smart zone where the technologies will be deployed in order to improve energy efficiency and grid performance. The first smart grid technology to be deployed in the zone will be a DMS (Distribution Management System) with integrated voltage and reactive power control linked to the current distribution grid control system. In 2008, Hydro-Québec introduced a simple voltage regulation and reactive power control system to the Pierre-Boucher substation to reduce energy use, grid losses and greenhouse gases (GHGs). Hydro-Québec estimates that a VVO (Volt Var Optimization) type smart system would allow it to increase energy efficiency compared to a VVC (Volt Var Control) type system. The second smart grid technology involves charging stations with and without intelligence for electric vehicles, scheduled for installation between 2010 and 2012. The agreement between Hydro-Québec and Mitsubishi calls for testing of up to 30 all-electric iMiEV type vehicles. The goal of the project is to better understand charging and driving behaviors, as well as charging infrastructure needs at 120V/15A, 240V/15-30A, and direct current charging (50kW).

Main application

Electric Vehicles and Vehicle2Grid Applications

Other applications

Smart Metering

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Increased internal transfer capacity between TSOs or DSOs

FRA7

VENTEEA

Leading organization

ERDF

Description

In 2011, ERDF submitted the demonstrator as part of an ADEME program called “smart grid electric network” (AMI). Early 2012, the French Commissioner General for Investment (CGI) approved the project. The demonstrator is focused on the integration of large wind energy in distribution networks. More precisely the project will study observability and controllability of wind-farms, voltage regulation and centralized local protection plan and power quality. If the costs benefits analysis is validated by all involved stakeholders, a battery storage system offering a full service package would be implemented on 20 kV level.

Main application

Integration of DER

Policy goals

Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Percentage reduction of electricity losses; Reduced peak load

GER2

Smart Area Aachen

Leading organization

Stadtwerke Aachen Aktiengesellschaft

Total budget

$9,152,280

Description

Smart Area Aachen aims at developing new holistic concepts and methods based on new equipment for future smart grid solutions. In this context, innovative technical solutions are identified, optimized and eventually verified in pilot trials. Moreover, new business models are developed for the different stakeholders and harmonization aspects are addressed in accompanying standardization activities.

Main application

Smart grid applications in general: equipment, planning, operation

Scenario for estimated costs and benefits

Smart grid infrastructure

Policy goals

Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.) Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND1

Puducherry

Leading organization

Puducherry Electricity Department

Total budget

$8,700,000

Description

Pilot covers 87,031 no. of consumers with dominant being domestic consumers. The module of automated metering infrastructure (AMI) for residential consumers and industrial consumers is proposed to be implemented to assist with consumer issues like event management & prioritizing, billing cycle review and revenue collection efficiency for energy auditing and AT&C loss reduction. The AMI system shall aid in knowing real time energy input from DT as well as energy consumption by consumers that can instantly help to know losses in the system. Common Meter Data Management System is proposed that shall take data from MDMS of different meter manufacturer/solution provider and integrate the information for use. The pilot project also proposes developing a mature model of “time of use tariff and net metering.”

Main application

AMI for Industrial and Residential Consumers

Scenario for estimated costs and benefits

The proposed Cost Benefit Analysis for the pilot is based on the assumption of reducing Distribution Losses from 14% resulting in savings of about 25.5 MUs, reducing cost of billing by up to 50% and Increasing revenue collection efficiency from 90% to 98%. The payback period is likely to be around 6 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND2

UGVCL, Gujarat

Leading organization

UGVCL

Total budget

$9,200,000

Description

UGVCL has proposed the pilot project in Naroda of Sabarmati circle which is an industrial and residential area and Deesa of Palanpur circle which is an agricultural area covering 20,524 consumers in Naroda and 18,898 agricultural unmetered consumers in Deesa-II division and accounting for input energy of around 1700 MU (Naroda : 374.52 MU & Deesa : 1321.27 MU for 2010-11). The functionalities of peak load management, outage management, power quality management are proposed by implementing automated metering infrastructure (AMI) for industrial, commercial and residential consumers. Committee also observed that some additional functionalities like load forecasting and asset management are also proposed and functionalities of load forecasting, peak power management and outage management are also considered at utility level which will impact all consumers of utility (i.e., 27 lac consumers) indirectly. Renewable energy integration has been proposed to be carried out at Patan Solar Park and few roof top installations at some of the universities. The pilot project proposes to introduce TOU tariff with approvals from GERC. Renewable energy integration is proposed through proper and accurate load forecast by real time monitoring of substations, feeders and RES generation.

Main application

Peak load management, outage management, and power quality management are proposed by implementing automated metering infrastructure (AMI) for industrial, commercial and residential consumers.

Other applications

Load forecasting and asset management are proposed. Load forecasting, peak power management and outage management are considered at utility level. Renewable energy integration at Patan Solar Park and few roof top installations are also envisaged.

Scenario for estimated costs and benefits

The ROI is proposed to be realized through benefits on account of reduction in AT&C losses from 12.44% to around 8.44% in Naroda and from 21.69% to 15% in Deesa; savings in peak power purchase cost by reduction of peak load by up to 5% in both areas; reduction in transformer failure rate from 16.52% to 8% in Deesa area; and reduction in number of outages, meter reading cost, cost of payment collection, etc. Based on projected savings the payback period is likely to be around 2 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND3

CESC, Mysore

Leading organization

CESC, Mysore

Total budget

$6,150,000

Description

CESC, Mysore has proposed the pilot project in Additional City Area Division (ACAD), Mysore involving 21,824 consumers with a good mix of residential, commercial, industrial and agricultural consumers including 512 irrigation pump sets covering over 14 feeders and 473 distribution transformers and accounting for input energy of 151.89 MU. The functionalities of peak load management, outage management are proposed by implementing automated metering infrastructure (AMI) for residential consumers and industrial consumers and integration of distributed generation / micro grid integration. Some additional functionality like agriculture DSM with community portal, consumer portal to support DSM/DR, employee portal for knowledge sharing and benefit realization, KPI based MIS and data analytics for decision support are also proposed. The pilot project proposes to introduce real time pricing signal by interfacing at SLDC level to get UI/ABT prices subject to regulatory consent. Implementation of Fault Location Isolation and System Restoration (FLISR) at feeders where alternate feeding arrangements are available is also proposed.

Main application

Peak load management, outage management by implementing automated metering infrastructure (AMI) for residential consumers and industrial consumers; Integration of distributed generation/micro grid integration

Other applications

Agriculture DSM with community portal

Scenario for estimated costs and benefits

ROI is proposed to be realized through benefits on account of reduction in AT&C losses from 10.6% to 5.7% in 3 years, shifting of load of up to 80% in industrial feeders and up to 20% for domestic consumer during peak hours, reduction in number of transformer failure, meter reading cost, reduction in unforeseen outages and also recovery time for unforeseen outages by 20% and 50%. Based on projected savings the payback period is likely to be less than 3 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND4

KSEB, Kerala

Leading organization

KSEB, Kerala

Total budget

$5,200,000

Description

KSEB Smart Grid Pilot covers around 25078 LT Industrial consumers of selected distribution section offices spread over the geographical area of Kerala State. The input energy for the total scheme area is 2108 MUs and for the LT Industrial consumers is 376 MUs. Automated metering infrastructure (AMI) is proposed to provide quality service, prevent tampering and unauthorised usage of load, accurate and timely metering and billing, avoiding costly field visits of Sub Engineers for meter reading, reducing supply restoration time, peak load management through load restriction for Remote Disconnection/Reconnection and Time of Day tariff.

Main application

Automated metering infrastructure (AMI); Peak load management

Scenario for estimated costs and benefits

ROI is proposed to be realized through benefits on account of Reduction in AT&C losses of about 1.17% (24.82 MUs) through reduction in loss due to manual error, tampers, thefts, short assessment, etc., savings on employee and travel cost for meter reading and introducing incremental tariff for peak hours through ToD Tariff. Based on above savings the payback period is estimated to be around 2.5 years

Policy goals

Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND5

APDCL, Assam

Leading organization

APDCL, Assam

Total budget

$5,500,000

Description

APDCL, Assam has proposed a Smart Grid Pilot in Guwahati distribution region, covering 15,000 consumers and involving 90MUs of input energy. APDCL is in the process IT Implementation under R-APDRP and SCADA/DMS implementation is also to be taken up shortly. APDCL has proposed the functionality of peak load management using industrial and residential AMI, integration of distributed generation (solar and available back-up DG set) and outage management system. The utility has envisaged that power quality monitoring will be a by-product of the deployment. In the smart grid pilot project Integration of the 100kW solar farm into the distribution network via a bidirectional inverter and use of battery storage, possibly Vanadium redox battery, in conjunction with the solar farm is proposed. In addition R&D works are proposed for: Forecasting of load based on the weather, social events, festivals, etc. and developing various “if-then” scenarios to find optimal course of action for each scenario; Developing controllers for the bidirectional inverter and battery integration; Development of filters for reduction of harmonics injected into the grid and integrating it into the smart meters; and Development of messaging systems (for display in house and on mobile) for power consumption information and methods to reduce energy consumption. Study of the Guwahati’s distribution grid to identify the locations and sizes of the Vanadium redox batteries for peak shaving and valley filling is also proposed.

Main application

Peak load management; Outage management by implementing automated metering infrastructure (AMI) for residential consumers and industrial consumers; Power quality management; Integration of distributed generation

Scenario for estimated costs and benefits

The cost benefit analysis for the pilot is based on increased available energy of 55,602.5 kWh during peak time resulting in a saving of Rs. 3 Cr per year, revenue increase through power quality measurements and power factor penalty (assuming a 5% variation in power factor across 20% of the customers, paying an average 2% penalty); Reduction in AT&C losses from 16.7% to 12.55%; Reduction in interest payments due to deferred capital investment in sub-transmission networks, improvement of availability (reduction of customer minutes lost) and improved management of power procurement options; Unscheduled interchange using short term load forecasts. Based on above savings the payback period is estimated to be around 5 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND6

APCPDCL, Andhra Pradesh

Leading organization

APCPDCL, Andhra Pradesh

Total budget

$7,900,000

Description

The design proposes a Smart Grid Control Center housing the IT systems, a two way communication system for AMI. The number of customers in the project area is 38,303. However over 11,904 are covered under AMI implementation and smart meters will be for these numbers of customers. The functionalities of peak load management, power quality and outage management are proposed by implementing automated metering infrastructure (AMI) for residential consumers and industrial consumers. DAS, IT and SCADA shall be implemented. The CBM for DTR is proposed as an early warning of health of assets. The customer web portal would provide all customer related information and to seek their participation.

Main application

Peak load management; Outage management; Power quality management are proposed by implementing automated metering infrastructure (AMI) for industrial and residential consumers

Other applications

Condition based monitoring for DTR and customer web portal

Scenario for estimated costs and benefits

The proposed cost benefit analysis for the pilot is based on the assumption of reducing AT&C loss from present 9.48% to 7.48% and energy saving during peak times by shifting about 35.68 MUs from peak periods and thereby reduced purchase of high cost power at peak hours. Based on above savings the payback period is estimated to be around 2.5 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND7

UHBVN, Haryana

Leading organization

UHBVN, Haryana

Total budget

$3,200,000

Description

UHBVN, Haryana has proposed a Smart Grid Pilot in Panipat City Subdivision (Haryana State) covering 30,544 consumers and distribution system of 531 DTs. The area has around 131.8 MU input energy consumption. IT implementation and system strengthening is likely to be completed in 2013. The functionality of peak load management is proposed by implementing automated metering infrastructure (AMI) for residential consumers and industrial consumers. Utility has also envisaged using data of energy input from DT as well as energy consumption by consumers for detecting pilferage in the system, increasing collection efficiency, reducing AT&C losses, outage management, tamper event detection, and power quality management and enabling operator to take informed business decision. The pilot project proposes evolving a model of "time of use tariff incentives and disincentive and net metering for Renewable Energy" and process of demand response and demand management for peak load management and to do research and development for developing a mature model of the same for deploying at other towns.

Main application

Peak load management by implementing automated metering infrastructure (AMI) for residential and industrial consumers

Scenario for estimated costs and benefits

The proposed Cost Benefit Analysis for the pilot is based on the assumption of reducing distribution losses (including pilferage) from 30.10% to 16.50%; reducing peak load consumption by up to 9,000 units through shifting of peak load demand to a non-peak time and thereby saving differential UI charges for peak and non-peak which is about [illegible] . 5 /unit for the utility; and by reducing cost of billing by up to 20%. Based on above savings the payback period is estimated to be around 4 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND9

TSECL, Tripura

Leading organization

TSECL, Tripura

Total budget

$4,500,000

Description

TSECL has proposed the pilot project in the Electrical Division No.1, of Agartala town covering 46,071 no. of consumers. IT implementation and system strengthening is likely to be completed in 2013. The functionality of peak load management is proposed by implementing automated metering infrastructure (AMI) for residential consumers and industrial consumers. The pilot project proposes developing a mature model of "time of use tariff and net metering."

Main application

Peak load management by implementing automated metering infrastructure (AMI) for residential and industrial consumers

Scenario for estimated costs and benefits

The proposed cost benefit analysis for the pilot is based on the assumption of reducing distribution losses (including pilferage) resulting in proposed savings of up to 10.95 MUs of energy, reducing Peak load consumption by up to 2,604 units through shifting of peak load demand to a non-peak time and thereby saving differential UI charges for peak and non-peak which is about □ . 5 /unit for the utility and by reducing cost of billing by up to 50%. Based on above savings the payback period is estimated to be around 6 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND10

HPSEB, Himachal Pradesh

Leading organization

HPSEB, Himachal Pradesh

Total budget

$3,400,000

Description

HPSEB, Himachal Pradesh has proposed a Smart Grid Pilot in industrial town of KalaAmb covering 650 consumers and having annual input energy of 533 MUs. The functionality of peak load management and outage management is proposed by implementing automated metering infrastructure (AMI) for industrial consumers, distribution automation and substation automation and power quality management by deploying power quality meters at HT consumers.

Main application

Peak load management, outage management, and power quality management are proposed by implementing automated metering infrastructure (AMI) for industrial consumers

Other applications

Transformer Monitoring Units proposed to be installed for condition based monitoring.

Scenario for estimated costs and benefits

The proposed cost benefit analysis for the pilot is based on the assumption of savings by shifting 10% peak load, reduction in penalties by 40% and reduction in outages by 60%. Based on above savings the payback period is estimated to be around 2 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND11

MSEDCL, Maharashtra

Leading organization

MSEDCL (Maharashtra State Electricity Distribution Company Ltd.)

Total budget

$4,000,000

Description

Pilot covers 25,629 consumers with a mix of residential, commercial and industrial consumers and input energy of 261.6 MU. The functionality of outage management is proposed by implementing automated metering infrastructure (AMI) for residential consumers and industrial consumers. AMI is also to be leveraged for remote connect/disconnect of customers, monitoring the consumption pattern, tamper detection, contract load monitoring, load curtailment program, i.e., reduced power supply instead of no power scenario, Time of Use metering and dynamic and real time pricing, demand forecasting, etc. Project proposes to introduce communication technologies like GPRS/CDMA/RF in metering environment with common protocol and near real time analytics technologies for meter analytics as well as near real time event insights coming from SCADA systems.

Main application

Outage management; Automated metering infrastructure (AMI) for residential consumers and industrial consumers

Other applications

AMI to be leveraged for remote connect/disconnect of customers; Monitoring the consumption pattern; Tamper detection; Contract load monitoring; Load curtailment program; Time of Use metering and dynamic and real time pricing; Demand forecasting; etc.

Scenario for estimated costs and benefits

ROI is proposed to be realized through benefits on account of Reduction in AT&C losses from 21.41% to 12%, reduction in requirement of field staff through proper management of unforeseen outages, improvement in reliability parameters like SAIFI, SAIDI, CAIDI, etc., reduction in meter reading cost, bringing efficiency in meter reading, etc. Payback period is likely to be less than 5 years.

Policy goals

Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses

IRL2

Smart green circuits. ESB Networks - Smart grid demonstration project

Leading organization

ESB Networks (IE)

Total budget

€2,000,000

Description

This project aims to enable the creation of smart green circuits, through the implementation of technology to reduce distribution losses, improve continuity with self healing loops, optimally use distribution connected generation, evaluate and optimize system voltages and power factors and investigate optimal system sectionalisation and power flows.

Main application

Smart Network Management

Other applications

Integration of DER, Integration of Large Scale RES

Policy goals

Additional RES hosting power in the grid/maximum power load Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Percentage reduction of electricity losses

IRL3

Smart Networks Communications

Leading organization

ESB Networks

Description

There is a need for a reliable, high speed, always available communications infrastructure to connect medium voltage control and monitoring points to the ESB backbone communications infrastructure. Current distribution automation and MV control of ESB Networks is using GPRS communications. However the limitations of GPRS in terms of cost and reliability have been encountered and a clear need for a DSO operated communications solution has been identified. ESB Networks is currently deploying a 4G (WiMax technology which also has LTE capability either as an alternative or complementary system) test network in Galway. This is connecting downline reclosers and voltage regulators initially for monitoring purposes and if proving suitable reliable and secure, for control purposes. A base station (covering 2 quadrants) and multiple consumer premises devices (4G modems at connected devices) are being deployed to establish whether the intended coverage is delivered. The project is addressing whether the data capacity, speed and latency needs of network management are met using this technology in addition to the cyber security implications. Additionally, other “final mile” radio technology solutions are being trialled to connect remote devices to the 4G network where they are beyond its reach.

Main application

Smart Network Management

Other applications

Integration of DER

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid maximum power load; Percentage reduction of electricity losses

IRL4

Informed system planning incorporating new energy sources

Leading organization

ESB Networks

Description

In recent times huge levels of data have become available to the DSO pertaining to system use both by customers (over the course of the 18 month, 6k+ participant smart metering trial) and distributed generators. At a time when there are both challenges introduced by new power flows and DG, and opportunities to find synergies between customer electricity use and generation, it is imperative that ESB Networks develops its planning procedures to reflect the trends and variations which can be identified. IBM is undertaking data analysis of all of the power flow data resources available to ESB Networks so as to identify what the opportunities are and the level of dynamic variation in any type of network use which should be reflected in planning. This work will aid the future integration of demand response into planning through identifying the realistic resource expected. It will also inform the level of real time data integration into system management which meets system needs in an efficient manger.

Main application

Integration of Large Scale RES

Other project applications

Smart Network Management, Integration of DER

Policy goals

Percentage reduction of electricity losses

ITA1

Telegestore

Leading organization

Enel Distribuzione

Description

Enel's Telegestore Project provides the installation of more than 32 million smart meters. These smart meters allow Enel to periodically collect data on voltage quality and interruptions, daily consumptions, active and reactive energy measurements, and remotely manage contractual activities. Meters are able to transmit data regarding consumptions, receive updates of the contractual parameters and remotely manage the supply connectivity.

Main application

Smart Metering

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Percentage reduction of electricity losses

KOR5

Jeju Test Bed_Smart Power Grid

Leading organization

KEPCO

Total budget

$31.9M

Description

Platform construction of demonstration project with digital substation and automated distribution system

Main application

Smart Network Management

Scenario for estimated costs and benefits

Deployment costs and benefits from energy cost savings

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Percentage reduction of electricity losses

MEX3

Advanced Metering Infrastructure (AMI)

Leading organization

Federal Electricity Commission (CFE)

Total budget

1,867 millions of pesos

Description

Count in the most critical areas for commercialization process with an advanced metering network that allows obtaining reliable and timely supply records in order to minimize nontechnical losses in these areas and automatize the marketing process (reading, cutting and reconnection).

Main application

Smart Metering

Scenario for estimated costs and benefits

For future projects the concepts that were considered to evaluate the performance are:

Costs:

- Investment costs

Loss reduction benefits:

- Power losses of the involved circuits (kW)
- Number of transformation points
- Installed capacity BTD (kVA)
- Demand (kW)
- Average monthly energy (kW/h)
- Technical losses (kW)
- Non Technical losses (kWh/ año)

Number of customers

Benefits for improvement in efficiency process:

- Consumption reading, energy cut, reconnection and illicit use attention
- Emergency
- Complaints

For projects that have been conducted, we have considered only partial benefits at the end of 2012 of the annual reduction losses of 158 millions of pesos. By the end of 2013 we will have a full assessment.

Policy goals

Percentage reduction of electricity losses

SWE1

Grid4EU

Leading organization

ERDF

Description

Grid4EU is led by a group of European DSOs and aims at testing in real size some innovative system concepts and technologies in order to highlight and help to remove some of the barriers to the smart grids deployment (technical, economic, societal, environmental or regulatory). It focuses on how DSOs can dynamically manage electricity supply and demand, which is crucial for integration of large amounts of renewable energy and empowers consumers to become active participants in their energy choices.

Main application

Smart Network Management; Integration of DER; Aggregation; Smart Metering-Pilot

Policy goals

Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Percentage reduction of electricity losses; Reduced peak load

SWE2

Smart Grid Gotland

Leading organization

GEAB

Total budget

28 MEUR (242 MSEK)

Description

The Smart Grid Gotland R&D demonstration project intends to develop strategies for the planning, construction and operation of a fully developed, large-scale smart grid, including a large share of intermittent production, primarily from wind power in the distribution network. New market models and services will be developed to pave the way for new market players.

Main application

Smart Network Management

Other applications

Integration of DER; Integration of Large Scale RES; Smart Customer and Smart Home; Smart Metering

Scenario for estimated costs and benefits

No net present value calculation is yet available.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE4

Stockholm Royal seaport Active House Pilot

Leading organization

Fortum Distribution AB

Total budget

20 msek

Description

The long-term outcome will be a test apartment, based in Stockholm Royal Seaport, which is part of the solution from the pre-study in the area's housing. The plausibility and attraction of solutions have been deemed to create conditions to expand the number of participating construction companies in next phase. Part solution was to work together with the results from other projects that also have Stockholm Royal Seaport as the test bed. The apartment, which is included in the test installations, will have access to leading technology in smart grids, appliances, information technology and design. They will also be active specifier and designers of new services and products being developed continuously. The results of this project make it possible for companies to develop products and services based on the technology that the project contributed. Researchers and entrepreneurs will be able to assimilate the results from this test apartment to develop their ideas and innovations.

Scenario for estimated costs and benefits

Customer participation in load shift to optimize load factors, impact climate effects and distribution automation systems to increase reliability and reduce losses. Hosting of DER at LV levels.

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE5

Stockholm Royal seaport demonstration phase

Leading organization

Fortum Distribution AB

Total budget

140 msek

Description

The program will specify, develop, test and evaluate both business and market models, new technical solutions and concepts, information and communications technology (ICT) as well as aspects of data security. As described in the pre-study, a set of scenario tests will be the cohesive factor in this work. In order to make it happen, an R&D platform needs to be developed and implemented as enablement for overall system tests, which will also include aspects of behavioural science. The first phase of the program and this application will focus on scenarios related to active end-customers and reliability of the future grid, where the urban smart grid in a new way creates opportunities for interaction with the end customer in order to, e.g., reduce CO_2 emissions. Also, scenarios for increased reliability and availability in a future urban smart grid will be tested.

Scenario for estimated costs and benefits

Customer participation in load shift to optimize load factors, impact climate effects and distribution automation systems to increase reliability and reduce losses. Hosting of DER at LV levels.

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE6

Smart Grid Hyllie

Leading organization

E.ON

Total budget

200 MSEK for 2011 through 2014. Additional years to follow.

Description

Hyllie - A test bed for developing solutions for a future transformed energy in the city of Malmö. The project includes: (a) Customer control of heat and electricity consumption, (b) Smart home and Smart building solutions, (c) Distributed generation – electricity and heat, (d) Smart grid solutions – DH and electricity, (e) Sustainable mobility solutions – gas and emobility, (f) CO_2 and resource efficient energy supply, and (g) Distributed energy storage.

Main application

Aggregation (Demand Response, VPP)

Other applications

Smart Customer and Smart Home

Scenario for estimated costs and benefits

Costs for 2011-2014 estimated to 200 MSEK (basically more or less all investments are to be seen as consumables); Analyses regarding benefits to be done in evaluation phase

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA2

Pacific Northwest Division Smart Grid Demonstration Project

Leading organization

Battelle Memorial Institute

Total budget

$177,642,503

Description
This demonstration will validate new technologies; provide two-way communication between distributed generation, storage and demand assets, and the existing grid infrastructure; quantify Smart Grid costs and benefits; advance interoperability standards and cyber security approaches; and validate new business models. More than 20 types of responsive Smart Grid assets will be tested across six regional and utility operational objectives at 15 unique distribution sites operated by 12 utilities across five states and three climatic regions. A base of Smart Grid technology serving more than 60,000 customers will be installed, validated, and operated. All use classes are represented in the demonstration including residential, commercial, industrial, and irrigation customers. The demonstration will develop a single integrated Smart Grid incentive-signaling approach and will test and validate its ability to continuously coordinate the responses of Smart Grid assets to meet a wide range of operational objectives. It will also engage distributed control so that wind integration problems are mitigated. Micro-grid islanding will also be evaluated for its potential to enhance reliability for customers and relieve energy demand.

Main application
Smart Network Management

Other applications
Integration of DER; Integration of Large Scale RES; Aggregation (Demand Response, VPP); Smart Customer and Smart Home; Smart Metering

Scenario for estimated costs and benefits
Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals
Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA3
Smart Grid Deployment

Leading organization
Duke Energy Carolinas, LLC

Total budget
$555,706,307

Description

This project includes advanced metering infrastructure (AMI) and distribution automation systems in five states. The project involves large-scale deployments of AMI and distribution automation in Ohio and Indiana, a pilot deployment of AMI and distribution automation in Kentucky, and deployment of distribution automation in North and South Carolina. The project includes pilot programs for electricity pricing including time-of-use rates, peak-time rebates, and critical-peak pricing. Customers in these pilot programs use home area networks, web portals, and direct load control devices to reduce their electricity consumption and peak demand. Distribution automation equipment will be installed on 1,926 out of 4,741 circuits, which includes: distribution automation communications network; SCADA communications network; automated distribution circuit switches; automated capacitors; and equipment condition monitors.

Main application

Smart Metering

Other applications

Smart Customer and Smart Home; Aggregation (Demand Response, VPP); Smart Network Management

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals

Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA4

Smart Grid Project

Leading organization

EPB

Total budget

$226,707,562

Description

This project involves the installation of advanced metering systems and communications infrastructure. The project installs automated distribution grid equipment expected to enhance the reliability and quality of electric service delivery. The project implements two-way communications and metering expected to: (1) enable customers to view their energy consumption at their convenience through systems such as web portals, (2) provide timebased rate programs to customers, (3) provide information and tools to improve outage management, and (4) reduce operations and maintenance costs.

Main application
Smart Metering

Other applications
Smart Customer and Smart Home; Aggregation (Demand Response, VPP); Smart Network Management

Scenario for estimated costs and benefits
Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals
Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA5
Energy Smart Florida

Leading organization
Florida Power & Light Company

Total budget
$578,963,325

Description
This project is deploying advanced metering infrastructure (AMI), distribution automation, new electricity pricing programs, and advanced monitoring equipment for the transmission system. AMI supports two-way communication between FPL and its 3 million consumers receiving smart meters, providing detailed information about electricity usage and the ability to implement new electricity pricing programs. New distribution automation devices expand the functionality of FPL's distribution system to increase reliability, reduce energy losses, and reduce operations and maintenance costs. Synchrophasor and line monitoring devices help increase the reliability and security of the transmission system.

Main application
Smart Metering

Other applications

Smart Customer and Smart Home; Aggregation (Demand Response, VPP); Smart Network Management

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI), distribution automation systems, and wide-area transmission monitoring

Policy goals

Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA6

Enhanced Demand and Distribution Management Regional Demonstration

Leading organization

National Rural Electric Cooperative Association

Total budget

$67,864,292

Description

This project is demonstrating Smart Grid technologies with 27 cooperatives in 11 states across multiple utilities, geographies, climates, and applications including low density areas, low consumer income areas, and service areas prone to natural disasters. NRECA will conduct studies in advanced volt/volt-ampere reactive for total demand; generation and transmission-wide (G&T) demand response over advanced metering infrastructure (AMI); critical peak pricing over AMI; water heater and air conditioning load control over AMI; advanced water heater control and thermal storage; consumer Internet energy usage portal pilots; consumer in-home energy display pilots; time-sensitive rates pilots; multiple AMI integration at G&T co-ops; distribution co-op meter data management system applications; and self-healing feeders for improved reliability.

Main application

Smart Metering

Other applications

Smart Network Management; Aggregation (Demand Response, VPP); Smart Customer and Smart Home

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA7

SmartSacramento

Leading organization

Sacramento Municipal Utility District

Total budget

$307,697,792

Description

This project involves system-wide deployment of an advanced metering system integrated with existing enterprise and information technology systems as well as a partial deployment of advanced distribution grid assets that equip SMUD’s distribution circuits with automated control and operation capabilities. The project also involves customer systems that provide usage and cost information to customers that educate and enable more control over their consumption. These systems enable more informed participation by customers and more effective management by SMUD to improve reliability and efficiency of grid operations and better optimize the use of assets. The project includes a field test of plug-in electric vehicle charging stations to assess their technical performance, vehicle charging patterns, and effects on electric distribution system operations.

Main application

Smart Metering

Other applications

Smart Network Management; Aggregation (Demand Response, VPP); Smart Customer and Smart Home; Electric Vehicles and Vehicle2Grid Applications

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA8

Positive Energy Smart Grid Integration Program

Leading organization

Oklahoma Gas and Electric

Total budget

$293,201,332

Description

This project involves system-wide deployment of a fully integrated advanced metering system, distribution of in-home devices to almost 6,000 customers, and installation of advanced distribution automation systems. The program aims at reducing peak loads, overall electricity use, and operations and maintenance costs while increasing distribution system efficiency, reliability, and power quality. The program implements secure wireless communications to: (1) allow smart meter customers to view their electricity consumption data through a personalized web site, and (2) allow OG&E to manage, measure, and verify targeted demand reductions during peak periods. New systems capture meter information for billing and implement new customer pricing programs and service offerings. The project deploys a more dynamic distribution management system, automated switching, and integrated voltage and reactive power control (IVVC) that reduces line losses, reduces operational costs, and improves service reliability. The program also includes a study of consumer behavior in response to different forms of dynamic pricing on an opt-in basis. Finally, the program includes collaboration with University of Oklahoma faculty and students to deploy technologies within 46 buildings on the campus and to take advantage of opportunities for education and training.

Main application

Smart Metering

Other applications

Smart Network Management; Aggregation (Demand Response, VPP); Smart Customer and Smart Home

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals

Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA9

Smart Grid Project

Leading organization

Southern Company Services, Inc.

Total budget

$330,130,482

Description

This project involves integrated upgrades of the distribution, transmission, and grid management systems. Major efforts include automation of major parts of the distribution system, automation of selected transmission lines, and new equipment for many substations.

Main application

Smart Network Management

Scenario for estimated costs and benefits

Distribution and substation automation

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Percentage reduction of electricity losses; Increased internal transfer capacity between TSOs or DSOs

USA10

SmartGrid Program

Leading organization

Talquin Electric Cooperative

Total budget

$16,200,000

Description

This project involves the installation of advanced metering, communications infrastructure, distribution automation equipment, load control devices, and other customer systems. The project implements two-way communications to: (1) enable customers to view their energy consumption at their convenience through customer systems and web portals, (2) provide time-based rate programs to customers, (3) provide information and tools to improve outage management, and (4) reduce operations and maintenance costs. The project also installs automated distribution grid equipment expected to: (1) enhance the reliability and quality of electric delivery, and (2) reduce operations and maintenance costs.

Main application

Smart Metering

Other applications

Smart Network Management, Smart Customer and Smart Home

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals

Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

2.4.2 Transmission Level

ID	Name
CAN2	Zone de réseau interatif
FRA7	VENTEEA
IRL5	DS3
SWE2	Smart Grid Gotland
SWE4	Stockholm Royal seaport Active House Pilot
SWE5	Stockholm Royal seaport demonstration phase
SWE6	Smart Grid Hyllie
USA5	Energy Smart Florida
USA9	Smart Grid Project

CAN2

Zone de réseau interatif

Leading organization

Hydro-Québec Distribution

Total budget

$25,585,000

Description

Hydro-Québec has a distribution grid evolution plan which includes progressive smart grid technology implementation. To ensure successful implementation, Hydro-Québec decided to create a smart zone where the technologies will be deployed in order to improve energy efficiency and grid performance. The first smart grid technology to be deployed in the zone will be a DMS (Distribution Management System) with integrated voltage and reactive power control linked to the current distribution grid control system. In 2008, Hydro-Québec introduced a simple voltage regulation and reactive power control system to the Pierre-Boucher substation to reduce energy use, grid losses and greenhouse gases (GHGs). Hydro-Québec estimates that a VVO (Volt Var Optimization) type smart system would allow it to increase energy efficiency compared to a VVC (Volt Var Control) type system. The second smart grid technology involves charging stations with and without intelligence for electric vehicles, scheduled for installation between 2010 and 2012. The agreement between Hydro-Québec and Mitsubishi calls for testing of up to 30 all-electric iMiEV type vehicles. The goal of the project is to better understand charging and driving behaviors, as well as charging infrastructure needs at 120V/15A, 240V/15-30A, and direct current charging (50kW).

Main application

Electric Vehicles and Vehicle2Grid Applications

Other applications

Smart Metering

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Increased internal transfer capacity between TSOs or DSOs

FRA7
VENTEEA

Leading organization
ERDF

Description
In 2011, ERDF submitted the demonstrator as part of an ADEME program called “smart grid electric network” (AMI). Early 2012, the French Commissioner General for Investment (CGI) approved the project. The demonstrator is focused on the integration of large wind energy in distribution networks. More precisely the project will study observability and controllability of wind-farms, voltage regulation and centralized local protection plan and power quality. If the costs benefits analysis is validated by all involved stakeholders, a battery storage system offering a full service package would be implemented on 20 kV level.

Main application
Integration of DER

Policy goals
Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Percentage reduction of electricity losses; Reduced peak load

IRL5
DS3

Leading organization
Eirgrid

Description
EirGrid’s DS3 programme is developing solutions to the challenges associated with increasing levels of renewable generation, particularly with regard to secure power system operation, as we work to achieve the 2020 renewable targets. The combination of the All island Grid Studies, EirGrid’s Grid 25, the facilitation of renewables studies, and a comprehensive analysis of the long-term needs of the power system conducted in 2011, form the backbone of our plans to facilitate the 40% target by 2020. The main operational areas that need to be addressed are the management of the system frequency, balancing the system in real time, managing system voltage and ensuring the compliance of plant with the Grid Code requirements. The work programme includes enhancing the portfolio performance, developing new operational policies and system tools to efficiently use the plant portfolio to the best of its capabilities, and regularly reviewing the needs of the system as the portfolio capability evolves.

Main application
Integration of Large Scale RES

Other applications
Smart Network Management; Aggregation (Demand Response, VPP); Integration of DER

Policy goals
Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES; Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Percentage reduction of electricity losses; Reduced peak load; Additional interconnection capacity (specify HVDC and HVAC)

SWE2
Smart Grid Gotland

Leading organization
GEAB

Total budget
28 MEUR (242 MSEK)

Description
The Smart Grid Gotland R&D demonstration project intends to develop strategies for the planning, construction and operation of a fully developed, large-scale smart grid, including a large share of intermittent production, primarily from wind power in the distribution network. New market models and services will be developed to pave the way for new market players.

Main application
Smart Network Management

Other applications
Integration of DER; Integration of Large Scale RES; Smart Customer and Smart Home; Smart Metering

Scenario for estimated costs and benefits
No net present value calculation is yet available.

Policy goals
Additional demand side management power managed in the grid/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of

consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE4

Stockholm Royal seaport Active House Pilot

Leading organization

Fortum Distribution AB

Total budget

20 msek

Description

The long-term outcome will be a test apartment, based in Stockholm Royal Seaport, which is part of the solution from the pre-study in the area's housing. The plausibility and attraction of solutions have been deemed to create conditions to expand the number of participating construction companies in next phase. Part solution was to work together with the results from other projects that also have Stockholm Royal Seaport as the test bed. The apartment, which is included in the test installations, will have access to leading technology in smart grids, appliances, information technology and design. They will also be active specifier and designers of new services and products being developed continuously. The results of this project make it possible for companies to develop products and services based on the technology that the project contributed. Researchers and entrepreneurs will be able to assimilate the results from this test apartment to develop their ideas and innovations.

Scenario for estimated costs and benefits

Customer participation in load shift to optimize load factors, impact climate effects and distribution automation systems to increase reliability and reduce losses. Hosting of DER at LV levels.

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE5

Stockholm Royal seaport demonstration phase

Leading organization

Fortum Distribution AB

Total budget

140 msek

Description

The program will specify, develop, test and evaluate both business and market models, new technical solutions and concepts, information and communications technology (ICT) as well as aspects of data security. As described in the pre-study, a set of scenario tests will be the cohesive factor in this work. In order to make it happen, an R&D platform needs to be developed and implemented as enablement for overall system tests, which will also include aspects of behavioural science. The first phase of the program and this application will focus on scenarios related to active end-customers and reliability of the future grid, where the urban smart grid in a new way creates opportunities for interaction with the end customer in order to, e.g., reduce CO_2 emissions. Also, scenarios for increased reliability and availability in a future urban smart grid will be tested.

Scenario for estimated costs and benefits

Customer participation in load shift to optimize load factors, impact climate effects and distribution automation systems to increase reliability and reduce losses. Hosting of DER at LV levels.

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE6

Smart Grid Hyllie

Leading organization

E.ON

Total budget

200 MSEK for 2011 through 2014. Additional years to follow.

Description

Hyllie - A test bed for developing solutions for a future transformed energy in the city of Malmö. The project includes: (a) Customer control of heat and electricity consumption, (b) Smart home and Smart building solutions, (c) Distributed generation – electricity and heat, (d) Smart grid solutions – DH and electricity, (e) Sustainable mobility solutions – gas and emobility, (f) CO_2 and resource efficient energy supply, and (g) Distributed energy storage.

Main application

Aggregation (Demand Response, VPP)

Other applications

Smart Customer and Smart Home

Scenario for estimated costs and benefits

Costs for 2011-2014 estimated to 200 MSEK (basically more or less all investments are to be seen as consumables); Analyses regarding benefits to be done in evaluation phase

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA5

Energy Smart Florida

Leading organization

Florida Power & Light Company

Total budget

$578,963,325

Description

This project is deploying advanced metering infrastructure (AMI), distribution automation, new electricity pricing programs, and advanced monitoring equipment for the transmission system. AMI supports two-way communication between FPL and its 3 million consumers receiving smart meters, providing detailed information about electricity usage and the ability to implement new electricity pricing programs. New distribution automation devices expand the functionality of FPL’s distribution system to increase reliability, reduce energy

losses, and reduce operations and maintenance costs. Synchrophasor and line monitoring devices help increase the reliability and security of the transmission system.

Main application

Smart Metering

Other applications

Smart Customer and Smart Home; Aggregation (Demand Response, VPP); Smart Network Management

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI), distribution automation systems, and wide-area transmission monitoring

Policy goals

Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA9

Smart Grid Project

Leading organization

Southern Company Services, Inc.

Total budget

$330,130,482

Description

This project involves integrated upgrades of the distribution, transmission, and grid management systems. Major efforts include automation of major parts of the distribution system, automation of selected transmission lines, and new equipment for many substations.

Main application

Smart Network Management

Scenario for estimated costs and benefits

Distribution and substation automation

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Percentage reduction of electricity losses; Increased internal transfer capacity between TSOs or DSOs

2.4.3 T&D Interface

ID	Name
CAN2	Zone de réseau interatif
IND2	UGVCL, Gujarat
IND3	CESC, Mysore
IND4	KSEB, Kerala
IRL5	DS3
SWE1	Grid4EU
SWE2	Smart Grid Gotland
SWE6	Smart Grid Hyllie
USA2	Pacific Northwest Division Smart Grid Demonstration Project
USA5	Energy Smart Florida
USA9	Smart Grid Project

CAN2

Zone de réseau interatif

Leading organization

Hydro-Québec Distribution

Total budget

$25,585,000

Description

Hydro-Québec has a distribution grid evolution plan which includes progressive smart grid technology implementation. To ensure successful implementation, Hydro-Québec decided to create a smart zone where the technologies will be deployed in order to improve energy efficiency and grid performance. The first smart grid technology to be deployed in the zone will be a DMS (Distribution Management System) with integrated voltage and reactive power control linked to the current distribution grid control system. In 2008, Hydro-Québec introduced a simple voltage regulation and reactive power control system to the Pierre-

Boucher substation to reduce energy use, grid losses and greenhouse gases (GHGs). Hydro-Québec estimates that a VVO (Volt Var Optimization) type smart system would allow it to increase energy efficiency compared to a VVC (Volt Var Control) type system. The second smart grid technology involves charging stations with and without intelligence for electric vehicles, scheduled for installation between 2010 and 2012. The agreement between Hydro-Québec and Mitsubishi calls for testing of up to 30 all-electric iMiEV type vehicles. The goal of the project is to better understand charging and driving behaviors, as well as charging infrastructure needs at 120V/15A, 240V/15-30A, and direct current charging (50kW).

Main application

Electric Vehicles and Vehicle2Grid Applications

Other applications

Smart Metering

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Increased internal transfer capacity between TSOs or DSOs

IND2

UGVCL, Gujarat

Leading organization

UGVCL

Total budget

$9,200,000

Description

UGVCL has proposed the pilot project in Naroda of Sabarmati circle which is an industrial and residential area and Deesa of Palanpur circle which is an agricultural area covering 20,524 consumers in Naroda and 18,898 agricultural unmetered consumers in Deesa-II division and accounting for input energy of around 1700 MU (Naroda : 374.52 MU & Deesa : 1321.27 MU for 2010-11). The functionalities of peak load management, outage management, power quality management are proposed by implementing automated metering infrastructure (AMI) for industrial, commercial and residential consumers. Committee also observed that some additional functionalities like load forecasting and asset management are also proposed and functionalities of load forecasting, peak power management and outage management are also considered at utility level which will impact all consumers of utility (i.e., 27 lac consumers) indirectly. Renewable energy integration has been proposed to be carried out at Patan Solar Park and few roof top installations at some of the universities. The pilot project proposes to introduce TOU tariff with approvals from GERC. Renewable energy integration is proposed through proper and accurate load forecast by real time monitoring of substations, feeders and RES generation.

Main application

Peak load management, outage management, and power quality management are proposed by implementing automated metering infrastructure (AMI) for industrial, commercial and residential consumers.

Other applications

Load forecasting and asset management are proposed. Load forecasting, peak power management and outage management are considered at utility level. Renewable energy integration at Patan Solar Park and few roof top installations are also envisaged.

Scenario for estimated costs and benefits

The ROI is proposed to be realized through benefits on account of reduction in AT&C losses from 12.44% to around 8.44% in Naroda and from 21.69% to 15% in Deesa; savings in peak power purchase cost by reduction of peak load by up to 5% in both areas; reduction in transformer failure rate from 16.52% to 8% in Deesa area; and reduction in number of outages, meter reading cost, cost of payment collection, etc. Based on projected savings the payback period is likely to be around 2 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND3

CESC, Mysore

Leading organization

CESC, Mysore

Total budget

$6,150,000

Description

CESC, Mysore has proposed the pilot project in Additional City Area Division (ACAD), Mysore involving 21,824 consumers with a good mix of residential, commercial, industrial and agricultural consumers including 512 irrigation pump sets covering over 14 feeders and 473 distribution transformers and accounting for input energy of 151.89 MU. The functionalities of peak load management, outage management are proposed by implementing automated metering infrastructure (AMI) for residential consumers and industrial consumers and integration of distributed generation / micro grid integration. Some additional functionality like agriculture DSM with community portal, consumer portal to support DSM/DR, employee portal for knowledge sharing and benefit realization, KPI based MIS and data analytics for decision support are also proposed. The pilot project proposes to introduce real time pricing signal by interfacing at SLDC level to get UI/ABT prices subject to regulatory consent. Implementation of Fault Location Isolation and System Restoration (FLISR) at feeders where alternate feeding arrangements are available is also proposed.

Main application

Peak load management, outage management by implementing automated metering infrastructure (AMI) for residential consumers and industrial consumers; Integration of distributed generation/micro grid integration

Other applications

Agriculture DSM with community portal

Scenario for estimated costs and benefits

ROI is proposed to be realized through benefits on account of reduction in AT&C losses from 10.6% to 5.7% in 3 years, shifting of load of up to 80% in industrial feeders and up to 20% for domestic consumer during peak hours, reduction in number of transformer failure, meter reading cost, reduction in unforeseen outages and also recovery time for unforeseen outages by 20% and 50%. Based on projected savings the payback period is likely to be less than 3 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND4

KSEB, Kerala

Leading organization

KSEB, Kerala

Total budget

$5,200,000

Description
KSEB Smart Grid Pilot covers around 25078 LT Industrial consumers of selected distribution section offices spread over the geographical area of Kerala State. The input energy for the total scheme area is 2108 MUs and for the LT Industrial consumers is 376 MUs. Automated metering infrastructure (AMI) is proposed to provide quality service, prevent tampering and unauthorised usage of load, accurate and timely metering and billing, avoiding costly field visits of Sub Engineers for meter reading, reducing supply restoration time, peak load management through load restriction for Remote Disconnection/Reconnection and Time of Day tariff.

Main application
Automated metering infrastructure (AMI); Peak load management

Scenario for estimated costs and benefits
ROI is proposed to be realized through benefits on account of Reduction in AT&C losses of about 1.17% (24.82 MUs) through reduction in loss due to manual error, tampers, thefts, short assessment, etc., savings on employee and travel cost for meter reading and introducing incremental tariff for peak hours through ToD Tariff. Based on above savings the payback period is estimated to be around 2.5 years

Policy goals
Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

IRL5
DS3

Leading organization
Eirgrid

Description
EirGrid's DS3 programme is developing solutions to the challenges associated with increasing levels of renewable generation, particularly with regard to secure power system operation, as we work to achieve the 2020 renewable targets. The combination of the All island Grid Studies, EirGrid's Grid 25, the facilitation of renewables studies, and a comprehensive analysis of the long-term needs of the power system conducted in 2011, form the backbone of our plans to facilitate the 40% target by 2020. The main operational areas that need to be addressed are the management of the system frequency, balancing the system in real time, managing system voltage and ensuring the compliance of plant with the Grid Code requirements. The work programme includes enhancing the portfolio performance, developing new operational policies and system tools to efficiently use the

plant portfolio to the best of its capabilities, and regularly reviewing the needs of the system as the portfolio capability evolves.

Main application
Integration of Large Scale RES

Other applications
Smart Network Management; Aggregation (Demand Response, VPP); Integration of DER

Policy goals
Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES; Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Percentage reduction of electricity losses; Reduced peak load; Additional interconnection capacity (specify HVDC and HVAC)

SWE1
Grid4EU

Leading organization
ERDF

Description
Grid4EU is led by a group of European DSOs and aims at testing in real size some innovative system concepts and technologies in order to highlight and help to remove some of the barriers to the smart grids deployment (technical, economic, societal, environmental or regulatory). It focuses on how DSOs can dynamically manage electricity supply and demand, which is crucial for integration of large amounts of renewable energy and empowers consumers to become active participants in their energy choices.

Main application
Smart Network Management; Integration of DER; Aggregation; Smart Metering-Pilot

Policy goals
Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Percentage reduction of electricity losses; Reduced peak load

SWE2
Smart Grid Gotland

Leading organization
GEAB

Total budget
28 MEUR (242 MSEK)

Description
The Smart Grid Gotland R&D demonstration project intends to develop strategies for the planning, construction and operation of a fully developed, large-scale smart grid, including a large share of intermittent production, primarily from wind power in the distribution network. New market models and services will be developed to pave the way for new market players.

Main application
Smart Network Management

Other applications
Integration of DER; Integration of Large Scale RES; Smart Customer and Smart Home; Smart Metering

Scenario for estimated costs and benefits
No net present value calculation is yet available.

Policy goals
Additional demand side management power managed in the grid/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE6
Smart Grid Hyllie

Leading organization
E.ON

Total budget
200 MSEK for 2011 through 2014. Additional years to follow.

Description

Hyllie - A test bed for developing solutions for a future transformed energy in the city of Malmö. The project includes: (a) Customer control of heat and electricity consumption, (b) Smart home and Smart building solutions, (c) Distributed generation – electricity and heat, (d) Smart grid solutions – DH and electricity, (e) Sustainable mobility solutions – gas and emobility, (f) CO_2 and resource efficient energy supply, and (g) Distributed energy storage.

Main application

Aggregation (Demand Response, VPP)

Other applications

Smart Customer and Smart Home

Scenario for estimated costs and benefits

Costs for 2011-2014 estimated to 200 MSEK (basically more or less all investments are to be seen as consumables); Analyses regarding benefits to be done in evaluation phase

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA2

Pacific Northwest Division Smart Grid Demonstration Project

Leading organization

Battelle Memorial Institute

Total budget

$177,642,503

Description

This demonstration will validate new technologies; provide two-way communication between distributed generation, storage and demand assets, and the existing grid infrastructure; quantify Smart Grid costs and benefits; advance interoperability standards and cyber security approaches; and validate new business models. More than 20 types of responsive Smart Grid assets will be tested across six regional and utility operational objectives at 15 unique distribution sites operated by 12 utilities across five states and three climatic regions. A base of Smart Grid technology serving more than 60,000 customers will be installed, validated, and operated. All use classes are represented in the demonstration including residential, commercial, industrial, and irrigation customers. The demonstration will develop a single integrated Smart Grid incentive-signaling approach and will test and validate its ability to continuously coordinate the responses of Smart Grid assets to meet a wide range of operational objectives. It will also engage distributed control so that wind integration problems are mitigated. Micro-grid islanding will also be evaluated for its potential to enhance reliability for customers and relieve energy demand.

Main application

Smart Network Management

Other applications

Integration of DER; Integration of Large Scale RES; Aggregation (Demand Response, VPP); Smart Customer and Smart Home; Smart Metering

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA5

Energy Smart Florida

Leading organization

Florida Power & Light Company

Total budget

$578,963,325

Description

This project is deploying advanced metering infrastructure (AMI), distribution automation, new electricity pricing programs, and advanced monitoring equipment for the transmission system. AMI supports two-way communication between FPL and its 3 million consumers receiving smart meters, providing detailed information about electricity usage and the ability to implement new electricity pricing programs. New distribution automation devices expand the functionality of FPL's distribution system to increase reliability, reduce energy

losses, and reduce operations and maintenance costs. Synchrophasor and line monitoring devices help increase the reliability and security of the transmission system.

Main application

Smart Metering

Other applications

Smart Customer and Smart Home; Aggregation (Demand Response, VPP); Smart Network Management

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI), distribution automation systems, and wide-area transmission monitoring

Policy goals

Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA9

Smart Grid Project

Leading organization

Southern Company Services, Inc.

Total budget

$330,130,482

Description

This project involves integrated upgrades of the distribution, transmission, and grid management systems. Major efforts include automation of major parts of the distribution system, automation of selected transmission lines, and new equipment for many substations.

Main application

Smart Network Management

Scenario for estimated costs and benefits

Distribution and substation automation

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Percentage reduction of electricity losses; Increased internal transfer capacity between TSOs or DSOs

2.5 Reliability (SAIDI, SAIFI, CAIDI, etc.) Improvements (Security and Quality of Supply)

Summaries of projects in the inventory selected as contributing to the policy goal of "Reliability (SAIDI, SAIFI, CAIDI, etc.) Improvements (Security and Quality of Supply)" are presented in order of their physical application domains: Distribution Level, Transmission Level, and T&D Interface. Within each domain, project summaries are presented in alphanumerical order of their unique Project IDs.

2.5.1 Distribution Level

ID	Name
CAN2	Zone de réseau interatif
CAN3	Energy storage for improved reliability in an outage-prone community
CAN4	Hydro One Smart Zone
FRA7	VENTEEA
GER1	i-Protect
GER2	Smart Area Aachen
GER4	eTelligence
IND2	UGVCL, Gujarat
IND3	CESC, Mysore
IND4	KSEB, Kerala
IND11	MSEDCL, Maharashtra
IRL2	Smart green circuits. ESB Networks - Smart grid demonstration project
KOR1	Jeju Test Bed_Smart Place
MEX1	Automation of the electrical system by EPROSEC (Protection and Sectioning equipment in aerial distribution networks of medium voltage)
NED1	Smart Grid Nieuweveens Landen Meppel
NED2	Smart Grid Nieuweveens Landen Meppel

SWE1	Grid4EU
SWE2	Smart Grid Gotland
SWE4	Stockholm Royal seaport Active House Pilot
SWE6	Smart Grid Hyllie
USA1	gridSMART(SM) Demonstration Project
USA2	Pacific Northwest Division Smart Grid Demonstration Project
USA3	Smart Grid Deployment
USA4	Smart Grid Project
USA5	Energy Smart Florida
USA6	Enhanced Demand and Distribution Management Regional Demonstration
USA7	SmartSacramento
USA8	Positive Energy Smart Grid Integration Program
USA9	Smart Grid Project
USA10	SmartGrid Program

CAN2

Zone de réseau interatif

Leading organization

Hydro-Québec Distribution

Total budget

$25,585,000

Description

Hydro-Québec has a distribution grid evolution plan which includes progressive smart grid technology implementation. To ensure successful implementation, Hydro-Québec decided to create a smart zone where the technologies will be deployed in order to improve energy efficiency and grid performance. The first smart grid technology to be deployed in the zone will be a DMS (Distribution Management System) with integrated voltage and reactive power control linked to the current distribution grid control system. In 2008, Hydro-Québec introduced a simple voltage regulation and reactive power control system to the Pierre-Boucher substation to reduce energy use, grid losses and greenhouse gases (GHGs). Hydro-Québec estimates that a VVO (Volt Var Optimization) type smart system would allow it to increase energy efficiency compared to a VVC (Volt Var Control) type system. The second smart grid technology involves charging stations with and without intelligence for electric vehicles, scheduled for installation between 2010 and 2012. The agreement between Hydro-Québec and Mitsubishi calls for testing of up to 30 all-electric iMiEV type vehicles.

The goal of the project is to better understand charging and driving behaviors, as well as charging infrastructure needs at 120V/15A, 240V/15-30A, and direct current charging (50kW).

Main application

Electric Vehicles and Vehicle2Grid Applications

Other applications

Smart Metering

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Increased internal transfer capacity between TSOs or DSOs

CAN3

Energy storage for improved reliability in an outage-prone community

Leading organization

British Columbia Hydro (BC Hydro)

Total budget

$13,490,000

Description

The purpose of the project is to demonstrate the use of energy storage technology to offset power during times of peak load and to act as the sole energy source in a scenario in which the community is islanded from the grid. BC Hydro plans to install a 1MW battery energy storage system on its Golden distribution network. The unit will be installed close to the community of Field approximately 55km from Golden.

Main application

Integration of DER

Other applications

Smart Network Management

Scenario for estimated costs and benefits

Estimated benefits come from two sources: (A) reduce the risk of Golden substation exceeding maximum load - at peak load battery will discharge to offset load at Golden substation - immediate benefit is to defer capital cost; and (B) mitigate impact of feeder outages for the community of Field - in the event of a feeder outage, the battery will supply power to the community of Field for a period of 6 to 7 hours at maximum load - immediate benefit is to remove the need to supply a diesel generator back-up, saving cost and GHG emissions.

Policy goals

Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Reduced peak load

CAN4

Hydro One Smart Zone

Leading organization

Hydro One

Total budget

$112,000,000

Description

Having already installed 1.2 million smart meters, Hydro One is taking the next step in building the Smart Grid with its Smart Zone, a comprehensive integration of field and back office solutions in a limited deployment in Owen Sound, Ontario. The focus will be on the integration of the distribution management system with the power system intelligent electronic devices that will be installed on the system. A successful integration will allow the safe and reliable connection of distributed generation. The project has four objectives: Integration of distributed generators into the rural distribution system; Distribution automation – monitoring and control for reliability and voltage optimization and loss reduction; Optimized outage restoration, using the communications capability of smart meters, and achieving the most efficient crew dispatch; Using system data to reduce field data collection and to improve distribution network asset planning and tools. This project will run from 2011-2013, at which time costs and benefits will be evaluated and Hydro One will proceed with a similar deployment to other parts of the province

Main application

Integration of DER

Other applications

Integration of DER; Smart Network Management; Policy Goals; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.)

FRA7

VENTEEA

Leading organization
ERDF

Description
In 2011, ERDF submitted the demonstrator as part of an ADEME program called “smart grid electric network” (AMI). Early 2012, the French Commissioner General for Investment (CGI) approved the project. The demonstrator is focused on the integration of large wind energy in distribution networks. More precisely the project will study observability and controllability of wind-farms, voltage regulation and centralized local protection plan and power quality. If the costs benefits analysis is validated by all involved stakeholders, a battery storage system offering a full service package would be implemented on 20 kV level.

Main application
Integration of DER

Policy goals
Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Percentage reduction of electricity losses; Reduced peak load

GER1
i-Protect

Leading organization
TU Dortmund University

Total budget
$1,958,804

Description
i-Protect develops new grid protection concepts based on novel ICT and automation systems. Protection and communication tasks are modularly separated among different and most powerful hardware resources to support requirements of secure smart grid operation. Here, hardware prototypes offering different protection and communication possibilities are developed together with software support. Moreover, those hardware and software systems are verified at laboratory level and eventually integrated in a wide area monitoring system. Compatibility to existing and matured protection systems are ensured by customized process couplers.

Main application
Grid protection

Scenario for estimated costs and benefits

Advanced grid protection systems

Policy goals

Additional DER hosting power input in the grid (incl. EV and storage)/maximum power Load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.)

GER2

Smart Area Aachen

Leading organization

Stadtwerke Aachen Aktiengesellschaft

Total budget

$9,152,280

Description

Smart Area Aachen aims at developing new holistic concepts and methods based on new equipment for future smart grid solutions. In this context, innovative technical solutions are identified, optimized and eventually verified in pilot trials. Moreover, new business models are developed for the different stakeholders and harmonization aspects are addressed in accompanying standardization activities.

Main application

Smart grid applications in general: equipment, planning, operation

Scenario for estimated costs and benefits

Smart grid infrastructure

Policy goals

Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.) Energy savings; Percentage reduction of electricity losses; Reduced peak load

GER4

eTelligence

Leading organization

EWE AG

Total budget

27.039.630,91 USD(1 USD = 0,739655 EUR)

Description

The main goal of eTelligence was to develop, build and test the integrated future smart energy system with a secure, interoperable ICT infrastructure. Parts of this overall system were tested in the field: 650 households including smart meter with new feedback systems and new electricity tariffs; an electronic market place; VPP including cold stores whose load was used to optimize the VPP. In addition, the project installed measurement equipment to optimize the grid management. To ensure the overall use, the project developed a power plant model which mapped the flexibilities and units of renewable energy in scenarios for 2020 and 2030 based on the results from the project.

Main application

Exploration of the future energy system

Other applications

Integration of DER, Aggregation (Demand Response, VPP); Smart Customer and Smart Home; Smart Metering

Policy goals

Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings

IND2

UGVCL, Gujarat

Leading organization

UGVCL

Total budget

$9,200,000

Description

UGVCL has proposed the pilot project in Naroda of Sabarmati circle which is an industrial and residential area and Deesa of Palanpur circle which is an agricultural area covering 20,524 consumers in Naroda and 18,898 agricultural unmetered consumers in Deesa-II division and accounting for input energy of around 1700 MU (Naroda : 374.52 MU & Deesa : 1321.27 MU for 2010-11). The functionalities of peak load management, outage management, power quality management are proposed by implementing automated metering infrastructure (AMI) for industrial, commercial and residential consumers. Committee also observed that some additional functionalities like load forecasting and asset management are also proposed and functionalities of load forecasting, peak power management and outage management are also considered at utility level which will impact all consumers of utility (i.e., 27 lac consumers) indirectly. Renewable energy integration has been proposed to be carried out at Patan Solar Park and few roof top installations at some of the universities. The pilot project proposes to introduce TOU tariff with approvals from GERC. Renewable energy integration is proposed through proper and accurate load forecast by real time monitoring of substations, feeders and RES generation.

Main application

Peak load management, outage management, and power quality management are proposed by implementing automated metering infrastructure (AMI) for industrial, commercial and residential consumers.

Other applications

Load forecasting and asset management are proposed. Load forecasting, peak power management and outage management are considered at utility level. Renewable energy integration at Patan Solar Park and few roof top installations are also envisaged.

Scenario for estimated costs and benefits

The ROI is proposed to be realized through benefits on account of reduction in AT&C losses from 12.44% to around 8.44% in Naroda and from 21.69% to 15% in Deesa; savings in peak power purchase cost by reduction of peak load by up to 5% in both areas; reduction in transformer failure rate from 16.52% to 8% in Deesa area; and reduction in number of outages, meter reading cost, cost of payment collection, etc. Based on projected savings the payback period is likely to be around 2 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND3

CESC, Mysore

Leading organization

CESC, Mysore

Total budget

$6,150,000

Description

CESC, Mysore has proposed the pilot project in Additional City Area Division (ACAD), Mysore involving 21,824 consumers with a good mix of residential, commercial, industrial and agricultural consumers including 512 irrigation pump sets covering over 14 feeders and 473 distribution transformers and accounting for input energy of 151.89 MU. The functionalities of peak load management, outage management are proposed by implementing automated metering infrastructure (AMI) for residential consumers and industrial consumers and integration of distributed generation / micro grid integration. Some additional functionality like agriculture DSM with community portal, consumer portal to support DSM/DR, employee portal for knowledge sharing and benefit realization, KPI based MIS and data analytics for decision support are also proposed. The pilot project proposes to introduce real time pricing signal by interfacing at SLDC level to get UI/ABT prices subject to regulatory consent. Implementation of Fault Location Isolation and System Restoration (FLISR) at feeders where alternate feeding arrangements are available is also proposed.

Main application

Peak load management, outage management by implementing automated metering infrastructure (AMI) for residential consumers and industrial consumers; Integration of distributed generation/micro grid integration

Other applications

Agriculture DSM with community portal

Scenario for estimated costs and benefits

ROI is proposed to be realized through benefits on account of reduction in AT&C losses from 10.6% to 5.7% in 3 years, shifting of load of up to 80% in industrial feeders and up to 20% for domestic consumer during peak hours, reduction in number of transformer failure, meter reading cost, reduction in unforeseen outages and also recovery time for unforeseen outages by 20% and 50%. Based on projected savings the payback period is likely to be less than 3 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND4

KSEB, Kerala

Leading organization

KSEB, Kerala

Total budget

$5,200,000

Description

KSEB Smart Grid Pilot covers around 25078 LT Industrial consumers of selected distribution section offices spread over the geographical area of Kerala State. The input energy for the total scheme area is 2108 MUs and for the LT Industrial consumers is 376 MUs. Automated metering infrastructure (AMI) is proposed to provide quality service, prevent tampering and unauthorised usage of load, accurate and timely metering and billing, avoiding costly field visits of Sub Engineers for meter reading, reducing supply restoration time, peak load management through load restriction for Remote Disconnection/Reconnection and Time of Day tariff.

Main application

Automated metering infrastructure (AMI); Peak load management

Scenario for estimated costs and benefits

ROI is proposed to be realized through benefits on account of Reduction in AT&C losses of about 1.17% (24.82 MUs) through reduction in loss due to manual error, tampers, thefts, short assessment, etc., savings on employee and travel cost for meter reading and introducing incremental tariff for peak hours through ToD Tariff. Based on above savings the payback period is estimated to be around 2.5 years

Policy goals

Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND11

MSEDCL, Maharashtra

Leading organization

MSEDCL (Maharashtra State Electricity Distribution Company Ltd.)

Total budget

$4,000,000

Description

Pilot covers 25,629 consumers with a mix of residential, commercial and industrial consumers and input energy of 261.6 MU. The functionality of outage management is proposed by implementing automated metering infrastructure (AMI) for residential consumers and industrial consumers. AMI is also to be leveraged for remote connect/disconnect of customers, monitoring the consumption pattern, tamper detection, contract load monitoring, load curtailment program, i.e., reduced power supply instead of no power scenario, Time of Use metering and dynamic and real time pricing, demand forecasting, etc. Project proposes to introduce communication technologies like GPRS/CDMA/RF in metering environment with common protocol and near real time analytics technologies for meter analytics as well as near real time event insights coming from SCADA systems.

Main application
Outage management; Automated metering infrastructure (AMI) for residential consumers and industrial consumers

Other applications
AMI to be leveraged for remote connect/disconnect of customers; Monitoring the consumption pattern; Tamper detection; Contract load monitoring; Load curtailment program; Time of Use metering and dynamic and real time pricing; Demand forecasting; etc.

Scenario for estimated costs and benefits
ROI is proposed to be realized through benefits on account of Reduction in AT&C losses from 21.41% to 12%, reduction in requirement of field staff through proper management of unforeseen outages, improvement in reliability parameters like SAIFI, SAIDI, CAIDI, etc., reduction in meter reading cost, bringing efficiency in meter reading, etc. Payback period is likely to be less than 5 years.

Policy goals
Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses

IRL2
Smart green circuits. ESB Networks - Smart grid demonstration project

Leading organization
ESB Networks (IE)

Total budget
€2,000,000

Description
This project aims to enable the creation of smart green circuits, through the implementation of technology to reduce distribution losses, improve continuity with self healing loops, optimally use distribution connected generation, evaluate and optimize system voltages and power factors and investigate optimal system sectionalisation and power flows.

Main application
Smart Network Management

Other applications
Integration of DER, Integration of Large Scale RES

Policy goals

Additional RES hosting power in the grid/maximum power load Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Percentage reduction of electricity losses

KOR1

Jeju Test Bed_Smart Place

Leading organization

KEPCO, KT, SKT, LG

Total budget

$96.4M

Description

AMI implementation for optimizing supply and demand with bidirectional communication technology between power suppliers and consumers

Main application

Smart Customer and Smart Home

Other applications

Smart Metering

Scenario for estimated costs and benefits

Deployment costs and benefits from energy cost savings

Policy goals

Additional demand side management power managed in the grid/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Reduced peak load

MEX1

Automation of the electrical system by EPROSEC (Protection and Sectioning equipment in aerial distribution networks of medium voltage)

Leading organization

Federal Electricity Commission (CFE)

Total budget

8,150 millions of pesos

Description

Currently we have installed 11,226 EPROSEC and will require to install another 31,686 EPROSEC in all the aerial electrical medium voltage network, so that in a disruption of the electrical service the maximum affected customers will be between 750 and 1,000 during the permanent fault, reestablishing supply to others remotely in less than 5 minutes, reducing the Average Time to Restoring interruptions in distribution circuits. Considering a contribution to reducing the TIU to reach a value of less than 30,607 minutes nationally in the 13 divisions by 2018.

Main application

Smart Network Management

Scenario for estimated costs and benefits

The economic evaluation considers operating income estimated as the sum of benefits by the electricity not supplied, saving on staff movements dedicated to address the power outages, and the productivity of the personnel assigned to other tasks and savings by reducing energy losses. The value of the project is 7,520 millions of pesos with an internal rate of return of 32%.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.)

NED1

Smart Grid Nieuweveens Landen Meppel

Leading organization

DNVKEMA

Total budget

5 million euros

Description

With the large scale introduction of renewable energy sources towards a sustainable energy system a number of challenges are imposed on the energy system. The intermittent character of renewable energy sources sets the need for more flexibility as well as backup power. To cope with these challenges, smart grid technology is being developed. Gas applications like (micro) cogeneration units and hybrid heat pump systems as well as the gas infrastructure play an essential role in smart grids and form a cost efficient cornerstone in balancing our networks, reduce (local) peak load on the electricity grid and prevent congestion. For the large scale implementation of a sustainable system, it is necessary to build experience in field tests. This is why DNV KEMA, together with TNO, ICT Automatisering, RWE Essent, Enexis and Gasunie started a living lab demonstration in Hoogkerk near Groningen in the Netherlands. PowerMatching City consists of 40-50 interconnected regular households of which 25 are already online since the beginning of 2010. These households are equipped with micro-cogeneration units, hybrid heat pumps, PV-solar panels, smart appliances and electric vehicles. Additional power is produced by a wind farm and a gas turbine.

Main application

Smart Network Management

Other applications

Smart Customer and Smart Home

Policy goals

Increased number of consumers participating in electricity markets and in energy efficiency measures; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Reduced peak load; Energy savings

NED2

Smart Grid Nieuweveens Landen Meppel

Leading organization

Municipality of Meppel and Rendo Energy company

Description

- Realising energy supplying neighborhood of over 3,000 households.
- Formation of a local sustainable energy company with participation of residents.
- Combining electricity, (bio)gas, heating and cooling in order to achieve a local energy balance.

Demonstrate technical and economical feasibility

Main application

Integration of DER

Other applications

Smart Customer and Smart Home

Scenario for estimated costs and benefits

Local sustainable energy company

Policy goals

Increased number of consumers participating in electricity markets and in energy efficiency measures; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Reduced peak load; Energy savings

Other applications

Integration of DER

Policy goals

Additional demand side management power managed in the grid/maximum power load; Reduced peak load Increased internal transfer capacity between TSOs or DSOs

SWE1

Grid4EU

Leading organization

ERDF

Description

Grid4EU is led by a group of European DSOs and aims at testing in real size some innovative system concepts and technologies in order to highlight and help to remove some of the barriers to the smart grids deployment (technical, economic, societal, environmental or regulatory). It focuses on how DSOs can dynamically manage electricity supply and demand, which is crucial for integration of large amounts of renewable energy and empowers consumers to become active participants in their energy choices.

Main application

Smart Network Management; Integration of DER; Aggregation; Smart Metering-Pilot

Policy goals

Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Percentage reduction of electricity losses; Reduced peak load

SWE2

Smart Grid Gotland

Leading organization

GEAB

Total budget

28 MEUR (242 MSEK)

Description

The Smart Grid Gotland R&D demonstration project intends to develop strategies for the planning, construction and operation of a fully developed, large-scale smart grid, including a large share of intermittent production, primarily from wind power in the distribution network. New market models and services will be developed to pave the way for new market players.

Main application
Smart Network Management

Other applications
Integration of DER; Integration of Large Scale RES; Smart Customer and Smart Home; Smart Metering

Scenario for estimated costs and benefits
No net present value calculation is yet available.

Policy goals
Additional demand side management power managed in the grid/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE4
Stockholm Royal seaport Active House Pilot

Leading organization
Fortum Distribution AB

Total budget
20 msek

Description
The long-term outcome will be a test apartment, based in Stockholm Royal Seaport, which is part of the solution from the pre-study in the area's housing. The plausibility and attraction of solutions have been deemed to create conditions to expand the number of participating construction companies in next phase. Part solution was to work together with the results from other projects that also have Stockholm Royal Seaport as the test bed. The apartment, which is included in the test installations, will have access to leading technology in smart grids, appliances, information technology and design. They will also be active specifier and designers of new services and products being developed continuously. The results of this project make it possible for companies to develop products and services based on the technology that the project contributed. Researchers and entrepreneurs will be able to assimilate the results from this test apartment to develop their ideas and innovations.

Scenario for estimated costs and benefits

Customer participation in load shift to optimize load factors, impact climate effects and distribution automation systems to increase reliability and reduce losses. Hosting of DER at LV levels.

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE6

Smart Grid Hyllie

Leading organization

E.ON

Total budget

200 MSEK for 2011 through 2014. Additional years to follow.

Description

Hyllie - A test bed for developing solutions for a future transformed energy in the city of Malmö. The project includes: (a) Customer control of heat and electricity consumption, (b) Smart home and Smart building solutions, (c) Distributed generation – electricity and heat, (d) Smart grid solutions – DH and electricity, (e) Sustainable mobility solutions – gas and emobility, (f) CO_2 and resource efficient energy supply, and (g) Distributed energy storage.

Main application

Aggregation (Demand Response, VPP)

Other applications

Smart Customer and Smart Home

Scenario for estimated costs and benefits

Costs for 2011-2014 estimated to 200 MSEK (basically more or less all investments are to be seen as consumables); Analyses regarding benefits to be done in evaluation phase

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA1

gridSMART(SM) Demonstration Project

Leading organization

AEP Ohio

Total budget

$148,821,823

Description

This project is to build a secure, interoperable, and integrated Smart Grid infrastructure that demonstrates the ability to maximize distribution system efficiency and reliability, and consumer use of demand response programs to reduce energy consumption, peak demand costs, and fossil fuel emissions. The demonstration area includes 150 square miles including approximately 110,000 meters and 70 distribution circuits. AEP Ohio will implement Smart Grid technology over 58 13kV circuits from 10 distribution stations and 12 34.5kV circuits from six distribution stations. Included in this project is a redistribution management system, integrated volt-VAR control, distribution automation, advanced meter infrastructure, home area networks, community energy storage, sodium sulfur battery storage, and renewable generation sources. These technologies will be combined with two-way consumer communication and information sharing, demand response, dynamic pricing, and consumer products, such as plug-in hybrid vehicles.

Main application

Smart Network Management

Other applications

Smart Customer and Smart Home; Integration of DER; Smart Metering; Aggregation (Demand Response, VPP); Electric Vehicles and Vehicle2Grid Applications

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency

measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Reduced peak load

USA2

Pacific Northwest Division Smart Grid Demonstration Project

Leading organization

Battelle Memorial Institute

Total budget

$177,642,503

Description

This demonstration will validate new technologies; provide two-way communication between distributed generation, storage and demand assets, and the existing grid infrastructure; quantify Smart Grid costs and benefits; advance interoperability standards and cyber security approaches; and validate new business models. More than 20 types of responsive Smart Grid assets will be tested across six regional and utility operational objectives at 15 unique distribution sites operated by 12 utilities across five states and three climatic regions. A base of Smart Grid technology serving more than 60,000 customers will be installed, validated, and operated. All use classes are represented in the demonstration including residential, commercial, industrial, and irrigation customers. The demonstration will develop a single integrated Smart Grid incentive-signaling approach and will test and validate its ability to continuously coordinate the responses of Smart Grid assets to meet a wide range of operational objectives. It will also engage distributed control so that wind integration problems are mitigated. Micro-grid islanding will also be evaluated for its potential to enhance reliability for customers and relieve energy demand.

Main application

Smart Network Management

Other applications

Integration of DER; Integration of Large Scale RES; Aggregation (Demand Response, VPP); Smart Customer and Smart Home; Smart Metering

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration

and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA3

Smart Grid Deployment

Leading organization

Duke Energy Carolinas, LLC

Total budget

$555,706,307

Description

This project includes advanced metering infrastructure (AMI) and distribution automation systems in five states. The project involves large-scale deployments of AMI and distribution automation in Ohio and Indiana, a pilot deployment of AMI and distribution automation in Kentucky, and deployment of distribution automation in North and South Carolina. The project includes pilot programs for electricity pricing including time-of-use rates, peak-time rebates, and critical-peak pricing. Customers in these pilot programs use home area networks, web portals, and direct load control devices to reduce their electricity consumption and peak demand. Distribution automation equipment will be installed on 1,926 out of 4,741 circuits, which includes: distribution automation communications network; SCADA communications network; automated distribution circuit switches; automated capacitors; and equipment condition monitors.

Main application

Smart Metering

Other applications

Smart Customer and Smart Home; Aggregation (Demand Response, VPP); Smart Network Management

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals

Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA4

Smart Grid Project

Leading organization

EPB

Total budget

$226,707,562

Description

This project involves the installation of advanced metering systems and communications infrastructure. The project installs automated distribution grid equipment expected to enhance the reliability and quality of electric service delivery. The project implements two-way communications and metering expected to: (1) enable customers to view their energy consumption at their convenience through systems such as web portals, (2) provide timebased rate programs to customers, (3) provide information and tools to improve outage management, and (4) reduce operations and maintenance costs.

Main application

Smart Metering

Other applications

Smart Customer and Smart Home; Aggregation (Demand Response, VPP); Smart Network Management

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals

Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA5

Energy Smart Florida

Leading organization

Florida Power & Light Company

Total budget

$578,963,325

Description

This project is deploying advanced metering infrastructure (AMI), distribution automation, new electricity pricing programs, and advanced monitoring equipment for the transmission system. AMI supports two-way communication between FPL and its 3 million consumers receiving smart meters, providing detailed information about electricity usage and the ability to implement new electricity pricing programs. New distribution automation devices expand the functionality of FPL's distribution system to increase reliability, reduce energy losses, and reduce operations and maintenance costs. Synchrophasor and line monitoring devices help increase the reliability and security of the transmission system.

Main application

Smart Metering

Other applications

Smart Customer and Smart Home; Aggregation (Demand Response, VPP); Smart Network Management

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI), distribution automation systems, and wide-area transmission monitoring

Policy goals

Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA6

Enhanced Demand and Distribution Management Regional Demonstration

Leading organization

National Rural Electric Cooperative Association

Total budget

$67,864,292

Description

This project is demonstrating Smart Grid technologies with 27 cooperatives in 11 states across multiple utilities, geographies, climates, and applications including low density areas, low consumer income areas, and service areas prone to natural disasters. NRECA will conduct studies in advanced volt/volt-ampere reactive for total demand; generation and transmission-wide (G&T) demand response over advanced metering infrastructure (AMI); critical peak pricing over AMI; water heater and air conditioning load control over AMI;

advanced water heater control and thermal storage; consumer Internet energy usage portal pilots; consumer in-home energy display pilots; time-sensitive rates pilots; multiple AMI integration at G&T co-ops; distribution co-op meter data management system applications; and self-healing feeders for improved reliability.

Main application

Smart Metering

Other applications

Smart Network Management; Aggregation (Demand Response, VPP); Smart Customer and Smart Home

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA7

SmartSacramento

Leading organization

Sacramento Municipal Utility District

Total budget

$307,697,792

Description

This project involves system-wide deployment of an advanced metering system integrated with existing enterprise and information technology systems as well as a partial deployment of advanced distribution grid assets that equip SMUD's distribution circuits with automated control and operation capabilities. The project also involves customer systems that provide usage and cost information to customers that educate and enable more control over their consumption. These systems enable more informed participation by customers and more effective management by SMUD to improve reliability and efficiency of grid operations and better optimize the use of assets. The project includes a field test of plug-in electric vehicle charging stations to assess their technical performance, vehicle charging patterns, and effects on electric distribution system operations.

Main application
Smart Metering

Other applications
Smart Network Management; Aggregation (Demand Response, VPP); Smart Customer and Smart Home; Electric Vehicles and Vehicle2Grid Applications

Scenario for estimated costs and benefits
Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals
Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA8
Positive Energy Smart Grid Integration Program

Leading organization
Oklahoma Gas and Electric

Total budget
$293,201,332

Description
This project involves system-wide deployment of a fully integrated advanced metering system, distribution of in-home devices to almost 6,000 customers, and installation of advanced distribution automation systems. The program aims at reducing peak loads, overall electricity use, and operations and maintenance costs while increasing distribution system efficiency, reliability, and power quality. The program implements secure wireless communications to: (1) allow smart meter customers to view their electricity consumption data through a personalized web site, and (2) allow OG&E to manage, measure, and verify targeted demand reductions during peak periods. New systems capture meter information for billing and implement new customer pricing programs and service offerings. The project deploys a more dynamic distribution management system, automated switching, and integrated voltage and reactive power control (IVVC) that reduces line losses, reduces operational costs, and improves service reliability. The program also includes a study of consumer behavior in response to different forms of dynamic pricing on an opt-in basis. Finally, the program includes collaboration with University of Oklahoma faculty and students to deploy technologies within 46 buildings on the campus and to take advantage of opportunities for education and training.

Main application
Smart Metering

Other applications
Smart Network Management; Aggregation (Demand Response, VPP); Smart Customer and Smart Home

Scenario for estimated costs and benefits
Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals
Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA9
Smart Grid Project

Leading organization
Southern Company Services, Inc.

Total budget
$330,130,482

Description
This project involves integrated upgrades of the distribution, transmission, and grid management systems. Major efforts include automation of major parts of the distribution system, automation of selected transmission lines, and new equipment for many substations.

Main application
Smart Network Management

Scenario for estimated costs and benefits
Distribution and substation automation

Policy goals
Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Percentage reduction of electricity losses; Increased internal transfer capacity between TSOs or DSOs

USA10
SmartGrid Program

Leading organization
Talquin Electric Cooperative

Total budget
$16,200,000

Description
This project involves the installation of advanced metering, communications infrastructure, distribution automation equipment, load control devices, and other customer systems. The project implements two-way communications to: (1) enable customers to view their energy consumption at their convenience through customer systems and web portals, (2) provide time-based rate programs to customers, (3) provide information and tools to improve outage management, and (4) reduce operations and maintenance costs. The project also installs automated distribution grid equipment expected to: (1) enhance the reliability and quality of electric delivery, and (2) reduce operations and maintenance costs.

Main application
Smart Metering

Other applications
Smart Network Management, Smart Customer and Smart Home

Scenario for estimated costs and benefits
Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals
Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

2.5.2 Transmission Level

ID	Name
CAN2	Zone de réseau interatif
CAN4	Hydro One Smart Zone
FRA2	Postes Intelligents (Smart Transformer)

FRA7	VENTEEA
IRL5	DS3
SWE2	Smart Grid Gotland
SWE4	Stockholm Royal seaport Active House Pilot
SWE6	Smart Grid Hyllie
USA5	Energy Smart Florida
USA9	Smart Grid Project

CAN2

Zone de réseau interatif

Leading organization

Hydro-Québec Distribution

Total budget

$25,585,000

Description

Hydro-Québec has a distribution grid evolution plan which includes progressive smart grid technology implementation. To ensure successful implementation, Hydro-Québec decided to create a smart zone where the technologies will be deployed in order to improve energy efficiency and grid performance. The first smart grid technology to be deployed in the zone will be a DMS (Distribution Management System) with integrated voltage and reactive power control linked to the current distribution grid control system. In 2008, Hydro-Québec introduced a simple voltage regulation and reactive power control system to the Pierre-Boucher substation to reduce energy use, grid losses and greenhouse gases (GHGs). Hydro-Québec estimates that a VVO (Volt Var Optimization) type smart system would allow it to increase energy efficiency compared to a VVC (Volt Var Control) type system. The second smart grid technology involves charging stations with and without intelligence for electric vehicles, scheduled for installation between 2010 and 2012. The agreement between Hydro-Québec and Mitsubishi calls for testing of up to 30 all-electric iMiEV type vehicles. The goal of the project is to better understand charging and driving behaviors, as well as charging infrastructure needs at 120V/15A, 240V/15-30A, and direct current charging (50kW).

Main application

Electric Vehicles and Vehicle2Grid Applications

Other applications

Smart Metering

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Increased internal transfer capacity between TSOs or DSOs

CAN4

Hydro One Smart Zone

Leading organization

Hydro One

Total budget

$112,000,000

Description

Having already installed 1.2 million smart meters, Hydro One is taking the next step in building the Smart Grid with its Smart Zone, a comprehensive integration of field and back office solutions in a limited deployment in Owen Sound, Ontario. The focus will be on the integration of the distribution management system with the power system intelligent electronic devices that will be installed on the system. A successful integration will allow the safe and reliable connection of distributed generation. The project has four objectives: Integration of distributed generators into the rural distribution system; Distribution automation – monitoring and control for reliability and voltage optimization and loss reduction; Optimized outage restoration, using the communications capability of smart meters, and achieving the most efficient crew dispatch; Using system data to reduce field data collection and to improve distribution network asset planning and tools. This project will run from 2011-2013, at which time costs and benefits will be evaluated and Hydro One will proceed with a similar deployment to other parts of the province

Main application

Integration of DER

Other applications

Integration of DER; Smart Network Management; Policy Goals; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.)

FRA2

Postes Intelligents (Smart Transformer)

Leading organization

RTE

Total budget

To be made public 1st quarter 2013.

Description

To be made public 1st quarter 2013.

Main application

Smart Network Management

Policy goals

Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.)

FRA7

VENTEEA

Leading organization

ERDF

Description

In 2011, ERDF submitted the demonstrator as part of an ADEME program called “smart grid electric network” (AMI). Early 2012, the French Commissioner General for Investment (CGI) approved the project. The demonstrator is focused on the integration of large wind energy in distribution networks. More precisely the project will study observability and controllability of wind-farms, voltage regulation and centralized local protection plan and power quality. If the costs benefits analysis is validated by all involved stakeholders, a battery storage system offering a full service package would be implemented on 20 kV level.

Main application

Integration of DER

Policy goals

Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Percentage reduction of electricity losses; Reduced peak load

IRL5

DS3

Leading organization

Eirgrid

Description
EirGrid's DS3 programme is developing solutions to the challenges associated with increasing levels of renewable generation, particularly with regard to secure power system operation, as we work to achieve the 2020 renewable targets. The combination of the All island Grid Studies, EirGrid's Grid 25, the facilitation of renewables studies, and a comprehensive analysis of the long-term needs of the power system conducted in 2011, form the backbone of our plans to facilitate the 40% target by 2020. The main operational areas that need to be addressed are the management of the system frequency, balancing the system in real time, managing system voltage and ensuring the compliance of plant with the Grid Code requirements. The work programme includes enhancing the portfolio performance, developing new operational policies and system tools to efficiently use the plant portfolio to the best of its capabilities, and regularly reviewing the needs of the system as the portfolio capability evolves.

Main application
Integration of Large Scale RES

Other applications
Smart Network Management; Aggregation (Demand Response, VPP); Integration of DER

Policy goals
Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES; Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Percentage reduction of electricity losses; Reduced peak load; Additional interconnection capacity (specify HVDC and HVAC)

SWE2
Smart Grid Gotland

Leading organization
GEAB

Total budget
28 MEUR (242 MSEK)

Description
The Smart Grid Gotland R&D demonstration project intends to develop strategies for the planning, construction and operation of a fully developed, large-scale smart grid, including a large share of intermittent production, primarily from wind power in the distribution network. New market models and services will be developed to pave the way for new market players.

Main application

Smart Network Management

Other applications

Integration of DER; Integration of Large Scale RES; Smart Customer and Smart Home; Smart Metering

Scenario for estimated costs and benefits

No net present value calculation is yet available.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE4

Stockholm Royal seaport Active House Pilot

Leading organization

Fortum Distribution AB

Total budget

20 msek

Description

The long-term outcome will be a test apartment, based in Stockholm Royal Seaport, which is part of the solution from the pre-study in the area's housing. The plausibility and attraction of solutions have been deemed to create conditions to expand the number of participating construction companies in next phase. Part solution was to work together with the results from other projects that also have Stockholm Royal Seaport as the test bed. The apartment, which is included in the test installations, will have access to leading technology in smart grids, appliances, information technology and design. They will also be active specifier and designers of new services and products being developed continuously. The results of this project make it possible for companies to develop products and services based on the technology that the project contributed. Researchers and entrepreneurs will be able to assimilate the results from this test apartment to develop their ideas and innovations.

Scenario for estimated costs and benefits

Customer participation in load shift to optimize load factors, impact climate effects and distribution automation systems to increase reliability and reduce losses. Hosting of DER at LV levels.

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE6

Smart Grid Hyllie

Leading organization

E.ON

Total budget

200 MSEK for 2011 through 2014. Additional years to follow.

Description

Hyllie - A test bed for developing solutions for a future transformed energy in the city of Malmö. The project includes: (a) Customer control of heat and electricity consumption, (b) Smart home and Smart building solutions, (c) Distributed generation – electricity and heat, (d) Smart grid solutions – DH and electricity, (e) Sustainable mobility solutions – gas and emobility, (f) CO_2 and resource efficient energy supply, and (g) Distributed energy storage.

Main application

Aggregation (Demand Response, VPP)

Other applications

Smart Customer and Smart Home

Scenario for estimated costs and benefits

Costs for 2011-2014 estimated to 200 MSEK (basically more or less all investments are to be seen as consumables); Analyses regarding benefits to be done in evaluation phase

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA5

Energy Smart Florida

Leading organization

Florida Power & Light Company

Total budget

$578,963,325

Description

This project is deploying advanced metering infrastructure (AMI), distribution automation, new electricity pricing programs, and advanced monitoring equipment for the transmission system. AMI supports two-way communication between FPL and its 3 million consumers receiving smart meters, providing detailed information about electricity usage and the ability to implement new electricity pricing programs. New distribution automation devices expand the functionality of FPL's distribution system to increase reliability, reduce energy losses, and reduce operations and maintenance costs. Synchrophasor and line monitoring devices help increase the reliability and security of the transmission system.

Main application

Smart Metering

Other applications

Smart Customer and Smart Home; Aggregation (Demand Response, VPP); Smart Network Management

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI), distribution automation systems, and wide-area transmission monitoring

Policy goals

Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA9

Smart Grid Project

Leading organization

Southern Company Services, Inc.

Total budget

$330,130,482

Description

This project involves integrated upgrades of the distribution, transmission, and grid management systems. Major efforts include automation of major parts of the distribution system, automation of selected transmission lines, and new equipment for many substations.

Main application

Smart Network Management

Scenario for estimated costs and benefits

Distribution and substation automation

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Percentage reduction of electricity losses; Increased internal transfer capacity between TSOs or DSOs

2.5.3 T&D Interface

ID	Name
CAN2	Zone de réseau interatif
CAN4	Hydro One Smart Zone
IND2	UGVCL, Gujarat
IND3	CESC, Mysore
IND4	KSEB, Kerala
IRL5	DS3
SWE1	Grid4EU
SWE2	Smart Grid Gotland

SWE6	Smart Grid Hyllie
USA2	Pacific Northwest Division Smart Grid Demonstration Project
USA5	Energy Smart Florida
USA9	Smart Grid Project

CAN2

Zone de réseau interatif

Leading organization

Hydro-Québec Distribution

Total budget

$25,585,000

Description

Hydro-Québec has a distribution grid evolution plan which includes progressive smart grid technology implementation. To ensure successful implementation, Hydro-Québec decided to create a smart zone where the technologies will be deployed in order to improve energy efficiency and grid performance. The first smart grid technology to be deployed in the zone will be a DMS (Distribution Management System) with integrated voltage and reactive power control linked to the current distribution grid control system. In 2008, Hydro-Québec introduced a simple voltage regulation and reactive power control system to the Pierre-Boucher substation to reduce energy use, grid losses and greenhouse gases (GHGs). Hydro-Québec estimates that a VVO (Volt Var Optimization) type smart system would allow it to increase energy efficiency compared to a VVC (Volt Var Control) type system. The second smart grid technology involves charging stations with and without intelligence for electric vehicles, scheduled for installation between 2010 and 2012. The agreement between Hydro-Québec and Mitsubishi calls for testing of up to 30 all-electric iMiEV type vehicles. The goal of the project is to better understand charging and driving behaviors, as well as charging infrastructure needs at 120V/15A, 240V/15-30A, and direct current charging (50kW).

Main application

Electric Vehicles and Vehicle2Grid Applications

Other applications

Smart Metering

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Increased internal transfer capacity between TSOs or DSOs

CAN4

Hydro One Smart Zone

Leading organization

Hydro One

Total budget

$112,000,000

Description

Having already installed 1.2 million smart meters, Hydro One is taking the next step in building the Smart Grid with its Smart Zone, a comprehensive integration of field and back office solutions in a limited deployment in Owen Sound, Ontario. The focus will be on the integration of the distribution management system with the power system intelligent electronic devices that will be installed on the system. A successful integration will allow the safe and reliable connection of distributed generation. The project has four objectives: Integration of distributed generators into the rural distribution system; Distribution automation – monitoring and control for reliability and voltage optimization and loss reduction; Optimized outage restoration, using the communications capability of smart meters, and achieving the most efficient crew dispatch; Using system data to reduce field data collection and to improve distribution network asset planning and tools. This project will run from 2011-2013, at which time costs and benefits will be evaluated and Hydro One will proceed with a similar deployment to other parts of the province

Main application

Integration of DER

Other applications

Integration of DER; Smart Network Management; Policy Goals; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.)

IND2

UGVCL, Gujarat

Leading organization

UGVCL

Total budget

$9,200,000

Description

UGVCL has proposed the pilot project in Naroda of Sabarmati circle which is an industrial and residential area and Deesa of Palanpur circle which is an agricultural area covering 20,524 consumers in Naroda and 18,898 agricultural unmetered consumers in Deesa-II division and accounting for input energy of around 1700 MU (Naroda : 374.52 MU & Deesa : 1321.27 MU for 2010-11). The functionalities of peak load management, outage management, power quality management are proposed by implementing automated metering infrastructure (AMI) for industrial, commercial and residential consumers. Committee also observed that some additional functionalities like load forecasting and asset management are also proposed and functionalities of load forecasting, peak power management and outage management are also considered at utility level which will impact all consumers of utility (i.e., 27 lac consumers) indirectly. Renewable energy integration has been proposed to be carried out at Patan Solar Park and few roof top installations at some of the universities. The pilot project proposes to introduce TOU tariff with approvals from GERC. Renewable energy integration is proposed through proper and accurate load forecast by real time monitoring of substations, feeders and RES generation.

Main application

Peak load management, outage management, and power quality management are proposed by implementing automated metering infrastructure (AMI) for industrial, commercial and residential consumers.

Other applications

Load forecasting and asset management are proposed. Load forecasting, peak power management and outage management are considered at utility level. Renewable energy integration at Patan Solar Park and few roof top installations are also envisaged.

Scenario for estimated costs and benefits

The ROI is proposed to be realized through benefits on account of reduction in AT&C losses from 12.44% to around 8.44% in Naroda and from 21.69% to 15% in Deesa; savings in peak power purchase cost by reduction of peak load by up to 5% in both areas; reduction in transformer failure rate from 16.52% to 8% in Deesa area; and reduction in number of outages, meter reading cost, cost of payment collection, etc. Based on projected savings the payback period is likely to be around 2 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND3

CESC, Mysore

Leading organization

CESC, Mysore

Total budget

$6,150,000

Description

CESC, Mysore has proposed the pilot project in Additional City Area Division (ACAD), Mysore involving 21,824 consumers with a good mix of residential, commercial, industrial and agricultural consumers including 512 irrigation pump sets covering over 14 feeders and 473 distribution transformers and accounting for input energy of 151.89 MU. The functionalities of peak load management, outage management are proposed by implementing automated metering infrastructure (AMI) for residential consumers and industrial consumers and integration of distributed generation / micro grid integration. Some additional functionality like agriculture DSM with community portal, consumer portal to support DSM/DR, employee portal for knowledge sharing and benefit realization, KPI based MIS and data analytics for decision support are also proposed. The pilot project proposes to introduce real time pricing signal by interfacing at SLDC level to get UI/ABT prices subject to regulatory consent. Implementation of Fault Location Isolation and System Restoration (FLISR) at feeders where alternate feeding arrangements are available is also proposed.

Main application

Peak load management, outage management by implementing automated metering infrastructure (AMI) for residential consumers and industrial consumers; Integration of distributed generation/micro grid integration

Other applications

Agriculture DSM with community portal

Scenario for estimated costs and benefits

ROI is proposed to be realized through benefits on account of reduction in AT&C losses from 10.6% to 5.7% in 3 years, shifting of load of up to 80% in industrial feeders and up to 20% for domestic consumer during peak hours, reduction in number of transformer failure, meter reading cost, reduction in unforeseen outages and also recovery time for unforeseen outages by 20% and 50%. Based on projected savings the payback period is likely to be less than 3 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency

measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND4

KSEB, Kerala

Leading organization

KSEB, Kerala

Total budget

$5,200,000

Description

KSEB Smart Grid Pilot covers around 25078 LT Industrial consumers of selected distribution section offices spread over the geographical area of Kerala State. The input energy for the total scheme area is 2108 MUs and for the LT Industrial consumers is 376 MUs. Automated metering infrastructure (AMI) is proposed to provide quality service, prevent tampering and unauthorised usage of load, accurate and timely metering and billing, avoiding costly field visits of Sub Engineers for meter reading, reducing supply restoration time, peak load management through load restriction for Remote Disconnection/Reconnection and Time of Day tariff.

Main application

Automated metering infrastructure (AMI); Peak load management

Scenario for estimated costs and benefits

ROI is proposed to be realized through benefits on account of Reduction in AT&C losses of about 1.17% (24.82 MUs) through reduction in loss due to manual error, tampers, thefts, short assessment, etc., savings on employee and travel cost for meter reading and introducing incremental tariff for peak hours through ToD Tariff. Based on above savings the payback period is estimated to be around 2.5 years

Policy goals

Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

IRL5

DS3

Leading organization

Eirgrid

Description

EirGrid's DS3 programme is developing solutions to the challenges associated with increasing levels of renewable generation, particularly with regard to secure power system operation, as we work to achieve the 2020 renewable targets. The combination of the All island Grid Studies, EirGrid's Grid 25, the facilitation of renewables studies, and a comprehensive analysis of the long-term needs of the power system conducted in 2011, form the backbone of our plans to facilitate the 40% target by 2020. The main operational areas that need to be addressed are the management of the system frequency, balancing the system in real time, managing system voltage and ensuring the compliance of plant with the Grid Code requirements. The work programme includes enhancing the portfolio performance, developing new operational policies and system tools to efficiently use the plant portfolio to the best of its capabilities, and regularly reviewing the needs of the system as the portfolio capability evolves.

Main application

Integration of Large Scale RES

Other applications

Smart Network Management; Aggregation (Demand Response, VPP); Integration of DER

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES; Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Percentage reduction of electricity losses; Reduced peak load; Additional interconnection capacity (specify HVDC and HVAC)

SWE1

Grid4EU

Leading organization

ERDF

Description

Grid4EU is led by a group of European DSOs and aims at testing in real size some innovative system concepts and technologies in order to highlight and help to remove some of the barriers to the smart grids deployment (technical, economic, societal, environmental or regulatory). It focuses on how DSOs can dynamically manage electricity supply and demand, which is crucial for integration of large amounts of renewable energy and empowers consumers to become active participants in their energy choices.

Main application

Smart Network Management; Integration of DER; Aggregation; Smart Metering-Pilot

Policy goals

Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Percentage reduction of electricity losses; Reduced peak load

SWE2

Smart Grid Gotland

Leading organization

GEAB

Total budget

28 MEUR (242 MSEK)

Description

The Smart Grid Gotland R&D demonstration project intends to develop strategies for the planning, construction and operation of a fully developed, large-scale smart grid, including a large share of intermittent production, primarily from wind power in the distribution network. New market models and services will be developed to pave the way for new market players.

Main application

Smart Network Management

Other applications

Integration of DER; Integration of Large Scale RES; Smart Customer and Smart Home; Smart Metering

Scenario for estimated costs and benefits

No net present value calculation is yet available.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE6

Smart Grid Hyllie

Leading organization

E.ON

Total budget

200 MSEK for 2011 through 2014. Additional years to follow.

Description

Hyllie - A test bed for developing solutions for a future transformed energy in the city of Malmö. The project includes: (a) Customer control of heat and electricity consumption, (b) Smart home and Smart building solutions, (c) Distributed generation – electricity and heat, (d) Smart grid solutions – DH and electricity, (e) Sustainable mobility solutions – gas and emobility, (f) CO_2 and resource efficient energy supply, and (g) Distributed energy storage.

Main application

Aggregation (Demand Response, VPP)

Other applications

Smart Customer and Smart Home

Scenario for estimated costs and benefits

Costs for 2011-2014 estimated to 200 MSEK (basically more or less all investments are to be seen as consumables); Analyses regarding benefits to be done in evaluation phase

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA2

Pacific Northwest Division Smart Grid Demonstration Project

Leading organization

Battelle Memorial Institute

Total budget

$177,642,503

Description

This demonstration will validate new technologies; provide two-way communication between distributed generation, storage and demand assets, and the existing grid infrastructure; quantify Smart Grid costs and benefits; advance interoperability standards and cyber security approaches; and validate new business models. More than 20 types of responsive Smart Grid assets will be tested across six regional and utility operational objectives at 15 unique distribution sites operated by 12 utilities across five states and three climatic regions. A base of Smart Grid technology serving more than 60,000 customers will be installed, validated, and operated. All use classes are represented in the demonstration including residential, commercial, industrial, and irrigation customers. The demonstration will develop a single integrated Smart Grid incentive-signaling approach and will test and validate its ability to continuously coordinate the responses of Smart Grid assets to meet a wide range of operational objectives. It will also engage distributed control so that wind integration problems are mitigated. Micro-grid islanding will also be evaluated for its potential to enhance reliability for customers and relieve energy demand.

Main application

Smart Network Management

Other applications

Integration of DER; Integration of Large Scale RES; Aggregation (Demand Response, VPP); Smart Customer and Smart Home; Smart Metering

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA5

Energy Smart Florida

Leading organization

Florida Power & Light Company

Total budget

$578,963,325

Description

This project is deploying advanced metering infrastructure (AMI), distribution automation, new electricity pricing programs, and advanced monitoring equipment for the transmission system. AMI supports two-way communication between FPL and its 3 million consumers receiving smart meters, providing detailed information about electricity usage and the ability to implement new electricity pricing programs. New distribution automation devices expand the functionality of FPL's distribution system to increase reliability, reduce energy losses, and reduce operations and maintenance costs. Synchrophasor and line monitoring devices help increase the reliability and security of the transmission system.

Main application

Smart Metering

Other applications

Smart Customer and Smart Home; Aggregation (Demand Response, VPP); Smart Network Management

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI), distribution automation systems, and wide-area transmission monitoring

Policy goals

Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA9

Smart Grid Project

Leading organization

Southern Company Services, Inc.

Total budget

$330,130,482

Description

This project involves integrated upgrades of the distribution, transmission, and grid management systems. Major efforts include automation of major parts of the distribution system, automation of selected transmission lines, and new equipment for many substations.

Main application
Smart Network Management

Scenario for estimated costs and benefits
Distribution and substation automation

Policy goals
Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Percentage reduction of electricity losses; Increased internal transfer capacity between TSOs or DSOs

2.6 Increased Number of Consumers Participating in Electricity Markets and in Energy Efficiency Measures (Sustainability and Integration)

Summaries of projects in the inventory selected as contributing to the policy goal of “Increased Number of Consumers Participating in Electricity Markets and in Energy Efficiency Measures (Sustainability and Integration)” are presented in order of their physical application domains: Distribution Level, Transmission Level, and T&D Interface. Within each domain, project summaries are presented in alphanumerical order of their unique Project IDs.

2.6.1 Distribution Level

ID	Name
CAN5	Ontario Smart Meter Initiative
FRA4	Smart Electric Lyon
FRA6	Greenlys
GER2	Smart Area Aachen
GER4	eTelligence
GER5	E-DeMa
GER6	Smart Watts
IND1	Puducherry
IND2	UGVCL, Gujarat
IND3	CESC, Mysore
IND4	KSEB, Kerala

IND5	APDCL, Assam
IND6	APCPDCL, Andhra Pradesh
IND7	UHBVN, Haryana
IND9	TSECL, Tripura
IND10	HPSEB, Himachal Pradesh
IRL1	CER National Smart Metering Plan
KOR4	Jeju Test Bed_Smart Electricity Service
NED1	Smart Grid Nieuweveens Landen Meppel
NED2	Smart Grid Nieuweveens Landen Meppel
SWE2	Smart Grid Gotland
SWE4	Stockholm Royal seaport Active House Pilot
SWE5	Stockholm Royal seaport demonstration phase
SWE6	Smart Grid Hyllie
USA1	gridSMART(SM) Demonstration Project
USA2	Pacific Northwest Division Smart Grid Demonstration Project
USA3	Smart Grid Deployment
USA4	Smart Grid Project
USA5	Energy Smart Florida
USA6	Enhanced Demand and Distribution Management Regional Demonstration
USA7	SmartSacramento
USA8	Positive Energy Smart Grid Integration Program

CAN5

Ontario Smart Meter Initiative

Leading organization

Ministry of Energy - sets the policy framework; Ontario Energy Board – provides regulatory guidance; Independent Electricity System Operator - Development and operation centralized Meter Data Management system; Local Distribution Companies - Purchasing, owni

Total budget

$1 Billion

Description

Ontario has introduced smart meters — along with a “time-of-use” electricity price structure — to help you manage customer electricity costs, while helping Ontario to build a more efficient, more environmentally sound electricity system. Smart meters have been installed in residences and small businesses across Ontario. A smart meter system opens up the opportunity for new kinds of conservation and demand management programs. In the future, smart meters could allow the introduction of different timebased incentive programs, or the opportunity to control energy use through energy management devices or smart appliances. Smart meter data also provides comprehensive, detailed information for electricity system planning, allowing us to identify where future generation, transmission and distribution investments are required. Time-of-use pricing encourages Ontarians to shift some electricity use to offpeak hours. By reducing peak demand, the province can reduce its use of the less environmentally attractive resources that are called on when demand is high. In the long run, lower peak demand will mean less need for new generating facilities and transmission and distribution infrastructure, lowering costs for all Ontarians.

Main application

Smart Metering

Scenario for estimated costs and benefits

LDC Operating Cost Reduction; Energy Cost Savings (societal benefits); Energy Cost Savings (societal benefits); Generation Capacity Avoidance; T&D Capacity Avoidance

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Reduced peak load

FRA4

Smart Electric Lyon

Leading organization

EDF

Total budget

To be made public 1st quarter 2013.

Description

To be made public 1st quarter 2013.

Main application

Smart Customer and Smart Home

Policy goals

Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings

FRA6

GreenLys

Leading organization

ERDF

Description

GreenLys is a systemic smart grid project which includes: - DER - Consumption - Networks (DSO & TSO). Main Goals: - decrease of greenhouse gases - control of energy bill - introduction and control of DER on LV networks - behavior of consumers, with incentive and innovative new offers - aggregator functions. Innovations: - Smart management of grid (seal-healing, smart metering using Linky infrastructure,...) - Demand side management, demand/response, energy saving and new offers (using boxes linked to Linky Infrastructure, tariffs, dynamic prices policy...) – Investments; Impact on studies and development of networks (especially for DSOs)

Main application

Smart Network Management; Integration of DER; Smart Customer and Smart Home

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Reduced peak load

GER2

Smart Area Aachen

Leading organization

Stadtwerke Aachen Aktiengesellschaft

Total budget

$9,152,280

Description

Smart Area Aachen aims at developing new holistic concepts and methods based on new equipment for future smart grid solutions. In this context, innovative technical solutions are identified, optimized and eventually verified in pilot trials. Moreover, new business models are developed for the different stakeholders and harmonization aspects are addressed in accompanying standardization activities.

Main application
Smart grid applications in general: equipment, planning, operation

Scenario for estimated costs and benefits
Smart grid infrastructure

Policy goals
Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.) Energy savings; Percentage reduction of electricity losses; Reduced peak load

GER4
eTelligence

Leading organization
EWE AG

Total budget
27.039.630,91 USD(1 USD = 0,739655 EUR)

Description
The main goal of eTelligence was to develop, build and test the integrated future smart energy system with a secure, interoperable ICT infrastructure. Parts of this overall system were tested in the field: 650 households including smart meter with new feedback systems and new electricity tariffs; an electronic market place; VPP including cold stores whose load was used to optimize the VPP. In addition, the project installed measurement equipment to optimize the grid management. To ensure the overall use, the project developed a power plant model which mapped the flexibilities and units of renewable energy in scenarios for 2020 and 2030 based on the results from the project.

Main application
Exploration of the future energy system

Other applications
Integration of DER, Aggregation (Demand Response, VPP); Smart Customer and Smart Home; Smart Metering

Policy goals
Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings

GER5

E-DeMa

Leading organization

RWE Deutschland AG

Total budget

22 Mio. €

Description

Field test with 700 households in the Rhine/Ruhr region in Germany (Mülheim and Krefeld). The infrastructure comprises smart meters, and a regional energy market place which acts as a data platform for the involved parties of the energy system including consumers, energy suppliers, DSOs, aggregators and service providers. An infrastructure to exploit the flexibilities of residential consumers has been implemented. Control of white goods is done automatically via a home energy controller, which receives price signals from the regional energy market place. A part of the consumers is equipped with an in-house display for pricing information.

Main application

Regional Energy Marketplace; Smart Metering; Active Demand in residential environment; Aggregation of Flexibilities from residential consumers

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals

Active demand for residential consumers, supporting integration of renewables, peak shaving, increased number of consumers participating in energy markets; Energy efficiency by transparency of energy consumption, reduction of peak load

GER6

Smart Watts

Leading organization

utilicount GmbH & Co. KG

Total budget

up to ca. 20 Million EUR

Description

Central idea of the project, “Smart Watts,” is to compensate the increased volatility of energy supply, due to the increased integration of renewable energy, by load balancing on the demand side and rises in energy efficiency - focused on private households. The market players gain access to current actual data by a dynamic information exchange of supply and demand information. This enables the generation of additional data such as dynamic purchasing conditions, which then can be offered to private households. The dynamic purchasing information (e.g., prices) are meant to motivate private households to shift their load. Therefore the households use an visualization, controlling and steering tablet pc App.

Main application

Smart Customer and Smart Home; Smart Metering; Aggregation (Demand Response, VPP)

Other applications

Aggregation (Demand Response, VPP)

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Additional Demand Side Management power managed in the grid/maximum power load; Reduced peak load; Energy savings

IND1

Puducherry

Leading organization

Puducherry Electricity Department

Total budget

$8,700,000

Description

Pilot covers 87,031 no. of consumers with dominant being domestic consumers. The module of automated metering infrastructure (AMI) for residential consumers and industrial consumers is proposed to be implemented to assist with consumer issues like event management & prioritizing, billing cycle review and revenue collection efficiency for energy auditing and AT&C loss reduction. The AMI system shall aid in knowing real time energy input from DT as well as energy consumption by consumers that can instantly help to know losses in the system. Common Meter Data Management System is proposed that shall take data from MDMS of different meter manufacturer/solution provider and integrate the information for use. The pilot project also proposes developing a mature model of “time of use tariff and net metering.”

Main application

AMI for Industrial and Residential Consumers

Scenario for estimated costs and benefits

The proposed Cost Benefit Analysis for the pilot is based on the assumption of reducing Distribution Losses from 14% resulting in savings of about 25.5 MUs, reducing cost of billing by up to 50% and Increasing revenue collection efficiency from 90% to 98%. The payback period is likely to be around 6 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND2

UGVCL, Gujarat

Leading organization

UGVCL

Total budget

$9,200,000

Description

UGVCL has proposed the pilot project in Naroda of Sabarmati circle which is an industrial and residential area and Deesa of Palanpur circle which is an agricultural area covering 20,524 consumers in Naroda and 18,898 agricultural unmetered consumers in Deesa-II division and accounting for input energy of around 1700 MU (Naroda : 374.52 MU & Deesa : 1321.27 MU for 2010-11). The functionalities of peak load management, outage management, power quality management are proposed by implementing automated metering infrastructure (AMI) for industrial, commercial and residential consumers. Committee also observed that some additional functionalities like load forecasting and asset management are also proposed and functionalities of load forecasting, peak power management and outage management are also considered at utility level which will impact all consumers of utility (i.e., 27 lac consumers) indirectly. Renewable energy integration has been proposed to be carried out at Patan Solar Park and few roof top installations at some of the universities. The pilot project proposes to introduce TOU tariff with approvals from GERC. Renewable energy integration is proposed through proper and accurate load forecast by real time monitoring of substations, feeders and RES generation.

Main application

Peak load management, outage management, and power quality management are proposed by implementing automated metering infrastructure (AMI) for industrial, commercial and residential consumers.

Other applications

Load forecasting and asset management are proposed. Load forecasting, peak power management and outage management are considered at utility level. Renewable energy integration at Patan Solar Park and few roof top installations are also envisaged.

Scenario for estimated costs and benefits

The ROI is proposed to be realized through benefits on account of reduction in AT&C losses from 12.44% to around 8.44% in Naroda and from 21.69% to 15% in Deesa; savings in peak power purchase cost by reduction of peak load by up to 5% in both areas; reduction in transformer failure rate from 16.52% to 8% in Deesa area; and reduction in number of outages, meter reading cost, cost of payment collection, etc. Based on projected savings the payback period is likely to be around 2 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND3

CESC, Mysore

Leading organization

CESC, Mysore

Total budget

$6,150,000

Description

CESC, Mysore has proposed the pilot project in Additional City Area Division (ACAD), Mysore involving 21,824 consumers with a good mix of residential, commercial, industrial and agricultural consumers including 512 irrigation pump sets covering over 14 feeders and 473 distribution transformers and accounting for input energy of 151.89 MU. The functionalities of peak load management, outage management are proposed by implementing automated metering infrastructure (AMI) for residential consumers and industrial consumers and integration of distributed generation / micro grid integration. Some additional functionality like agriculture DSM with community portal, consumer portal to support DSM/DR, employee portal for knowledge sharing and benefit realization, KPI based MIS and data analytics for decision support are also proposed. The pilot project proposes to introduce real time pricing signal by interfacing at SLDC level to get UI/ABT prices subject to regulatory consent. Implementation of Fault Location Isolation and System Restoration (FLISR) at feeders where alternate feeding arrangements are available is also proposed.

Main application

Peak load management, outage management by implementing automated metering infrastructure (AMI) for residential consumers and industrial consumers; Integration of distributed generation/micro grid integration

Other applications

Agriculture DSM with community portal

Scenario for estimated costs and benefits

ROI is proposed to be realized through benefits on account of reduction in AT&C losses from 10.6% to 5.7% in 3 years, shifting of load of up to 80% in industrial feeders and up to 20% for domestic consumer during peak hours, reduction in number of transformer failure, meter reading cost, reduction in unforeseen outages and also recovery time for unforeseen outages by 20% and 50%. Based on projected savings the payback period is likely to be less than 3 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND4

KSEB, Kerala

Leading organization

KSEB, Kerala

Total budget

$5,200,000

Description

KSEB Smart Grid Pilot covers around 25078 LT Industrial consumers of selected distribution section offices spread over the geographical area of Kerala State. The input energy for the total scheme area is 2108 MUs and for the LT Industrial consumers is 376 MUs. Automated metering infrastructure (AMI) is proposed to provide quality service, prevent tampering and unauthorised usage of load, accurate and timely metering and billing, avoiding costly field visits of Sub Engineers for meter reading, reducing supply restoration time, peak load management through load restriction for Remote Disconnection/Reconnection and Time of Day tariff.

Main application

Automated metering infrastructure (AMI); Peak load management

Scenario for estimated costs and benefits

ROI is proposed to be realized through benefits on account of Reduction in AT&C losses of about 1.17% (24.82 MUs) through reduction in loss due to manual error, tampers, thefts, short assessment, etc., savings on employee and travel cost for meter reading and introducing incremental tariff for peak hours through ToD Tariff. Based on above savings the payback period is estimated to be around 2.5 years

Policy goals

Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND5

APDCL, Assam

Leading organization

APDCL, Assam

Total budget

$5,500,000

Description

APDCL, Assam has proposed a Smart Grid Pilot in Guwahati distribution region, covering 15,000 consumers and involving 90MUs of input energy. APDCL is in the process IT Implementation under R-APDRP and SCADA/DMS implementation is also to be taken up shortly. APDCL has proposed the functionality of peak load management using industrial and residential AMI, integration of distributed generation (solar and available back-up DG set) and outage management system. The utility has envisaged that power quality monitoring will be a by-product of the deployment. In the smart grid pilot project Integration of the 100kW solar farm into the distribution network via a bidirectional inverter and use of battery storage, possibly Vanadium redox battery, in conjunction with the solar farm is proposed. In addition R&D works are proposed for: Forecasting of load based on the weather, social events, festivals, etc. and developing various "if-then" scenarios to find optimal course of action for each scenario; Developing controllers for the bidirectional inverter and battery integration; Development of filters for reduction of harmonics injected into the grid and integrating it into the smart meters; and Development of messaging systems (for display in house and on mobile) for power consumption information and methods to reduce energy consumption. Study of the Guwahati's distribution grid to identify the locations and sizes of the Vanadium redox batteries for peak shaving and valley filling is also proposed.

Main application

Peak load management; Outage management by implementing automated metering infrastructure (AMI) for residential consumers and industrial consumers; Power quality management; Integration of distributed generation

Scenario for estimated costs and benefits

The cost benefit analysis for the pilot is based on increased available energy of 55,602.5 kWh during peak time resulting in a saving of Rs. 3 Cr per year, revenue increase through power quality measurements and power factor penalty (assuming a 5% variation in power factor across 20% of the customers, paying an average 2% penalty); Reduction in AT&C losses from 16.7% to 12.55%; Reduction in interest payments due to deferred capital investment in sub-transmission networks, improvement of availability (reduction of customer minutes lost) and improved management of power procurement options; Unscheduled interchange using short term load forecasts. Based on above savings the payback period is estimated to be around 5 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND6

APCPDCL, Andhra Pradesh

Leading organization

APCPDCL, Andhra Pradesh

Total budget

$7,900,000

Description

The design proposes a Smart Grid Control Center housing the IT systems, a two way communication system for AMI. The number of customers in the project area is 38,303. However over 11,904 are covered under AMI implementation and smart meters will be for these numbers of customers. The functionalities of peak load management, power quality and outage management are proposed by implementing automated metering infrastructure (AMI) for residential consumers and industrial consumers. DAS, IT and SCADA shall be implemented. The CBM for DTR is proposed as an early warning of health of assets. The customer web portal would provide all customer related information and to seek their participation.

Main application

Peak load management; Outage management; Power quality management are proposed by implementing automated metering infrastructure (AMI) for industrial and residential consumers

Other applications

Condition based monitoring for DTR and customer web portal

Scenario for estimated costs and benefits

The proposed cost benefit analysis for the pilot is based on the assumption of reducing AT&C loss from present 9.48% to 7.48% and energy saving during peak times by shifting about 35.68 MUs from peak periods and thereby reduced purchase of high cost power at peak hours. Based on above savings the payback period is estimated to be around 2.5 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND7

UHBVN, Haryana

Leading organization

UHBVN, Haryana

Total budget

$3,200,000

Description

UHBVN, Haryana has proposed a Smart Grid Pilot in Panipat City Subdivision (Haryana State) covering 30,544 consumers and distribution system of 531 DTs. The area has around 131.8 MU input energy consumption. IT implementation and system strengthening is likely to be completed in 2013. The functionality of peak load management is proposed by implementing automated metering infrastructure (AMI) for residential consumers and industrial consumers. Utility has also envisaged using data of energy input from DT as well as energy consumption by consumers for detecting pilferage in the system, increasing collection efficiency, reducing AT&C losses, outage management, tamper event detection, and power quality management and enabling operator to take informed business decision. The pilot project proposes evolving a model of "time of use tariff incentives and disincentive and net metering for Renewable Energy" and process of demand response and demand management for peak load management and to do research and development for developing a mature model of the same for deploying at other towns.

Main application

Peak load management by implementing automated metering infrastructure (AMI) for residential and industrial consumers

Scenario for estimated costs and benefits

The proposed Cost Benefit Analysis for the pilot is based on the assumption of reducing distribution losses (including pilferage) from 30.10% to 16.50%; reducing peak load consumption by up to 9,000 units through shifting of peak load demand to a non-peak time and thereby saving differential UI charges for peak and non-peak which is about □ . 5 /unit for the utility; and by reducing cost of billing by up to 20%. Based on above savings the payback period is estimated to be around 4 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND9

TSECL, Tripura

Leading organization

TSECL, Tripura

Total budget

$4,500,000

Description

TSECL has proposed the pilot project in the Electrical Division No.1, of Agartala town covering 46,071 no. of consumers. IT implementation and system strengthening is likely to be completed in 2013. The functionality of peak load management is proposed by implementing automated metering infrastructure (AMI) for residential consumers and industrial consumers. The pilot project proposes developing a mature model of “time of use tariff and net metering.”

Main application

Peak load management by implementing automated metering infrastructure (AMI) for residential and industrial consumers

Scenario for estimated costs and benefits

The proposed cost benefit analysis for the pilot is based on the assumption of reducing distribution losses (including pilferage) resulting in proposed savings of up to 10.95 MUs of energy, reducing Peak load consumption by up to 2,604 units through shifting of peak load demand to a non-peak time and thereby saving differential UI charges for peak and non-peak which is about □ . 5 /unit for the utility and by reducing cost of billing by up to 50%. Based on above savings the payback period is estimated to be around 6 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND10

HPSEB, Himachal Pradesh

Leading organization

HPSEB, Himachal Pradesh

Total budget

$3,400,000

Description

HPSEB, Himachal Pradesh has proposed a Smart Grid Pilot in industrial town of KalaAmb covering 650 consumers and having annual input energy of 533 MUs. The functionality of peak load management and outage management is proposed by implementing automated metering infrastructure (AMI) for industrial consumers, distribution automation and substation automation and power quality management by deploying power quality meters at HT consumers.

Main application

Peak load management, outage management, and power quality management are proposed by implementing automated metering infrastructure (AMI) for industrial consumers

Other applications

Transformer Monitoring Units proposed to be installed for condition based monitoring.

Scenario for estimated costs and benefits

The proposed cost benefit analysis for the pilot is based on the assumption of savings by shifting 10% peak load, reduction in penalties by 40% and reduction in outages by 60%. Based on above savings the payback period is estimated to be around 2 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Percentage reduction of electricity losses; Reduced peak load

IRL1

CER National Smart Metering Plan

Leading organization

Electricity Supply Board - Networks (IE)

Description

The project assessed: the impact of Time of Use pricing and billing/information stimuli on the customer behaviour; and the available technologies for AMI roll out in an Irish context.

The outcomes of both were factored into the cost benefit analysis for the full roll out of AMI in Ireland.

Main application
Smart Metering

Other applications
Smart Customer and Smart Home

Policy goals
Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES), Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Reduced peak load

KOR4
Jeju Test Bed_Smart Electricity Service

Leading organization
KPX, KEPCO

Total budget
$18.0M

Description
Operating power grid system with Total Operation Center(TOC) and information management based on real time rates

Main application
Aggregation (Demand Response, VPP)

Other applications
Smart Network Management

Scenario for estimated costs and benefits
Deployment costs and benefits from energy cost savings

Policy goals
Increased number of consumers participating in electricity markets and in energy efficiency measures; Reduced peak load

NED1
Smart Grid Nieuweveens Landen Meppel

Leading organization
DNVKEMA

Total budget
5 million euros

Description
With the large scale introduction of renewable energy sources towards a sustainable energy system a number of challenges are imposed on the energy system. The intermittent character of renewable energy sources sets the need for more flexibility as well as backup power. To cope with these challenges, smart grid technology is being developed. Gas applications like (micro) cogeneration units and hybrid heat pump systems as well as the gas infrastructure play an essential role in smart grids and form a cost efficient cornerstone in balancing our networks, reduce (local) peak load on the electricity grid and prevent congestion. For the large scale implementation of a sustainable system, it is necessary to build experience in field tests. This is why DNV KEMA, together with TNO, ICT Automatisering, RWE Essent, Enexis and Gasunie started a living lab demonstration in Hoogkerk near Groningen in the Netherlands. PowerMatching City consists of 40-50 interconnected regular households of which 25 are already online since the beginning of 2010. These households are equipped with micro-cogeneration units, hybrid heat pumps, PV-solar panels, smart appliances and electric vehicles. Additional power is produced by a wind farm and a gas turbine.

Main application
Smart Network Management

Other applications
Smart Customer and Smart Home

Policy goals
Increased number of consumers participating in electricity markets and in energy efficiency measures; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Reduced peak load; Energy savings

NED2
Smart Grid Nieuweveens Landen Meppel

Leading organization
Municipality of Meppel and Rendo Energy company

Description

- Realising energy supplying neighborhood of over 3,000 households.
- Formation of a local sustainable energy company with participation of residents.
- Combining electricity, (bio)gas, heating and cooling in order to achieve a local energy balance.

Demonstrate technical and economical feasibility

Main application

Integration of DER

Other applications

Smart Customer and Smart Home

Scenario for estimated costs and benefits

Local sustainable energy company

Policy goals

Increased number of consumers participating in electricity markets and in energy efficiency measures; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Reduced peak load; Energy savings

SWE2

Smart Grid Gotland

Leading organization

GEAB

Total budget

28 MEUR (242 MSEK)

Description

The Smart Grid Gotland R&D demonstration project intends to develop strategies for the planning, construction and operation of a fully developed, large-scale smart grid, including a large share of intermittent production, primarily from wind power in the distribution network. New market models and services will be developed to pave the way for new market players.

Main application

Smart Network Management

Other applications

Integration of DER; Integration of Large Scale RES; Smart Customer and Smart Home; Smart Metering

Scenario for estimated costs and benefits

No net present value calculation is yet available.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE4

Stockholm Royal seaport Active House Pilot

Leading organization

Fortum Distribution AB

Total budget

20 msek

Description

The long-term outcome will be a test apartment, based in Stockholm Royal Seaport, which is part of the solution from the pre-study in the area's housing. The plausibility and attraction of solutions have been deemed to create conditions to expand the number of participating construction companies in next phase. Part solution was to work together with the results from other projects that also have Stockholm Royal Seaport as the test bed. The apartment, which is included in the test installations, will have access to leading technology in smart grids, appliances, information technology and design. They will also be active specifier and designers of new services and products being developed continuously. The results of this project make it possible for companies to develop products and services based on the technology that the project contributed. Researchers and entrepreneurs will be able to assimilate the results from this test apartment to develop their ideas and innovations.

Scenario for estimated costs and benefits

Customer participation in load shift to optimize load factors, impact climate effects and distribution automation systems to increase reliability and reduce losses. Hosting of DER at LV levels.

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand

side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE5

Stockholm Royal seaport demonstration phase

Leading organization

Fortum Distribution AB

Total budget

140 msek

Description

The program will specify, develop, test and evaluate both business and market models, new technical solutions and concepts, information and communications technology (ICT) as well as aspects of data security. As described in the pre-study, a set of scenario tests will be the cohesive factor in this work. In order to make it happen, an R&D platform needs to be developed and implemented as enablement for overall system tests, which will also include aspects of behavioural science. The first phase of the program and this application will focus on scenarios related to active end-customers and reliability of the future grid, where the urban smart grid in a new way creates opportunities for interaction with the end customer in order to, e.g., reduce CO_2 emissions. Also, scenarios for increased reliability and availability in a future urban smart grid will be tested.

Scenario for estimated costs and benefits

Customer participation in load shift to optimize load factors, impact climate effects and distribution automation systems to increase reliability and reduce losses. Hosting of DER at LV levels.

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE6

Smart Grid Hyllie

Leading organization

E.ON

Total budget

200 MSEK for 2011 through 2014. Additional years to follow.

Description

Hyllie - A test bed for developing solutions for a future transformed energy in the city of Malmö. The project includes: (a) Customer control of heat and electricity consumption, (b) Smart home and Smart building solutions, (c) Distributed generation – electricity and heat, (d) Smart grid solutions – DH and electricity, (e) Sustainable mobility solutions – gas and emobility, (f) CO_2 and resource efficient energy supply, and (g) Distributed energy storage.

Main application

Aggregation (Demand Response, VPP)

Other applications

Smart Customer and Smart Home

Scenario for estimated costs and benefits

Costs for 2011-2014 estimated to 200 MSEK (basically more or less all investments are to be seen as consumables); Analyses regarding benefits to be done in evaluation phase

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA1

gridSMART(SM) Demonstration Project

Leading organization

AEP Ohio

Total budget

$148,821,823

Description

This project is to build a secure, interoperable, and integrated Smart Grid infrastructure that demonstrates the ability to maximize distribution system efficiency and reliability, and consumer use of demand response programs to reduce energy consumption, peak demand costs, and fossil fuel emissions. The demonstration area includes 150 square miles including approximately 110,000 meters and 70 distribution circuits. AEP Ohio will implement Smart Grid technology over 58 13kV circuits from 10 distribution stations and 12 34.5kV circuits from six distribution stations. Included in this project is a redistribution management system, integrated volt-VAR control, distribution automation, advanced meter infrastructure, home area networks, community energy storage, sodium sulfur battery storage, and renewable generation sources. These technologies will be combined with two-way consumer communication and information sharing, demand response, dynamic pricing, and consumer products, such as plug-in hybrid vehicles.

Main application

Smart Network Management

Other applications

Smart Customer and Smart Home; Integration of DER; Smart Metering; Aggregation (Demand Response, VPP); Electric Vehicles and Vehicle2Grid Applications

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Reduced peak load

USA2

Pacific Northwest Division Smart Grid Demonstration Project

Leading organization

Battelle Memorial Institute

Total budget

$177,642,503

Description

This demonstration will validate new technologies; provide two-way communication between distributed generation, storage and demand assets, and the existing grid infrastructure; quantify Smart Grid costs and benefits; advance interoperability standards and cyber security approaches; and validate new business models. More than 20 types of responsive Smart Grid assets will be tested across six regional and utility operational objectives at 15 unique distribution sites operated by 12 utilities across five states and three climatic regions. A base of Smart Grid technology serving more than 60,000 customers will be installed, validated, and operated. All use classes are represented in the demonstration including residential, commercial, industrial, and irrigation customers. The demonstration will develop a single integrated Smart Grid incentive-signaling approach and will test and validate its ability to continuously coordinate the responses of Smart Grid assets to meet a wide range of operational objectives. It will also engage distributed control so that wind integration problems are mitigated. Micro-grid islanding will also be evaluated for its potential to enhance reliability for customers and relieve energy demand.

Main application

Smart Network Management

Other applications

Integration of DER; Integration of Large Scale RES; Aggregation (Demand Response, VPP); Smart Customer and Smart Home; Smart Metering

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA3

Smart Grid Deployment

Leading organization

Duke Energy Carolinas, LLC

Total budget

$555,706,307

Description

This project includes advanced metering infrastructure (AMI) and distribution automation systems in five states. The project involves large-scale deployments of AMI and distribution automation in Ohio and Indiana, a pilot deployment of AMI and distribution automation in Kentucky, and deployment of distribution automation in North and South Carolina. The project includes pilot programs for electricity pricing including time-of-use rates, peak-time rebates, and critical-peak pricing. Customers in these pilot programs use home area networks, web portals, and direct load control devices to reduce their electricity consumption and peak demand. Distribution automation equipment will be installed on 1,926 out of 4,741 circuits, which includes: distribution automation communications network; SCADA communications network; automated distribution circuit switches; automated capacitors; and equipment condition monitors.

Main application
Smart Metering

Other applications
Smart Customer and Smart Home; Aggregation (Demand Response, VPP); Smart Network Management

Scenario for estimated costs and benefits
Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals
Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA4
Smart Grid Project

Leading organization
EPB
Total budget
$226,707,562

Description
This project involves the installation of advanced metering systems and communications infrastructure. The project installs automated distribution grid equipment expected to enhance the reliability and quality of electric service delivery. The project implements two-way communications and metering expected to: (1) enable customers to view their energy consumption at their convenience through systems such as web portals, (2) provide timebased rate programs to customers, (3) provide information and tools to improve outage management, and (4) reduce operations and maintenance costs.

Main application
Smart Metering

Other applications

Smart Customer and Smart Home; Aggregation (Demand Response, VPP); Smart Network Management

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals

Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA5

Energy Smart Florida

Leading organization

Florida Power & Light Company

Total budget

$578,963,325

Description

This project is deploying advanced metering infrastructure (AMI), distribution automation, new electricity pricing programs, and advanced monitoring equipment for the transmission system. AMI supports two-way communication between FPL and its 3 million consumers receiving smart meters, providing detailed information about electricity usage and the ability to implement new electricity pricing programs. New distribution automation devices expand the functionality of FPL's distribution system to increase reliability, reduce energy losses, and reduce operations and maintenance costs. Synchrophasor and line monitoring devices help increase the reliability and security of the transmission system.

Main application

Smart Metering

Other applications

Smart Customer and Smart Home; Aggregation (Demand Response, VPP); Smart Network Management

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI), distribution automation systems, and wide-area transmission monitoring

Policy goals

Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA6

Enhanced Demand and Distribution Management Regional Demonstration

Leading organization

National Rural Electric Cooperative Association

Total budget

$67,864,292

Description

This project is demonstrating Smart Grid technologies with 27 cooperatives in 11 states across multiple utilities, geographies, climates, and applications including low density areas, low consumer income areas, and service areas prone to natural disasters. NRECA will conduct studies in advanced volt/volt-ampere reactive for total demand; generation and transmission-wide (G&T) demand response over advanced metering infrastructure (AMI); critical peak pricing over AMI; water heater and air conditioning load control over AMI; advanced water heater control and thermal storage; consumer Internet energy usage portal pilots; consumer in-home energy display pilots; time-sensitive rates pilots; multiple AMI integration at G&T co-ops; distribution co-op meter data management system applications; and self-healing feeders for improved reliability.

Main application

Smart Metering

Other applications

Smart Network Management; Aggregation (Demand Response, VPP); Smart Customer and Smart Home

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency

measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA7

SmartSacramento

Leading organization

Sacramento Municipal Utility District

Total budget

$307,697,792

Description

This project involves system-wide deployment of an advanced metering system integrated with existing enterprise and information technology systems as well as a partial deployment of advanced distribution grid assets that equip SMUD's distribution circuits with automated control and operation capabilities. The project also involves customer systems that provide usage and cost information to customers that educate and enable more control over their consumption. These systems enable more informed participation by customers and more effective management by SMUD to improve reliability and efficiency of grid operations and better optimize the use of assets. The project includes a field test of plug-in electric vehicle charging stations to assess their technical performance, vehicle charging patterns, and effects on electric distribution system operations.

Main application

Smart Metering

Other applications

Smart Network Management; Aggregation (Demand Response, VPP); Smart Customer and Smart Home; Electric Vehicles and Vehicle2Grid Applications

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA8

Positive Energy Smart Grid Integration Program

Leading organization

Oklahoma Gas and Electric

Total budget

$293,201,332

Description

This project involves system-wide deployment of a fully integrated advanced metering system, distribution of in-home devices to almost 6,000 customers, and installation of advanced distribution automation systems. The program aims at reducing peak loads, overall electricity use, and operations and maintenance costs while increasing distribution system efficiency, reliability, and power quality. The program implements secure wireless communications to: (1) allow smart meter customers to view their electricity consumption data through a personalized web site, and (2) allow OG&E to manage, measure, and verify targeted demand reductions during peak periods. New systems capture meter information for billing and implement new customer pricing programs and service offerings. The project deploys a more dynamic distribution management system, automated switching, and integrated voltage and reactive power control (IVVC) that reduces line losses, reduces operational costs, and improves service reliability. The program also includes a study of consumer behavior in response to different forms of dynamic pricing on an opt-in basis. Finally, the program includes collaboration with University of Oklahoma faculty and students to deploy technologies within 46 buildings on the campus and to take advantage of opportunities for education and training.

Main application

Smart Metering

Other applications

Smart Network Management; Aggregation (Demand Response, VPP); Smart Customer and Smart Home

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals

Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

2.6.2 Transmission Level

ID	Name
FRA6	Greenlys
SWE2	Smart Grid Gotland
SWE4	Stockholm Royal seaport Active House Pilot
SWE5	Stockholm Royal seaport demonstration phase
SWE6	Smart Grid Hyllie
USA5	Energy Smart Florida

FRA6

GreenLys

Leading organization

ERDF

Description

GreenLys is a systemic smart grid project which includes: - DER - Consumption - Networks (DSO & TSO). Main Goals: - decrease of greenhouse gases - control of energy bill - introduction and control of DER on LV networks - behavior of consumers, with incentive and innovative new offers - aggregator functions. Innovations: - Smart management of grid (seal-healing, smart metering using Linky infrastructure,...) - Demand side management, demand/response, energy saving and new offers (using boxes linked to Linky Infrastructure, tariffs, dynamic prices policy...) – Investments; Impact on studies and development of networks (especially for DSOs)

Main application

Smart Network Management; Integration of DER; Smart Customer and Smart Home

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Reduced peak load

SWE2
Smart Grid Gotland

Leading organization
GEAB

Total budget
28 MEUR (242 MSEK)

Description
The Smart Grid Gotland R&D demonstration project intends to develop strategies for the planning, construction and operation of a fully developed, large-scale smart grid, including a large share of intermittent production, primarily from wind power in the distribution network. New market models and services will be developed to pave the way for new market players.

Main application
Smart Network Management

Other applications
Integration of DER; Integration of Large Scale RES; Smart Customer and Smart Home; Smart Metering

Scenario for estimated costs and benefits
No net present value calculation is yet available.

Policy goals
Additional demand side management power managed in the grid/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE4
Stockholm Royal seaport Active House Pilot

Leading organization
Fortum Distribution AB

Total budget
20 msek

Description

The long-term outcome will be a test apartment, based in Stockholm Royal Seaport, which is part of the solution from the pre-study in the area's housing. The plausibility and attraction of solutions have been deemed to create conditions to expand the number of participating construction companies in next phase. Part solution was to work together with the results from other projects that also have Stockholm Royal Seaport as the test bed. The apartment, which is included in the test installations, will have access to leading technology in smart grids, appliances, information technology and design. They will also be active specifier and designers of new services and products being developed continuously. The results of this project make it possible for companies to develop products and services based on the technology that the project contributed. Researchers and entrepreneurs will be able to assimilate the results from this test apartment to develop their ideas and innovations.

Scenario for estimated costs and benefits

Customer participation in load shift to optimize load factors, impact climate effects and distribution automation systems to increase reliability and reduce losses. Hosting of DER at LV levels.

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE5

Stockholm Royal seaport demonstration phase

Leading organization

Fortum Distribution AB

Total budget

140 msek

Description

The program will specify, develop, test and evaluate both business and market models, new technical solutions and concepts, information and communications technology (ICT) as well as aspects of data security. As described in the pre-study, a set of scenario tests will be the cohesive factor in this work. In order to make it happen, an R&D platform needs to be developed and implemented as enablement for overall system tests, which will also include aspects of behavioural science. The first phase of the program and this application will focus

on scenarios related to active end-customers and reliability of the future grid, where the urban smart grid in a new way creates opportunities for interaction with the end customer in order to, e.g., reduce CO_2 emissions. Also, scenarios for increased reliability and availability in a future urban smart grid will be tested.

Scenario for estimated costs and benefits

Customer participation in load shift to optimize load factors, impact climate effects and distribution automation systems to increase reliability and reduce losses. Hosting of DER at LV levels.

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE6

Smart Grid Hyllie

Leading organization

E.ON

Total budget

200 MSEK for 2011 through 2014. Additional years to follow.

Description

Hyllie - A test bed for developing solutions for a future transformed energy in the city of Malmö. The project includes: (a) Customer control of heat and electricity consumption, (b) Smart home and Smart building solutions, (c) Distributed generation – electricity and heat, (d) Smart grid solutions – DH and electricity, (e) Sustainable mobility solutions – gas and emobility, (f) CO_2 and resource efficient energy supply, and (g) Distributed energy storage.

Main application

Aggregation (Demand Response, VPP)

Other applications

Smart Customer and Smart Home

Scenario for estimated costs and benefits

Costs for 2011-2014 estimated to 200 MSEK (basically more or less all investments are to be seen as consumables); Analyses regarding benefits to be done in evaluation phase

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA5

Energy Smart Florida

Leading organization

Florida Power & Light Company

Total budget

$578,963,325

Description

This project is deploying advanced metering infrastructure (AMI), distribution automation, new electricity pricing programs, and advanced monitoring equipment for the transmission system. AMI supports two-way communication between FPL and its 3 million consumers receiving smart meters, providing detailed information about electricity usage and the ability to implement new electricity pricing programs. New distribution automation devices expand the functionality of FPL's distribution system to increase reliability, reduce energy losses, and reduce operations and maintenance costs. Synchrophasor and line monitoring devices help increase the reliability and security of the transmission system.

Main application

Smart Metering

Other applications

Smart Customer and Smart Home; Aggregation (Demand Response, VPP); Smart Network Management

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI), distribution automation systems, and wide-area transmission monitoring

Policy goals

Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

2.6.3 T&D Interface

ID	Name
FRA6	Greenlys
IND2	UGVCL, Gujarat
IND3	CESC, Mysore
IND4	KSEB, Kerala
SWE2	Smart Grid Gotland
SWE6	Smart Grid Hyllie
USA2	Pacific Northwest Division Smart Grid Demonstration Project
USA5	Energy Smart Florida

FRA6

GreenLys

Leading organization

ERDF

Description

GreenLys is a systemic smart grid project which includes: - DER - Consumption - Networks (DSO & TSO). Main Goals: - decrease of greenhouse gases - control of energy bill - introduction and control of DER on LV networks - behavior of consumers, with incentive and innovative new offers - aggregator functions. Innovations: - Smart management of grid (seal-healing, smart metering using Linky infrastructure,...) - Demand side management, demand/response, energy saving and new offers (using boxes linked to Linky Infrastructure, tariffs, dynamic prices policy...) – Investments; Impact on studies and development of networks (especially for DSOs)

Main application

Smart Network Management; Integration of DER; Smart Customer and Smart Home

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Reduced peak load

IND2

UGVCL, Gujarat

Leading organization

UGVCL

Total budget

$9,200,000

Description

UGVCL has proposed the pilot project in Naroda of Sabarmati circle which is an industrial and residential area and Deesa of Palanpur circle which is an agricultural area covering 20,524 consumers in Naroda and 18,898 agricultural unmetered consumers in Deesa-II division and accounting for input energy of around 1700 MU (Naroda : 374.52 MU & Deesa : 1321.27 MU for 2010-11). The functionalities of peak load management, outage management, power quality management are proposed by implementing automated metering infrastructure (AMI) for industrial, commercial and residential consumers. Committee also observed that some additional functionalities like load forecasting and asset management are also proposed and functionalities of load forecasting, peak power management and outage management are also considered at utility level which will impact all consumers of utility (i.e., 27 lac consumers) indirectly. Renewable energy integration has been proposed to be carried out at Patan Solar Park and few roof top installations at some of the universities. The pilot project proposes to introduce TOU tariff with approvals from GERC. Renewable energy integration is proposed through proper and accurate load forecast by real time monitoring of substations, feeders and RES generation.

Main application

Peak load management, outage management, and power quality management are proposed by implementing automated metering infrastructure (AMI) for industrial, commercial and residential consumers.

Other applications

Load forecasting and asset management are proposed. Load forecasting, peak power management and outage management are considered at utility level. Renewable energy integration at Patan Solar Park and few roof top installations are also envisaged.

Scenario for estimated costs and benefits

The ROI is proposed to be realized through benefits on account of reduction in AT&C losses from 12.44% to around 8.44% in Naroda and from 21.69% to 15% in Deesa; savings in peak power purchase cost by reduction of peak load by up to 5% in both areas; reduction in transformer failure rate from 16.52% to 8% in Deesa area; and reduction in number of outages, meter reading cost, cost of payment collection, etc. Based on projected savings the payback period is likely to be around 2 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND3

CESC, Mysore

Leading organization

CESC, Mysore

Total budget

$6,150,000

Description

CESC, Mysore has proposed the pilot project in Additional City Area Division (ACAD), Mysore involving 21,824 consumers with a good mix of residential, commercial, industrial and agricultural consumers including 512 irrigation pump sets covering over 14 feeders and 473 distribution transformers and accounting for input energy of 151.89 MU. The functionalities of peak load management, outage management are proposed by implementing automated metering infrastructure (AMI) for residential consumers and industrial consumers and integration of distributed generation / micro grid integration. Some additional functionality like agriculture DSM with community portal, consumer portal to support DSM/DR, employee portal for knowledge sharing and benefit realization, KPI based MIS and data analytics for decision support are also proposed. The pilot project proposes to introduce real time pricing signal by interfacing at SLDC level to get UI/ABT prices subject to regulatory consent. Implementation of Fault Location Isolation and System Restoration (FLISR) at feeders where alternate feeding arrangements are available is also proposed.

Main application

Peak load management, outage management by implementing automated metering infrastructure (AMI) for residential consumers and industrial consumers; Integration of distributed generation/micro grid integration

Other applications

Agriculture DSM with community portal

Scenario for estimated costs and benefits

ROI is proposed to be realized through benefits on account of reduction in AT&C losses from 10.6% to 5.7% in 3 years, shifting of load of up to 80% in industrial feeders and up to 20% for domestic consumer during peak hours, reduction in number of transformer failure, meter reading cost, reduction in unforeseen outages and also recovery time for unforeseen outages by 20% and 50%. Based on projected savings the payback period is likely to be less than 3 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND4

KSEB, Kerala

Leading organization

KSEB, Kerala

Total budget

$5,200,000

Description

KSEB Smart Grid Pilot covers around 25078 LT Industrial consumers of selected distribution section offices spread over the geographical area of Kerala State. The input energy for the total scheme area is 2108 MUs and for the LT Industrial consumers is 376 MUs. Automated metering infrastructure (AMI) is proposed to provide quality service, prevent tampering and unauthorised usage of load, accurate and timely metering and billing, avoiding costly field visits of Sub Engineers for meter reading, reducing supply restoration time, peak load management through load restriction for Remote Disconnection/Reconnection and Time of Day tariff.

Main application

Automated metering infrastructure (AMI); Peak load management

Scenario for estimated costs and benefits

ROI is proposed to be realized through benefits on account of Reduction in AT&C losses of about 1.17% (24.82 MUs) through reduction in loss due to manual error, tampers, thefts, short assessment, etc., savings on employee and travel cost for meter reading and introducing incremental tariff for peak hours through ToD Tariff. Based on above savings the payback period is estimated to be around 2.5 years

Policy goals

Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE2

Smart Grid Gotland

Leading organization

GEAB

Total budget

28 MEUR (242 MSEK)

Description

The Smart Grid Gotland R&D demonstration project intends to develop strategies for the planning, construction and operation of a fully developed, large-scale smart grid, including a large share of intermittent production, primarily from wind power in the distribution network. New market models and services will be developed to pave the way for new market players.

Main application

Smart Network Management

Other applications

Integration of DER; Integration of Large Scale RES; Smart Customer and Smart Home; Smart Metering

Scenario for estimated costs and benefits

No net present value calculation is yet available.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE6
Smart Grid Hyllie

Leading organization
E.ON

Total budget
200 MSEK for 2011 through 2014. Additional years to follow.

Description
Hyllie - A test bed for developing solutions for a future transformed energy in the city of Malmö. The project includes: (a) Customer control of heat and electricity consumption, (b) Smart home and Smart building solutions, (c) Distributed generation – electricity and heat, (d) Smart grid solutions – DH and electricity, (e) Sustainable mobility solutions – gas and emobility, (f) CO_2 and resource efficient energy supply, and (g) Distributed energy storage.

Main application
Aggregation (Demand Response, VPP)

Other applications
Smart Customer and Smart Home

Scenario for estimated costs and benefits
Costs for 2011-2014 estimated to 200 MSEK (basically more or less all investments are to be seen as consumables); Analyses regarding benefits to be done in evaluation phase

Policy goals
Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA2
Pacific Northwest Division Smart Grid Demonstration Project

Leading organization
Battelle Memorial Institute

Total budget
$177,642,503

Description

This demonstration will validate new technologies; provide two-way communication between distributed generation, storage and demand assets, and the existing grid infrastructure; quantify Smart Grid costs and benefits; advance interoperability standards and cyber security approaches; and validate new business models. More than 20 types of responsive Smart Grid assets will be tested across six regional and utility operational objectives at 15 unique distribution sites operated by 12 utilities across five states and three climatic regions. A base of Smart Grid technology serving more than 60,000 customers will be installed, validated, and operated. All use classes are represented in the demonstration including residential, commercial, industrial, and irrigation customers. The demonstration will develop a single integrated Smart Grid incentive-signaling approach and will test and validate its ability to continuously coordinate the responses of Smart Grid assets to meet a wide range of operational objectives. It will also engage distributed control so that wind integration problems are mitigated. Micro-grid islanding will also be evaluated for its potential to enhance reliability for customers and relieve energy demand.

Main application

Smart Network Management

Other applications

Integration of DER; Integration of Large Scale RES; Aggregation (Demand Response, VPP); Smart Customer and Smart Home; Smart Metering

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA5

Energy Smart Florida

Leading organization

Florida Power & Light Company

Total budget

$578,963,325

Description

This project is deploying advanced metering infrastructure (AMI), distribution automation, new electricity pricing programs, and advanced monitoring equipment for the transmission system. AMI supports two-way communication between FPL and its 3 million consumers receiving smart meters, providing detailed information about electricity usage and the ability to implement new electricity pricing programs. New distribution automation devices expand the functionality of FPL's distribution system to increase reliability, reduce energy losses, and reduce operations and maintenance costs. Synchrophasor and line monitoring devices help increase the reliability and security of the transmission system.

Main application

Smart Metering

Other applications

Smart Customer and Smart Home; Aggregation (Demand Response, VPP); Smart Network Management

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI), distribution automation systems, and wide-area transmission monitoring

Policy goals

Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

2.7 Additional Demand Side Management Power Managed in the Grid/Maximum Power Load (Sustainability and Integration)

Summaries of projects in the inventory selected as contributing to the policy goal of "Additional Demand Side Management Power Managed in the Grid/Maximum Power Load (Sustainability and Integration)" are presented in order of their physical application domains: Distribution Level, Transmission Level, and T&D Interface. Within each domain, project summaries are presented in alphanumerical order of their unique Project IDs.

2.7.1 Distribution Level

ID	Name
FRA5	PREMIO-('Production Répartie, Enr et MDE, Intégrées et Optimisées', or, in English, 'Integration and Optimization of DG, DSM and Renewable Energies')
FRA6	Greenlys
GER5	E-DeMa
GER6	Smart Watts
GER7	Model City Mannheim
IND1	Puducherry
IND2	UGVCL, Gujarat
IND3	CESC, Mysore
IND4	KSEB, Kerala
IND5	APDCL, Assam
IND6	APCPDCL, Andhra Pradesh
IND7	UHBVN, Haryana
IND9	TSECL, Tripura
IND10	HPSEB, Himachal Pradesh
KOR1	Jeju Test Bed_Smart Place
MEX1	Automation of the electrical system by EPROSEC (Protection and Sectioning equipment in aerial distribution networks of medium voltage)
SUI2	GridBox
SWE2	Smart Grid Gotland
SWE4	Stockholm Royal seaport Active House Pilot
SWE5	Stockholm Royal seaport demonstration phase
SWE6	Smart Grid Hyllie
USA1	gridSMART(SM) Demonstration Project
USA2	Pacific Northwest Division Smart Grid Demonstration Project
USA3	Smart Grid Deployment
USA4	Smart Grid Project
USA5	Energy Smart Florida
USA6	Enhanced Demand and Distribution Management Regional Demonstration
USA7	SmartSacramento

USA8	Positive Energy Smart Grid Integration Program
USA10	SmartGrid Program

FRA5

PREMIO-('Production Répartie, Enr et MDE, Intégrées et Optimisées', or, in English, 'Integration and Optimization of DG, DSM and Renewable Energies')

Leading organization

CAPENERGIE – France

Description

PREMIO is primarily a technical proposal created to address the following goals: – to develop a dynamic demand-response specifically for peak shaving purposes, – to increase the flexibility of the power system, – to promote a new energy culture which encourages energy efficiency, – to integrate distributed generation and particularly renewable energies, – to reduce greenhouse gas emissions from polluting power plants, especially during peak load times, and – to manage regional electrical energy from a wide range of local actors. PREMIO combines the control of installed distributed resources for optimal use with an awareness campaign promoting demand side management (DSM). The PREMIO platform includes a virtual power plant (VPP) which integrates approximately fifty distributed resources, all of which are distributed generation, storage technologies and customers' curtailable loads. The limited number of installations suggests that project results will be qualitative rather than quantitative.

Main application

Integration of DER; Aggregation

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Energy savings; Reduced peak load

FRA6

GreenLys

Leading organization

ERDF

Description

GreenLys is a systemic smart grid project which includes: - DER - Consumption - Networks (DSO & TSO). Main Goals: - decrease of greenhouse gases - control of energy bill - introduction and control of DER on LV networks - behavior of consumers, with incentive and innovative new offers - aggregator functions. Innovations: - Smart management of grid (seal-healing, smart metering using Linky infrastructure,...) - Demand side management, demand/response, energy saving and new offers (using boxes linked to Linky Infrastructure, tariffs, dynamic prices policy...) – Investments; Impact on studies and development of networks (especially for DSOs)

Main application

Smart Network Management; Integration of DER; Smart Customer and Smart Home

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Reduced peak load

GER5

E-DeMa

Leading organization

RWE Deutschland AG

Total budget

22 Mio. €

Description

Field test with 700 households in the Rhine/Ruhr region in Germany (Mülheim and Krefeld). The infrastructure comprises smart meters, and a regional energy market place which acts as a data platform for the involved parties of the energy system including consumers, energy suppliers, DSOs, aggregators and service providers. An infrastructure to exploit the flexibilities of residential consumers has been implemented. Control of white goods is done automatically via a home energy controller, which receives price signals from the regional energy market place. A part of the consumers is equipped with an in-house display for pricing information.

Main application

Regional Energy Marketplace; Smart Metering; Active Demand in residential environment; Aggregation of Flexibilities from residential consumers

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals

Active demand for residential consumers, supporting integration of renewables, peak shaving, increased number of consumers participating in energy markets; Energy efficiency by transparency of energy consumption, reduction of peak load

GER6

Smart Watts

Leading organization

utilicount GmbH & Co. KG

Total budget

up to ca. 20 Million EUR

Description

Central idea of the project, “Smart Watts,” is to compensate the increased volatility of energy supply, due to the increased integration of renewable energy, by load balancing on the demand side and rises in energy efficiency - focused on private households. The market players gain access to current actual data by a dynamic information exchange of supply and demand information. This enables the generation of additional data such as dynamic purchasing conditions, which then can be offered to private households. The dynamic purchasing information (e.g., prices) are meant to motivate private households to shift their load. Therefore the households use an visualization, controlling and steering tablet pc App.

Main application

Smart Customer and Smart Home; Smart Metering; Aggregation (Demand Response, VPP)

Other applications

Aggregation (Demand Response, VPP)

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Additional Demand Side Management power managed in the grid/maximum power load; Reduced peak load; Energy savings

GER7

Model City Mannheim

Leading organization

MVV Energie AG

Total budget

20,800,000€

Description

(1) Better integration of renewable energy sources via balancing volatile generation and usage, (2) Demand side response via variable tariffs as inventive for load shifting, (3)Increase of connection capacity of renewable energy sources in distribution grids and management of bi-directional energy flows via cellular grid operation

Main application

Aggregation (Demand Response, VPP)

Other applications

Smart Network Management

Scenario for estimated costs and benefits

Distribution automation systems

Policy goals

Additional Demand Side Management power managed in the grid/maximum power load; Additional RES hosting power in the grid /maximum power load; Energy savings; Reduced peak load

IND1

Puducherry

Leading organization

Puducherry Electricity Department

Total budget

$8,700,000

Description

Pilot covers 87,031 no. of consumers with dominant being domestic consumers. The module of automated metering infrastructure (AMI) for residential consumers and industrial consumers is proposed to be implemented to assist with consumer issues like event management & prioritizing, billing cycle review and revenue collection efficiency for energy auditing and AT&C loss reduction. The AMI system shall aid in knowing real time energy input from DT as well as energy consumption by consumers that can instantly help to know losses in the system. Common Meter Data Management System is proposed that shall take data from MDMS of different meter manufacturer/solution provider and integrate the information for use. The pilot project also proposes developing a mature model of “time of use tariff and net metering.”

Main application

AMI for Industrial and Residential Consumers

Scenario for estimated costs and benefits

The proposed Cost Benefit Analysis for the pilot is based on the assumption of reducing Distribution Losses from 14% resulting in savings of about 25.5 MUs, reducing cost of billing by up to 50% and Increasing revenue collection efficiency from 90% to 98%. The payback period is likely to be around 6 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND2

UGVCL, Gujarat

Leading organization

UGVCL

Total budget

$9,200,000

Description

UGVCL has proposed the pilot project in Naroda of Sabarmati circle which is an industrial and residential area and Deesa of Palanpur circle which is an agricultural area covering 20,524 consumers in Naroda and 18,898 agricultural unmetered consumers in Deesa-II division and accounting for input energy of around 1700 MU (Naroda : 374.52 MU & Deesa : 1321.27 MU for 2010-11). The functionalities of peak load management, outage management, power quality management are proposed by implementing automated metering infrastructure (AMI) for industrial, commercial and residential consumers. Committee also observed that some additional functionalities like load forecasting and asset management are also proposed and functionalities of load forecasting, peak power management and outage management are also considered at utility level which will impact all consumers of utility (i.e., 27 lac consumers) indirectly. Renewable energy integration has been proposed to be carried out at Patan Solar Park and few roof top installations at some of the universities. The pilot project proposes to introduce TOU tariff with approvals from GERC. Renewable energy integration is proposed through proper and accurate load forecast by real time monitoring of substations, feeders and RES generation.

Main application

Peak load management, outage management, and power quality management are proposed by implementing automated metering infrastructure (AMI) for industrial, commercial and residential consumers.

Other applications

Load forecasting and asset management are proposed. Load forecasting, peak power management and outage management are considered at utility level. Renewable energy integration at Patan Solar Park and few roof top installations are also envisaged.

Scenario for estimated costs and benefits

The ROI is proposed to be realized through benefits on account of reduction in AT&C losses from 12.44% to around 8.44% in Naroda and from 21.69% to 15% in Deesa; savings in peak power purchase cost by reduction of peak load by up to 5% in both areas; reduction in transformer failure rate from 16.52% to 8% in Deesa area; and reduction in number of outages, meter reading cost, cost of payment collection, etc. Based on projected savings the payback period is likely to be around 2 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND3

CESC, Mysore

Leading organization

CESC, Mysore

Total budget

$6,150,000

Description

CESC, Mysore has proposed the pilot project in Additional City Area Division (ACAD), Mysore involving 21,824 consumers with a good mix of residential, commercial, industrial and agricultural consumers including 512 irrigation pump sets covering over 14 feeders and 473 distribution transformers and accounting for input energy of 151.89 MU. The functionalities of peak load management, outage management are proposed by implementing automated metering infrastructure (AMI) for residential consumers and industrial consumers and integration of distributed generation / micro grid integration. Some additional functionality like agriculture DSM with community portal, consumer portal to support DSM/DR, employee portal for knowledge sharing and benefit realization, KPI based MIS and data analytics for decision support are also proposed. The pilot project proposes to introduce real time pricing signal by interfacing at SLDC level to get UI/ABT prices subject to regulatory consent. Implementation of Fault Location Isolation and System Restoration (FLISR) at feeders where alternate feeding arrangements are available is also proposed.

Main application

Peak load management, outage management by implementing automated metering infrastructure (AMI) for residential consumers and industrial consumers; Integration of distributed generation/micro grid integration

Other applications

Agriculture DSM with community portal

Scenario for estimated costs and benefits

ROI is proposed to be realized through benefits on account of reduction in AT&C losses from 10.6% to 5.7% in 3 years, shifting of load of up to 80% in industrial feeders and up to 20% for domestic consumer during peak hours, reduction in number of transformer failure, meter reading cost, reduction in unforeseen outages and also recovery time for unforeseen outages by 20% and 50%. Based on projected savings the payback period is likely to be less than 3 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND4

KSEB, Kerala

Leading organization

KSEB, Kerala

Total budget

$5,200,000

Description

KSEB Smart Grid Pilot covers around 25078 LT Industrial consumers of selected distribution section offices spread over the geographical area of Kerala State. The input energy for the total scheme area is 2108 MUs and for the LT Industrial consumers is 376 MUs. Automated metering infrastructure (AMI) is proposed to provide quality service, prevent tampering and unauthorised usage of load, accurate and timely metering and billing, avoiding costly field visits of Sub Engineers for meter reading, reducing supply restoration time, peak load management through load restriction for Remote Disconnection/Reconnection and Time of Day tariff.

Main application

Automated metering infrastructure (AMI); Peak load management

Scenario for estimated costs and benefits

ROI is proposed to be realized through benefits on account of Reduction in AT&C losses of about 1.17% (24.82 MUs) through reduction in loss due to manual error, tampers, thefts, short assessment, etc., savings on employee and travel cost for meter reading and introducing incremental tariff for peak hours through ToD Tariff. Based on above savings the payback period is estimated to be around 2.5 years

Policy goals

Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND5

APDCL, Assam

Leading organization

APDCL, Assam

Total budget

$5,500,000

Description

APDCL, Assam has proposed a Smart Grid Pilot in Guwahati distribution region, covering 15,000 consumers and involving 90MUs of input energy. APDCL is in the process IT Implementation under R-APDRP and SCADA/DMS implementation is also to be taken up shortly. APDCL has proposed the functionality of peak load management using industrial and residential AMI, integration of distributed generation (solar and available back-up DG set) and outage management system. The utility has envisaged that power quality monitoring will be a by-product of the deployment. In the smart grid pilot project Integration of the 100kW solar farm into the distribution network via a bidirectional inverter and use of battery storage, possibly Vanadium redox battery, in conjunction with the solar farm is proposed. In addition R&D works are proposed for: Forecasting of load based on the weather, social events, festivals, etc. and developing various “if-then” scenarios to find optimal course of action for each scenario; Developing controllers for the bidirectional inverter and battery integration; Development of filters for reduction of harmonics injected into the grid and integrating it into the smart meters; and Development of messaging systems (for display in house and on mobile) for power consumption information and methods to reduce energy consumption. Study of the Guwahati’s distribution grid to identify the locations and sizes of the Vanadium redox batteries for peak shaving and valley filling is also proposed.

Main application

Peak load management; Outage management by implementing automated metering infrastructure (AMI) for residential consumers and industrial consumers; Power quality management; Integration of distributed generation

Scenario for estimated costs and benefits

The cost benefit analysis for the pilot is based on increased available energy of 55,602.5 kWh during peak time resulting in a saving of Rs. 3 Cr per year, revenue increase through power quality measurements and power factor penalty (assuming a 5% variation in power factor across 20% of the customers, paying an average 2% penalty); Reduction in AT&C losses from 16.7% to 12.55%; Reduction in interest payments due to deferred capital investment in sub-transmission networks, improvement of availability (reduction of customer minutes lost) and improved management of power procurement options; Unscheduled interchange using short term load forecasts. Based on above savings the payback period is estimated to be around 5 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND6

APCPDCL, Andhra Pradesh

Leading organization

APCPDCL, Andhra Pradesh

Total budget

$7,900,000

Description

The design proposes a Smart Grid Control Center housing the IT systems, a two way communication system for AMI. The number of customers in the project area is 38,303. However over 11,904 are covered under AMI implementation and smart meters will be for these numbers of customers. The functionalities of peak load management, power quality and outage management are proposed by implementing automated metering infrastructure (AMI) for residential consumers and industrial consumers. DAS, IT and SCADA shall be implemented. The CBM for DTR is proposed as an early warning of health of assets. The customer web portal would provide all customer related information and to seek their participation.

Main application

Peak load management; Outage management; Power quality management are proposed by implementing automated metering infrastructure (AMI) for industrial and residential consumers

Other applications

Condition based monitoring for DTR and customer web portal

Scenario for estimated costs and benefits

The proposed cost benefit analysis for the pilot is based on the assumption of reducing AT&C loss from present 9.48% to 7.48% and energy saving during peak times by shifting about 35.68 MUs from peak periods and thereby reduced purchase of high cost power at peak hours. Based on above savings the payback period is estimated to be around 2.5 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND7

UHBVN, Haryana

Leading organization

UHBVN, Haryana

Total budget

$3,200,000

Description

UHBVN, Haryana has proposed a Smart Grid Pilot in Panipat City Subdivision (Haryana State) covering 30,544 consumers and distribution system of 531 DTs. The area has around 131.8 MU input energy consumption. IT implementation and system strengthening is likely to be completed in 2013. The functionality of peak load management is proposed by implementing automated metering infrastructure (AMI) for residential consumers and industrial consumers. Utility has also envisaged using data of energy input from DT as well as energy consumption by consumers for detecting pilferage in the system, increasing collection efficiency, reducing AT&C losses, outage management, tamper event detection, and power quality management and enabling operator to take informed business decision. The pilot project proposes evolving a model of “time of use tariff incentives and disincentive and net metering for Renewable Energy” and process of demand response and demand management for peak load management and to do research and development for developing a mature model of the same for deploying at other towns.

Main application

Peak load management by implementing automated metering infrastructure (AMI) for residential and industrial consumers

Scenario for estimated costs and benefits

The proposed Cost Benefit Analysis for the pilot is based on the assumption of reducing distribution losses (including pilferage) from 30.10% to 16.50%; reducing peak load consumption by up to 9,000 units through shifting of peak load demand to a non-peak time and thereby saving differential UI charges for peak and non-peak which is about □ . 5 /unit for the utility; and by reducing cost of billing by up to 20%. Based on above savings the payback period is estimated to be around 4 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND9

TSECL, Tripura

Leading organization

TSECL, Tripura

Total budget

$4,500,000

Description

TSECL has proposed the pilot project in the Electrical Division No.1, of Agartala town covering 46,071 no. of consumers. IT implementation and system strengthening is likely to be completed in 2013. The functionality of peak load management is proposed by implementing automated metering infrastructure (AMI) for residential consumers and industrial consumers. The pilot project proposes developing a mature model of “time of use tariff and net metering.”

Main application

Peak load management by implementing automated metering infrastructure (AMI) for residential and industrial consumers

Scenario for estimated costs and benefits

The proposed cost benefit analysis for the pilot is based on the assumption of reducing distribution losses (including pilferage) resulting in proposed savings of up to 10.95 MUs of energy, reducing Peak load consumption by up to 2,604 units through shifting of peak load demand to a non-peak time and thereby saving differential UI charges for peak and non-peak which is about ⍰ . 5 /unit for the utility and by reducing cost of billing by up to 50%. Based on above savings the payback period is estimated to be around 6 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND10

HPSEB, Himachal Pradesh

Leading organization

HPSEB, Himachal Pradesh

Total budget
$3,400,000

Description
HPSEB, Himachal Pradesh has proposed a Smart Grid Pilot in industrial town of KalaAmb covering 650 consumers and having annual input energy of 533 MUs. The functionality of peak load management and outage management is proposed by implementing automated metering infrastructure (AMI) for industrial consumers, distribution automation and substation automation and power quality management by deploying power quality meters at HT consumers.

Main application
Peak load management, outage management, and power quality management are proposed by implementing automated metering infrastructure (AMI) for industrial consumers

Other applications
Transformer Monitoring Units proposed to be installed for condition based monitoring.

Scenario for estimated costs and benefits
The proposed cost benefit analysis for the pilot is based on the assumption of savings by shifting 10% peak load, reduction in penalties by 40% and reduction in outages by 60%. Based on above savings the payback period is estimated to be around 2 years.

Policy goals
Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Percentage reduction of electricity losses; Reduced peak load

KOR1
Jeju Test Bed_Smart Place

Leading organization
KEPCO, KT, SKT, LG

Total budget
$96.4M

Description
AMI implementation for optimizing supply and demand with bidirectional communication technology between power suppliers and consumers

Main application
Smart Customer and Smart Home

Other applications
Smart Metering

Scenario for estimated costs and benefits
Deployment costs and benefits from energy cost savings

Policy goals
Additional demand side management power managed in the grid/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Reduced peak load

MEX1
Automation of the electrical system by EPROSEC (Protection and Sectioning equipment in aerial distribution networks of medium voltage)

Leading organization
Federal Electricity Commission (CFE)

Total budget
8,150 millions of pesos

Description
Currently we have installed 11,226 EPROSEC and will require to install another 31,686 EPROSEC in all the aerial electrical medium voltage network, so that in a disruption of the electrical service the maximum affected customers will be between 750 and 1,000 during the permanent fault, reestablishing supply to others remotely in less than 5 minutes, reducing the Average Time to Restoring interruptions in distribution circuits. Considering a contribution to reducing the TIU to reach a value of less than 30,607 minutes nationally in the 13 divisions by 2018.

Main application
Smart Network Management

Scenario for estimated costs and benefits
The economic evaluation considers operating income estimated as the sum of benefits by the electricity not supplied, saving on staff movements dedicated to address the power outages, and the productivity of the personnel assigned to other tasks and savings by reducing energy losses. The value of the project is 7,520 millions of pesos with an internal rate of return of 32%.

Policy goals
Additional demand side management power managed in the grid/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.)

SUI2
GridBox

Leading organization
SCS AG, Switzerland

Description
A monitoring and control infrastructure for the future electricity grids will be defined and tested. It consists of intelligent low-cost "GridBoxes." The goal is high operational grid stability with masses of decentralized electricity infeeds and flexible consumer equipment in an automated end-consumer market considering minimization of costs. The concept foresees communication between the GridBoxes with the goal to detect the regional grid state including all information of elements within the regional grid.

Main application
Smart Network Management

Other applications
Integration of DER

Policy goals
Additional demand side management power managed in the grid/maximum power load; Reduced peak load Increased internal transfer capacity between TSOs or DSOs

SWE2
Smart Grid Gotland

Leading organization
GEAB

Total budget
28 MEUR (242 MSEK)

Description
The Smart Grid Gotland R&D demonstration project intends to develop strategies for the planning, construction and operation of a fully developed, large-scale smart grid, including a large share of intermittent production, primarily from wind power in the distribution network. New market models and services will be developed to pave the way for new market players.

Main application
Smart Network Management

Other applications

Integration of DER; Integration of Large Scale RES; Smart Customer and Smart Home; Smart Metering

Scenario for estimated costs and benefits

No net present value calculation is yet available.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE4

Stockholm Royal seaport Active House Pilot

Leading organization

Fortum Distribution AB

Total budget

20 msek

Description

The long-term outcome will be a test apartment, based in Stockholm Royal Seaport, which is part of the solution from the pre-study in the area's housing. The plausibility and attraction of solutions have been deemed to create conditions to expand the number of participating construction companies in next phase. Part solution was to work together with the results from other projects that also have Stockholm Royal Seaport as the test bed. The apartment, which is included in the test installations, will have access to leading technology in smart grids, appliances, information technology and design. They will also be active specifier and designers of new services and products being developed continuously. The results of this project make it possible for companies to develop products and services based on the technology that the project contributed. Researchers and entrepreneurs will be able to assimilate the results from this test apartment to develop their ideas and innovations.

Scenario for estimated costs and benefits

Customer participation in load shift to optimize load factors, impact climate effects and distribution automation systems to increase reliability and reduce losses. Hosting of DER at LV levels.

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE5

Stockholm Royal seaport demonstration phase

Leading organization

Fortum Distribution AB

Total budget

140 msek

Description

The program will specify, develop, test and evaluate both business and market models, new technical solutions and concepts, information and communications technology (ICT) as well as aspects of data security. As described in the pre-study, a set of scenario tests will be the cohesive factor in this work. In order to make it happen, an R&D platform needs to be developed and implemented as enablement for overall system tests, which will also include aspects of behavioural science. The first phase of the program and this application will focus on scenarios related to active end-customers and reliability of the future grid, where the urban smart grid in a new way creates opportunities for interaction with the end customer in order to, e.g., reduce CO_2 emissions. Also, scenarios for increased reliability and availability in a future urban smart grid will be tested.

Scenario for estimated costs and benefits

Customer participation in load shift to optimize load factors, impact climate effects and distribution automation systems to increase reliability and reduce losses. Hosting of DER at LV levels.

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE6
Smart Grid Hyllie

Leading organization
E.ON

Total budget
200 MSEK for 2011 through 2014. Additional years to follow.

Description
Hyllie - A test bed for developing solutions for a future transformed energy in the city of Malmö. The project includes: (a) Customer control of heat and electricity consumption, (b) Smart home and Smart building solutions, (c) Distributed generation – electricity and heat, (d) Smart grid solutions – DH and electricity, (e) Sustainable mobility solutions – gas and emobility, (f) CO_2 and resource efficient energy supply, and (g) Distributed energy storage.

Main application
Aggregation (Demand Response, VPP)

Other applications
Smart Customer and Smart Home

Scenario for estimated costs and benefits
Costs for 2011-2014 estimated to 200 MSEK (basically more or less all investments are to be seen as consumables); Analyses regarding benefits to be done in evaluation phase

Policy goals
Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA1
gridSMART(SM) Demonstration Project

Leading organization
AEP Ohio

Total budget
$148,821,823

Description

This project is to build a secure, interoperable, and integrated Smart Grid infrastructure that demonstrates the ability to maximize distribution system efficiency and reliability, and consumer use of demand response programs to reduce energy consumption, peak demand costs, and fossil fuel emissions. The demonstration area includes 150 square miles including approximately 110,000 meters and 70 distribution circuits. AEP Ohio will implement Smart Grid technology over 58 13kV circuits from 10 distribution stations and 12 34.5kV circuits from six distribution stations. Included in this project is a redistribution management system, integrated volt-VAR control, distribution automation, advanced meter infrastructure, home area networks, community energy storage, sodium sulfur battery storage, and renewable generation sources. These technologies will be combined with two-way consumer communication and information sharing, demand response, dynamic pricing, and consumer products, such as plug-in hybrid vehicles.

Main application

Smart Network Management

Other applications

Smart Customer and Smart Home; Integration of DER; Smart Metering; Aggregation (Demand Response, VPP); Electric Vehicles and Vehicle2Grid Applications

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Reduced peak load

USA2

Pacific Northwest Division Smart Grid Demonstration Project

Leading organization

Battelle Memorial Institute

Total budget

$177,642,503

Description

This demonstration will validate new technologies; provide two-way communication between distributed generation, storage and demand assets, and the existing grid infrastructure; quantify Smart Grid costs and benefits; advance interoperability standards and cyber security approaches; and validate new business models. More than 20 types of responsive Smart Grid assets will be tested across six regional and utility operational objectives at 15 unique distribution sites operated by 12 utilities across five states and three climatic regions. A base of Smart Grid technology serving more than 60,000 customers will be installed, validated, and operated. All use classes are represented in the demonstration including residential, commercial, industrial, and irrigation customers. The demonstration will develop a single integrated Smart Grid incentive-signaling approach and will test and validate its ability to continuously coordinate the responses of Smart Grid assets to meet a wide range of operational objectives. It will also engage distributed control so that wind integration problems are mitigated. Micro-grid islanding will also be evaluated for its potential to enhance reliability for customers and relieve energy demand.

Main application
Smart Network Management

Other applications
Integration of DER; Integration of Large Scale RES; Aggregation (Demand Response, VPP); Smart Customer and Smart Home; Smart Metering

Scenario for estimated costs and benefits
Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals
Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA3
Smart Grid Deployment

Leading organization
Duke Energy Carolinas, LLC

Total budget
$555,706,307

Description
This project includes advanced metering infrastructure (AMI) and distribution automation systems in five states. The project involves large-scale deployments of AMI and distribution

automation in Ohio and Indiana, a pilot deployment of AMI and distribution automation in Kentucky, and deployment of distribution automation in North and South Carolina. The project includes pilot programs for electricity pricing including time-of-use rates, peak-time rebates, and critical-peak pricing. Customers in these pilot programs use home area networks, web portals, and direct load control devices to reduce their electricity consumption and peak demand. Distribution automation equipment will be installed on 1,926 out of 4,741 circuits, which includes: distribution automation communications network; SCADA communications network; automated distribution circuit switches; automated capacitors; and equipment condition monitors.

Main application

Smart Metering

Other applications

Smart Customer and Smart Home; Aggregation (Demand Response, VPP); Smart Network Management

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals

Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA4

Smart Grid Project

Leading organization

EPB

Total budget

$226,707,562

Description

This project involves the installation of advanced metering systems and communications infrastructure. The project installs automated distribution grid equipment expected to enhance the reliability and quality of electric service delivery. The project implements two-way communications and metering expected to: (1) enable customers to view their energy consumption at their convenience through systems such as web portals, (2) provide timebased rate programs to customers, (3) provide information and tools to improve outage management, and (4) reduce operations and maintenance costs.

Main application
Smart Metering

Other applications
Smart Customer and Smart Home; Aggregation (Demand Response, VPP); Smart Network Management

Scenario for estimated costs and benefits
Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals
Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA5
Energy Smart Florida

Leading organization
Florida Power & Light Company

Total budget
$578,963,325

Description
This project is deploying advanced metering infrastructure (AMI), distribution automation, new electricity pricing programs, and advanced monitoring equipment for the transmission system. AMI supports two-way communication between FPL and its 3 million consumers receiving smart meters, providing detailed information about electricity usage and the ability to implement new electricity pricing programs. New distribution automation devices expand the functionality of FPL's distribution system to increase reliability, reduce energy losses, and reduce operations and maintenance costs. Synchrophasor and line monitoring devices help increase the reliability and security of the transmission system.

Main application
Smart Metering

Other applications
Smart Customer and Smart Home; Aggregation (Demand Response, VPP); Smart Network Management

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI), distribution automation systems, and wide-area transmission monitoring

Policy goals

Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA6

Enhanced Demand and Distribution Management Regional Demonstration

Leading organization

National Rural Electric Cooperative Association

Total budget

$67,864,292

Description

This project is demonstrating Smart Grid technologies with 27 cooperatives in 11 states across multiple utilities, geographies, climates, and applications including low density areas, low consumer income areas, and service areas prone to natural disasters. NRECA will conduct studies in advanced volt/volt-ampere reactive for total demand; generation and transmission-wide (G&T) demand response over advanced metering infrastructure (AMI); critical peak pricing over AMI; water heater and air conditioning load control over AMI; advanced water heater control and thermal storage; consumer Internet energy usage portal pilots; consumer in-home energy display pilots; time-sensitive rates pilots; multiple AMI integration at G&T co-ops; distribution co-op meter data management system applications; and self-healing feeders for improved reliability.

Main application

Smart Metering

Other applications

Smart Network Management; Aggregation (Demand Response, VPP); Smart Customer and Smart Home

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA7

SmartSacramento

Leading organization

Sacramento Municipal Utility District

Total budget

$307,697,792

Description

This project involves system-wide deployment of an advanced metering system integrated with existing enterprise and information technology systems as well as a partial deployment of advanced distribution grid assets that equip SMUD's distribution circuits with automated control and operation capabilities. The project also involves customer systems that provide usage and cost information to customers that educate and enable more control over their consumption. These systems enable more informed participation by customers and more effective management by SMUD to improve reliability and efficiency of grid operations and better optimize the use of assets. The project includes a field test of plug-in electric vehicle charging stations to assess their technical performance, vehicle charging patterns, and effects on electric distribution system operations.

Main application

Smart Metering

Other applications

Smart Network Management; Aggregation (Demand Response, VPP); Smart Customer and Smart Home; Electric Vehicles and Vehicle2Grid Applications

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency

measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA8

Positive Energy Smart Grid Integration Program

Leading organization

Oklahoma Gas and Electric

Total budget

$293,201,332

Description

This project involves system-wide deployment of a fully integrated advanced metering system, distribution of in-home devices to almost 6,000 customers, and installation of advanced distribution automation systems. The program aims at reducing peak loads, overall electricity use, and operations and maintenance costs while increasing distribution system efficiency, reliability, and power quality. The program implements secure wireless communications to: (1) allow smart meter customers to view their electricity consumption data through a personalized web site, and (2) allow OG&E to manage, measure, and verify targeted demand reductions during peak periods. New systems capture meter information for billing and implement new customer pricing programs and service offerings. The project deploys a more dynamic distribution management system, automated switching, and integrated voltage and reactive power control (IVVC) that reduces line losses, reduces operational costs, and improves service reliability. The program also includes a study of consumer behavior in response to different forms of dynamic pricing on an opt-in basis. Finally, the program includes collaboration with University of Oklahoma faculty and students to deploy technologies within 46 buildings on the campus and to take advantage of opportunities for education and training.

Main application

Smart Metering

Other applications

Smart Network Management; Aggregation (Demand Response, VPP); Smart Customer and Smart Home

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals

Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency

measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA10

SmartGrid Program

Leading organization

Talquin Electric Cooperative

Total budget

$16,200,000

Description

This project involves the installation of advanced metering, communications infrastructure, distribution automation equipment, load control devices, and other customer systems. The project implements two-way communications to: (1) enable customers to view their energy consumption at their convenience through customer systems and web portals, (2) provide time-based rate programs to customers, (3) provide information and tools to improve outage management, and (4) reduce operations and maintenance costs. The project also installs automated distribution grid equipment expected to: (1) enhance the reliability and quality of electric delivery, and (2) reduce operations and maintenance costs.

Main application

Smart Metering

Other applications

Smart Network Management, Smart Customer and Smart Home

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals

Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

2.7.2 Transmission Level

ID	Name
FRA5	PREMIO-('Production Répartie, Enr et MDE, Intégrées et Optimisées', or, in English, 'Integration and Optimization of DG, DSM and Renewable Energies')
FRA6	Greenlys
IRL5	DS3
SWE2	Smart Grid Gotland
SWE4	Stockholm Royal seaport Active House Pilot
SWE5	Stockholm Royal seaport demonstration phase
SWE6	Smart Grid Hyllie
USA5	Energy Smart Florida

FRA5

PREMIO-('Production Répartie, Enr et MDE, Intégrées et Optimisées', or, in English, 'Integration and Optimization of DG, DSM and Renewable Energies')

Leading organization

CAPENERGIE – France

Description

PREMIO is primarily a technical proposal created to address the following goals: – to develop a dynamic demand-response specifically for peak shaving purposes, – to increase the flexibility of the power system, – to promote a new energy culture which encourages energy efficiency, – to integrate distributed generation and particularly renewable energies, – to reduce greenhouse gas emissions from polluting power plants, especially during peak load times, and – to manage regional electrical energy from a wide range of local actors. PREMIO combines the control of installed distributed resources for optimal use with an awareness campaign promoting demand side management (DSM). The PREMIO platform includes a virtual power plant (VPP) which integrates approximately fifty distributed resources, all of which are distributed generation, storage technologies and customers' curtailable loads. The limited number of installations suggests that project results will be qualitative rather than quantitative.

Main application

Integration of DER; Aggregation

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Energy savings; Reduced peak load

FRA6

GreenLys

Leading organization

ERDF

Description

GreenLys is a systemic smart grid project which includes: - DER - Consumption - Networks (DSO & TSO). Main Goals: - decrease of greenhouse gases - control of energy bill - introduction and control of DER on LV networks - behavior of consumers, with incentive and innovative new offers - aggregator functions. Innovations: - Smart management of grid (seal-healing, smart metering using Linky infrastructure,...) - Demand side management, demand/response, energy saving and new offers (using boxes linked to Linky Infrastructure, tariffs, dynamic prices policy...) – Investments; Impact on studies and development of networks (especially for DSOs)

Main application

Smart Network Management; Integration of DER; Smart Customer and Smart Home

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Reduced peak load

IRL5

DS3

Leading organization

Eirgrid

Description

EirGrid's DS3 programme is developing solutions to the challenges associated with increasing levels of renewable generation, particularly with regard to secure power system operation, as we work to achieve the 2020 renewable targets. The combination of the All island Grid Studies, EirGrid's Grid 25, the facilitation of renewables studies, and a comprehensive analysis of the long-term needs of the power system conducted in 2011, form the backbone of our plans to facilitate the 40% target by 2020. The main operational areas that need to be addressed are the management of the system frequency, balancing the system in real time, managing system voltage and ensuring the compliance of plant with the Grid Code requirements. The work programme includes enhancing the portfolio performance, developing new operational policies and system tools to efficiently use the plant portfolio to the best of its capabilities, and regularly reviewing the needs of the system as the portfolio capability evolves.

Main application

Integration of Large Scale RES

Other applications

Smart Network Management; Aggregation (Demand Response, VPP); Integration of DER

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES; Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Percentage reduction of electricity losses; Reduced peak load; Additional interconnection capacity (specify HVDC and HVAC)

SWE2

Smart Grid Gotland

Leading organization

GEAB

Total budget

28 MEUR (242 MSEK)

Description

The Smart Grid Gotland R&D demonstration project intends to develop strategies for the planning, construction and operation of a fully developed, large-scale smart grid, including a large share of intermittent production, primarily from wind power in the distribution network. New market models and services will be developed to pave the way for new market players.

Main application

Smart Network Management

Other applications

Integration of DER; Integration of Large Scale RES; Smart Customer and Smart Home; Smart Metering

Scenario for estimated costs and benefits

No net present value calculation is yet available.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE4

Stockholm Royal seaport Active House Pilot

Leading organization

Fortum Distribution AB

Total budget

20 msek

Description

The long-term outcome will be a test apartment, based in Stockholm Royal Seaport, which is part of the solution from the pre-study in the area's housing. The plausibility and attraction of solutions have been deemed to create conditions to expand the number of participating construction companies in next phase. Part solution was to work together with the results from other projects that also have Stockholm Royal Seaport as the test bed. The apartment, which is included in the test installations, will have access to leading technology in smart grids, appliances, information technology and design. They will also be active specifier and designers of new services and products being developed continuously. The results of this project make it possible for companies to develop products and services based on the technology that the project contributed. Researchers and entrepreneurs will be able to assimilate the results from this test apartment to develop their ideas and innovations.

Scenario for estimated costs and benefits

Customer participation in load shift to optimize load factors, impact climate effects and distribution automation systems to increase reliability and reduce losses. Hosting of DER at LV levels.

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE5

Stockholm Royal seaport demonstration phase

Leading organization

Fortum Distribution AB

Total budget

140 msek

Description

The program will specify, develop, test and evaluate both business and market models, new technical solutions and concepts, information and communications technology (ICT) as well as aspects of data security. As described in the pre-study, a set of scenario tests will be the cohesive factor in this work. In order to make it happen, an R&D platform needs to be developed and implemented as enablement for overall system tests, which will also include aspects of behavioural science. The first phase of the program and this application will focus on scenarios related to active end-customers and reliability of the future grid, where the urban smart grid in a new way creates opportunities for interaction with the end customer in order to, e.g., reduce CO_2 emissions. Also, scenarios for increased reliability and availability in a future urban smart grid will be tested.

Scenario for estimated costs and benefits

Customer participation in load shift to optimize load factors, impact climate effects and distribution automation systems to increase reliability and reduce losses. Hosting of DER at LV levels.

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE6

Smart Grid Hyllie

Leading organization
E.ON

Total budget
200 MSEK for 2011 through 2014. Additional years to follow.

Description
Hyllie - A test bed for developing solutions for a future transformed energy in the city of Malmö. The project includes: (a) Customer control of heat and electricity consumption, (b) Smart home and Smart building solutions, (c) Distributed generation – electricity and heat, (d) Smart grid solutions – DH and electricity, (e) Sustainable mobility solutions – gas and emobility, (f) CO_2 and resource efficient energy supply, and (g) Distributed energy storage.

Main application
Aggregation (Demand Response, VPP)

Other applications
Smart Customer and Smart Home

Scenario for estimated costs and benefits
Costs for 2011-2014 estimated to 200 MSEK (basically more or less all investments are to be seen as consumables); Analyses regarding benefits to be done in evaluation phase

Policy goals
Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA5
Energy Smart Florida

Leading organization
Florida Power & Light Company

Total budget
$578,963,325

Description

This project is deploying advanced metering infrastructure (AMI), distribution automation, new electricity pricing programs, and advanced monitoring equipment for the transmission system. AMI supports two-way communication between FPL and its 3 million consumers receiving smart meters, providing detailed information about electricity usage and the ability to implement new electricity pricing programs. New distribution automation devices expand the functionality of FPL's distribution system to increase reliability, reduce energy losses, and reduce operations and maintenance costs. Synchrophasor and line monitoring devices help increase the reliability and security of the transmission system.

Main application

Smart Metering

Other applications

Smart Customer and Smart Home; Aggregation (Demand Response, VPP); Smart Network Management

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI), distribution automation systems, and wide-area transmission monitoring

Policy goals

Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

2.7.3 T&D Interface

ID	Name
FRA6	Greenlys
IND2	UGVCL, Gujarat
IND3	CESC, Mysore
IND4	KSEB, Kerala
IRL5	DS3
SWE2	Smart Grid Gotland
SWE6	Smart Grid Hyllie
USA2	Pacific Northwest Division Smart Grid Demonstration Project
USA5	Energy Smart Florida

FRA6

GreenLys

Leading organization

ERDF

Description

GreenLys is a systemic smart grid project which includes: - DER - Consumption - Networks (DSO & TSO). Main Goals: - decrease of greenhouse gases - control of energy bill - introduction and control of DER on LV networks - behavior of consumers, with incentive and innovative new offers - aggregator functions. Innovations: - Smart management of grid (seal-healing, smart metering using Linky infrastructure,...) - Demand side management, demand/response, energy saving and new offers (using boxes linked to Linky Infrastructure, tariffs, dynamic prices policy...) – Investments; Impact on studies and development of networks (especially for DSOs)

Main application

Smart Network Management; Integration of DER; Smart Customer and Smart Home

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Reduced peak load

IND2

UGVCL, Gujarat

Leading organization

UGVCL

Total budget

$9,200,000

Description

UGVCL has proposed the pilot project in Naroda of Sabarmati circle which is an industrial and residential area and Deesa of Palanpur circle which is an agricultural area covering 20,524 consumers in Naroda and 18,898 agricultural unmetered consumers in Deesa-II division and accounting for input energy of around 1700 MU (Naroda : 374.52 MU & Deesa : 1321.27 MU for 2010-11). The functionalities of peak load management, outage management, power quality management are proposed by implementing automated metering infrastructure (AMI) for industrial, commercial and residential consumers.

Committee also observed that some additional functionalities like load forecasting and asset management are also proposed and functionalities of load forecasting, peak power management and outage management are also considered at utility level which will impact all consumers of utility (i.e., 27 lac consumers) indirectly. Renewable energy integration has been proposed to be carried out at Patan Solar Park and few roof top installations at some of the universities. The pilot project proposes to introduce TOU tariff with approvals from GERC. Renewable energy integration is proposed through proper and accurate load forecast by real time monitoring of substations, feeders and RES generation.

Main application

Peak load management, outage management, and power quality management are proposed by implementing automated metering infrastructure (AMI) for industrial, commercial and residential consumers.

Other applications

Load forecasting and asset management are proposed. Load forecasting, peak power management and outage management are considered at utility level. Renewable energy integration at Patan Solar Park and few roof top installations are also envisaged.

Scenario for estimated costs and benefits

The ROI is proposed to be realized through benefits on account of reduction in AT&C losses from 12.44% to around 8.44% in Naroda and from 21.69% to 15% in Deesa; savings in peak power purchase cost by reduction of peak load by up to 5% in both areas; reduction in transformer failure rate from 16.52% to 8% in Deesa area; and reduction in number of outages, meter reading cost, cost of payment collection, etc. Based on projected savings the payback period is likely to be around 2 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND3

CESC, Mysore

Leading organization

CESC, Mysore

Total budget

$6,150,000

Description

CESC, Mysore has proposed the pilot project in Additional City Area Division (ACAD), Mysore involving 21,824 consumers with a good mix of residential, commercial, industrial and agricultural consumers including 512 irrigation pump sets covering over 14 feeders and 473 distribution transformers and accounting for input energy of 151.89 MU. The functionalities of peak load management, outage management are proposed by implementing automated metering infrastructure (AMI) for residential consumers and industrial consumers and integration of distributed generation / micro grid integration. Some additional functionality like agriculture DSM with community portal, consumer portal to support DSM/DR, employee portal for knowledge sharing and benefit realization, KPI based MIS and data analytics for decision support are also proposed. The pilot project proposes to introduce real time pricing signal by interfacing at SLDC level to get UI/ABT prices subject to regulatory consent. Implementation of Fault Location Isolation and System Restoration (FLISR) at feeders where alternate feeding arrangements are available is also proposed.

Main application

Peak load management, outage management by implementing automated metering infrastructure (AMI) for residential consumers and industrial consumers; Integration of distributed generation/micro grid integration

Other applications

Agriculture DSM with community portal

Scenario for estimated costs and benefits

ROI is proposed to be realized through benefits on account of reduction in AT&C losses from 10.6% to 5.7% in 3 years, shifting of load of up to 80% in industrial feeders and up to 20% for domestic consumer during peak hours, reduction in number of transformer failure, meter reading cost, reduction in unforeseen outages and also recovery time for unforeseen outages by 20% and 50%. Based on projected savings the payback period is likely to be less than 3 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

IND4

KSEB, Kerala

Leading organization

KSEB, Kerala

Total budget

$5,200,000

Description

KSEB Smart Grid Pilot covers around 25078 LT Industrial consumers of selected distribution section offices spread over the geographical area of Kerala State. The input energy for the total scheme area is 2108 MUs and for the LT Industrial consumers is 376 MUs. Automated metering infrastructure (AMI) is proposed to provide quality service, prevent tampering and unauthorised usage of load, accurate and timely metering and billing, avoiding costly field visits of Sub Engineers for meter reading, reducing supply restoration time, peak load management through load restriction for Remote Disconnection/Reconnection and Time of Day tariff.

Main application

Automated metering infrastructure (AMI); Peak load management

Scenario for estimated costs and benefits

ROI is proposed to be realized through benefits on account of Reduction in AT&C losses of about 1.17% (24.82 MUs) through reduction in loss due to manual error, tampers, thefts, short assessment, etc., savings on employee and travel cost for meter reading and introducing incremental tariff for peak hours through ToD Tariff. Based on above savings the payback period is estimated to be around 2.5 years

Policy goals

Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

IRL5

DS3

Leading organization

Eirgrid

Description

EirGrid's DS3 programme is developing solutions to the challenges associated with increasing levels of renewable generation, particularly with regard to secure power system operation, as we work to achieve the 2020 renewable targets. The combination of the All island Grid Studies, EirGrid's Grid 25, the facilitation of renewables studies, and a comprehensive analysis of the long-term needs of the power system conducted in 2011, form the backbone of our plans to facilitate the 40% target by 2020. The main operational areas that need to be addressed are the management of the system frequency, balancing the system in real time, managing system voltage and ensuring the compliance of plant with the Grid Code requirements. The work programme includes enhancing the portfolio performance, developing new operational policies and system tools to efficiently use the plant portfolio to the best of its capabilities, and regularly reviewing the needs of the system as the portfolio capability evolves.

Main application

Integration of Large Scale RES

Other applications

Smart Network Management; Aggregation (Demand Response, VPP); Integration of DER

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES; Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Percentage reduction of electricity losses; Reduced peak load; Additional interconnection capacity (specify HVDC and HVAC)

SWE2

Smart Grid Gotland

Leading organization

GEAB

Total budget

28 MEUR (242 MSEK)

Description

The Smart Grid Gotland R&D demonstration project intends to develop strategies for the planning, construction and operation of a fully developed, large-scale smart grid, including a large share of intermittent production, primarily from wind power in the distribution network. New market models and services will be developed to pave the way for new market players.

Main application

Smart Network Management

Other applications

Integration of DER; Integration of Large Scale RES; Smart Customer and Smart Home; Smart Metering

Scenario for estimated costs and benefits

No net present value calculation is yet available.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE6

Smart Grid Hyllie

Leading organization

E.ON

Total budget

200 MSEK for 2011 through 2014. Additional years to follow.

Description

Hyllie - A test bed for developing solutions for a future transformed energy in the city of Malmö. The project includes: (a) Customer control of heat and electricity consumption, (b) Smart home and Smart building solutions, (c) Distributed generation – electricity and heat, (d) Smart grid solutions – DH and electricity, (e) Sustainable mobility solutions – gas and emobility, (f) CO_2 and resource efficient energy supply, and (g) Distributed energy storage.

Main application

Aggregation (Demand Response, VPP)

Other applications

Smart Customer and Smart Home

Scenario for estimated costs and benefits

Costs for 2011-2014 estimated to 200 MSEK (basically more or less all investments are to be seen as consumables); Analyses regarding benefits to be done in evaluation phase

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA2

Pacific Northwest Division Smart Grid Demonstration Project

Leading organization

Battelle Memorial Institute

Total budget

$177,642,503

Description

This demonstration will validate new technologies; provide two-way communication between distributed generation, storage and demand assets, and the existing grid infrastructure; quantify Smart Grid costs and benefits; advance interoperability standards and cyber security approaches; and validate new business models. More than 20 types of responsive Smart Grid assets will be tested across six regional and utility operational objectives at 15 unique distribution sites operated by 12 utilities across five states and three climatic regions. A base of Smart Grid technology serving more than 60,000 customers will be installed, validated, and operated. All use classes are represented in the demonstration including residential, commercial, industrial, and irrigation customers. The demonstration will develop a single integrated Smart Grid incentive-signaling approach and will test and validate its ability to continuously coordinate the responses of Smart Grid assets to meet a wide range of operational objectives. It will also engage distributed control so that wind integration problems are mitigated. Micro-grid islanding will also be evaluated for its potential to enhance reliability for customers and relieve energy demand.

Main application

Smart Network Management

Other applications

Integration of DER; Integration of Large Scale RES; Aggregation (Demand Response, VPP); Smart Customer and Smart Home; Smart Metering

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA5

Energy Smart Florida

Leading organization

Florida Power & Light Company

Total budget

$578,963,325

Description

This project is deploying advanced metering infrastructure (AMI), distribution automation, new electricity pricing programs, and advanced monitoring equipment for the transmission system. AMI supports two-way communication between FPL and its 3 million consumers receiving smart meters, providing detailed information about electricity usage and the ability to implement new electricity pricing programs. New distribution automation devices expand the functionality of FPL's distribution system to increase reliability, reduce energy losses, and reduce operations and maintenance costs. Synchrophasor and line monitoring devices help increase the reliability and security of the transmission system.

Main application

Smart Metering

Other applications

Smart Customer and Smart Home; Aggregation (Demand Response, VPP); Smart Network Management

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI), distribution automation systems, and wide-area transmission monitoring

Policy goals

Additional demand side management power managed in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

2.8 Additional DER Hosting Power Input in the Grid (Incl. EV and Storage)/Maximum Power Load (Sustainability and Integration)

Summaries of projects in the inventory selected as contributing to the policy goal of "Additional DER Hosting Power Input in the Grid (Incl. EV and Storage)/Maximum Power Load (Sustainability and Integration)" are presented in order of their physical application domains: Distribution Level, Transmission Level, and T&D Interface. Within each domain, project summaries are presented in alphanumerical order of their unique Project IDs.

2.8.1 Distribution Level

ID	Name
AUT2	SG Showcase Region Salzburg
AUT3	SG Pioneer Region Upper Austria
CAN2	Zone de réseau interatif
CAN3	Energy storage for improved reliability in an outage-prone community
CAN4	Hydro One Smart Zone
FRA1	Smart Grid Vendée
FRA5	PREMIO-('Production Répartie, Enr et MDE, Intégrées et Optimisées', or, in English, 'Integration and Optimization of DG, DSM and Renewable Energies')
FRA6	Greenlys
FRA7	VENTEEA
GER1	i-Protect
ITA2	POI Energie Rinnovabili e Risparmio Energetico 2007-2013. " Programma Reti Intelligenti MT": Progetto Campania, Progetto Puglia, Progetto Calabria, and Progetto Sicilia
KOR2	Jeju Test Bed_Smart Transportation
SUI1	Swiss2G
SWE1	Grid4EU
SWE4	Stockholm Royal seaport Active House Pilot
SWE5	Stockholm Royal seaport demonstration phase
SWE6	Smart Grid Hyllie
USA1	gridSMART(SM) Demonstration Project
USA2	Pacific Northwest Division Smart Grid Demonstration Project

USA6	Enhanced Demand and Distribution Management Regional Demonstration
USA7	SmartSacramento

AUT2
SG Showcase Region Salzburg

Leading organization
Salzburg AG

Total budget
EUR 7.7m

Description
SGMS consists of several research activities and lies the focus on:

- Active operation of middle and low voltage networks (Projects ZUQDE and DG DemoNet Validation)
- Load shifting and demand side management: especially the role of the buildings as active power grid components in a Smart Grid are investigated (Building2Grid, Consumer2Grid, HiT: Rosa Zukunft)
- Field testing and pilot project with Smart Metering considering the sectors electricity, gas, water and district heating
- Integration of e-mobility (Vehicle2Grid Strategies)
- Currently (2012-2014) field tests in the community Köstendorf and in the medium voltage grid in the region Lungau are undertaken to validate simulation results and so far the concept has proven successful

Main application
Smart Network Management

Other applications
Integration of DER; Electric Vehicles and Vehicle2Grid applications; Smart Customer and Smart Home

Policy goals
Additional DER hosting power input in the grid (incl. EV and storage)/ maximum power load; Energy savings

AUT3
SG Pioneer Region Upper Austria

Leading organization
Energie AG

Total budget
EUR 3.8m

Description

The project aims to enable an efficient and cost effective use of existing grid infrastructures based on a three-step concept: intelligent planning, on-line monitoring, and active grid management. Communication-based systems for automatic control concepts for low voltage networks will be developed and evaluated by putting them into practice. Smart Meters are used as monitoring device for the grid. Smart Meter communication infrastructure is used for network control purposes.

Main application

Integration of DER

Other applications

Smart Network Management, Smart Metering

Policy goals

Additional DER hosting power input in the grid (incl. EV and storage)/ maximum power
Load Energy savings

$25,585,000

Description

Hydro-Québec has a distribution grid evolution plan which includes progressive smart grid technology implementation. To ensure successful implementation, Hydro-Québec decided to create a smart zone where the technologies will be deployed in order to improve energy efficiency and grid performance. The first smart grid technology to be deployed in the zone will be a DMS (Distribution Management System) with integrated voltage and reactive power control linked to the current distribution grid control system. In 2008, Hydro-Québec introduced a simple voltage regulation and reactive power control system to the Pierre-Boucher substation to reduce energy use, grid losses and greenhouse gases (GHGs). Hydro-Québec estimates that a VVO (Volt Var Optimization) type smart system would allow it to increase energy efficiency compared to a VVC (Volt Var Control) type system. The second smart grid technology involves charging stations with and without intelligence for electric vehicles, scheduled for installation between 2010 and 2012. The agreement between Hydro-Québec and Mitsubishi calls for testing of up to 30 all-electric iMiEV type vehicles. The goal of the project is to better understand charging and driving behaviors, as well as charging infrastructure needs at 120V/15A, 240V/15-30A, and direct current charging (50kW).

Main application

Electric Vehicles and Vehicle2Grid Applications

Other applications

Smart Metering

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Increased internal transfer capacity between TSOs or DSOs

CAN2

Zone de réseau interatif

Leading organization

Hydro-Québec Distribution

Total budget

$25,585,000

Description

Hydro-Québec has a distribution grid evolution plan which includes progressive smart grid technology implementation. To ensure successful implementation, Hydro-Québec decided to create a smart zone where the technologies will be deployed in order to improve energy efficiency and grid performance. The first smart grid technology to be deployed in the zone will be a DMS (Distribution Management System) with integrated voltage and reactive power control linked to the current distribution grid control system. In 2008, Hydro-Québec introduced a simple voltage regulation and reactive power control system to the Pierre-Boucher substation to reduce energy use, grid losses and greenhouse gases (GHGs). Hydro-Québec estimates that a VVO (Volt Var Optimization) type smart system would allow it to increase energy efficiency compared to a VVC (Volt Var Control) type system. The second smart grid technology involves charging stations with and without intelligence for electric vehicles, scheduled for installation between 2010 and 2012. The agreement between Hydro-Québec and Mitsubishi calls for testing of up to 30 all-electric iMiEV type vehicles. The goal of the project is to better understand charging and driving behaviors, as well as charging infrastructure needs at 120V/15A, 240V/15-30A, and direct current charging (50kW).

Main application

Electric Vehicles and Vehicle2Grid Applications

Other applications

Smart Metering

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings;

Percentage reduction of electricity losses; Increased internal transfer capacity between TSOs or DSOs

CAN3

Energy storage for improved reliability in an outage-prone community

Leading organization

British Columbia Hydro (BC Hydro)

Total budget

$13,490,000

Description

The purpose of the project is to demonstrate the use of energy storage technology to offset power during times of peak load and to act as the sole energy source in a scenario in which the community is islanded from the grid. BC Hydro plans to install a 1MW battery energy storage system on its Golden distribution network. The unit will be installed close to the community of Field approximately 55km from Golden.

Main application

Integration of DER

Other applications

Smart Network Management

Scenario for estimated costs and benefits

Estimated benefits come from two sources: (A) reduce the risk of Golden substation exceeding maximum load - at peak load battery will discharge to offset load at Golden substation - immediate benefit is to defer capital cost; and (B) mitigate impact of feeder outages for the community of Field - in the event of a feeder outage, the battery will supply power to the community of Field for a period of 6 to 7 hours at maximum load - immediate benefit is to remove the need to supply a diesel generator back-up, saving cost and GHG emissions.

Policy goals

Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Reduced peak load

CAN4

Hydro One Smart Zone

Leading organization

Hydro One

Total budget
$112,000,000

Description
Having already installed 1.2 million smart meters, Hydro One is taking the next step in building the Smart Grid with its Smart Zone, a comprehensive integration of field and back office solutions in a limited deployment in Owen Sound, Ontario. The focus will be on the integration of the distribution management system with the power system intelligent electronic devices that will be installed on the system. A successful integration will allow the safe and reliable connection of distributed generation. The project has four objectives: Integration of distributed generators into the rural distribution system; Distribution automation – monitoring and control for reliability and voltage optimization and loss reduction; Optimized outage restoration, using the communications capability of smart meters, and achieving the most efficient crew dispatch; Using system data to reduce field data collection and to improve distribution network asset planning and tools. This project will run from 2011-2013, at which time costs and benefits will be evaluated and Hydro One will proceed with a similar deployment to other parts of the province

Main application
Integration of DER

Other applications
Integration of DER; Smart Network Management; Policy Goals; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.)

FRA1
Smart Grid Vendée

Leading organization
SyDEV

Total budget
To be made public 1st quarter 2013.

Description
To be made public 1st quarter 2013.

Main application
Smart Network Management

Other applications
Aggregation (Demand Response, VPP)

Policy goals

Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Energy savings

FRA5

PREMIO-('Production Répartie, Enr et MDE, Intégrées et Optimisées', or, in English, 'Integration and Optimization of DG, DSM and Renewable Energies')

Leading organization

CAPENERGIE – France

Description

PREMIO is primarily a technical proposal created to address the following goals: – to develop a dynamic demand-response specifically for peak shaving purposes, – to increase the flexibility of the power system, – to promote a new energy culture which encourages energy efficiency, – to integrate distributed generation and particularly renewable energies, – to reduce greenhouse gas emissions from polluting power plants, especially during peak load times, and – to manage regional electrical energy from a wide range of local actors. PREMIO combines the control of installed distributed resources for optimal use with an awareness campaign promoting demand side management (DSM). The PREMIO platform includes a virtual power plant (VPP) which integrates approximately fifty distributed resources, all of which are distributed generation, storage technologies and customers' curtailable loads. The limited number of installations suggests that project results will be qualitative rather than quantitative.

Main application

Integration of DER; Aggregation

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Energy savings; Reduced peak load

FRA6

GreenLys

Leading organization

ERDF

Description

GreenLys is a systemic smart grid project which includes: - DER - Consumption - Networks (DSO & TSO). Main Goals: - decrease of greenhouse gases - control of energy bill -

introduction and control of DER on LV networks - behavior of consumers, with incentive and innovative new offers - aggregator functions. Innovations: - Smart management of grid (seal-healing, smart metering using Linky infrastructure,...) - Demand side management, demand/response, energy saving and new offers (using boxes linked to Linky Infrastructure, tariffs, dynamic prices policy...) – Investments; Impact on studies and development of networks (especially for DSOs)

Main application

Smart Network Management; Integration of DER; Smart Customer and Smart Home

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Reduced peak load

FRA7

VENTEEA

Leading organization

ERDF

Description

In 2011, ERDF submitted the demonstrator as part of an ADEME program called “smart grid electric network” (AMI). Early 2012, the French Commissioner General for Investment (CGI) approved the project. The demonstrator is focused on the integration of large wind energy in distribution networks. More precisely the project will study observability and controllability of wind-farms, voltage regulation and centralized local protection plan and power quality. If the costs benefits analysis is validated by all involved stakeholders, a battery storage system offering a full service package would be implemented on 20 kV level.

Main application

Integration of DER

Policy goals

Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Percentage reduction of electricity losses; Reduced peak load

GER1

i-Protect

Leading organization

TU Dortmund University

Total budget

$1,958,804

Description

i-Protect develops new grid protection concepts based on novel ICT and automation systems. Protection and communication tasks are modularly separated among different and most powerful hardware resources to support requirements of secure smart grid operation. Here, hardware prototypes offering different protection and communication possibilities are developed together with software support. Moreover, those hardware and software systems are verified at laboratory level and eventually integrated in a wide area monitoring system. Compatibility to existing and matured protection systems are ensured by customized process couplers.

Main application

Grid protection

Scenario for estimated costs and benefits

Advanced grid protection systems

Policy goals

Additional DER hosting power input in the grid (incl. EV and storage)/maximum power Load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.)

ITA2

POI Energie Rinnovabili e Risparmio Energetico 2007-2013. " Programma Reti Intelligenti MT": Progetto Campania, Progetto Puglia, Progetto Calabria, and Progetto Sicilia

Leading organization

Enel Distribuzione SpA

Description

The Inter-regional Operative program (Programma Operativo Interregionale (POI)) , is composed of 4 regional projects (Progetto Campania, Progetto Puglia, Progetto Calabria, Progetto Sicilia) aiming at "increasing the share of renewable energy in the overall consumption, increasing the level of energy efficiency, promoting local development." In this framework, the projects aim at facilitating the integration of Distributed Generation (DG) testing on pilot sites the evolution of the network management options towards an active/passive system, to maximise the integration of all energy sources in the network. The project focuses on the transformation of the network structure to allow the inclusion of PV plants ranging from 100 kW to 1MW. The distribution network is already fit for the inclusion of a small amount of DG, and the project will increase the hosting capacity (in terms of number and rating of the DG plants). The activity involves portions of the distribution network in all four regions, and at each location, it includes: the preparation of the site (infrastructure), the evolution of the protection schemes with special reference to the sensitivity of the generators to MV network disturbances and the remote tripping of generators from the DSO, innovative voltage regulation systems and meshed distribution system configurations.

Main application

Smart Network Management; Integration of DER

Policy goals

Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load

KOR2

Jeju Test Bed_Smart Transportation

Leading organization

KEPCO, SK Energy, GS Cartex

Total budget

$48.7M

Description

Element technology development for commercializing EVs and new business model development by testing various charging infrastructure

Main application

Electric Vehicles and Vehicle2Grid Applications

Scenario for estimated costs and benefits

Deployment costs and benefits from energy cost savings

Policy goals

Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Energy savings

SUI1
Swiss2G

Leading organization
SUPSI, Switzerland

Description
The overall goal of this pilot and demonstration project is the investigation of the technical feasibility of secure decentralized energy production, storage and consumption by combining available and new ICT and energy technologies in an intelligent, distributed, self-organizing system. The specific goal of the project is the optimization of the low voltage grid by algorithms based on decentralized decision at the home and appliance level with limited grid state knowledge at the individual 400V plugs, implemented in developed household appliance controllers. Swiss2G intends to analyse to which extent two-way communication can be avoided at the same time guaranteed high quality and availability of electricity.

Main application
Smart Network Management

Other applications
Integration of DER

Policy goals
Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Reduced peak load

SWE1
Grid4EU

Leading organization
ERDF

Description
Grid4EU is led by a group of European DSOs and aims at testing in real size some innovative system concepts and technologies in order to highlight and help to remove some of the barriers to the smart grids deployment (technical, economic, societal, environmental or regulatory). It focuses on how DSOs can dynamically manage electricity supply and demand, which is crucial for integration of large amounts of renewable energy and empowers consumers to become active participants in their energy choices.

Main application
Smart Network Management; Integration of DER; Aggregation; Smart Metering-Pilot

Policy goals

Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Percentage reduction of electricity losses; Reduced peak load

SWE4

Stockholm Royal seaport Active House Pilot

Leading organization

Fortum Distribution AB

Total budget

20 msek

Description

The long-term outcome will be a test apartment, based in Stockholm Royal Seaport, which is part of the solution from the pre-study in the area's housing. The plausibility and attraction of solutions have been deemed to create conditions to expand the number of participating construction companies in next phase. Part solution was to work together with the results from other projects that also have Stockholm Royal Seaport as the test bed. The apartment, which is included in the test installations, will have access to leading technology in smart grids, appliances, information technology and design. They will also be active specifier and designers of new services and products being developed continuously. The results of this project make it possible for companies to develop products and services based on the technology that the project contributed. Researchers and entrepreneurs will be able to assimilate the results from this test apartment to develop their ideas and innovations.

Scenario for estimated costs and benefits

Customer participation in load shift to optimize load factors, impact climate effects and distribution automation systems to increase reliability and reduce losses. Hosting of DER at LV levels.

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE5

Stockholm Royal seaport demonstration phase

Leading organization

Fortum Distribution AB

Total budget

140 msek

Description

The program will specify, develop, test and evaluate both business and market models, new technical solutions and concepts, information and communications technology (ICT) as well as aspects of data security. As described in the pre-study, a set of scenario tests will be the cohesive factor in this work. In order to make it happen, an R&D platform needs to be developed and implemented as enablement for overall system tests, which will also include aspects of behavioural science. The first phase of the program and this application will focus on scenarios related to active end-customers and reliability of the future grid, where the urban smart grid in a new way creates opportunities for interaction with the end customer in order to, e.g., reduce CO_2 emissions. Also, scenarios for increased reliability and availability in a future urban smart grid will be tested.

Scenario for estimated costs and benefits

Customer participation in load shift to optimize load factors, impact climate effects and distribution automation systems to increase reliability and reduce losses. Hosting of DER at LV levels.

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE6

Smart Grid Hyllie

Leading organization

E.ON

Total budget

200 MSEK for 2011 through 2014. Additional years to follow.

Description

Hyllie - A test bed for developing solutions for a future transformed energy in the city of Malmö. The project includes: (a) Customer control of heat and electricity consumption, (b) Smart home and Smart building solutions, (c) Distributed generation – electricity and heat, (d) Smart grid solutions – DH and electricity, (e) Sustainable mobility solutions – gas and emobility, (f) CO_2 and resource efficient energy supply, and (g) Distributed energy storage.

Main application

Aggregation (Demand Response, VPP)

Other applications

Smart Customer and Smart Home

Scenario for estimated costs and benefits

Costs for 2011-2014 estimated to 200 MSEK (basically more or less all investments are to be seen as consumables); Analyses regarding benefits to be done in evaluation phase

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA1

gridSMART(SM) Demonstration Project

Leading organization

AEP Ohio

Total budget

$148,821,823

Description

This project is to build a secure, interoperable, and integrated Smart Grid infrastructure that demonstrates the ability to maximize distribution system efficiency and reliability, and consumer use of demand response programs to reduce energy consumption, peak demand costs, and fossil fuel emissions. The demonstration area includes 150 square miles including approximately 110,000 meters and 70 distribution circuits. AEP Ohio will implement Smart Grid technology over 58 13kV circuits from 10 distribution stations and 12 34.5kV circuits from six distribution stations. Included in this project is a redistribution management system, integrated volt-VAR control, distribution automation, advanced meter infrastructure, home area networks, community energy storage, sodium sulfur battery storage, and renewable generation sources. These technologies will be combined with two-way consumer communication and information sharing, demand response, dynamic pricing, and consumer products, such as plug-in hybrid vehicles.

Main application

Smart Network Management

Other applications

Smart Customer and Smart Home; Integration of DER; Smart Metering; Aggregation (Demand Response, VPP); Electric Vehicles and Vehicle2Grid Applications

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Reduced peak load

USA2

Pacific Northwest Division Smart Grid Demonstration Project

Leading organization

Battelle Memorial Institute

Total budget

$177,642,503

Description

This demonstration will validate new technologies; provide two-way communication between distributed generation, storage and demand assets, and the existing grid infrastructure; quantify Smart Grid costs and benefits; advance interoperability standards and cyber security approaches; and validate new business models. More than 20 types of responsive Smart Grid assets will be tested across six regional and utility operational objectives at 15 unique distribution sites operated by 12 utilities across five states and three climatic regions. A base of Smart Grid technology serving more than 60,000 customers will be installed, validated, and operated. All use classes are represented in the demonstration including residential, commercial, industrial, and irrigation customers. The demonstration will develop a single integrated Smart Grid incentive-signaling approach and will test and validate its ability to continuously coordinate the responses of Smart Grid assets to meet a wide range of operational objectives. It will also engage distributed control so that wind integration problems are mitigated. Micro-grid islanding will also be evaluated for its potential to enhance reliability for customers and relieve energy demand.

Main application
Smart Network Management

Other applications
Integration of DER; Integration of Large Scale RES; Aggregation (Demand Response, VPP); Smart Customer and Smart Home; Smart Metering

Scenario for estimated costs and benefits
Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals
Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA6
Enhanced Demand and Distribution Management Regional Demonstration

Leading organization
National Rural Electric Cooperative Association

Total budget
$67,864,292

Description
This project is demonstrating Smart Grid technologies with 27 cooperatives in 11 states across multiple utilities, geographies, climates, and applications including low density areas, low consumer income areas, and service areas prone to natural disasters. NRECA will conduct studies in advanced volt/volt-ampere reactive for total demand; generation and transmission-wide (G&T) demand response over advanced metering infrastructure (AMI); critical peak pricing over AMI; water heater and air conditioning load control over AMI; advanced water heater control and thermal storage; consumer Internet energy usage portal pilots; consumer in-home energy display pilots; time-sensitive rates pilots; multiple AMI integration at G&T co-ops; distribution co-op meter data management system applications; and self-healing feeders for improved reliability.

Main application
Smart Metering

Other applications
Smart Network Management; Aggregation (Demand Response, VPP); Smart Customer and Smart Home

Scenario for estimated costs and benefits
Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals
Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA7
SmartSacramento

Leading organization
Sacramento Municipal Utility District

Total budget
$307,697,792

Description
This project involves system-wide deployment of an advanced metering system integrated with existing enterprise and information technology systems as well as a partial deployment of advanced distribution grid assets that equip SMUD's distribution circuits with automated control and operation capabilities. The project also involves customer systems that provide usage and cost information to customers that educate and enable more control over their consumption. These systems enable more informed participation by customers and more effective management by SMUD to improve reliability and efficiency of grid operations and better optimize the use of assets. The project includes a field test of plug-in electric vehicle charging stations to assess their technical performance, vehicle charging patterns, and effects on electric distribution system operations.

Main application
Smart Metering

Other applications

Smart Network Management; Aggregation (Demand Response, VPP); Smart Customer and Smart Home; Electric Vehicles and Vehicle2Grid Applications

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

2.8.2 Transmission Level

ID	Name
CAN2	Zone de réseau interatif
CAN4	Hydro One Smart Zone
FRA1	Smart Grid Vendée
FRA5	PREMIO-('Production Répartie, Enr et MDE, Intégrées et Optimisées', or, in English, 'Integration and Optimization of DG, DSM and Renewable Energies')
FRA6	Greenlys
FRA7	VENTEEA
IRL5	DS3
SWE4	Stockholm Royal seaport Active House Pilot
SWE5	Stockholm Royal seaport demonstration phase
SWE6	Smart Grid Hyllie

CAN2
Zone de réseau interatif

Leading organization

Hydro-Québec Distribution

Total budget

$25,585,000

Description

Hydro-Québec has a distribution grid evolution plan which includes progressive smart grid technology implementation. To ensure successful implementation, Hydro-Québec decided to create a smart zone where the technologies will be deployed in order to improve energy efficiency and grid performance. The first smart grid technology to be deployed in the zone will be a DMS (Distribution Management System) with integrated voltage and reactive power control linked to the current distribution grid control system. In 2008, Hydro-Québec introduced a simple voltage regulation and reactive power control system to the Pierre-Boucher substation to reduce energy use, grid losses and greenhouse gases (GHGs). Hydro-Québec estimates that a VVO (Volt Var Optimization) type smart system would allow it to increase energy efficiency compared to a VVC (Volt Var Control) type system. The second smart grid technology involves charging stations with and without intelligence for electric vehicles, scheduled for installation between 2010 and 2012. The agreement between Hydro-Québec and Mitsubishi calls for testing of up to 30 all-electric iMiEV type vehicles. The goal of the project is to better understand charging and driving behaviors, as well as charging infrastructure needs at 120V/15A, 240V/15-30A, and direct current charging (50kW).

Main application

Electric Vehicles and Vehicle2Grid Applications

Other applications

Smart Metering

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Increased internal transfer capacity between TSOs or DSOs

CAN4

Hydro One Smart Zone

Leading organization

Hydro One

Total budget

$112,000,000

Description

Having already installed 1.2 million smart meters, Hydro One is taking the next step in building the Smart Grid with its Smart Zone, a comprehensive integration of field and back office solutions in a limited deployment in Owen Sound, Ontario. The focus will be on the integration of the distribution management system with the power system intelligent electronic devices that will be installed on the system. A successful integration will allow the safe and reliable connection of distributed generation. The project has four objectives: Integration of distributed generators into the rural distribution system; Distribution automation – monitoring and control for reliability and voltage optimization and loss reduction; Optimized outage restoration, using the communications capability of smart meters, and achieving the most efficient crew dispatch; Using system data to reduce field data collection and to improve distribution network asset planning and tools. This project will run from 2011-2013, at which time costs and benefits will be evaluated and Hydro One will proceed with a similar deployment to other parts of the province

Main application

Integration of DER

Other applications

Integration of DER; Smart Network Management; Policy Goals; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.)

FRA1

Smart Grid Vendée

Leading organization

SyDEV

Total budget

To be made public 1st quarter 2013.

Description

To be made public 1st quarter 2013.

Main application

Smart Network Management

Other applications

Aggregation (Demand Response, VPP)

Policy goals

Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Energy savings

FRA5

PREMIO-('Production Répartie, Enr et MDE, Intégrées et Optimisées', or, in English, 'Integration and Optimization of DG, DSM and Renewable Energies')

Leading organization

CAPENERGIE – France

Description

PREMIO is primarily a technical proposal created to address the following goals: – to develop a dynamic demand-response specifically for peak shaving purposes, – to increase the flexibility of the power system, – to promote a new energy culture which encourages energy efficiency, – to integrate distributed generation and particularly renewable energies, – to reduce greenhouse gas emissions from polluting power plants, especially during peak load times, and – to manage regional electrical energy from a wide range of local actors. PREMIO combines the control of installed distributed resources for optimal use with an awareness campaign promoting demand side management (DSM). The PREMIO platform includes a virtual power plant (VPP) which integrates approximately fifty distributed resources, all of which are distributed generation, storage technologies and customers' curtailable loads. The limited number of installations suggests that project results will be qualitative rather than quantitative.

Main application

Integration of DER; Aggregation

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Energy savings; Reduced peak load

FRA6

GreenLys

Leading organization

ERDF

Description

GreenLys is a systemic smart grid project which includes: - DER - Consumption - Networks (DSO & TSO). Main Goals: - decrease of greenhouse gases - control of energy bill - introduction and control of DER on LV networks - behavior of consumers, with incentive and innovative new offers - aggregator functions. Innovations: - Smart management of grid (seal-healing, smart metering using Linky infrastructure,...) - Demand side management, demand/response, energy saving and new offers (using boxes linked to Linky Infrastructure, tariffs, dynamic prices policy...) – Investments; Impact on studies and development of networks (especially for DSOs)

Main application

Smart Network Management; Integration of DER; Smart Customer and Smart Home

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Reduced peak load

FRA7

VENTEEA

Leading organization

ERDF

Description

In 2011, ERDF submitted the demonstrator as part of an ADEME program called "smart grid electric network" (AMI). Early 2012, the French Commissioner General for Investment (CGI) approved the project. The demonstrator is focused on the integration of large wind energy in distribution networks. More precisely the project will study observability and controllability of wind-farms, voltage regulation and centralized local protection plan and power quality. If the costs benefits analysis is validated by all involved stakeholders, a battery storage system offering a full service package would be implemented on 20 kV level.

Main application

Integration of DER

Policy goals

Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Percentage reduction of electricity losses; Reduced peak load

IRL5

DS3

Leading organization

Eirgrid

Description

EirGrid’s DS3 programme is developing solutions to the challenges associated with increasing levels of renewable generation, particularly with regard to secure power system operation, as we work to achieve the 2020 renewable targets. The combination of the All island Grid Studies, EirGrid’s Grid 25, the facilitation of renewables studies, and a comprehensive analysis of the long-term needs of the power system conducted in 2011, form the backbone of our plans to facilitate the 40% target by 2020. The main operational areas that need to be addressed are the management of the system frequency, balancing the system in real time, managing system voltage and ensuring the compliance of plant with the Grid Code requirements. The work programme includes enhancing the portfolio performance, developing new operational policies and system tools to efficiently use the plant portfolio to the best of its capabilities, and regularly reviewing the needs of the system as the portfolio capability evolves.

Main application

Integration of Large Scale RES

Other applications

Smart Network Management; Aggregation (Demand Response, VPP); Integration of DER

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES; Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Percentage reduction of electricity losses; Reduced peak load; Additional interconnection capacity (specify HVDC and HVAC)

SWE4

Stockholm Royal seaport Active House Pilot

Leading organization

Fortum Distribution AB

Total budget

20 msek

Description

The long-term outcome will be a test apartment, based in Stockholm Royal Seaport, which is part of the solution from the pre-study in the area's housing. The plausibility and attraction of solutions have been deemed to create conditions to expand the number of participating construction companies in next phase. Part solution was to work together with the results from other projects that also have Stockholm Royal Seaport as the test bed. The apartment, which is included in the test installations, will have access to leading technology in smart grids, appliances, information technology and design. They will also be active specifier and designers of new services and products being developed continuously. The results of this project make it possible for companies to develop products and services based on the technology that the project contributed. Researchers and entrepreneurs will be able to assimilate the results from this test apartment to develop their ideas and innovations.

Scenario for estimated costs and benefits

Customer participation in load shift to optimize load factors, impact climate effects and distribution automation systems to increase reliability and reduce losses. Hosting of DER at LV levels.

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE5

Stockholm Royal seaport demonstration phase

Leading organization

Fortum Distribution AB

Total budget

140 msek

Description

The program will specify, develop, test and evaluate both business and market models, new technical solutions and concepts, information and communications technology (ICT) as well as aspects of data security. As described in the pre-study, a set of scenario tests will be the cohesive factor in this work. In order to make it happen, an R&D platform needs to be developed and implemented as enablement for overall system tests, which will also include aspects of behavioural science. The first phase of the program and this application will focus on scenarios related to active end-customers and reliability of the future grid, where the urban smart grid in a new way creates opportunities for interaction with the end customer in order to, e.g., reduce CO_2 emissions. Also, scenarios for increased reliability and availability in a future urban smart grid will be tested.

Scenario for estimated costs and benefits

Customer participation in load shift to optimize load factors, impact climate effects and distribution automation systems to increase reliability and reduce losses. Hosting of DER at LV levels.

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE6

Smart Grid Hyllie

Leading organization

E.ON

Total budget

200 MSEK for 2011 through 2014. Additional years to follow.

Description

Hyllie - A test bed for developing solutions for a future transformed energy in the city of Malmö. The project includes: (a) Customer control of heat and electricity consumption, (b) Smart home and Smart building solutions, (c) Distributed generation – electricity and heat, (d) Smart grid solutions – DH and electricity, (e) Sustainable mobility solutions – gas and emobility, (f) CO_2 and resource efficient energy supply, and (g) Distributed energy storage.

Main application

Aggregation (Demand Response, VPP)

Other applications

Smart Customer and Smart Home

Scenario for estimated costs and benefits

Costs for 2011-2014 estimated to 200 MSEK (basically more or less all investments are to be seen as consumables); Analyses regarding benefits to be done in evaluation phase

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand

side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

2.8.3 T&D Interface

ID	Name
CAN2	Zone de réseau interatif
CAN4	Hydro One Smart Zone
FRA1	Smart Grid Vendée
FRA6	Greenlys
IRL5	DS3
SWE1	Grid4EU
SWE6	Smart Grid Hyllie
USA2	Pacific Northwest Division Smart Grid Demonstration Project

CAN2
Zone de réseau interatif

Leading organization
Hydro-Québec Distribution

Total budget
$25,585,000

Description
Hydro-Québec has a distribution grid evolution plan which includes progressive smart grid technology implementation. To ensure successful implementation, Hydro-Québec decided to create a smart zone where the technologies will be deployed in order to improve energy efficiency and grid performance. The first smart grid technology to be deployed in the zone will be a DMS (Distribution Management System) with integrated voltage and reactive power control linked to the current distribution grid control system. In 2008, Hydro-Québec introduced a simple voltage regulation and reactive power control system to the Pierre-Boucher substation to reduce energy use, grid losses and greenhouse gases (GHGs). Hydro-Québec estimates that a VVO (Volt Var Optimization) type smart system would allow it to increase energy efficiency compared to a VVC (Volt Var Control) type system. The second smart grid technology involves charging stations with and without intelligence for electric vehicles, scheduled for installation between 2010 and 2012. The agreement between

Hydro-Québec and Mitsubishi calls for testing of up to 30 all-electric iMiEV type vehicles. The goal of the project is to better understand charging and driving behaviors, as well as charging infrastructure needs at 120V/15A, 240V/15-30A, and direct current charging (50kW).

Main application

Electric Vehicles and Vehicle2Grid Applications

Other applications

Smart Metering

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Increased internal transfer capacity between TSOs or DSOs

CAN4

Hydro One Smart Zone

Leading organization

Hydro One

Total budget

$112,000,000

Description

Having already installed 1.2 million smart meters, Hydro One is taking the next step in building the Smart Grid with its Smart Zone, a comprehensive integration of field and back office solutions in a limited deployment in Owen Sound, Ontario. The focus will be on the integration of the distribution management system with the power system intelligent electronic devices that will be installed on the system. A successful integration will allow the safe and reliable connection of distributed generation. The project has four objectives: Integration of distributed generators into the rural distribution system; Distribution automation – monitoring and control for reliability and voltage optimization and loss reduction; Optimized outage restoration, using the communications capability of smart meters, and achieving the most efficient crew dispatch; Using system data to reduce field data collection and to improve distribution network asset planning and tools. This project will run from 2011-2013, at which time costs and benefits will be evaluated and Hydro One will proceed with a similar deployment to other parts of the province

Main application

Integration of DER

Other applications

Integration of DER; Smart Network Management; Policy Goals; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.)

FRA1

Smart Grid Vendée

Leading organization

SyDEV

Total budget

To be made public 1st quarter 2013.

Description

To be made public 1st quarter 2013.

Main application

Smart Network Management

Other applications

Aggregation (Demand Response, VPP)

Policy goals

Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Energy savings

FRA6

GreenLys

Leading organization

ERDF

Description

GreenLys is a systemic smart grid project which includes: - DER - Consumption - Networks (DSO & TSO). Main Goals: - decrease of greenhouse gases - control of energy bill - introduction and control of DER on LV networks - behavior of consumers, with incentive and innovative new offers - aggregator functions. Innovations: - Smart management of grid (seal-healing, smart metering using Linky infrastructure,...) - Demand side management, demand/response, energy saving and new offers (using boxes linked to Linky Infrastructure, tariffs, dynamic prices policy...) – Investments; Impact on studies and development of networks (especially for DSOs)

Main application

Smart Network Management; Integration of DER; Smart Customer and Smart Home

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Reduced peak load

IRL5

DS3

Leading organization

Eirgrid

Description

EirGrid's DS3 programme is developing solutions to the challenges associated with increasing levels of renewable generation, particularly with regard to secure power system operation, as we work to achieve the 2020 renewable targets. The combination of the All island Grid Studies, EirGrid's Grid 25, the facilitation of renewables studies, and a comprehensive analysis of the long-term needs of the power system conducted in 2011, form the backbone of our plans to facilitate the 40% target by 2020. The main operational areas that need to be addressed are the management of the system frequency, balancing the system in real time, managing system voltage and ensuring the compliance of plant with the Grid Code requirements. The work programme includes enhancing the portfolio performance, developing new operational policies and system tools to efficiently use the plant portfolio to the best of its capabilities, and regularly reviewing the needs of the system as the portfolio capability evolves.

Main application

Integration of Large Scale RES

Other applications

Smart Network Management; Aggregation (Demand Response, VPP); Integration of DER

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES; Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Percentage reduction of electricity losses; Reduced peak load; Additional interconnection capacity (specify HVDC and HVAC)

SWE1

Grid4EU

Leading organization

ERDF

Description

Grid4EU is led by a group of European DSOs and aims at testing in real size some innovative system concepts and technologies in order to highlight and help to remove some of the barriers to the smart grids deployment (technical, economic, societal, environmental or regulatory). It focuses on how DSOs can dynamically manage electricity supply and demand, which is crucial for integration of large amounts of renewable energy and empowers consumers to become active participants in their energy choices.

Main application

Smart Network Management; Integration of DER; Aggregation; Smart Metering-Pilot

Policy goals

Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Percentage reduction of electricity losses; Reduced peak load

SWE6

Smart Grid Hyllie

Leading organization

E.ON

Total budget

200 MSEK for 2011 through 2014. Additional years to follow.

Description

Hyllie - A test bed for developing solutions for a future transformed energy in the city of Malmö. The project includes: (a) Customer control of heat and electricity consumption, (b) Smart home and Smart building solutions, (c) Distributed generation – electricity and heat, (d) Smart grid solutions – DH and electricity, (e) Sustainable mobility solutions – gas and emobility, (f) CO_2 and resource efficient energy supply, and (g) Distributed energy storage.

Main application

Aggregation (Demand Response, VPP)

Other applications
Smart Customer and Smart Home

Scenario for estimated costs and benefits
Costs for 2011-2014 estimated to 200 MSEK (basically more or less all investments are to be seen as consumables); Analyses regarding benefits to be done in evaluation phase

Policy goals
Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA2
Pacific Northwest Division Smart Grid Demonstration Project

Leading organization
Battelle Memorial Institute

Total budget
$177,642,503

Description
This demonstration will validate new technologies; provide two-way communication between distributed generation, storage and demand assets, and the existing grid infrastructure; quantify Smart Grid costs and benefits; advance interoperability standards and cyber security approaches; and validate new business models. More than 20 types of responsive Smart Grid assets will be tested across six regional and utility operational objectives at 15 unique distribution sites operated by 12 utilities across five states and three climatic regions. A base of Smart Grid technology serving more than 60,000 customers will be installed, validated, and operated. All use classes are represented in the demonstration including residential, commercial, industrial, and irrigation customers. The demonstration will develop a single integrated Smart Grid incentive-signaling approach and will test and validate its ability to continuously coordinate the responses of Smart Grid assets to meet a wide range of operational objectives. It will also engage distributed control so that wind integration problems are mitigated. Micro-grid islanding will also be evaluated for its potential to enhance reliability for customers and relieve energy demand.

Main application
Smart Network Management

Other applications

Integration of DER; Integration of Large Scale RES; Aggregation (Demand Response, VPP); Smart Customer and Smart Home; Smart Metering

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

2.9 Additional RES Hosting Power in the Grid/Maximum Power Load (Sustainability and Integration)

Summaries of projects in the inventory selected as contributing to the policy goal of "Additional RES Hosting Power in the Grid/Maximum Power Load (Sustainability and Integration)" are presented in order of their physical application domains: Distribution Level, Transmission Level, and T&D Interface. Within each domain, project summaries are presented in alphanumerical order of their unique Project IDs.

2.9.1 Distribution Level

ID	Name
BEL3	Meta-PV
CAN1	PowerShift Atlantic
FRA5	PREMIO-('Production Répartie, Enr et MDE, Intégrées et Optimisées', or, in English, 'Integration and Optimization of DG, DSM and Renewable Energies')
FRA6	Greenlys
GER2	Smart Area Aachen
GER5	E-DeMa
GER7	Model City Mannheim
GER8	Regenerative Modellregion Harz

IND2	UGVCL, Gujarat
IRL2	Smart green circuits. ESB Networks - Smart grid demonstration project
IRL3	Smart Networks Communications
IRL6	DSO/TSO Project re operation and control of voltage
ITA2	POI Energie Rinnovabili e Risparmio Energetico 2007-2013. " Programma Reti Intelligenti MT": Progetto Campania, Progetto Puglia, Progetto Calabria, and Progetto Sicilia
KOR3	Jeju Test Bed_Smart Renewable
SWE1	Grid4EU
SWE2	Smart Grid Gotland
SWE4	Stockholm Royal seaport Active House Pilot
SWE5	Stockholm Royal seaport demonstration phase
SWE6	Smart Grid Hyllie
USA2	Pacific Northwest Division Smart Grid Demonstration Project

BEL3
Meta-PV

Leading organization
3E N.V

Description
MetaPV is the first project world-wide that will demonstrate the provision of electrical benefits from photovoltaics (PV) on a large scale. Additional benefits for active grid support from PV will be demonstrated at two sites: a residential area of 128 households with 4 kWp each, and an industrial zone of 31 PV systems with 200 kWp each. The enhanced control capacities to be implemented into PV inverters and demonstrated are active voltage control, fault ride-through capability, autonomous grid operation, and interaction of distribution system control with PV systems. A detailed technical and economic assessment of the additional services from PV will be carried out, in addition to an evaluation of the role of PV in an area fully supplied by renewable sources. PV side and network side will be both addressed. Small and large PV inverters for residential and industrial applications, which can both provide additional benefits for electrical network operation, will be developed. On the network side, adapted concepts for grid planning and operation of distribution networks with large amounts of PV generation will be developed. Based on the development and suggestions of the first phase, pilot demonstrations will be carried out and evaluated in residential and industrial areas.

Main application
Smart Network Management, Integration of DER, Integration of large scale RES,

Policy goals
Additional RES hosting power in the grid/maximum power load

CAN1
PowerShift Atlantic

Leading organization
New Brunswick Power

Total budget
$32,053,000

Description
PowerShift Atlantic is a collaborative research project led in partnership by Natural Resources Canada through the Clean Energy Fund, New Brunswick Power, Saint John Energy, Maritime Electric, Nova Scotia Power, New Brunswick System Operator, the Universi

Main application
Aggregation (Demand Response, VPP)

Other applications
Smart Network Management; Integration of DER; Integration of Large Scale RES

Scenario for estimated costs and benefits
The impact of the Virtual Power Plant (VPP) solution is established by comparing the differences in generation utilization and the associated production costs by evaluating the system with, and without, the VPP. This will be used to determine:-Peak reduc

Policy goals
Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES)

FRA5
PREMIO-('Production Répartie, Enr et MDE, Intégrées et Optimisées', or, in English, 'Integration and Optimization of DG, DSM and Renewable Energies')

Leading organization
CAPENERGIE – France

Description

PREMIO is primarily a technical proposal created to address the following goals: – to develop a dynamic demand-response specifically for peak shaving purposes, – to increase the flexibility of the power system, – to promote a new energy culture which encourages energy efficiency, – to integrate distributed generation and particularly renewable energies, – to reduce greenhouse gas emissions from polluting power plants, especially during peak load times, and – to manage regional electrical energy from a wide range of local actors. PREMIO combines the control of installed distributed resources for optimal use with an awareness campaign promoting demand side management (DSM). The PREMIO platform includes a virtual power plant (VPP) which integrates approximately fifty distributed resources, all of which are distributed generation, storage technologies and customers' curtailable loads. The limited number of installations suggests that project results will be qualitative rather than quantitative.

Main application

Integration of DER; Aggregation

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Energy savings; Reduced peak load

FRA6

GreenLys

Leading organization

ERDF

Description

GreenLys is a systemic smart grid project which includes: - DER - Consumption - Networks (DSO & TSO). Main Goals: - decrease of greenhouse gases - control of energy bill - introduction and control of DER on LV networks - behavior of consumers, with incentive and innovative new offers - aggregator functions. Innovations: - Smart management of grid (seal-healing, smart metering using Linky infrastructure,...) - Demand side management, demand/response, energy saving and new offers (using boxes linked to Linky Infrastructure, tariffs, dynamic prices policy...) – Investments; Impact on studies and development of networks (especially for DSOs)

Main application

Smart Network Management; Integration of DER; Smart Customer and Smart Home

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Reduced peak load

GER2

Smart Area Aachen

Leading organization

Stadtwerke Aachen Aktiengesellschaft

Total budget

$9,152,280

Description

Smart Area Aachen aims at developing new holistic concepts and methods based on new equipment for future smart grid solutions. In this context, innovative technical solutions are identified, optimized and eventually verified in pilot trials. Moreover, new business models are developed for the different stakeholders and harmonization aspects are addressed in accompanying standardization activities.

Main application

Smart grid applications in general: equipment, planning, operation

Scenario for estimated costs and benefits

Smart grid infrastructure

Policy goals

Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.) Energy savings; Percentage reduction of electricity losses; Reduced peak load

GER5

E-DeMa

Leading organization

RWE Deutschland AG

Total budget

22 Mio. €

Description

Field test with 700 households in the Rhine/Ruhr region in Germany (Mülheim and Krefeld). The infrastructure comprises smart meters, and a regional energy market place which acts as a data platform for the involved parties of the energy system including consumers, energy suppliers, DSOs, aggregators and service providers. An infrastructure to exploit the flexibilities of residential consumers has been implemented. Control of white goods is done automatically via a home energy controller, which receives price signals from the regional energy market place. A part of the consumers is equipped with an in-house display for pricing information.

Main application

Regional Energy Marketplace; Smart Metering; Active Demand in residential environment; Aggregation of Flexibilities from residential consumers

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals

Active demand for residential consumers, supporting integration of renewables, peak shaving, increased number of consumers participating in energy markets; Energy efficiency by transparency of energy consumption, reduction of peak load

GER7

Model City Mannheim

Leading organization

MVV Energie AG

Total budget

20,800,000€

Description

(1) Better integration of renewable energy sources via balancing volatile generation and usage, (2) Demand side response via variable tariffs as inventive for load shifting, (3)Increase of connection capacity of renewable energy sources in distribution grids and management of bi-directional energy flows via cellular grid operation

Main application

Aggregation (Demand Response, VPP)

Other applications

Smart Network Management

Scenario for estimated costs and benefits

Distribution automation systems

Policy goals

Additional Demand Side Management power managed in the grid/maximum power load; Additional RES hosting power in the grid /maximum power load; Energy savings; Reduced peak load

GER8

Regenerative Modellregion Harz

Leading organization

Fraunhofer IWES

Total budget

16,000,000

Description

There have been three main goals: (1.) Development of a virtual power plant control center for renewable energies, (2) Marketing of electric energy produced by the virtual power plant, and (3) Support of grid operation by network monitoring and ancillary services.

Main application

Smart Network Management

Other applications

Smart Network Management

Scenario for estimated costs and benefits

Not possible

Policy goals

Additional RES hosting power in the grid /maximum power load

IND2

UGVCL, Gujarat

Leading organization

UGVCL

Total budget

$9,200,000

Description

UGVCL has proposed the pilot project in Naroda of Sabarmati circle which is an industrial and residential area and Deesa of Palanpur circle which is an agricultural area covering 20,524 consumers in Naroda and 18,898 agricultural unmetered consumers in Deesa-II division and accounting for input energy of around 1700 MU (Naroda : 374.52 MU & Deesa :

1321.27 MU for 2010-11). The functionalities of peak load management, outage management, power quality management are proposed by implementing automated metering infrastructure (AMI) for industrial, commercial and residential consumers. Committee also observed that some additional functionalities like load forecasting and asset management are also proposed and functionalities of load forecasting, peak power management and outage management are also considered at utility level which will impact all consumers of utility (i.e., 27 lac consumers) indirectly. Renewable energy integration has been proposed to be carried out at Patan Solar Park and few roof top installations at some of the universities. The pilot project proposes to introduce TOU tariff with approvals from GERC. Renewable energy integration is proposed through proper and accurate load forecast by real time monitoring of substations, feeders and RES generation.

Main application

Peak load management, outage management, and power quality management are proposed by implementing automated metering infrastructure (AMI) for industrial, commercial and residential consumers.

Other applications

Load forecasting and asset management are proposed. Load forecasting, peak power management and outage management are considered at utility level. Renewable energy integration at Patan Solar Park and few roof top installations are also envisaged.

Scenario for estimated costs and benefits

The ROI is proposed to be realized through benefits on account of reduction in AT&C losses from 12.44% to around 8.44% in Naroda and from 21.69% to 15% in Deesa; savings in peak power purchase cost by reduction of peak load by up to 5% in both areas; reduction in transformer failure rate from 16.52% to 8% in Deesa area; and reduction in number of outages, meter reading cost, cost of payment collection, etc. Based on projected savings the payback period is likely to be around 2 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

IRL2

Smart green circuits. ESB Networks - Smart grid demonstration project

Leading organization

ESB Networks (IE)

Total budget
€2,000,000

Description
This project aims to enable the creation of smart green circuits, through the implementation of technology to reduce distribution losses, improve continuity with self healing loops, optimally use distribution connected generation, evaluate and optimize system voltages and power factors and investigate optimal system sectionalisation and power flows.

Main application
Smart Network Management

Other applications
Integration of DER, Integration of Large Scale RES

Policy goals
Additional RES hosting power in the grid/maximum power load Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Percentage reduction of electricity losses

IRL3
Smart Networks Communications

Leading organization
ESB Networks

Description
There is a need for a reliable, high speed, always available communications infrastructure to connect medium voltage control and monitoring points to the ESB backbone communications infrastructure. Current distribution automation and MV control of ESB Networks is using GPRS communications. However the limitations of GPRS in terms of cost and reliability have been encountered and a clear need for a DSO operated communications solution has been identified. ESB Networks is currently deploying a 4G (WiMax technology which also has LTE capability either as an alternative or complementary system) test network in Galway. This is connecting downline reclosers and voltage regulators initially for monitoring purposes and if proving suitable reliable and secure, for control purposes. A base station (covering 2 quadrants) and multiple consumer premises devices (4G modems at connected devices) are being deployed to establish whether the intended coverage is delivered. The project is addressing whether the data capacity, speed and latency needs of network management are met using this technology in addition to the cyber security implications. Additionally, other “final mile” radio technology solutions are being trialled to connect remote devices to the 4G network where they are beyond its reach.

Main application
Smart Network Management

Other applications
Integration of DER

Policy goals
Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid maximum power load; Percentage reduction of electricity losses

IRL6
DSO/TSO Project re operation and control of voltage

Leading organization
Eirgrid

Description
To develop the operational protocols to maximise the capability of embedded wind farms to manage the voltage both on the Dx and Tx system.

Main application
Integration of DER

Other applications
Smart Network Management

Policy goals
Additional RES hosting power in the grid /maximum power load; Increased internal transfer capacity between TSOs or DSOs

ITA2
POI Energie Rinnovabili e Risparmio Energetico 2007-2013. " Programma Reti Intelligenti MT": Progetto Campania, Progetto Puglia, Progetto Calabria, and Progetto Sicilia

Leading organization
Enel Distribuzione SpA

Description
The Inter-regional Operative program (Programma Operativo Interregionale (POI)) , is composed of 4 regional projects (Progetto Campania, Progetto Puglia, Progetto Calabria, Progetto Sicilia) aiming at "increasing the share of renewable energy in the overall consumption, increasing the level of energy efficiency, promoting local development." In this framework, the projects aim at facilitating the integration of Distributed Generation (DG) testing on pilot sites the evolution of the network management options towards an

active/passive system, to maximise the integration of all energy sources in the network. The project focuses on the transformation of the network structure to allow the inclusion of PV plants ranging from 100 kW to 1MW. The distribution network is already fit for the inclusion of a small amount of DG, and the project will increase the hosting capacity (in terms of number and rating of the DG plants). The activity involves portions of the distribution network in all four regions, and at each location, it includes: the preparation of the site (infrastructure), the evolution of the protection schemes with special reference to the sensitivity of the generators to MV network disturbances and the remote tripping of generators from the DSO, innovative voltage regulation systems and meshed distribution system configurations.

Main application

Smart Network Management; Integration of DER

Policy goals

Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load

KOR3

Jeju Test Bed_Smart Renewable

Leading organization

KEPCO, Hyundai Heavy Industries, POSCO ICT

Total budget

$41.2M

Description

Integrating RES for stable system and testing system efficiency with RES and ESS under virtual real-time tariff

Main application

Integration of DER

Scenario for estimated costs and benefits

Deployment costs and benefits from energy cost savings

Policy goals

Additional RES hosting power in the grid/maximum power load; Energy savings

SWE1

Grid4EU

Leading organization

ERDF

Description

Grid4EU is led by a group of European DSOs and aims at testing in real size some innovative system concepts and technologies in order to highlight and help to remove some of the barriers to the smart grids deployment (technical, economic, societal, environmental or regulatory). It focuses on how DSOs can dynamically manage electricity supply and demand, which is crucial for integration of large amounts of renewable energy and empowers consumers to become active participants in their energy choices.

Main application

Smart Network Management; Integration of DER; Aggregation; Smart Metering-Pilot

Policy goals

Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Percentage reduction of electricity losses; Reduced peak load

SWE2

Smart Grid Gotland

Leading organization

GEAB

Total budget

28 MEUR (242 MSEK)

Description

The Smart Grid Gotland R&D demonstration project intends to develop strategies for the planning, construction and operation of a fully developed, large-scale smart grid, including a large share of intermittent production, primarily from wind power in the distribution network. New market models and services will be developed to pave the way for new market players.

Main application

Smart Network Management

Other applications

Integration of DER; Integration of Large Scale RES; Smart Customer and Smart Home; Smart Metering

Scenario for estimated costs and benefits

No net present value calculation is yet available.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE4

Stockholm Royal seaport Active House Pilot

Leading organization

Fortum Distribution AB

Total budget

20 msek

Description

The long-term outcome will be a test apartment, based in Stockholm Royal Seaport, which is part of the solution from the pre-study in the area's housing. The plausibility and attraction of solutions have been deemed to create conditions to expand the number of participating construction companies in next phase. Part solution was to work together with the results from other projects that also have Stockholm Royal Seaport as the test bed. The apartment, which is included in the test installations, will have access to leading technology in smart grids, appliances, information technology and design. They will also be active specifier and designers of new services and products being developed continuously. The results of this project make it possible for companies to develop products and services based on the technology that the project contributed. Researchers and entrepreneurs will be able to assimilate the results from this test apartment to develop their ideas and innovations.

Scenario for estimated costs and benefits

Customer participation in load shift to optimize load factors, impact climate effects and distribution automation systems to increase reliability and reduce losses. Hosting of DER at LV levels.

Policy goals
Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE5
Stockholm Royal seaport demonstration phase

Leading organization
Fortum Distribution AB

Total budget
140 msek

Description
The program will specify, develop, test and evaluate both business and market models, new technical solutions and concepts, information and communications technology (ICT) as well as aspects of data security. As described in the pre-study, a set of scenario tests will be the cohesive factor in this work. In order to make it happen, an R&D platform needs to be developed and implemented as enablement for overall system tests, which will also include aspects of behavioural science. The first phase of the program and this application will focus on scenarios related to active end-customers and reliability of the future grid, where the urban smart grid in a new way creates opportunities for interaction with the end customer in order to, e.g., reduce CO_2 emissions. Also, scenarios for increased reliability and availability in a future urban smart grid will be tested.

Scenario for estimated costs and benefits
Customer participation in load shift to optimize load factors, impact climate effects and distribution automation systems to increase reliability and reduce losses. Hosting of DER at LV levels.

Policy goals
Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE6
Smart Grid Hyllie

Leading organization
E.ON

Total budget
200 MSEK for 2011 through 2014. Additional years to follow.

Description
Hyllie - A test bed for developing solutions for a future transformed energy in the city of Malmö. The project includes: (a) Customer control of heat and electricity consumption, (b) Smart home and Smart building solutions, (c) Distributed generation – electricity and heat, (d) Smart grid solutions – DH and electricity, (e) Sustainable mobility solutions – gas and emobility, (f) CO_2 and resource efficient energy supply, and (g) Distributed energy storage.

Main application
Aggregation (Demand Response, VPP)

Other applications
Smart Customer and Smart Home

Scenario for estimated costs and benefits
Costs for 2011-2014 estimated to 200 MSEK (basically more or less all investments are to be seen as consumables); Analyses regarding benefits to be done in evaluation phase

Policy goals
Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA2
Pacific Northwest Division Smart Grid Demonstration Project

Leading organization
Battelle Memorial Institute

Total budget
$177,642,503

Description

This demonstration will validate new technologies; provide two-way communication between distributed generation, storage and demand assets, and the existing grid infrastructure; quantify Smart Grid costs and benefits; advance interoperability standards and cyber security approaches; and validate new business models. More than 20 types of responsive Smart Grid assets will be tested across six regional and utility operational objectives at 15 unique distribution sites operated by 12 utilities across five states and three climatic regions. A base of Smart Grid technology serving more than 60,000 customers will be installed, validated, and operated. All use classes are represented in the demonstration including residential, commercial, industrial, and irrigation customers. The demonstration will develop a single integrated Smart Grid incentive-signaling approach and will test and validate its ability to continuously coordinate the responses of Smart Grid assets to meet a wide range of operational objectives. It will also engage distributed control so that wind integration problems are mitigated. Micro-grid islanding will also be evaluated for its potential to enhance reliability for customers and relieve energy demand.

Main application

Smart Network Management

Other applications

Integration of DER; Integration of Large Scale RES; Aggregation (Demand Response, VPP); Smart Customer and Smart Home; Smart Metering

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

2.9.2 Transmission Level

ID	Name
FRA5	PREMIO-('Production Répartie, Enr et MDE, Intégrées et Optimisées', or, in English, 'Integration and Optimization of DG, DSM and Renewable Energies')
FRA6	Greenlys
GER8	Regenerative Modellregion Harz
IRL5	DS3
IRL6	DSO/TSO Project re operation and control of voltage
IRL9	Wind Security Assessment Tool
SWE2	Smart Grid Gotland
SWE4	Stockholm Royal seaport Active House Pilot
SWE5	Stockholm Royal seaport demonstration phase
SWE6	Smart Grid Hyllie

FRA5

PREMIO-('Production Répartie, Enr et MDE, Intégrées et Optimisées', or, in English, 'Integration and Optimization of DG, DSM and Renewable Energies')

Leading organization

CAPENERGIE – France

Description

PREMIO is primarily a technical proposal created to address the following goals: – to develop a dynamic demand-response specifically for peak shaving purposes, – to increase the flexibility of the power system, – to promote a new energy culture which encourages energy efficiency, – to integrate distributed generation and particularly renewable energies, – to reduce greenhouse gas emissions from polluting power plants, especially during peak load times, and – to manage regional electrical energy from a wide range of local actors. PREMIO combines the control of installed distributed resources for optimal use with an awareness campaign promoting demand side management (DSM). The PREMIO platform includes a virtual power plant (VPP) which integrates approximately fifty distributed resources, all of which are distributed generation, storage technologies and customers' curtailable loads. The limited number of installations suggests that project results will be qualitative rather than quantitative.

Main application

Integration of DER; Aggregation

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Energy savings; Reduced peak load

FRA6

GreenLys

Leading organization

ERDF

Description

GreenLys is a systemic smart grid project which includes: - DER - Consumption - Networks (DSO & TSO). Main Goals: - decrease of greenhouse gases - control of energy bill - introduction and control of DER on LV networks - behavior of consumers, with incentive and innovative new offers - aggregator functions. Innovations: - Smart management of grid (seal-healing, smart metering using Linky infrastructure,...) - Demand side management, demand/response, energy saving and new offers (using boxes linked to Linky Infrastructure, tariffs, dynamic prices policy...) – Investments; Impact on studies and development of networks (especially for DSOs)

Main application

Smart Network Management; Integration of DER; Smart Customer and Smart Home

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Reduced peak load

GER8

Regenerative Modellregion Harz

Leading organization

Fraunhofer IWES

Total budget

16,000,000

Description
There have been three main goals: (1.) Development of a virtual power plant control center for renewable energies, (2) Marketing of electric energy produced by the virtual power plant, and (3) Support of grid operation by network monitoring and ancillary services.

Main application
Smart Network Management

Other applications
Smart Network Management

Scenario for estimated costs and benefits
Not possible

Policy goals
Additional RES hosting power in the grid /maximum power load

IRL5
DS3

Leading organization
Eirgrid

Description
EirGrid's DS3 programme is developing solutions to the challenges associated with increasing levels of renewable generation, particularly with regard to secure power system operation, as we work to achieve the 2020 renewable targets. The combination of the All island Grid Studies, EirGrid's Grid 25, the facilitation of renewables studies, and a comprehensive analysis of the long-term needs of the power system conducted in 2011, form the backbone of our plans to facilitate the 40% target by 2020. The main operational areas that need to be addressed are the management of the system frequency, balancing the system in real time, managing system voltage and ensuring the compliance of plant with the Grid Code requirements. The work programme includes enhancing the portfolio performance, developing new operational policies and system tools to efficiently use the plant portfolio to the best of its capabilities, and regularly reviewing the needs of the system as the portfolio capability evolves.

Main application
Integration of Large Scale RES

Other applications
Smart Network Management; Aggregation (Demand Response, VPP); Integration of DER

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES; Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Percentage reduction of electricity losses; Reduced peak load; Additional interconnection capacity (specify HVDC and HVAC)

IRL6

DSO/TSO Project re operation and control of voltage

Leading organization

Eirgrid

Description

To develop the operational protocols to maximise the capability of embedded wind farms to manage the voltage both on the Dx and Tx system.

Main application

Integration of DER

Other applications

Smart Network Management

Policy goals

Additional RES hosting power in the grid /maximum power load; Increased internal transfer capacity between TSOs or DSOs

IRL9

Wind Security Assessment Tool

Leading organization

Eirgrid

Description

WSAT. Wind Security Assessment Tool. One of the most critical tools used in the ControlCentres is the wind forecast tool. This tool collates data from several different third-party wind forecasters to provide an estimate of how much wind generation will be available over the coming hours and days. When there are very high wind generation levels, particularly during times of low electrical demand, wind generation may need to be curtailed. This is done using the wind dispatch tool, which sends out instructions to the wind farms electronically, taking into account various market rules and priorities. The stability of the power system is affected by wind generation, and so to study this in realtime, a Wind Security Assessment Tool (WSAT) was introduced into the Dublin Control Centre in

2010. WSAT provides a real-time transient stability and voltage stability assessment of the current state of the power system. This allows the Grid Controllers to monitor system stability in real-time and take corrective actions as appropriate.

Main application
Integration of DER

Other applications
Integration of Large Scale RES

Policy goals
Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load

SWE2
Smart Grid Gotland

Leading organization
GEAB

Total budget
28 MEUR (242 MSEK)

Description
The Smart Grid Gotland R&D demonstration project intends to develop strategies for the planning, construction and operation of a fully developed, large-scale smart grid, including a large share of intermittent production, primarily from wind power in the distribution network. New market models and services will be developed to pave the way for new market players.

Main application
Smart Network Management

Other applications
Integration of DER; Integration of Large Scale RES; Smart Customer and Smart Home; Smart Metering

Scenario for estimated costs and benefits
No net present value calculation is yet available.

Policy goals
Additional demand side management power managed in the grid/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of

consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE4

Stockholm Royal seaport Active House Pilot

Leading organization

Fortum Distribution AB

Total budget

20 msek

Description

The long-term outcome will be a test apartment, based in Stockholm Royal Seaport, which is part of the solution from the pre-study in the area's housing. The plausibility and attraction of solutions have been deemed to create conditions to expand the number of participating construction companies in next phase. Part solution was to work together with the results from other projects that also have Stockholm Royal Seaport as the test bed. The apartment, which is included in the test installations, will have access to leading technology in smart grids, appliances, information technology and design. They will also be active specifier and designers of new services and products being developed continuously. The results of this project make it possible for companies to develop products and services based on the technology that the project contributed. Researchers and entrepreneurs will be able to assimilate the results from this test apartment to develop their ideas and innovations.

Scenario for estimated costs and benefits

Customer participation in load shift to optimize load factors, impact climate effects and distribution automation systems to increase reliability and reduce losses. Hosting of DER at LV levels.

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE5

Stockholm Royal seaport demonstration phase

Leading organization

Fortum Distribution AB

Total budget

140 msek

Description

The program will specify, develop, test and evaluate both business and market models, new technical solutions and concepts, information and communications technology (ICT) as well as aspects of data security. As described in the pre-study, a set of scenario tests will be the cohesive factor in this work. In order to make it happen, an R&D platform needs to be developed and implemented as enablement for overall system tests, which will also include aspects of behavioural science. The first phase of the program and this application will focus on scenarios related to active end-customers and reliability of the future grid, where the urban smart grid in a new way creates opportunities for interaction with the end customer in order to, e.g., reduce CO_2 emissions. Also, scenarios for increased reliability and availability in a future urban smart grid will be tested.

Scenario for estimated costs and benefits

Customer participation in load shift to optimize load factors, impact climate effects and distribution automation systems to increase reliability and reduce losses. Hosting of DER at LV levels.

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE6

Smart Grid Hyllie

Leading organization

E.ON

Total budget

200 MSEK for 2011 through 2014. Additional years to follow.

Description

Hyllie - A test bed for developing solutions for a future transformed energy in the city of Malmö. The project includes: (a) Customer control of heat and electricity consumption, (b) Smart home and Smart building solutions, (c) Distributed generation – electricity and heat, (d) Smart grid solutions – DH and electricity, (e) Sustainable mobility solutions – gas and emobility, (f) CO_2 and resource efficient energy supply, and (g) Distributed energy storage.

Main application

Aggregation (Demand Response, VPP)

Other applications

Smart Customer and Smart Home

Scenario for estimated costs and benefits

Costs for 2011-2014 estimated to 200 MSEK (basically more or less all investments are to be seen as consumables); Analyses regarding benefits to be done in evaluation phase

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

2.9.3 T&D Interface

ID	Name
CAN1	PowerShift Atlantic
FRA6	Greenlys
GER8	Regenerative Modellregion Harz
IND2	UGVCL, Gujarat
IRL5	DS3
IRL6	DSO/TSO Project re operation and control of voltage
SWE1	Grid4EU
SWE2	Smart Grid Gotland
SWE6	Smart Grid Hyllie

USA2 Pacific Northwest Division Smart Grid Demonstration Project

CAN1

PowerShift Atlantic

Leading organization

New Brunswick Power

Total budget

$32,053,000

Description

PowerShift Atlantic is a collaborative research project led in partnership by Natural Resources Canada through the Clean Energy Fund, New Brunswick Power, Saint John Energy, Maritime Electric, Nova Scotia Power, New Brunswick System Operator, the Universi

Main application

Aggregation (Demand Response, VPP)

Other applications

Smart Network Management; Integration of DER; Integration of Large Scale RES

Scenario for estimated costs and benefits

The impact of the Virtual Power Plant (VPP) solution is established by comparing the differences in generation utilization and the associated production costs by evaluating the system with, and without, the VPP. This will be used to determine:-Peak reduc

Policy goals

Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES)

FRA6

GreenLys

Leading organization

ERDF

Description

GreenLys is a systemic smart grid project which includes: - DER - Consumption - Networks (DSO & TSO). Main Goals: - decrease of greenhouse gases - control of energy bill - introduction and control of DER on LV networks - behavior of consumers, with incentive and innovative new offers - aggregator functions. Innovations: - Smart management of grid (seal-healing, smart metering using Linky infrastructure,...) - Demand side management, demand/response, energy saving and new offers (using boxes linked to Linky Infrastructure, tariffs, dynamic prices policy...) – Investments; Impact on studies and development of networks (especially for DSOs)

Main application
Smart Network Management; Integration of DER; Smart Customer and Smart Home

Policy goals
Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Energy savings; Reduced peak load

GER8
Regenerative Modellregion Harz

Leading organization
Fraunhofer IWES

Total budget
16,000,000

Description
There have been three main goals: (1.) Development of a virtual power plant control center for renewable energies, (2) Marketing of electric energy produced by the virtual power plant, and (3) Support of grid operation by network monitoring and ancillary services.

Main application
Smart Network Management

Other applications
Smart Network Management

Scenario for estimated costs and benefits
Not possible

Policy goals
Additional RES hosting power in the grid /maximum power load

IND2
UGVCL, Gujarat

Leading organization
UGVCL

Total budget

$9,200,000

Description

UGVCL has proposed the pilot project in Naroda of Sabarmati circle which is an industrial and residential area and Deesa of Palanpur circle which is an agricultural area covering 20,524 consumers in Naroda and 18,898 agricultural unmetered consumers in Deesa-II division and accounting for input energy of around 1700 MU (Naroda : 374.52 MU & Deesa : 1321.27 MU for 2010-11). The functionalities of peak load management, outage management, power quality management are proposed by implementing automated metering infrastructure (AMI) for industrial, commercial and residential consumers. Committee also observed that some additional functionalities like load forecasting and asset management are also proposed and functionalities of load forecasting, peak power management and outage management are also considered at utility level which will impact all consumers of utility (i.e., 27 lac consumers) indirectly. Renewable energy integration has been proposed to be carried out at Patan Solar Park and few roof top installations at some of the universities. The pilot project proposes to introduce TOU tariff with approvals from GERC. Renewable energy integration is proposed through proper and accurate load forecast by real time monitoring of substations, feeders and RES generation.

Main application

Peak load management, outage management, and power quality management are proposed by implementing automated metering infrastructure (AMI) for industrial, commercial and residential consumers.

Other applications

Load forecasting and asset management are proposed. Load forecasting, peak power management and outage management are considered at utility level. Renewable energy integration at Patan Solar Park and few roof top installations are also envisaged.

Scenario for estimated costs and benefits

The ROI is proposed to be realized through benefits on account of reduction in AT&C losses from 12.44% to around 8.44% in Naroda and from 21.69% to 15% in Deesa; savings in peak power purchase cost by reduction of peak load by up to 5% in both areas; reduction in transformer failure rate from 16.52% to 8% in Deesa area; and reduction in number of outages, meter reading cost, cost of payment collection, etc. Based on projected savings the payback period is likely to be around 2 years.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration

and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

IRL5

DS3

Leading organization

Eirgrid

Description

EirGrid's DS3 programme is developing solutions to the challenges associated with increasing levels of renewable generation, particularly with regard to secure power system operation, as we work to achieve the 2020 renewable targets. The combination of the All island Grid Studies, EirGrid's Grid 25, the facilitation of renewables studies, and a comprehensive analysis of the long-term needs of the power system conducted in 2011, form the backbone of our plans to facilitate the 40% target by 2020. The main operational areas that need to be addressed are the management of the system frequency, balancing the system in real time, managing system voltage and ensuring the compliance of plant with the Grid Code requirements. The work programme includes enhancing the portfolio performance, developing new operational policies and system tools to efficiently use the plant portfolio to the best of its capabilities, and regularly reviewing the needs of the system as the portfolio capability evolves.

Main application

Integration of Large Scale RES

Other applications

Smart Network Management; Aggregation (Demand Response, VPP); Integration of DER

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES; Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Percentage reduction of electricity losses; Reduced peak load; Additional interconnection capacity (specify HVDC and HVAC)

IRL6

DSO/TSO Project re operation and control of voltage

Leading organization

Eirgrid

Description
To develop the operational protocols to maximise the capability of embedded wind farms to manage the voltage both on the Dx and Tx system.

Main application
Integration of DER

Other applications
Smart Network Management

Policy goals
Additional RES hosting power in the grid /maximum power load; Increased internal transfer capacity between TSOs or DSOs

SWE1
Grid4EU

Leading organization
ERDF

Description
Grid4EU is led by a group of European DSOs and aims at testing in real size some innovative system concepts and technologies in order to highlight and help to remove some of the barriers to the smart grids deployment (technical, economic, societal, environmental or regulatory). It focuses on how DSOs can dynamically manage electricity supply and demand, which is crucial for integration of large amounts of renewable energy and empowers consumers to become active participants in their energy choices.

Main application
Smart Network Management; Integration of DER; Aggregation; Smart Metering-Pilot

Policy goals
Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Percentage reduction of electricity losses; Reduced peak load

SWE2
Smart Grid Gotland

Leading organization
GEAB

Total budget

28 MEUR (242 MSEK)

Description

The Smart Grid Gotland R&D demonstration project intends to develop strategies for the planning, construction and operation of a fully developed, large-scale smart grid, including a large share of intermittent production, primarily from wind power in the distribution network. New market models and services will be developed to pave the way for new market players.

Main application

Smart Network Management

Other applications

Integration of DER; Integration of Large Scale RES; Smart Customer and Smart Home; Smart Metering

Scenario for estimated costs and benefits

No net present value calculation is yet available.

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

SWE6

Smart Grid Hyllie

Leading organization

E.ON

Total budget

200 MSEK for 2011 through 2014. Additional years to follow.

Description

Hyllie - A test bed for developing solutions for a future transformed energy in the city of Malmö. The project includes: (a) Customer control of heat and electricity consumption, (b) Smart home and Smart building solutions, (c) Distributed generation – electricity and heat, (d) Smart grid solutions – DH and electricity, (e) Sustainable mobility solutions – gas and emobility, (f) CO_2 and resource efficient energy supply, and (g) Distributed energy storage.

Main application
Aggregation (Demand Response, VPP)

Other applications
Smart Customer and Smart Home

Scenario for estimated costs and benefits
Costs for 2011-2014 estimated to 200 MSEK (basically more or less all investments are to be seen as consumables); Analyses regarding benefits to be done in evaluation phase

Policy goals
Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

USA2
Pacific Northwest Division Smart Grid Demonstration Project

Leading organization
Battelle Memorial Institute

Total budget
$177,642,503

Description
This demonstration will validate new technologies; provide two-way communication between distributed generation, storage and demand assets, and the existing grid infrastructure; quantify Smart Grid costs and benefits; advance interoperability standards and cyber security approaches; and validate new business models. More than 20 types of responsive Smart Grid assets will be tested across six regional and utility operational objectives at 15 unique distribution sites operated by 12 utilities across five states and three climatic regions. A base of Smart Grid technology serving more than 60,000 customers will be installed, validated, and operated. All use classes are represented in the demonstration including residential, commercial, industrial, and irrigation customers. The demonstration will develop a single integrated Smart Grid incentive-signaling approach and will test and validate its ability to continuously coordinate the responses of Smart Grid assets to meet a wide range of operational objectives. It will also engage distributed control so that wind integration problems are mitigated. Micro-grid islanding will also be evaluated for its potential to enhance reliability for customers and relieve energy demand.

Main application

Smart Network Management

Other applications

Integration of DER; Integration of Large Scale RES; Aggregation (Demand Response, VPP); Smart Customer and Smart Home; Smart Metering

Scenario for estimated costs and benefits

Advanced metering infrastructure (AMI) and distribution automation systems

Policy goals

Additional demand side management power managed in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional RES hosting power in the grid/maximum power load; Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Increased number of consumers participating in electricity markets and in energy efficiency measures; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Reduced peak load

2.10 Increased Internal Transfer Capacity Between TSOs or DSOs (Coordination and Interconnection)

Summaries of projects in the inventory selected as contributing to the policy goal of "Increased Internal Transfer Capacity Between TSOs or DSOs (Coordination and Interconnection)" are presented in order of their physical application domains: Distribution Level, Transmission Level, and T&D Interface. Within each domain, project summaries are presented in alphanumerical order of their unique Project IDs.

2.10.1 Distribution Level

ID	Name
CAN2	Zone de réseau interatif
GER3	MeRegio
IRL6	DSO/TSO Project re operation and control of voltage
SUI2	GridBox
USA9	Smart Grid Project

CAN2

Zone de réseau interatif

Leading organization

Hydro-Québec Distribution

Total budget

$25,585,000

Description

Hydro-Québec has a distribution grid evolution plan which includes progressive smart grid technology implementation. To ensure successful implementation, Hydro-Québec decided to create a smart zone where the technologies will be deployed in order to improve energy efficiency and grid performance. The first smart grid technology to be deployed in the zone will be a DMS (Distribution Management System) with integrated voltage and reactive power control linked to the current distribution grid control system. In 2008, Hydro-Québec introduced a simple voltage regulation and reactive power control system to the Pierre-Boucher substation to reduce energy use, grid losses and greenhouse gases (GHGs). Hydro-Québec estimates that a VVO (Volt Var Optimization) type smart system would allow it to increase energy efficiency compared to a VVC (Volt Var Control) type system. The second smart grid technology involves charging stations with and without intelligence for electric vehicles, scheduled for installation between 2010 and 2012. The agreement between Hydro-Québec and Mitsubishi calls for testing of up to 30 all-electric iMiEV type vehicles. The goal of the project is to better understand charging and driving behaviors, as well as charging infrastructure needs at 120V/15A, 240V/15-30A, and direct current charging (50kW).

Main application

Electric Vehicles and Vehicle2Grid Applications

Other applications

Smart Metering

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Increased internal transfer capacity between TSOs or DSOs

GER3
MeRegio

Leading organization
EnBW Energie Baden-Wuerttemberg AG

Total budget
24 Mio. EUR

Description
Around 1,000 private and industrial customers have been equipped with smart meters and a dynamic price signal. The goal of the project was to evaluate whether and how customers react on dynamic prices which have been calculated according to the availability of renewable energy.

Main application
Integration of Large Scale RES

Other applications
Smart Customer and Smart Home

Scenario for estimated costs and benefits
The project was for research/demonstration. Up to now there is no business case behind.

Policy goals
Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Energy savings; Reduced peak load; Increased internal transfer capacity between TSOs or DSOs

IRL6
DSO/TSO Project re operation and control of voltage

Leading organization
Eirgrid

Description
To develop the operational protocols to maximise the capability of embedded wind farms to manage the voltage both on the Dx and Tx system.

Main application
Integration of DER

Other applications
Smart Network Management

Policy goals
Additional RES hosting power in the grid /maximum power load; Increased internal transfer capacity between TSOs or DSOs

SUI2
GridBox

Leading organization
SCS AG, Switzerland

Description
A monitoring and control infrastructure for the future electricity grids will be defined and tested. It consists of intelligent low-cost “GridBoxes.” The goal is high operational grid stability with masses of decentralized electricity infeeds and flexible consumer equipment in an automated end-consumer market considering minimization of costs. The concept foresees communication between the GridBoxes with the goal to detect the regional grid state including all information of elements within the regional grid.

Main application
Smart Network Management

Other applications
Integration of DER

Policy goals
Additional demand side management power managed in the grid/maximum power load; Reduced peak load Increased internal transfer capacity between TSOs or DSOs

USA9
Smart Grid Project

Leading organization
Southern Company Services, Inc.

Total budget
$330,130,482

Description
This project involves integrated upgrades of the distribution, transmission, and grid management systems. Major efforts include automation of major parts of the distribution system, automation of selected transmission lines, and new equipment for many substations.

Main application
Smart Network Management

Scenario for estimated costs and benefits
Distribution and substation automation

Policy goals
Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Percentage reduction of electricity losses; Increased internal transfer capacity between TSOs or DSOs

2.10.2 Transmission Level

ID	Name
CAN2	Zone de réseau interatif
GER3	MeRegio
IRL6	DSO/TSO Project re operation and control of voltage
USA9	Smart Grid Project

CAN2
Zone de réseau interatif

Leading organization
Hydro-Québec Distribution

Total budget
$25,585,000

Description
Hydro-Québec has a distribution grid evolution plan which includes progressive smart grid technology implementation. To ensure successful implementation, Hydro-Québec decided to create a smart zone where the technologies will be deployed in order to improve energy efficiency and grid performance. The first smart grid technology to be deployed in the zone will be a DMS (Distribution Management System) with integrated voltage and reactive power control linked to the current distribution grid control system. In 2008, Hydro-Québec introduced a simple voltage regulation and reactive power control system to the Pierre-Boucher substation to reduce energy use, grid losses and greenhouse gases (GHGs). Hydro-Québec estimates that a VVO (Volt Var Optimization) type smart system would allow it to increase energy efficiency compared to a VVC (Volt Var Control) type system. The second

smart grid technology involves charging stations with and without intelligence for electric vehicles, scheduled for installation between 2010 and 2012. The agreement between Hydro-Québec and Mitsubishi calls for testing of up to 30 all-electric iMiEV type vehicles. The goal of the project is to better understand charging and driving behaviors, as well as charging infrastructure needs at 120V/15A, 240V/15-30A, and direct current charging (50kW).

Main application

Electric Vehicles and Vehicle2Grid Applications

Other applications

Smart Metering

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Increased internal transfer capacity between TSOs or DSOs

GER3

MeRegio

Leading organization

EnBW Energie Baden-Wuerttemberg AG

Total budget

24 Mio. EUR

Description

Around 1,000 private and industrial customers have been equipped with smart meters and a dynamic price signal. The goal of the project was to evaluate whether and how customers react on dynamic prices which have been calculated according to the availability of renewable energy.

Main application

Integration of Large Scale RES

Other applications

Smart Customer and Smart Home

Scenario for estimated costs and benefits

The project was for research/demonstration. Up to now there is no business case behind.

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Energy savings; Reduced peak load; Increased internal transfer capacity between TSOs or DSOs

IRL6

DSO/TSO Project re operation and control of voltage

Leading organization

Eirgrid

Description

To develop the operational protocols to maximise the capability of embedded wind farms to manage the voltage both on the Dx and Tx system.

Main application

Integration of DER

Other applications

Smart Network Management

Policy goals

Additional RES hosting power in the grid /maximum power load; Increased internal transfer capacity between TSOs or DSOs

USA9

Smart Grid Project

Leading organization

Southern Company Services, Inc.

Total budget

$330,130,482

Description

This project involves integrated upgrades of the distribution, transmission, and grid management systems. Major efforts include automation of major parts of the distribution system, automation of selected transmission lines, and new equipment for many substations.

Main application

Smart Network Management

Scenario for estimated costs and benefits

Distribution and substation automation

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Percentage reduction of electricity losses; Increased internal transfer capacity between TSOs or DSOs

2.10.3 T&D Interface

ID	Name
CAN2	Zone de réseau interatif
GER3	MeRegio
IRL6	DSO/TSO Project re operation and control of voltage
USA9	Smart Grid Project

CAN2

Zone de réseau interatif

Leading organization

Hydro-Québec Distribution

Total budget

$25,585,000

Description

Hydro-Québec has a distribution grid evolution plan which includes progressive smart grid technology implementation. To ensure successful implementation, Hydro-Québec decided to create a smart zone where the technologies will be deployed in order to improve energy efficiency and grid performance. The first smart grid technology to be deployed in the zone will be a DMS (Distribution Management System) with integrated voltage and reactive power control linked to the current distribution grid control system. In 2008, Hydro-Québec introduced a simple voltage regulation and reactive power control system to the Pierre-Boucher substation to reduce energy use, grid losses and greenhouse gases (GHGs). Hydro-Québec estimates that a VVO (Volt Var Optimization) type smart system would allow it to increase energy efficiency compared to a VVC (Volt Var Control) type system. The second smart grid technology involves charging stations with and without intelligence for electric vehicles, scheduled for installation between 2010 and 2012. The agreement between Hydro-Québec and Mitsubishi calls for testing of up to 30 all-electric iMiEV type vehicles.

The goal of the project is to better understand charging and driving behaviors, as well as charging infrastructure needs at 120V/15A, 240V/15-30A, and direct current charging (50kW).

Main application
Electric Vehicles and Vehicle2Grid Applications

Other applications
Smart Metering

Policy goals
Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Energy savings; Percentage reduction of electricity losses; Increased internal transfer capacity between TSOs or DSOs

GER3
MeRegio

Leading organization
EnBW Energie Baden-Wuerttemberg AG

Total budget
24 Mio. EUR

Description
Around 1,000 private and industrial customers have been equipped with smart meters and a dynamic price signal. The goal of the project was to evaluate whether and how customers react on dynamic prices which have been calculated according to the availability of renewable energy.

Main application
Integration of Large Scale RES

Other applications
Smart Customer and Smart Home

Scenario for estimated costs and benefits
The project was for research/demonstration. Up to now there is no business case behind.

Policy goals
Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Energy savings; Reduced peak load; Increased internal transfer capacity between TSOs or DSOs

IRL6
DSO/TSO Project re operation and control of voltage

Leading organization
Eirgrid

Description
To develop the operational protocols to maximise the capability of embedded wind farms to manage the voltage both on the Dx and Tx system.

Main application
Integration of DER

Other applications
Smart Network Management

Policy goals
Additional RES hosting power in the grid /maximum power load; Increased internal transfer capacity between TSOs or DSOs

USA9
Smart Grid Project

Leading organization
Southern Company Services, Inc.

Total budget
$330,130,482

Description
This project involves integrated upgrades of the distribution, transmission, and grid management systems. Major efforts include automation of major parts of the distribution system, automation of selected transmission lines, and new equipment for many substations.

Main application
Smart Network Management

Scenario for estimated costs and benefits
Distribution and substation automation

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES); Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Percentage reduction of electricity losses; Increased internal transfer capacity between TSOs or DSOs

2.11 Additional Interconnection Capacity, Specify HVDC and HVAC (Coordination and Interconnection)

Summaries of projects in the inventory selected as contributing to the policy goal of "Additional Interconnection Capacity, Specify HVDC and HVAC (Coordination and Interconnection)" are presented in order of their physical application domains: Distribution Level, Transmission Level, and T&D Interface. Within each domain, project summaries are presented in alphanumerical order of their unique Project IDs.

2.11.1 Distribution Level

No technologies assigned to this level.

2.11.2 Transmission Level

ID	Name
IRL5	DS3

IRL5

DS3

Leading organization

Eirgrid

Description

EirGrid's DS3 programme is developing solutions to the challenges associated with increasing levels of renewable generation, particularly with regard to secure power system operation, as we work to achieve the 2020 renewable targets. The combination of the All island Grid Studies, EirGrid's Grid 25, the facilitation of renewables studies, and a comprehensive analysis of the long-term needs of the power system conducted in 2011, form the backbone of our plans to facilitate the 40% target by 2020. The main operational areas that need to be addressed are the management of the system frequency, balancing the system in real time, managing system voltage and ensuring the compliance of plant with the Grid Code requirements. The work programme includes enhancing the portfolio performance, developing new operational policies and system tools to efficiently use the plant portfolio to the best of its capabilities, and regularly reviewing the needs of the system as the portfolio capability evolves.

Main application

Integration of Large Scale RES

Other applications

Smart Network Management; Aggregation (Demand Response, VPP); Integration of DER

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES; Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Percentage reduction of electricity losses; Reduced peak load; Additional interconnection capacity (specify HVDC and HVAC)

2.11.3 T&D Interface

ID	Name
IRL5	DS3

IRL5
DS3

Leading organization

Eirgrid

Description

EirGrid's DS3 programme is developing solutions to the challenges associated with increasing levels of renewable generation, particularly with regard to secure power system operation, as we work to achieve the 2020 renewable targets. The combination of the All island Grid Studies, EirGrid's Grid 25, the facilitation of renewables studies, and a comprehensive analysis of the long-term needs of the power system conducted in 2011, form the backbone of our plans to facilitate the 40% target by 2020. The main operational areas that need to be addressed are the management of the system frequency, balancing the system in real time, managing system voltage and ensuring the compliance of plant with the Grid Code requirements. The work programme includes enhancing the portfolio performance, developing new operational policies and system tools to efficiently use the plant portfolio to the best of its capabilities, and regularly reviewing the needs of the system as the portfolio capability evolves.

Main application

Integration of Large Scale RES

Other applications

Smart Network Management; Aggregation (Demand Response, VPP); Integration of DER

Policy goals

Estimated reductions of CO_2 (via reduced energy losses, energy savings, integration of RES; Additional RES hosting power in the grid/maximum power load; Additional DER hosting power input in the grid (incl. EV and storage)/maximum power load; Additional demand side management power managed in the grid/maximum power load; Duration and frequency of interruptions (e.g., SAIDI, SAIFI, CAIDI, etc.); Percentage reduction of electricity losses; Reduced peak load; Additional interconnection capacity (specify HVDC and HVAC)