EEGI Member States Initiative

Contribution of National Projects to the SET Plan

Smart Grid Week 2012

Session Strategies and Current Developments in Austria and International

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Content

- EEGI Roadmap
- EEGI Member States Initiative
- Austrian Contribution
- Conclusions

EEGI Objectives

- The European Electricity Grid Initiative (EEGI) - is one of the European Industrial Initiatives under the Strategic Energy Technology Plan (SET-Plan)
- The EEGI has been created to accelerate the development of the electricity networks of the future in Europe, the Smart Grids
- The EEGI will conduct the extra RD&D efforts needed to develop new solutions to overcome different barriers
  - Technology barriers
  - RD&D organization barriers
  - Market failures and distortions: missing incentives
  - Public barriers

EEGI Smart Grid Model

SMART GRIDS
Functional level

Level 5: Smart Customers
Customers aware and actively participating

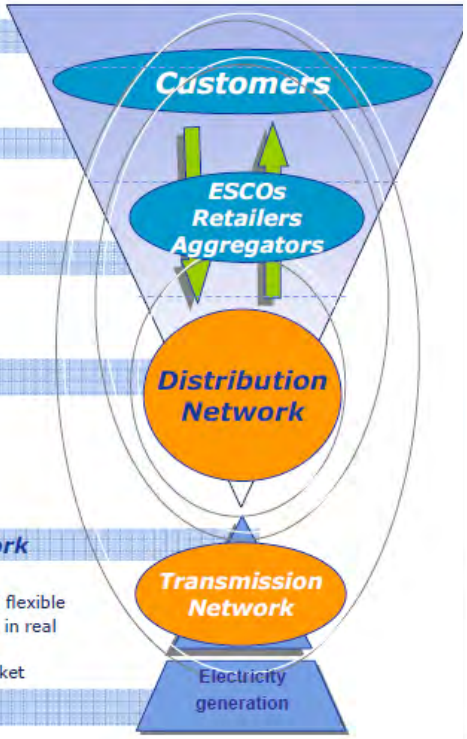
Level 4: Smart Energy Management
Management of end-use energy efficiency, aggregation, retail

Level 3: Smart Integration
Renewable energy, DG, electric vehicles, electricity storage and aggregation

Level 2: Smart network and processes
More automated MV distribution networks with self healing capabilities.
Monitored and controlled LV networks
IT supported monitoring process

Level 1: Smart Pan-European Transmission network
Novel approaches to develop a pan-European grid
Affordable technologies to make the transmission system more clever and flexible
Critical building blocks to operate the interconnected transmission system in real time and reliably
Market simulation techniques to develop a single European electricity market

Level 0: New generation technologies




entsoe
Reliable Sustainable Connected
EDSO
for smart grids

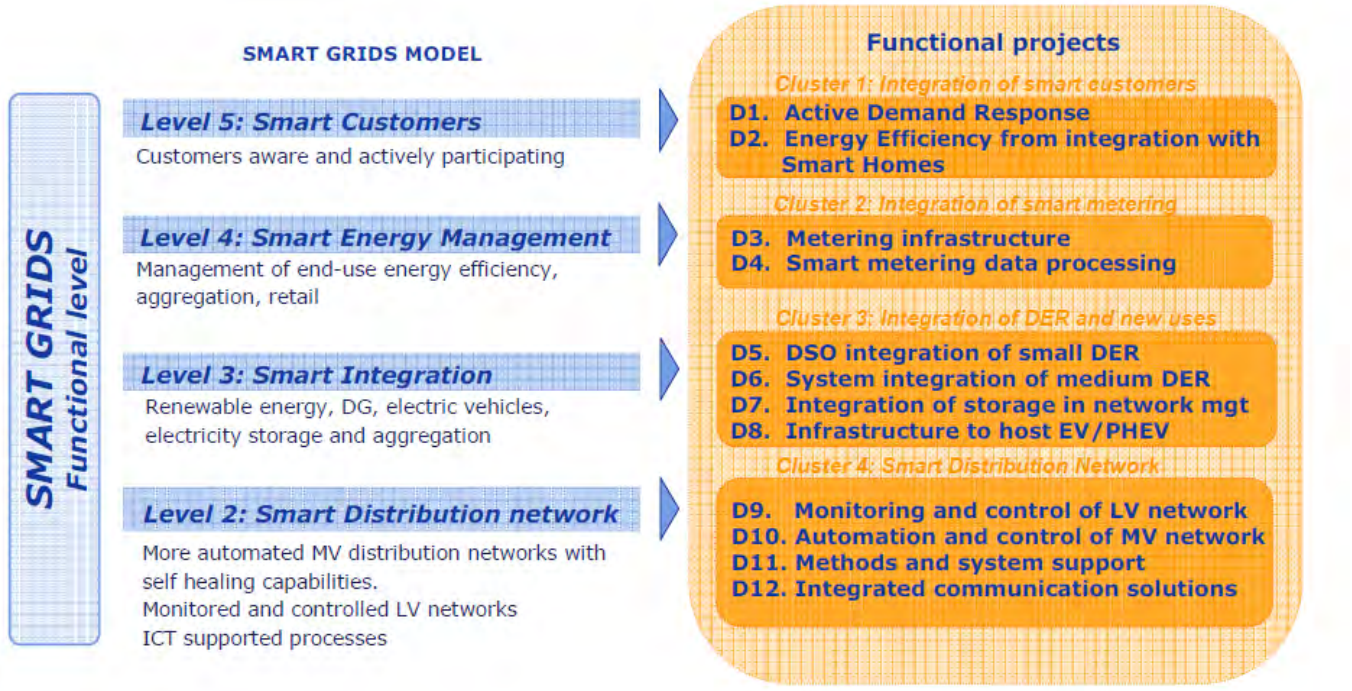
The European Electricity Grid Initiative (EEGI)

Roadmap 2010-18
and
Detailed Implementation Plan 2010-12

May 25th 2010

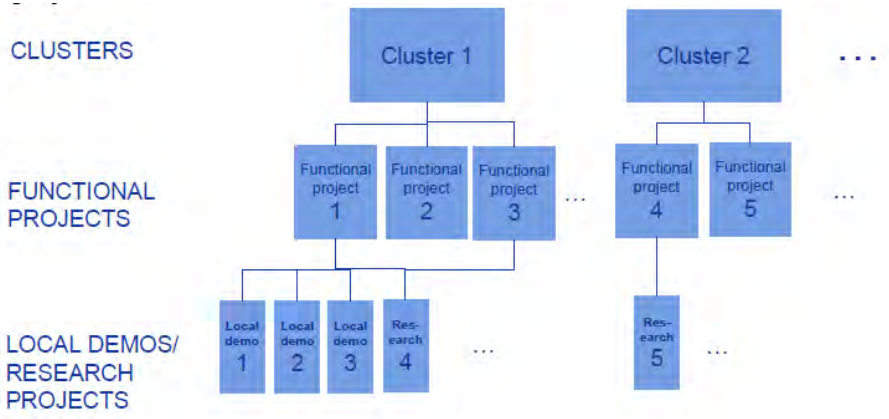
http://www.smartgrids.eu/web/node/20

EEGI Smart Grid Model and functional projects



- A functional project is a functional description and definition of demonstration and/or research activities needed to reach specific functional goals, and includes budget figures and KPIs to monitor the performance

Framework of functional projects



	Local Demo project A	Local Demo project B	Research project C	...
Functional project 1	X	X	X	
Functional project 2		X		...
Functional project 3	X		X	
....	...			

- Cluster (set of functional projects)
- Functional projects (set of physical projects demonstration and/or research)
- Local demonstration and research projects

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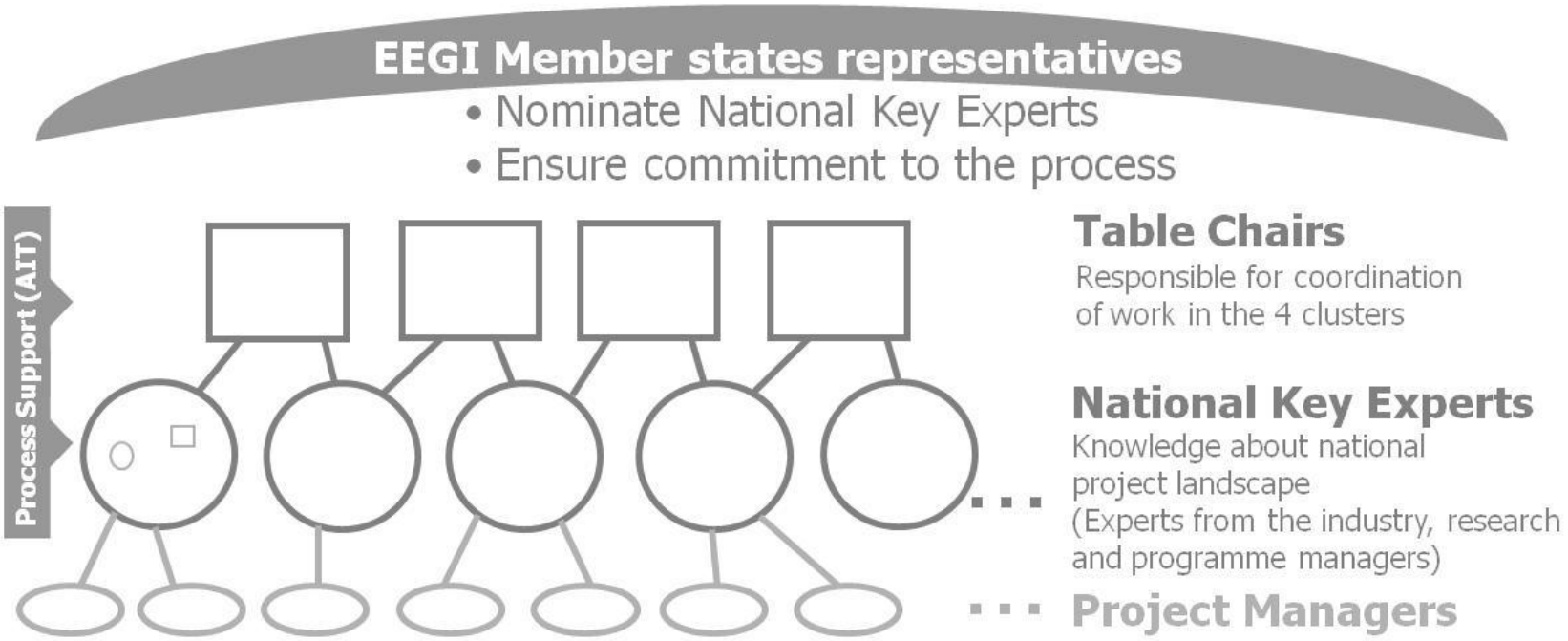
Objectives

- to define the process and pathway towards joint programming for EEGI functional projects
  - memberstate level
  - European commission level
- to bring the functional projects (demonstrators) into life according to EEGI priority list
- to start a community building process

Framework of analysis and main outcome

- Resources provided by 22 Member States and supported by the Austrian Federal Ministry for Transport, Innovation and Technology (BMVIT) and ERA-Net SG
- Nominated experts identified EEGI relevant Smart Grid projects (EC-funded as well as national) – Improvement of JRC data base
- Descriptions of functional projects developed by table chairs and agreed by national experts (based on EEGI Roadmap)
- Allocation of Smart Grid projects to functional projects by national experts
- Comparison of submitted information with the objectives in the description of functional projects (= gap analysis) by table chairs

Cooperation Structure – Network of Experts



Descriptions of functional projects

D5 Integration of small renewable in the distribution network

Main/general objective:
The main objective of the project is to demonstrate, if **low voltage (LV) network hosting capacity** for small scale distributed energy resources (SDER) can be economically increased by monitoring and control of small scale distributed energy resources as well as by enhanced network planning and operation strategies. It will bring related solutions from "small pilot stage" to a maturity level sufficient for full deployment.

This functional project needs a set of local, national demonstration projects to cover different conditions needed for a comprehensive test of solutions. The conditions include different generation technologies (e.g. solar, micro CHP, Wind) as well as different network topologies (e.g. rural/urban) as well as cultural and climatic conditions (e.g. north/south). It is estimated that for this functional project the number of local projects, that will be needed to cover the different conditions all over Europe should be 4 – 6, considering that a single local project will cover different conditions.

Objectives and Benefits:

- Increase the low voltage grid hosting capacity for small scale distributed generation resources mainly based on renewable energy resources (e.g. PV)
- Better monitoring of LV network operating conditions
- Optimization of the utilization of existing LV network assets
- Increase/Maintain the network availability/power quality in presence of high penetration of small scale DER
- Reduction in SDER cut-off due to congestion (power curtailment)
- Cost reduction for medium scale DER integration
- Enable increased participation of grid users in network operation/ energy markets
- Reduction in network losses
- Interaction of LV distribution networks with high share of small scale DER with medium voltage networks
- Containment of costs compared with a "business as usual" approach (network reinforcement)
- Open new business opportunities related to "ancillary services" (e.g. voltage control, reactive power provision) for the low voltage network
- Create new business opportunities for equipment manufacturers
- Give a technological leading position to European equipment manufacturers
- Reduction of CO_2, direct and indirect

D5 Integration of small renewable in the distribution network	
Component	• "Grid friendly" behaviour of PV inverters (ancillary services like e.g. reactive and active power control, frequency control, harmonics filtering) • Improved network assets (e.g. distribution transformers with on load tap changing) • Network monitoring systems and related communication infrastructure supporting small scale DER integration in low voltage networks • Interfacing with new generation of controlled power converters for small production units and loads
Network	• Better exploitation of the existing low voltage infrastructure in order to increase hosting capacity for small scale DER • Monitoring of LV networks (e.g. smart meter as monitoring device) • Voltage control and congestion management in LV network by reactive and active power management • Generation-load balancing • Improved power quality (reduction of voltage unbalance, flicker and harmonics) • Grid losses reduction by SDER • Intelligent LV network planning for an optimal integration of small scale DER • ICT infrastructure in low voltage networks for monitoring and control of SDER
Market/Models	• Reducing costs of SDER integration - cost benefit analysis • Necessary incentives/market mechanisms (e.g. for ancillary services) • New market rules necessary for successful deployment of small scale DER • Coordination between technical grid control and market based power balancing (e.g. technical virtual power plant vs. market based virtual power plant) • Real-time markets and customer behaviour • Market design for all involved stakeholders and interaction: Equipment manufacturers, ICT and system architecture companies, retailers, generators, consumers and prosumers on LV-level, DSOs, regulators
Customer Acceptance	• Enabling and encouraging stronger and more direct involvement of consumers in their energy usage and management, while ensuring non discrimination • Testing demand response mechanisms in low voltage networks • Explore how new tariffs can alter customer behaviour • Integration of home automation systems in network management for demand side management and demand response purpose
Framework	• New frameworks for network interconnection, interconnection standards • Investigation of mandatory requirements for SDER vs. remunerated ancillary services • Device and system level interoperability (e.g. communication interfaces) • Standardisation based on IEC 61850 and 61970/61968 (CIM) • What regulatory changes would be needed (for project execution and deployment)? • European and national (local demonstrator) energy policies and energy strategies • Recommendations and solutions to remove barriers considering economic, regulatory, societal and cultural aspects

Mapping of Smart Grid projects

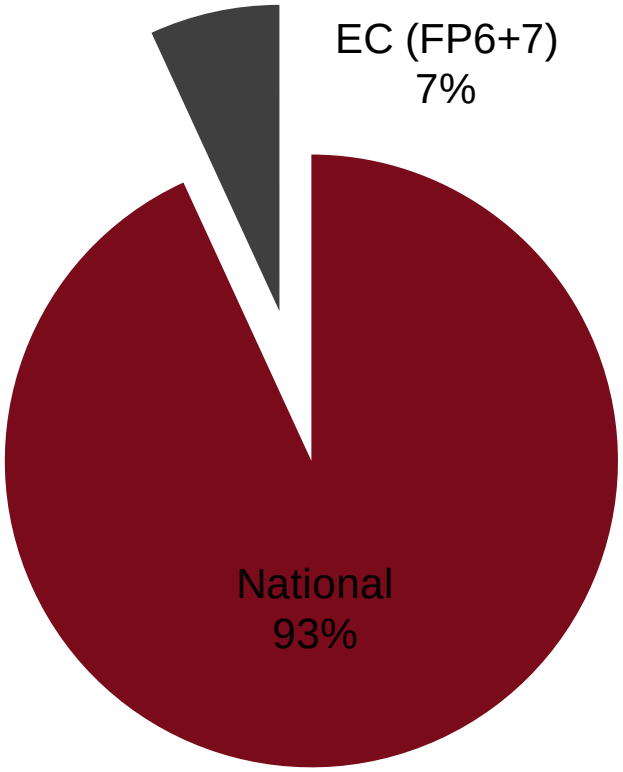
- 203 EEGI relevant Smart Grid projects identified by national key experts
- Allocation of Smart Grid projects to functional projects by national key experts
  - Cluster 1 Smart customers: 92 projects
  - Cluster 2 Smart metering: 59 projects
  - Cluster 3 DER integration: 146 projects
  - Cluster 4 Smart Distribution: 113 projects
- Austrian Projects are mainly addressing cluster 1 and 3

Project and investment overview

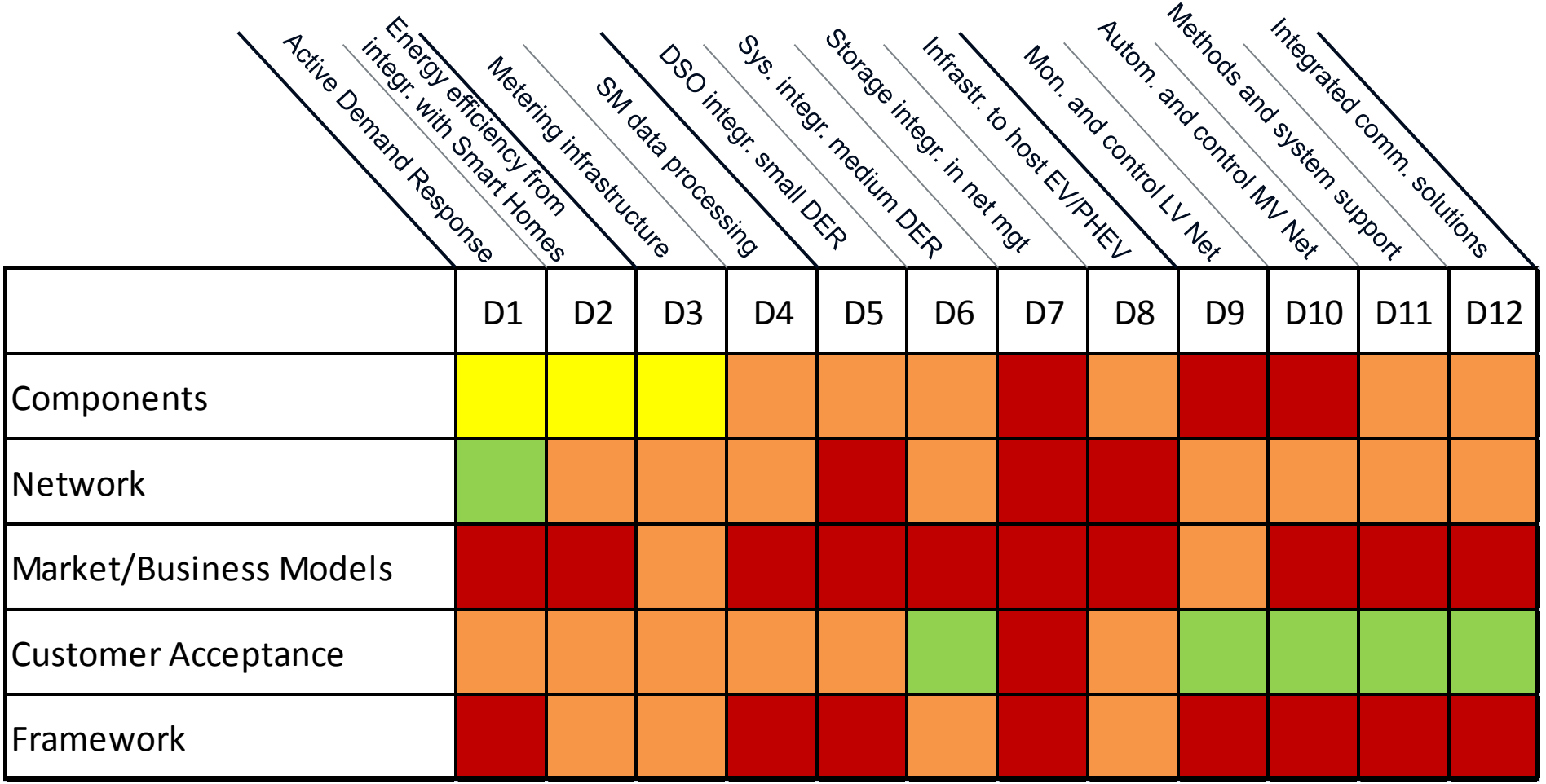
- 203 European projects in total
  - 111 projects with significant demo part; 15 projects EC-funded, 189 MS-funded
- Budget for SG projects on national level (industry + public funding): € 2.5bn acc. to JRC (excl. € 2.5bn smart-meter roll-outs)
- Budget for SG projects on EU level (industry + EC funding): € 184m acc. to JRC (FP6 and FP7 funding)

→ Lots of results but lack of European-wide coordination

Smart Grid investment



Overview: progress of functional projects



	Defined objectives of functional projects fulfilled or not relevant
	Significant number of projects; other European countries would considerably benefit from dissemination
	Objectives partially met or likely to be met in existing projects within the next two years
	Objectives not addressed at all or in very few projects

Summary of gap analysis

- Framework needed for new structures: market mechanisms, common standards, regulatory framework, data privacy
- Cost-benefit analysis to accelerate the implementation of innovative technologies
- Gaps on the technological side: LV grid monitoring and simulation models, storage, network security, integration of ICT systems and their verification, etc
- Many results of projects expected in the next two years; in particular regarding e-mobility, active demand side management, voltage control concepts
- Dissemination of achieved results, know-how transfer to speed up implementation

Recommendation: Structure for upcoming calls

- For well progressed functional projects:
  - FP7: Maintaining „family-of-project concept“s – focus on know-how dissemination
  - Dedicated technology research
- For less progressed functional projects:
  - Dedicated system and technology support (research) depending on the progress of individual functional projects
- Many gaps could be solved on national level and via transnational programmes (cooperation of few countries struggling with similar issues, eg wind, small PV-integration)

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Austrian Contribution

Distributed Generation mainly based on renewable sources in **Distribution Networks**

Distribution, Network Planning and Operation
Control concepts for the integration of distributed generation (voltage control, virtual power plant,…)

Demand Side Management
- Load management
- Customer response
- Customer Integration

Integrated planning and operation of distributed networks with consumer integration (load management, e-mobility;…) with a high share of distributed generation

Austrian research focus in electricity networks

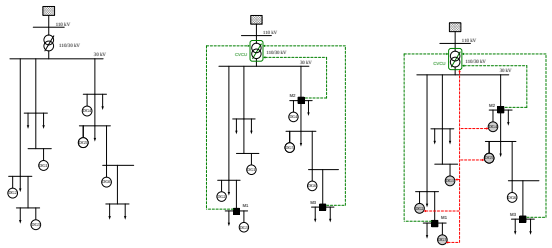
Austrian Contribution

- Among other individual projects:
  - Model Region Vorarlberg
  - Smart Grid Model Region Salzburg
  - Smart Grid Pioneer Region Upper Austria

Project chain - DG DemoNet (MV Network)

Influence of distributed generation on the paramater of power quality

DG DEMO NETZ KONZEPT



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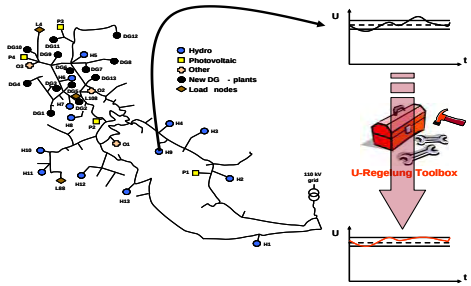


Design of voltage control concepts to increase the hosting capacity of networks, Technical and economical assessement

Improvement of concepts, advanced planning tools

DG DEMO NETZ VALIDIERUNG

Development, field test, analysis and validation – proof of concept

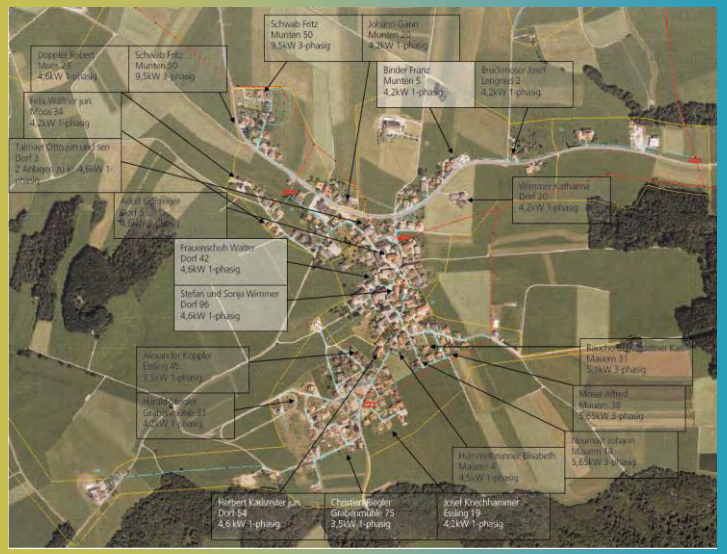
Project DG DemoNet Smart LV Grid

Smart LV Grid Concepts
Smart planning, monitoring, control approaches

Co-Simulation
ICT and power network
as design platform

Photovoltaic
on every 2nd roof

Field test area
Low voltage grid section



validation of solutions for future problems

e-vehicels
in every 2nd garage

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Conclusions

- A high share of knowledge and experiences are gained on a national level (national funded projects)
- International cooperation to share experiences and to investigate replicability and scalability of individual solutions is necessary
- Austrian projects can and will play an important role for the SET Plan

- Final Report:
- http://www.gridplus.eu/Documents/EEGI_Member_States_Initiative_-_Final_Report.pdf
- http://www.smartgrids.eu/documents/EEGI/EEGI_Member_States_Initiative_-_Final_Report.pdf

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