International Energy Agency

Implementing Agreement on Demand-Side Management Technologies and Programmes

2013 annual report

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2013 Annual Report

Edited by Anne Bengtson
Executive Secretary
IEA Demand-Side Management Programme

January 2014

Foreword

This report is the twentieth Annual Report of the IEA Implementing Agreement on Demand-Side Management Technologies and Programmes, summarising the activities of the twentieth year.

The report was published by the Executive Committee and was edited by the Executive Secretary, with contributions from the Chairman and the Operating Agents.

Stockholm, January 2014

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Overview of the IEA and the IEA Demand-Side Management Programme

The International Energy Agency

The International Energy Agency (IEA) is an autonomous agency established in 1974. The IEA carries out a comprehensive programme of energy co-operation among 28 advanced economies, each of which is obliged to hold oil stocks equivalent to 90 days of its net imports.

The aims of the IEA are to:

- Secure member countries' access to reliable and ample supplies of all forms of energy; in particular, through maintaining effective emergency response capabilities in case of oil supply disruptions.
- Promote sustainable energy policies that spur economic growth and environmental protection in a global context – particularly in terms of reducing greenhouse-gas emissions that contribute to climate change.
- Improve transparency of international markets through collection and analysis of energy data.
- Support global collaboration on energy technology to secure future energy supplies and mitigate their environmental impact, including through improved energy efficiency and development and deployment of low-carbon technologies.
- Find solutions to global energy challenges through engagement and dialogue with non-member countries, industry, international organisations and other stakeholders.

To attain these goals, increased co-operation between industries, businesses and government energy technology research is indispensable. The public and private sectors must work together, share burdens and resources, while at the same time multiplying results and outcomes.

The multilateral technology initiatives (Implementing Agreements) supported by the IEA are a flexible and effective framework for IEA member and non-member countries, businesses, industries, international organisations and non-government organisations to research breakthrough technologies, to fill existing research gaps, to build pilot plants, to carry out deployment or demonstration programmes – in short to encourage technology-related activities that support energy security, economic growth and environmental protection.

More than 6,000 specialists carry out a vast body of research through these various initiatives. To date, more than 1,000 projects have been completed. There are currently 41 Implementing Agreements (IAs) working in the areas of:

- Cross-Cutting Activities (information exchange, modelling, technology transfer)
- End-Use (buildings, electricity, industry, transport)
- Fossil Fuels (greenhouse-gas mitigation, supply, transformation)
- Fusion Power (international experiments)
- Renewable Energies and Hydrogen (technologies and deployment)

The IAs are at the core of a network of senior experts consisting of the Committee on Energy Research and Technology (CERT), four working parties and three expert groups. A key role of the CERT is to provide leadership by guiding the IAs to shape work programmes that address current energy issues productively, by regularly reviewing their accomplishments, and suggesting reinforced efforts where needed. For further information on the IEA, the CERT and the IAs, please consult www.iea.org/techinitiatives.

The Implementing Agreement on Demand Side Management Technologies and Programmes (DSM IA) belongs to the End-Use category above.

IEA Demand Side Management Programme

The Demand-Side Management (DSM) Programme, which was initiated in 1993,

deals with a variety of strategies to reduce energy demand. The following 15 member countries, and two Sponsors have been working to identify and promote opportunities for DSM during 2013:

Austria	Italy	Spain	Sponsors:
Belgium	Korea	Sweden	The Regulatory
Finland	Netherlands	Switzerland	Assistance Project (RAP)
France	New Zealand	United Kingdom	The European
India	Norway	United States	Copper Institute

Programme Vision: In order to create more reliable and more sustainable energy systems and markets, demand side measures should be the first considered and actively incorporated into energy policies and business strategies.

Programme Mission: To deliver to our stakeholders useful information and effective guidance for crafting and implementing DSM policies and measures, as well as technologies and applications that facilitate energy system operations or needed market transformations.

A total of 23 projects or "Tasks" have been initiated since the beginning of the DSM Programme. The overall program is monitored by an Executive Committee consisting of representatives from each contracting party to the Implementing Agreement. The leadership and management of the individual Tasks are the responsibility of Operating Agents. These Tasks and their respective Operating Agents are:

Task 1 – International Database on Demand-Side Management & Evaluation Guidebook on the Impact of DSM and EE for Kyoto's GHG Targets – *Completed*
Harry Vreuls, Netherlands Enterprise Agency, the Netherlands

Task 2 – Communications Technologies for Demand-Side Management – *Completed*
Richard Formby, EA Technology, United Kingdom

Task 3 – Co-operative Procurement of Innovative Technologies for Demand-Side Management – *Completed*
Hans Westling, Promandat AB, Sweden

Task 4 – Development of Improved Methods for Integrating Demand-Side Management into Resource Planning – *Completed*
Grayson Heffner, EPRI, United States

Task 5 – Techniques for Implementation of Demand-Side Management Technology in the Marketplace – *Completed*
Juan Comas, FECSA, Spain

Task 6 – DSM and Energy Efficiency in Changing Electricity Business Environments – *Completed*
David Crossley, Energy Futures, Australia Pty. Ltd., Australia

Task 7 – International Collaboration on Market Transformation – *Completed*
Verney Ryan, BRE, United Kingdom

Task 8 – Demand-Side Bidding in a Competitive Electricity Market – *Completed*
Linda Hull, EA Technology Ltd, United Kingdom

Task 9 – The Role of Municipalities in a Liberalised System – *Completed*
Martin Cahn, Energie Cites, France

Task 10 – Performance Contracting – *Completed*
Hans Westling, Promandat AB, Sweden

Task 11 – Time of Use Pricing and Energy Use for Demand Management Delivery – *Completed*
Richard Formby, EA Technology Ltd, United Kingdom

Task 13 – Demand Response Resources – *Completed*
Ross Malme, RETX, United States

Task 14 – Market Mechanisms for White Certificates Trading – *Completed*
Antonio Capozza, CESI, Italy

Task 15 – Network-Driven DSM – *Completed*
David Crossley, Energy Futures Australia Pty. Ltd, Australia

Task 16 – Competitive Energy Services (Energy Contracting ESCo Services)
Jan W. Bleyl, Graz Energy Agency, Austria

Task 17 – Integration of DSM, Energy Efficiency, Distributed Generation, Renewable Energy Sources and Energy Storages
Seppo Kärkkäinen, Elektraflex Oy, Finland

Task 18 – Demand Side Management and Climate Change – *Completed*
David Crossley, Energy Futures Australia Pty. Ltd, Australia

Task 19 – Micro Demand Response and Energy Saving – *Completed*
Linda Hull, Barry Watson, John Baker, EA Technology Ltd., United Kingdom

Task 20 – Branding of Energy Efficiency
Balawant Joshi, ABPS Infrastructure Private Limited, India

Task 21 – Standardisation of Energy Saving Calculations
Harry Vreuls, Netherlands Enterprise Agency, the Netherlands

Task 22 – Energy Efficiency Portfolio Standards – *Completed*
Balawant Joshi, ABPS Infrastructure Private Limited, India

Task 23 – The Role of the Demand Side in Delivering Effective Smart Grids
Linda Hull, EA Technology, United Kingdom

Task 24 – Closing the Loop - Behaviour change in DSM: from theory to policies and practice
Sea Rotmann, New Zealand, and Ruth Mourik, the Netherlands

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Also, visit the IEA DSM website: www.ieadsm.org

CHAPTER I

Chairman's Report

The year 2013 was a year with both positive and negative elements for the Implementing Agreement on Demand Side Management.

The downside is the fact that France will leave the Implementing Agreement, and that the five-year extension has not been granted.

The positive elements are much bigger though when it comes to the Implementing Agreement's strategic direction, the work plan and membership.

Strategic Direction

We have drafted a strategic plan for the upcoming years, and are busy finalising the work plan.

The umbrella for the strategic plan is the concept of Integrated Demand Side Management. Three pillars working together to achieve optimal use of energy produced:

- Distributed Generation focused on prosumers and their contribution to secured and affordable energy supply, which in turn will lead to the integration of new options of renewable energy production and storage. Improved models will help us to link these technologies to existing and more traditional energy production and distribution.
- Demand Response focused on an improved connection with the end user. With the role out of smart grids, an improved set of options to influence load shape and load shift is entering the market. As the use of this technology still leads to privacy debates, continued research to define options and benefits is only growing.
- Energy Efficiency, often referred to as the "biggest source of stable energy supply", focused on creating important tools for DSM Programme members, the IEA and the energy community as a whole.

Work Plan

- The DSM University, a long time wish of our previous Chair Hans Nilsson, is getting into shape. With the support of the European Copper Institute we are ready to launch an online DSM course. This outreach will also contain webinars held in collaboration with our sponsor, the Regulatory Assistance Project (RAP).
- Tasks focused on the concept of Integrated Demand Side Management are being extended and new ones are being started. Keep track of our work on the DSM programme and new developments on our website (www.ieadsm.org).
- The dissemination of our results will continue and we will keep looking for new avenues for sharing our work.
  - Before an Executive Committee meeting we have the tradition of holding a one-day workshop, where national and international colleagues in the DSM field meet and exchange ideas and information. In 2013, these very successful workshops were held in Utrecht (The Netherlands) and Luzern (Switzerland). The Executive

Committee is looking forward to the workshop in Wellington (New Zealand) next year.

- A framework for a new website was defined in the 3rd quarter of 2013.
- Executive Committee members participated in a number of international meetings and conferences both inside and outside the IEA.

Membership

- New Zealand re-joined.
- South Africa has announced it will become a member.
- The European Copper Institute has become a very active member. They made it possible to connect to DSM professionals in China. Strengthening those ties will be a goal for 2014. They are also helping the Implementing Agreement take new steps in our outreach activities.

The importance of this Implementing Agreement is that it is more focused on improving the uptake of new technology and business models for energy efficiency coming to the market. Collaboration with other parts of the IEA is key for this success. In 2013, the DSM Implementing Agreement worked on collaboration with ISGAN, 4E, EGRD and the Future Buildings Forum. This led to contacts and collaboration between Operating Agents in different Implementing Agreements. In addition, input was given to IEA publications, and Executive Committee members participated in reviews of these documents.

At the end of 2012, a number of reports were published by the Implementing Agreement. Based on these publications the Executive Committee decided this year to continue Tasks on energy services, behaviour change and distributed generation.

Task 24, Closing the Loop, published a major document in November of 2013 "Most of the time we do what we do most of the time. And sometimes we do something new. Analysis of case studies, DSM Task 24".

Readers are warned in advance that this document has the nickname "The Monster" because of its size. At the same time, this is the most extensive report in the field and is a must-read for everybody that wants to use knowledge of real-life behaviour change programmes and policies in a structured way, or to simply read about some cracking stories from around the world.

I hope that you, as a reader of this document, are challenged by its content. And the beauty of it all: you don't have to wait for the 2014 edition, you can contact us anytime through the website or via social media.

Rob Kool, Chairman

Highlights & Achievements

The major accomplishments of the Tasks that were on-going in 2013 are summarised below. Additional details can be found in Chapter III.

Task 16 – Competitive Energy Services (Energy Contracting, ESCo Services) Phase III: Energy Efficiency and Demand Response Services.

Task 16 Phase III started in July 2012 and will be finalised in June 2015. The goals of Task 16 – Phase III are to contribute to the development and implementation of innovative and competitive energy efficiency and demand response services.

Objectives

- Continue the DSM Energy Services Expert Platform
- Support and follow up country-specific national implementation activities in order to foster ESCo market development
- Design, elaborate and test innovative Energy-Contracting and financing models and publish them
- Elaborate and assess the feasibility of business models for Demand Response energy services
- Use the expert platform as a competence centre for energy and demand response services for international and national dissemination and assistance services (e.g. coaching, training courses, publications) in the field of Energy-Contracting and to contribute to a "DSM Centre of Excellence".

The underlying goal is to increase understanding of Energy-Contracting as a tool to implement energy efficiency projects: Pros and cons, potentials, limits and added values of ESCo products in comparison to in-house implementation.

Key accomplishments in 2013:

During 2013, the Think Tank has worked on a variety of topics leading to publications and presentations at various national and international events. Some of it is new work is still in progress.

Outlines of current or planned Think Tank topics include:

- The Role of 'Facilitators' to Enable Energy Efficiency Projects
- Simplified Measurement & Verification in combination with + Quality Assurance Instruments Options for Energy Savings in ESCo Projects
- Demand Response Services – Business Cases and Development as Energy Services. An Opportunity for ESCos?
- Integrated Energy Contracting (IEC): A New Energy Service Business Model to Combine Energy Efficiency and (Renewable) Supply

During 2013, Task 16 has produced a number of publications and given presentations at various conferences and workshops to disseminate and discuss the Task results. Furthermore, stakeholder workshops were organised in conjunction with each project meeting to discuss Energy-Contracting topics relevant to the host country of the meeting.

More information on Task 16. See also Chapter III.

Task 20 – Branding of Energy Efficiency

The Task was initiated in November 2009 and the first Experts meeting was held in December 2009, to launch the Task. Task work started in 2010. However, the Task was suspended in March 2011 and was resumed in January 2013. The Operating Agent had

submitted a revised Work Plan which was approved by the ExCo. The OA has already initiated the work on developing 6 to 7 case studies on best practices in branding of energy efficiency. These case studies will be used to identify the best practices in branding of energy efficiency and will be part of the report on "Best Practices in Branding Energy Efficiency" (Subtask 5). The Operating Agent will complete the report on Subtask 5 and present the report at the Executive Committee meeting in March 2014.

Task 21 – Standardisation of Energy Savings Calculations

The Task was initiated in April 2009 and will be finalised in April 2014.

The overall aim of Task 21 is to identify basic concepts, calculation rules and systems for Energy Savings Calculations (ESC) standards. Additionally, a methodology will be developed to nominate and describe the several Demand Response products. Within this framework of basic concept and calculation rules, the relationship to reduction of the environmental impacts in greenhouse gas emissions from energy savings will also be incorporated. The Task will also explore how and by what type of organisations these standards could be used and improved to increase international comparable evaluation of policies and measures.

Three primary objectives for the Task are to:

- Summarise and compare the current methods and standards used for determining energy use, energy demand and energy and emissions savings from energy efficiency actions and policies;
- Identify the organisations that are and could be responsible for use and maintenance of such methods and standards; and
- Recommendations how existing methods, standards and resources can be expanded and/or used for comparing different countries and international efficiency policies and actions.

Different national and international standardisation bodies are involved in the Task work. The Task has close co-operation with CEN, the European Standardisation body, who is working on the development of standards on energy efficiency. Working relations have also been established with the European Joint Research Centre that supports the European Commission for the development of methods to report on the development of energy efficiency in EU countries.

Key accomplishment in 2013

During 2013 the following reports were produced:

(1) Harmonised Energy Savings Calculations for selected end-use technologies, key elements and practical formulas;

(2) Guidelines for Harmonised Energy Savings Calculations;

(3) Roadmaps for improved Harmonised Energy Savings Calculations

Task 21 will formally close at the end of April 2014.

More information about Task 21. See also Chapter III.

Task 23: The Role of the Demand Side in Delivering Effective Smart Grids

Task 23 started in June 2012 and will continue until the end of May 2014.

The aim of Task 23 is to identify and where possible quantify the risks and rewards associated with Smart Meters and Smart Grids from the perspective of the consumer, both now and in the future. By identifying the potential risks and rewards the Task will seek to identify best practice guidelines in order to ensure the demand side contributes to the delivery of effective Smart Grids.

Objectives of the Task

- Understand the impact of the structure of energy markets on the interactions of consumers with Smart Grids;
- Explore the impact of technologies on the ability of customers so that they are able (and willing) to contribute towards the successful implementation of Smart Grids;
- Identify the risks and rewards associated with Smart Grids from the perspective of customers;
- Understand the opportunity for stakeholders to influence these risks and rewards;
- Identify tools to minimise the risks and maximise the rewards associated with the Smart Grid from the point of view of the consumer, whilst still satisfying the needs of other stakeholders;
- Understand customer reactions and preferences to offers and opportunities that a smart grid might provide (including local supply); and
- Understand regulatory options, practice and consequences.

The Task focuses on the interaction of policies, technologies and tools with customers, and examines the impact of these interactions on the effectiveness of Smart Grids.

The Task consists of five Subtasks

Subtask 1: Impact of energy markets on the role of customers;

Subtask 2: Interaction between technology and customers;

Subtask 3: Identification of Risks and Rewards associated with Smart Grids;

Subtask 4: Defining offers and programs (tools) to help ensure Smart Grids meet needs of customers; and

Subtask 5: Helping customers to actively engage with Smart Grids – Synthesis and Dissemination of Findings

Key accomplishments in 2013

A number of consumer surveys were reviewed to gauge consumer reaction to Smart Grid related initiatives and other related activities. The consumer surveys cover a range of aspects of energy consumption and attitudes towards sustainable behaviour.

A number of case studies of Smart Grid related pilots have been by provided by the Task experts. These have been analysed to provide an overview of willingness and engagement in Smart Grid related activities.

During 2013 the following reports have been produced:

- Subtask 1 report showing the impact of markets on customers' willingness and ability to participate in Smart Grids
- Subtask 2 report showing the interaction of consumers with a range of Smart Grid related initiatives. The report also includes a summary of 23 surveys of consumer attitudes towards Smart Grid related initiatives and 27 case studies are also presented.

- Subtask 3 report which provides an overview of the way that risks and rewards are perceived by consumers and how these perceptions impact on the decision making process.
- Subtask 4: Report on designing Smart grid Initiatives to maximise customer engagement
- Subtask 5: Production of dissemination materials

More information about Task 23. See also Chapter III

Task 24 – Closing the Loop – Behaviour Change in DSM: From Theory to Practice

Task 24 started its operation in January 2012 and will be finalised in December 2014. However, the Operating Agents have already alerted the Executive Committee members by presenting a proposal for an extension, which will be developed further and presented at the Executive Committee meeting in March 2014. See section on work in preparation.

The main objective of Task 24 is to create a global expert network and design a framework to allow policymakers, funders of DSM programmes, researchers and DSM implementers to:

- Create and enable an international expert network interacting with countries' expert networks
- Provide a helicopter overview of behaviour change models, frameworks, disciplines, contexts, monitoring and evaluation metrics
- Provide detailed assessments of successful applications focusing on participating/sponsoring countries' needs (smart meters, SMEs, transport, building retrofits)
- Create and internationally validated monitoring and evaluation template
- Break down silos and enable mutual learning on how to turn good theory into best practice

The Task is divided into five Subtasks

Subtask1: Helicopter overview of models, frameworks, contexts, case studies and evaluation metrics

Subtask 2: In depth analysis of topics of particular interest to participating countries

Subtask 3: Evaluation tool

Subtask 4: Country-specific project ideas, research priorities, to do/not to do lists and ideas for pilot projects

Subtask 5: Social media expert platform

Key accomplishments in 2013

Task 24 is well on track and has achieved several major milestones this year. These include:

- Published Subtask 1 report: Task 24: "Most of the time we do what we do most of the time. And sometimes we do something new. Analysis of case studies, DSM Task 24."
- Presented the Task widely at some of the largest sustainability and behaviour change conferences in Europe and in the US
- Published the Task widely on social media, blogs, columns, articles and magazines and got a paper accepted for the 2013 eceee Summer Study, the 3rd International

Exergy, Life Cycle Assessment, and Sustainability Workshop & Symposium in Greece, the 2013 Behaviour, Energy and Climate Change conference in Sacramento and the 2013 NERI conference in Wellington, New Zealand

- Created a social expert platform which now has almost 200 experts from 21 countries on it so far
- Developed templates and collected models of understanding behaviour change and pilots, programmes and policies on the four themes of Task 24
- Undertook in-depth case studies in Norway, Austria, Sweden and Switzerland
- Worked with the international expert community towards developing a meaningful evaluation tool for different behaviour changers.

More information about Task 24. See also Chapter III.

Work in Preparation

Task 17: Integration of Demand Side Management Distributed Generation, Renewable Energy Sources and Energy Storage

At the end of 2012, the Finnish Operating Agent of Task 17 retired. During 2013 a new Operating Agent and Co-Operating Agent were identified and approved. In the autumn of 2013, the Task 17 definition for Phase III was developed at a workshop together with experts and interested stakeholders. The Task is expected to start in 2014.

The main objective of Task 17 is to study how to optimally integrate flexible demand with Distributed Generation, Energy Storages and Smart Grids, thereby increasing the value of Demand Response and Distributed Generation, decreasing the problems caused by intermittent distributed generation and reduction of the emissions of the system. The Task will look at integration issues from the system point of view on the grid, market, customer and communities.

Work on the continuation of Task 17-Phase III will concentrate on the impact of such flexibility on various stakeholders and focuses on the lessons learned by evaluating the benefits and costs of existing pilot projects. The Task will address the current role and potential of flexible buildings (residential and commercial) equipped with Distributed Energy Resources – DER (electric vehicles, photovoltaics, electricity, heat storage and heat pumps) and their impacts on the grid and markets. The scalability and applicability of already completed and on-going projects will be explored, especially in the context of specific regional differences and requirements.

The Subtasks in Phase III (in addition to Subtasks 1-4 in Phase I, and Subtasks 5–9 in Phase II will be:

- Subtask 10: Potentials of Flexible Prosumers
- Subtask 11: Impact on Stakeholder
- Subtask 12: Sharing Experiences
- Subtask 13: Conclusion and Recommendation

More information about Task 17. See also Chapter III.

The DSM University

In the Annual Report 2011 there was a survey of articles in technical and scientific journals over the last few years that showed that the DSM concept is widely used but also that it is increasingly being used for very specific purposes. We concluded that there is a DSM (application) for every need and that the needs are different throughout the world depending on actors and market organisation.

We, however, also had to conclude that the literature holds very few references to the IEA, any of the Implementing Agreements or to the IEA Secretariat's analytical work.

The survey confirmed that there is a need for what we have nicknamed "The DSM University" in order to help bring more order to the science itself, but especially to see that all the important work created over the years in the DSM Programme and related Implementing Agreements, is disseminated better.

The DSM Programme has volumes of results, access to leading experts in the field, and a desire to share its knowledge and experiences with a broader audience. What better way to do this than through a "DSM University". The university would reach out to not only targeted audiences, but also those with a general interest in one or more aspects of Demand Side Management. This university concept is in the development stage, but the potential can already be seen by those involved.

We are therefore happy to announce that beginning 2014 we will launch the DSM University on a web-base provided by Leonardo Energy, an initiative by the Copper Alliance, who is a participant in the DSM IA. We will try to serve all those interested regardless of their circumstances in terms of market organisation, tradition, or access to technologies etc.

DSM is unique because it refers to all kinds of technological and behavioural changes to the energy system, that originate from the demand side of the market. The purpose of DSM can be multi-fold, but large-scale energy efficiency improvement is certainly a primary goal. To manage this broad topic, the DSM University will focus on six themes.

1. **Logic of DSM**, in which an overview of DSM and the motivations for its application are presented. The target audience is decision-makers and people who want to see how issues connect to each other.
2. **Governance**, in which incentives, cost/benefit analysis, planning, evaluation and regulation are covered as well as institutional issues, such as barriers and biases.
3. **Energy use (Load Level)**, in which the technologies and measures to promote load level changes including strategic shifts of energy use to reduce carbon emissions are addressed.
4. **Flexibility (Load Shape)**, in which the technologies and applications in Demand Response systems are covered as well as customer benefits and participation.
5. **Integration**, in which putting energy efficiency, storage and RES together into systems are examined.
6. **Business models**, in which the means to deliver energy services is presented.

The university plans to reach its varied audience through multiple venues – webinars, topic reports, issue reports, blogs and e-learning.

More information about the DSM University.

Task 25 – Business models for energy services

Task 25 on Business Models for energy services has been discussed at the Executive Committee meeting in Switzerland, October 2013.

It was decided that this Task is highly needed and may enter the Task Definition Phase, under Task number 25.

The proposal will be further developed during 2014 in close cooperation with the interested countries Austria, Belgium, Finland, Netherlands, Sweden and Switzerland, and will be presented to the Executive Committee in March 2014.

The Task will be tailored to country-specific needs and demands in terms of business models and energy services to be analysed and will therefore focus on a selection of:

- SMEs, industries and households (including communities)
- Load reduction + load shifting + (micro) generation
- Stakeholders:
  1. energy service delivering companies (energy companies, DSOs, intermediaries, ESCOs),
  2. policy makers, governmental authorities,
  3. end users of these services: businesses, home owners.
- The Task will focus on all aspects influencing the impact and societal embedding of business models, e.g. the ecosystem surrounding a business model, including different value-flows.

The objectives/Subtasks of Task 25 will be to:

(1) Identify proven and potential business models for energy services in different countries, with special focus on (how to create conducive) market dynamics and policies in different countries

(2) Analyse acceptance and effectiveness of these energy services and their business models in creating lasting load reduction, shifting or generation and other non-energy benefits and in creating a market

(3) Research success and failure factors in 9 building blocks of business models + market dynamics and policies

(4) Develop a canvas for energy service business models able to mainstream and up-scale and disseminating it through national workshops

(5) Creating roadmaps with necessary policies and strategies of different stakeholders to encourage market creation and mainstreaming of business models in different countries

(6) Creating and maintaining a digital platform for shared learning, best practices and know-how with national sub departments focused on bringing knowledge to the national market, including banks and other funders!

(7) Develop a database including useful contractual formats, business plans etc.

The Task will start during 2014.

Task 24 Extension – Closing the Loop –
Behaviour Change in DSM: From Theory to Practice

The main objective of Task 24 is to create a global expert network and allow various 'behaviour changers' to engage in shared learning and tell their stories of success and failure when turning behaviour change theory into practice. An extension for this Task will go quite a way towards improving our collective, global knowledge and actively designing, implementing, evaluating and iterating successful interventions in policy, programmes and pilots.

The proposed new work will include 5 new Subtasks:

- Subtask 6: Who are the behaviour changers?
- Subtask 7: What do behaviour changers most need to change?
- Subtask 8: What tool do behaviour changers need?
- Subtask 9: How to change the behaviour changers
- Subtask 10: (voluntary) – Implementation, Evaluation, Iteration

Subtask 0: Task Management and Subtask 5: Expert Platform will continue during the extension.

Visibility

Maintaining and increasing visibility of the Programme among its key audience continues to be a major activity of the Executive Committee. The principal tools available at present are the website, the Annual report, the Spotlight Newsletter, the Programme Brochure, Task flyers and social media.

The Annual Report for 2012 was produced and distributed to approx. 250 recipients in January 2013. It pulled together in one substantial document an overview of the Programme's activities and details on each of the individual Tasks.

The Spotlight Newsletter is produced in electronic format only and is designed as a printable newsletter. It is distributed by e-mail to a wide list of contacts. Executive Committee members forward the newsletter to those national contacts that used to receive the printed version or they print and distribute hard copies. Four issues were produced in 2013 and included articles on:

Issue 48 – April 2013

- New Member: European Copper Institute
- Note from the Chairman: Energy Efficiency – Who is afraid of the M word?
- Task 24: The Netherlands holds 3rd Behaviour Change Workshop
- Centre of Excellence: DSM University in the works
- Case Study: Energy Australia Pricing Strategy Study – Australia

Online version of the Spotlight Newsletter – Issue 48

Issue 49 – June 2013

- Task 24: Is the Human Aspect of Energy Use Finally Becoming Interesting to Decision Makers?
- Note from the Chairman: Teaming Up
- Task 17: Providing Users Network Flexibility

- Task 23: Smart Grids and the Consumer
- These Behavioural People – Hans Nilsson

Online version of the Spotlight Newsletter – Issue 49

Issue 50 – October 2013

- State Grid China Hosts ESCo Manager Training on Detailed Economic Calculation and Analyses of ESCo Projects
- Note from the Chairman: The Pros and Cons of being a –Sumer
- Task 16: ESCo Project and Market Development: A Role for Facilitators to Play
- Switzerland: New Energy Strategy Turns to DSM
- Task 21: Standardisation of Energy Savings, Will the US Move Forward?
- Task 23: Assessing Risks and Rewards and the Impact on Smart Grids

Online version of the Spotlight Newsletter – Issue 50

Issue 51 – December 2013

- Task 16: ESCo Project and Market Development: A Role for 'Facilitators' to Play
- A DSM University
- Task 24: Bridging Sectors with Storytelling
- Chairman's Note: Energy Efficiency an Economic Driver

Online version of the Spotlight Newsletter – Issue 51

Four issues of the DSM Spotlight Newsletter will be produced in 2014

At the beginning of a new Task, a flyer is produced to stimulate interest in participating in the Task. When the work is completed, a second flyer is produced reporting on Task activities.

Analysis of visits to the website shows a worldwide readership. In 2012, further improvements to the website were made by adding columns, a calendar, news, an articles section, and improvements were made to the workshops section. In 2013, Bruno De Wachter, Leonardo Energy provided a column titled: "A DSM for every need".

In 2010, the DSM Programme introduced social media to their website. The number of members on the DSM LinkedIn and Facebook groups and the Twitter account is increasing on a daily basis. Strong relationships with other social media energy efficiency mavens have continued to build in 2013 including the DSM Programme being showcased in the largest industrial energy efficiency social media network, the EEIP (www.ee-ip.org), the 'Energy in Demand' blog (www.energyindemand.com) and the ECEEE website via columns (www.eceee.org). Social media will continue to be a strong feature of the DSM Programme in 2014.

During 2013, Dr Sea Rotmann, Visibility Committee Chairman, has continued the development of a communications strategy for the DSM Programme (together with the Chair/s, Secretary, Editor and Programme Advisor), and individual communications and disseminations plans for all current Tasks (with Task Operating Agents). The plan will be presented in 2014.

Participation in the IEA DSM Programme as of December 2013

Task	1		2	3	4	5	6	7	8	9	10	11	13	14	15	16	17	18	19	20	21	22	23	24
Country	ST 8	ST 9														III	II							
Australia			✿		✿		✿						✿		✿			✿						
Austria					✿					✿	✿					■	✿							✿
Belgium	✿	✿					✿									✿								✿
Canada		✿	✿										✿											
Denmark	✿	✿		✿	✿		✿	✿				✿	✿											
EC				✿		✿	✿		✿					✿										
Finland			✿	✿	✿	✿	✿	✿	✿		✿	✿	✿				✿		✿		✿			
France	✿	✿	✿		✿		✿			✿				✿	✿		✿	✿	✿	✿				
Greece							✿		✿		✿	✿							✿					
India															✿			✿	✿	✿		✿		
Italy		✿	✿		✿						✿		✿	✿			✿							✿
Japan	✿		✿		✿		✿				✿		✿											
Korea	✿	✿		✿	✿		✿	✿					✿			✿	✿				✿		✿	
Netherlands	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿		✿	✿		✿		✿		✿	◆
New Zealand															✿									✿
Norway	✿		✿		✿	✿	✿		✿		✿		✿	✿							✿		✿	✿
Spain			✿	✿	✿	✿	✿		✿	✿		✿	✿		✿		✿	✿	✿	✿	✿	✿		
Sweden	✿	✿		✿	✿	✿	✿	✿	✿	✿	✿	✿		✿		✿							✿	✿
Switzerland			✿		✿											✿					✿			✿
United Kingdom			✿	✿	✿		✿	✿	✿			✿		✿					✿				✿	
United States	✿			✿	✿						✿		✿		✿		✿			✿	✿	✿		
World Bank/ Tanzania						✿																		
RAP																						✿		
ECI																								

✿ Operating Agent and participating country ■ Operating Agent ◆ Co-operating Agent and participating country ✿ Participating country

Completed Tasks ST = Subtask

Benefits of participation

Enables complex and/or expensive projects to be undertaken

Many countries do not have the expertise or resources to undertake every desirable research project. A collaborative project enables the strength and contribution of many countries to undertake collectively what individually would be prohibitive.

Enhances national R & D programmes

National researchers involved in international projects are exposed to a multiplicity of ideas and approaches.

Promotes standardisation

Collaborative work encourages the use of standard terminology, notation, units of measurement, while also encouraging the portability of computer programs, and common methodology, procedures and reporting formats make interpretation and comparison easier.

Accelerates the pace of technology development

Interaction among project participants allows cross-fertilisation of new ideas, helping to spread innovative developments rapidly, while increasing the range of technologies and approaches employed.

Promotes international understanding

Collaboration promotes international goodwill, and helps participants broaden their views beyond their national perspective. The IEA DSM Programme provides an international platform of work. This is the only international organisation that addresses management of energy on the demand side of the meter in a collaborative manner.

Reflects latest trends and issues

New areas of work are continually added to the programme's scope to address changes in the energy market.

Enables complex and/or expensive projects to be undertaken. Collaborative projects allow countries to undertake projects that otherwise would be prohibitive due to lack of expertise and/or resources.

Saves time and money

Countries fund a portion of the international team's work, but have access to all project results.

Creates important networks

Specialists active in Demand Side Management, Demand Response, and Energy Efficiency, have the opportunity to work with other key experts from around the world.

Increases the size of the technology database

Collaboration among multiple countries creates a pool of information much larger than a single country could assemble by itself.

Permits national specialisation

Countries can focus on particular aspects of a technology's development or deployment while maintaining access to the entire project's information.

Promotes standardization

Encourages the use and diffusion of standard terminology, notations, units of measurement, methodologies, and procedures and reporting formats to make interpretation and comparison easier.

To learn more

Visit the DSM Programme web site www.ieadsm.org to view:

- Project publications – handbooks, guidelines, technical reports and data bases
- DSM newsletters, Spotlight
- DSM Annual Report
- Contact information
- Conferences, workshops and symposia

Streamlined Steps for Joining the DSM Implementing Agreement (DSM IA)

If you are from a country that is a member of the IEA or is currently participating in an Implementing Agreement, take these three steps and you can join the DSM IA:

1. **Talk to Us**
2. **Meet with Us**
3. **Write to Us**

And You Are In!! Details below:

Interested Country – DSM Programme

1. **Talk to us** – Your country expresses interest in joining the Implementing Agreement by contacting an Operating Agent, the Chairman or the Executive Secretary. The Executive Committee promptly provides information on activities, participation obligations, benefits and the process to join the Programme. The Executive Committee also invites country to attend Executive Committee meetings and Task meetings of interest.
2. **Meet with us** – Your country attends Executive Committee meetings and Task meetings as an Observer.
3. **Write to us** – If your country is interested in joining the DSM Programme, your country sends a letter to the IEA Executive Director identifying the contracting party, who will sign the Implementing Agreement, the Executive Committee member from that country, and the Task or Tasks that country will participate in. Immediately upon receiving a copy of that letter, the DSM Programme will consider your country to be a participating country

If your country is not a member country of the IEA or not participating in an IEA Programme, after Step 1 the Executive Committee will forward your country's expression of interest in joining the DSM Programme to the IEA Secretariat for consideration and approval. Once that approval has been received, the DSM Executive Committee will vote to invite that country to join the Implementing Agreement. If favourable, the

Executive Committee will invite your country to the next Executive Committee meeting, leaving Step 3 to complete the process to join.

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DSM priorities in participating countries

AUSTRIA

DSM Developments and Priorities in Austria

Energy efficiency plays a vital role in Austria's energy strategy and energy research strategy. The goal in Austria's energy strategy is to achieve energy efficiency gains of 200 PJ (16%) in the non-emission trading sectors until 2020 based on 2005, thus enabling renewable energies to achieve a share of 34% through additional 70 PJ. The vision of the energy research strategy puts this further and formulates a share of 85% of renewables as a goal for 2050. This will only be possible through a massive increase of energy efficiency and reduction in consumption.

Austria' government submitted a draft energy efficiency law in early 2013 in order to implement the European energy Efficiency Directive. It included measures for enterprises (compulsory energy management systems, energy audits or advice, depending on size), for governmental owned buildings and obligations for energy companies to save energy at their customers. However, the bill didn't get the necessary 2/3 majority and was put on hold until after the election of the federal government in autumn 2013. The new government has to take it up again in 2014.

With the "Smart meters Regulation" of April 2012, the Roadmap for Smart Metering in Austria is set. By 2015 15% of customers are to be equipped with smart meters, by 2017 17% and by 2019 95%. The regulator e-control specified minimum technical requirements, but some issues like privacy issues, data management and ownership of data are still unsolved. These might be important for future DSM activities.

Several research activities and programs are going on in Austria that are of importance with regard to fostering DSM applications:

An important research and development area at the moment are Smart Grids. The Technology Platform "Smart Grids Austria" brings together key actors (technology-providers, energy companies (network operators) and R & D institutions) under one roof and has established itself as a partner for the public sector and other interested stakeholders. Quite a few pilot projects have been started, in particular the Model Region Salzburg, receiving a perception even beyond the Austrian borders. Currently, a "Technology Roadmap Smart Grids 2020" is about to be created with the short-to medium-term time horizon to 2020, based on the results of previous research and pilot projects. The stakeholder process and the completion of the roadmap are planned for autumn 2014.

The climate and energy fund in Austria (KLIEN) and the Federal Ministry for Transport, Innovation and Technology conduct important research programs relevant to energy efficiency and DSM, like:

- City of the Future
- Smart cities demonstration projects
- "e!Mission.at" for energy technology innovations

- Lighthouse projects for electro mobility and e-mobility model regions
- Climate and energy model regions
- etc.

With the new research program "City of the Future" and the support of Smart Cities demonstration projects the priority in smart city developments are strengthened. In previous years several "smart city master plans" have been developed and based on that specific implementation projects like a large demonstration project in the City of Graz are under way. As a smart city development is all about integrating the different aspects of energy efficiency renewables and efficient mobility, DSM approaches are an important part.

In addition to the urban focus in smart cities, energy and climate model regions are initiated and supported in the more rural areas. Regional actors are supposed to act as change agents towards energy efficiency, renewables and climate protection.

The Austrian Climate Initiative "klima:aktiv" was extended until the year 2020. "Klima:aktiv" offers information and consultancy, works on quality standards and helps to build up networks for a climate friendly future.

Relevant questions and topics in Austria, when it comes to DSM, are currently in the following areas (without claim to be complete):

- Distribution network as bottlenecks for renewables integrations
- Virtual power plant development and demonstration (incl. market issues for balancing energy and power)
- Energy efficiency services by energy utilities
- Viable smart grid based services (customer needs, markets, other actors?)
- Making industries to participate: DR resources, EMS ISO 50001, Smart grids
- Distributed energy resources in Smart Cities
- Behaviour change issues in several areas

BELGIUM

DSM Developments and Priorities in Belgium

DSM has not been a hot topic for the federal Government this year, and many actions have been delayed due to the coming elections.

The action of the Government was mainly focussed on the security of supply and on the design and implementation of the new production plan for the coming years.

Regarding demand-side management, the TSO has extended the portfolio of its ancillary services (tertiary reserves) to smaller grid users, operating either through an aggregator or as grid user directly, now in a test phase for a limited power volume (50 MW).

They also decided to extend their 1st reserve portfolio to industries and aggregators.

At the same time, they are in the process on defining with DSOs a new balancing system to allow flexibility both at transmission and distribution level, in order to avoid local imbalances resulting from the activation of capacity reserves on behalf of the transmission grid operator.

The federal Government mainly focussed on the finalization of the new Load-Shedding plan, allowing to reduce final demand thanks to automatic and manual actions, in the case of predicted electricity shortfall.

Regarding smart metering devices, Belgium is now fully busy with regional test-phase programmes and won't proceed with a full roll out any time soon.

Our country is not a good student in the class, as DSM was not high on the political agenda. But we look forward to improve our contribution and involvement in the coming years.

EUROPEAN COPPER INSTITUTE (Sponsor)

Mobilizing the potential of flexible industrial process

The *"Wind Powered Industrial Processes"* concept aims to bring economic and environmental benefits to the industry by powering energy intensive process by wind or other sustainable but variable energy sources. There are different ways to achieve that and they might include storage of energy, flexible operation of the process and/or storage of products.

In a larger perspective, the main outcome of this project is to *assess the available power reserve/DSM in industrial sectors* that use a flexible process and have relevant storage capacity. These sectors are: Chlorine, E-Steel, Aluminium, Desalination, Cold Storage, Air Separation, Mechanical Pulping, Paper recycling, Cement production, Copper and Zinc production.

In a preliminary phase, a draft assessment pointed out that for the suitable industrial processes, 68 GW of on-site wind could be accommodated under economic conditions, producing 170 TWh/year and allowing to provide 55% of overall energy demand of these industries.

The overall objective is to start working on a demonstration project within 2014.

FINLAND

DSM Developments and Priorities in Finland

Introduction

The views of the different Finnish actor groups are summarised here. These actors comprise the following:

- Government and other authorities responsible for the energy policy
- Transmission system operator (TSO)
- Distribution system operators (DSO)
- Competitive energy market actors
- Researchers and developers of fields where DSM has an important role
- Consumers

Also the most important legal requirements that implement the energy policy are briefly discussed. They are related to 1) smart metering and 2) energy efficiency.

Energy policy

The main DSM related drivers for energy policy include 1) enabling the policy targets on CO_2 emissions, use of renewable energy sources, dispersed generation, energy efficiency and supply security with minimum costs for consumers, 2) giving consumers better access and engagement to the electricity market, 3) reducing the dependence on imported electricity and imported fossil fuels, and 4) monitoring and verification of energy efficiency. The strategies and action plans of the Finnish government are published in the following documents

- Climate and Energy Strategy, November 2008, Government Report to Parliament
- Proposal for Energy Saving and Energy Efficiency Measures, June 2009, Energy Efficiency Committee
- Government Decision on Energy Efficiency, February 2010
- National Energy Efficiency Action Plan, June 2011
- Energy and Climate Strategy 2012, Government Report to Parliament 2013

The main areas of energy efficiency policy are:

- Research & development of new technologies (60–120 M€/a)
- Implementation of EU directives (Labelling, EBD, ESD, CHP, Ecodesign)
- Energy efficiency agreements
- Energy auditing scheme (2–3 M€/a)
- Subsidies for energy efficiency investments in industry etc. (5 M€/a)
- Subsidies for energy renovations of residential buildings (15 M€/a)
- Information activities (2 M€/a)
- Guidelines for energy efficiency in public procurement
- New legislation (Energy Companies, Public Sector)
- Government Decision on Energy Efficiency Action Plan (4 February 2010)
- And ~30 % of electricity production in CHP

The government has decided to implement energy efficiency measures for the period between 2009 and 2020 to enforce the objectives of Long-Term Climate and Energy Strategy (2008) and of the Government Foresight Report on Long-Term Climate and Energy Policy (2009). The operative is outside of emission trading sector (building, transport, households and services). The measures comprise energy efficiency agreements with industry, services, energy production, municipalities, transportation, residential buildings, and agriculture and forestry. The goal is to enhance final energy consumption by 37 TWh from which electricity 5-6 TWh. The measures correspond to approximately 9 milj. t. reduction in CO_2 (calc. by Motiva).

In Finland the legislation sets requirements for smart metering. Almost every customer will have settlement based on hourly-metered consumption in the beginning of 2014. Also outputs for ToU and load control are required in the smart meters. The next day after the consumption the consumers have access to their own hourly-metered consumption. The main objectives for this legislation are related to DSM and are:

1) enabling more demand response,
2) giving better support for energy efficiency services,
3) enabling easy exchange of the electricity retailer,

4) improving the efficiency of the energy system, and
5) improving consumer awareness of energy consumption. Legal requirements on how to implement data security and privacy are missing but the relevant actors are increasingly aware of the related challenges and how to mitigate them.

There is also new electricity market legislation that targets to improving the supply reliability of electricity customers and tightens the requirements for the length of interruption times and the related penalties. In order to avoid complexity the network regulation is biased to make network owners favour network investments instead of demand side management, distributed generation and storage. In some rural network areas this combination may lead to situations where network strengthening and cabling with high costs is applied in situations where demand side resources and their management combined with smart network automation can do the same for much smaller costs to the consumers. Research and debate regarding this issue has not yet properly started, but in the near future needs may emerge to focus on this regulatory challenge.

DSM priorities of the different actors

TSO

- Integration of flexible Demand Side Resources to energy markets and grids
- Managing conflicts between the interests of the market and the grid
- Integration of Demand Side Responses to ESCO business
- HEMS and BEMS based DSM
- Reducing energy purchasing and balancing costs
- Improving the security of the operation of grids and energy markets
- Cyber security of demand response
- DR services for the TSO
- DR services for the competitive market actors
- Verification and settlement of responses for services that require better than hourly time resolution
- Solving technical barriers regarding real time metering and "time stamp" of the change
- Frequency based load control as disturbance reserve of power system. Maybe also as operation reserves.

DSOs

- Solving regulatory barriers for using Demand Side Resources and responses as an alternative to network investments (, because the present regulation model favours network investments)
- Managing conflicts between the interests of the market and the grid (not yet, but in the future)
- Forecasting responses, predictability of responses
- Power based tariff structures
- Possible obligations relating to DE infrastructure and services in the future by law

Competitive electricity market actors

The electricity retailers (retail suppliers) are now busy preparing to the ubiquitous hourly measurement based settlement. They have introduced new DR products and services. Their priorities include the following:

- Integration of flexible Demand Side Resources to energy markets and grids
- Communication services and data models for the integration
- Smart metering based DSM (mainly DR)
- HEMS and BEMS based DSM (mainly DR)
- Consumer acceptance and trust.

There are aggregators that provide for the competitive electricity market actors services for integration of demand side resources to the electricity market, and for related communication and balance management.

DSM related research and development

The researchers for customer aspects of energy efficiency mentioned the following DSM priorities:

- Behaviour change
- Integration of DG (e.g. balancing the variations in power generation using DSM).
- Controllability and dimensioning of demand side heat pumps and energy storages
- Power based tariff structures and cost minimization of customers

The researches of 1) demand response, 2) smart metering, 3) CO_2 emission mitigation, 4) electricity infrastructure operation and security, 5) energy markets and 6) system integration of renewable energy sources such as wind power bring forward the following DSM priorities:

- Using DR on the balancing market (managing pay back effects and recovery times, verification, etc.)
- Load and response modelling and forecasting in the presence of large scale DSM (changes in the load behaviour, responses to DR)
- Optimisation of the responses
- System level impacts of different DSM services on CO_2 and consumption of fossil fuels (now and in future energy scenarios)
- Integration with the automation and ICT systems and services for the energy market actors
- Integration with the automation and ICT systems and service for the energy consumers
- Monitoring energy performance
- Managing conflicts between the interests of the market and the grid
- Removing or mitigating regulatory barriers for DR
- Cyber security of DSM services.

The researchers of energy efficiency of buildings have been asked about the DSM priorities, but they have not yet answered. This may indicate that there is a need to disseminate DSM knowledge so that the role and importance of DSM is better understood by all relevant actors.

Consumers

In Finland the competitive electricity market includes also consumers and contracts that disconnect the customers from competition are not allowed. Thus implementing DSM is not possible without stable long term acceptance and trust by consumers. It was not possible to ask directly the views of a representative number of consumers. Some consumer questionnaires have been implemented, but it is very challenging to implement them. Often the results of the queries are highly unreliable due to problems in framing and formulation of the questions. Those representing the consumers emphasise that it is important that the retail electricity market and DSM offerings are such that the consumers can understand and compare them easily and without high costs.

INDIA

DSM Developments and Priorities in India

The Indian power sector has an installed generation capacity of 229 GW. Despite growth in generation, the country faces peak power and energy shortages. Realizing the underlying potential of Demand Side Management (DSM) measures which is estimated as 15% reduction of the country's total electricity demand, Government of India through Bureau of Energy Efficiency (BEE), a statutory body constituted under EC Act 2001, has initiated several market based DSM measures in various sectors including lighting, commercial buildings and domestic appliances etc. The 11th five year plan (2007–2012), resulted in avoided capacity addition of 10836 MW through such measures and a reduction in peak demand through energy efficiency is envisaged during the 12th five year plan (2012–2017) is 12,350 MW. Some of the policy initiatives /schemes are as under:

Standards and Labelling Programme

The Standards and Labelling programme is a key thrust area of BEE. The programme has been working in two phases, Mandatory and voluntary in terms of category of appliances. BEE has 4 appliances under the mandatory phase namely Distribution transformers, direct cool refrigerators, tubular fluorescent lamps and air conditioners. The voluntary phase covers over 13 appliances including laptops, geysers, colour television etc. The objectives of this program is to provide the consumer an informed choice about the energy saving, and thereby the cost saving potential of the marketed household appliances or other equipment. This is expected to impact the energy savings in the medium and long run while at the same time it will position domestic industry to compete in such markets where norms for energy efficiency are mandatory. The programme seeks to include 27 high energy consuming end use equipment's and appliances by the end 12th five year plan.

Energy conservation building code (ECBC)

Energy Conservation Building Codes (ECBC) set minimum energy performance standards for commercial buildings having a connected load of 100 KW or contracted demand of 120 kVA or more for efficient use of energy. The ESCO mode of operation although yet to kick off on a commercial scale in India has been explored and regarded as the most viable option to implement energy efficiency measures both in buildings and in the industrial sector. In order to promote a market pull for energy efficient buildings,

BEE has developed a voluntary star-rating programme for buildings based on actual performance of a building in terms of energy usage over its area.

Agricultural DSM Programme

India`s Agriculture sector consumes 17% of total National electricity consumption with total 19 million pump sets in the country. There is a 30–40% energy saving potential that exists by mere replacement of in-efficient pumps with energy efficient pumps. The Ag DSM scheme of BEE was initiated in the 11th plan in eleven DISCOMs and covered about 20,000 pump sets & preparation of 11 bankable Detailed Project Reports (DPRs). Considering the potential, first pilot A DSM project is being implemented in Solapur, Maharashtra through Public Private Partnership (PPP) mode. More than 2200 agricultural pump sets have been already replaced with Energy Efficient Star Rated Pump Sets (EEPS) with annual energy savings of 6.1 MU.

Lighting DSM

In the lighting sector, BEE has initiated Bachat Lamp Yojana (BLY) Scheme to promote energy efficient lighting in India. Under this scheme, long-life, quality CFLs would be distributed by investor to grid-connected residential households in exchange of an incandescent lamp (ICL) and INR 15. Each household can get a maximum of four self-ballasted CFLs under the scheme. Long life quality CFLs distributed to a household under the scheme would have an average rated life of 6000 hours and above. Three types of ICL lamp wattages commonly in use viz. 40 W, 60 W and 100 W are likely for replacement under the BLY scheme. The BLY scheme upon implementation would result in reducing an estimated 6000 MW of electricity generation capacity translating into a potential saving of INR 24000 crores per annum and combined GHG emission savings of 20 million tonnes of CO_2 from grid connected power plants.

National mission for enhanced energy efficiency (NMEEE)

The National Action Plan for Climate change was announced by the Honourable Prime Minister of India on June 30, 2008, which gives significant importance to energy efficiency and implementation of DSM programmes. One of the principles of NAPCC is devise efficient and cost effective strategies for end use Demand side management. One of eight missions of the plan is the National Mission for Enhanced Energy Efficiency (NMEEE).

Under the NMEEE, a market based mechanism known as Perform, Achieve and Trade (PAT) has been developed and launched to improve energy efficiency in the large energy intensive industries. It is envisaged that 6.686 million tonnes of oil equivalent will be reduced by 2014-15, which is about 4% of energy consumed by these industries. Under the PAT scheme, targets have been specified for all energy intensive industries notified as designated consumers (DCs) under EC Act including Thermal Power Stations. The PAT scheme also aims to establish a market-based mechanism to enhance cost effectiveness of improvements in energy efficiency in energy intensive industries through certification of energy savings that could be traded.

Smart Grids

Realizing the growing importance of smart grid technologies in the Indian power sector, the Ministry of Power (MoP) had taken early steps in 2010 by constituting the India Smart Grid Task Force (ISGTF). The mandate of both this agency is to advise

the government on appropriate policies and programs for accelerated development of smart grids in India. As on date, 14 Smart Grid Pilot projects have been approved for different distribution utilities last year by MoP, Govt of India.

In the demand side, a model regulation has been created by the forum of regulators to define roles of the distribution companies and DSM cells in states agencies in monitoring utility driven DSM measures in India. This is a critical step in order to enhance DSM measures and enhance future success of DSM in India.

ITALY

DSM Developments and Priorities in Italy

Analysis of the impact of a mandatory
Time-of-Use rate among Italian residential customers

The Italian Authority for Electricity and Gas (AEEG), through the deliberation ARG/elt 22/10, approved the entry into force of a mandatory Time-of-Use tariff based on two time slots for residential customers in Italy starting from July 1st 2010.

The introduction of the ToU tariff is the last step of a process whose goal was to progressively expose Italian customers to time variable costs of electricity supply; the process started several years ago, with high and medium voltage customers, and was extended to low voltage customers with the deliberations AEEG 211/04 and AEEG 56/08.

The mandatory ToU tariff provides for variable prices of electricity depending on the hour of the day: the price is higher during "peak hours" (F1 time slot, which includes hours between 8 am and 7 pm during working days) and lower during "off-peak hours" (F2 and F3 time slots, which comprise the remaining hours not included in the F1 time slot).

The ToU tariff represented a strong innovation for Italian residential customers, thus the AEEG established that it would have been introduced gradually: a 18-months transition period (from July 1st 2010 to December 31st 2011) was therefore scheduled with a limited price difference between peak and off-peak hours (transitional ToU tariff); after such a period, the price difference has become larger, in accordance to the competitive market price of electricity (final ToU tariff).

The energy price during peak and off-peak hours are, respectively, higher and lower than the corresponding value of a hypothetical flat tariff; however, the differences between the flat and the ToU tariff prices are higher at peak time than at off-peak, due to the fact that off-peak hours are more than twice the number of peak hours during a typical year. The values of energy price differences relative to the 3rd quarter of 2011 are shown in Table 1:

Energi price difference	
Energy price difference between flat tariff and ToU tariff (peak hours) (€/kWh)	–0.00590
Energy price difference between flat tariff and ToU tariff (off-peak hours) (€/kWh)	0.00295

The introduction of the Time-of-Use tariff for residential customers in Italy is a significant event: in fact, 20 millions of families are currently paying their electricity consumptions with a variable price during the day and this represents an unprecedented

occasion to analyse the changes of customers' behaviour in response to time variable electricity prices.

In order to assess the impact of the tariff in the short and medium term on the Italian consumers, RSE started a research project in collaboration and under the patronage of AEEG. To this aim, a group composed of about 28,000 household users (the so-called *"customer panel"*), statistically representative of the whole Italian population, was selected; their monthly electricity consumption data measured by smart meters were collected, starting from July 2009 (i.e. one year before the introduction of the mandatory ToU tariff); this allowed for an analysis of the change of consumption behaviour after the introduction of the transitional ToU tariff.

The results show that, even if there has been a limited shift of consumption from peak hours to off-peak hours in the period following the introduction of the mandatory ToU tariff, the change in the behaviour of the users is not negligible: this means that the ToU tariff in Italy has been capable of shaping users' habits to a certain extent, according to price signal.

Analysis of behavioural aspects in end users interaction

The results of the analysis of the impact of the mandatory ToU tariff among Italian residential has showed the importance of end users' acceptance when implementing energy efficiency measures. Behavioural aspects acquire in fact a great importance, which should support technological development, in order to foresee and overcome possible obstacles which might arise and to make as fruitful as possible the use of the demand response schemes.

To this aim it is crucial to gain a deep understanding of the needs and roles of the different types of end users and to understand the enabling factors to foster for success. RSE has currently working on this subject, both on the European level, thanks to the participation to the S3C project (Smart consumer Smart customer Smart citizen), and on the international scale, thanks to participation to the DSM Task 24 (Closing the loop – Behaviour change in DSM, from theory to policies and practice).

Policy makers, in particular on the local scale, will benefit of these activities: they will draw on the best practices and use the developed guidelines to implement pilots projects and successfully have a confrontation with the different actors in the energy system.

KOREA

DSM Developments and Priorities in Korea

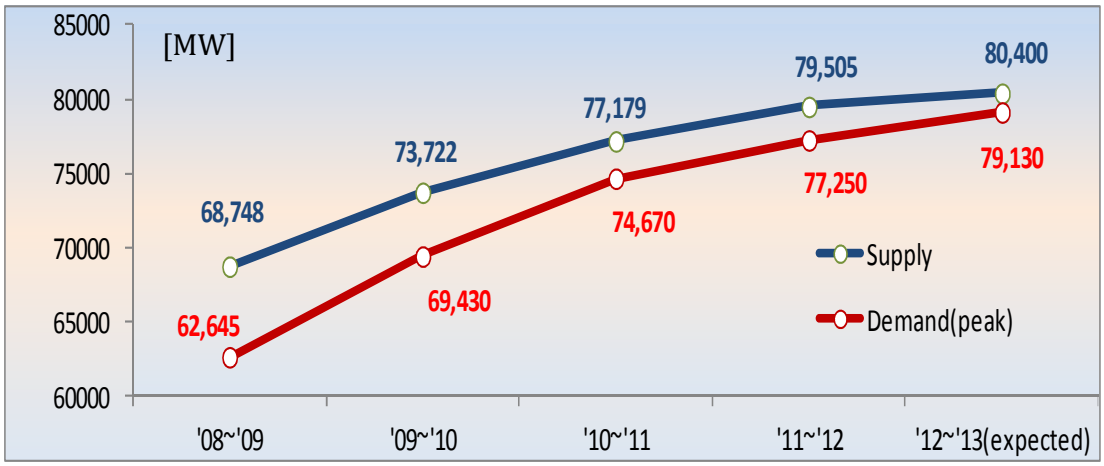
DSM based on ICT in Action Plan for the next progress.

It has many difficulties to cope with properly the rapidly increased power demand, because the social cost for power generation has dramatically increased.

It's time to consider shifting from the policy of investing the power supply proportionate to the need of it to that of focusing on both demand side management based on ICT technology fundamentally

We have objective to combine ICT technology [1] with electricity market to create the new business model and the job.

[1] ICT technology covers ESS, EMS, LED lighting etc



Power supply and demand (Unit :MW)

	'11.1.17	'12.2.2	'12.8.6	'13-'14 Winter Season	
				3rd Week in December	3rd~4th week in January
Capacity	76,130	79,340	81,550	81,740	82,240
Supply	77,180	79,510	77,080	77,210	80,400
Demand (peak)	74,670	77,250	77,270	75,500	79,130
Reserved	2,510	2,260	-190	1,710	1,270

1. ESS (Energy Storage System)

It is scheduled to interconnect the ESS with the renewable energy to improve the quality of electricity and to shift the peak load by introducing 'Weighting Factor' to the electricity generated by this combination (ESS + RPS) in peak time.

We recommend the participant (with contract power over 300,000kW) to install ESS (over 5% of contract power)

2. EMS (Energy Management System)

Korea government has a plan to induce all public buildings (over 10,000m2 of total floor area) and energy-consuming building (over 2000TOE) to install EMS by supporting subsidies to the SME that establishes the EMS and meliorating the program to make the ESCO with EMS technology easier to enter the market and to foster it to be a aggregator that can take part in the power market and make profit.

3. High energy-efficiency equipment with ICT

Public buildings have to replace all existing lamps with the LED's until 2020

Dissemination plan on LED lighting in public building

Classification	'13	'15	'17	'20
New Building	30 %	60 %	100 %	-
Existing Building	40 %	60%	80 %	100 %

Private buildings have to install the LED lightings in the building up to 30% of total lightings by enforcing the criteria in the Energy Saving Designing Standard.

4. Smart Plug

Korea has made a plan to introduce to combine the function of Smart Plug in the home appliances and to make a technical standard to utilize the service of Smart Plug in any products.

NETHERLANDS

DSM Developments and Priorities in the Netherlands

The Dutch energy policy is strongly interrelated with the climate change policy and concentrates it efforts in three areas: increase of renewable energy, improved energy efficiency and security of supply.

The main types of renewable energy in the Netherlands are wind, solar, biofuel and geothermal. In 2010 renewable energy accounted for just 4% of total Dutch energy consumption. In 2020 this percentage must have risen to 14. This increase must however take place in a economically responsible manner, according to the Dutch Government, and must not result in excessive costs. Three sustainable energy sources seem to have the best credentials for future prospects for a sustainable Dutch energy supply: bio-fuels, and onshore and offshore wind power. Innovation is necessary to enable renewables to compete with grey energy in the long term (2050 onwards). The Government wishes to help, not by offering expensive and ineffective operating grants, but by promoting innovation, among other things through the renewable energy incentive scheme (SDE+).

In November 2013 two important policy papers were published: the Energy Agreement for Sustainable Growth and the Climate Agenda: resilient, prosperous and green.

In the *Energy Agreement for Sustainable Growth* (Energieakkoord voor duurzame groei), more than forty organisations have laid the basis for a robust, future- proof energy and climate policy enjoying broad support. They include central, regional and local government, employers' associations and unions, nature conservation and environmental organisations, and other civil-society organisations and financial institutions. This agreement offers long-term prospects with arrangements for the short and medium term, creates trust, and thus reduces investment uncertainty among both individuals and businesses. The agreement will give a major boost to investment and employment and help the faltering economy get back on track as quickly as possible. It will also minimise the burden on households and businesses.

The purpose of the Energy Agreement is to express the Government's aim of achieving, within an international context, a wholly sustainable energy supply system by 2050. The parties to the Energy Agreement will strive to achieve the following objectives:

- a saving in final energy consumption averaging 1.5% annually. This is expected to be more than enough to comply with the relevant EU Energy Efficiency Directive;
- in this context, a 100 petajoule (PJ) saving in the country's final energy consumption by 2020;
- an increase in the proportion of energy generated from renewable sources from 4.4% currently to 14% in 2020, in accordance with EU arrangements;
- a further increase in that proportion to 16% in 2023;
- at least 15,000 full-time jobs, a large proportion of which will be created in the next few years.

The *arrangements for saving energy* focus both on the built environment and on increasing energy efficiency in industry, agriculture, and the rest of the commercial sector as well as for mobility and transport . This objective is linked to two evaluation points: by the end of 2016 at least 35% will have been achieved and by the end of 2018 at least 65%. Should it appear that we are not likely to achieve the agreed objectives, then additional measures will be put in place. These may be more binding and/or tax-related measures, or other measures – voluntary or non-voluntary – to make the aim of saving 100 PJ more likely. Like the measures specified in this agreement, the package of measures will focus on the end-user and therefore not on the supplier.

There are numerous opportunities for achieving significant energy savings in *the built environment*. The basic principle is that individuals and businesses have an interest themselves in saving energy and will shoulder responsibility for doing so. A combination has therefore been chosen of information provision, awareness-raising, reducing the burden, and funding support.

A revolving fund will be established for energy saving in the built environment amounting to some EUR 600m. This national energy-saving fund will already become operational in 2013 with a component focusing on owner occupiers – meaning that owners of listed buildings will also be eligible for financing from the fund – making it possible for this large group of individuals to take profitable measures to save energy. Energy companies will be given the opportunity to offer customers more financing options, with loans being repaid via the energy bill.

Financing options and any future policy measures can make use of the energy performance certificate, to which favourable financing can be linked. All homeowners, landlords, and tenants who do not yet have an energy label will be assigned an indicative label for their home in 2014 and 2015, based on a uniform method applying to the whole country. This label indicates the home's energy performance and serves to raise awareness. The intention is to conclude an agreement in 2013 between central government and the Association of Netherlands Municipalities (VNG) on providing municipalities with active support concerning local and regional energy saving and energy generation.

The parties to the Voluntary Energy Saving Agreement for the Rented Sector [Convenant Energiebesparing Huursector] have committed themselves to the agreed objectives of ensuring an average of Label B for corporations and a minimum of Label C for 80% of private landlords by 2020. In that context, central government is providing EUR 400m in funding for landlords in the subsidised rented housing sector for the purpose of investment in energy-saving measures between 2014 and 2017, with the aim being to contribute to achieving the objectives of the Voluntary Agreement. In the short term, this measure will promote a substantial wave of investment in making rented housing energy-efficient.

For all types of public and other real estate, there will be an independent centre of expertise which will provide support in identifying the most effective measures in the area of energy efficiency. In addition, implementation and enforcement of the Environmental Management Act [Wet milieubeheer] – with an obligation to implement energy-saving measures with a cost-recovery period of five years or less – will be substantially improved, for example with the aid of lists of specific approved measures. Municipalities and provinces (the clients of the Regional Implementation Services [Regionale Uitvoeringsdiensten]) will prioritise enforcement of the energy-

saving obligation in that Act. Finally, there will be a pilot project aimed at continuing, as of 2016, with a system for Energy Performance Assessment ("EPA") which can provide effective assistance to businesses in achieving and enforcing measures with a cost-recovery period of five years or less, in accordance with the Act. Specific aspects of the impact of the pilot project will be evaluated towards the end of 2015. The EPA system will be introduced in 2016 in those sectors in which the pilot project has shown that it is effective.

Industry, agriculture, and the commercial sector as a whole see increased energy efficiency as an opportunity to boost the competitiveness of energy-intensive businesses, to create employment, and to achieve climate objectives in a cost-effective manner. The energy-intensive sector of industry aims to become an international leader in energy efficiency.

An independent centre of expertise will be set up to assist businesses and funding bodies in identifying the most effective measures in the area of energy efficiency in industry and agriculture.

The impending disappearance of combined heat and power (CHP) will not help in this regard. The Environmental Management Act also needs to be implemented and enforced more effectively in industry, the agricultural sector, and the commercial sector in general. The large energy-intensive companies, those covered by the ETS, will join with government in endeavouring to supplement the Long-term Voluntary Agreement on Energy Efficiency [MEE-convenant] with a framework of company-specific (i.e. one-to-one) agreements. These will focus on improving the energy efficiency and competitiveness of the companies concerned. There will also be an EPA pilot project (with evaluation) for other companies (i.e. non-MEE companies) as outlined above under "built environment". Cost-effective utilisation of industrial waste heat deserves to be prioritised, and the parties will produce a coherent action plan for utilising the potential of this technology in the Netherlands. The possibilities of a regional heat infrastructure will be investigated for various parts of the country, based on and comparable with the proposals already made by the Rotterdam region.

There is broad support for an ambitious programme to save energy in the *greenhouse horticulture* sector. This sector, the authorities, and the environmental organisations have agreed that an improved CO_2-system for this sector should take effect no later than 1 January 2015. Agreement has been reached with the sector that – in addition to the current policy – an energy saving of 11 PJ will be achieved by 2020.

Traffic and transport should become more efficient and mobility more sustainable. The parties have agreed on ambitious targets, namely a 60% reduction in CO_2 emissions by 2050 (compared to 1990), with a reduction of 25 Mton (-17%) in 2030 en route to attaining that target. In order to achieve this, the parties have drawn up a green agenda for growth setting out long-term prospects and short-term measures. Steps will be taken in twelve key areas. The parties will shortly produce a shared overall strategy concerning the future fuel mix, public-private partnership in preparing the market, source-specific policy and Dutch leadership, and arrangements regarding the public infrastructure for charging electric vehicles. Other important topics will also be dealt with, including the use by the transport sector of a uniform measuring method for reducing CO_2.These matters will be worked out in the near future, with central government taking the lead as regards the policy measures and cooperating with the organisations involved. In the context of the targeted energy saving of at least 100 PJ energy (final) for the economy as a whole, the parties have agreed that the transport and mobility sector will contribute

by saving an expected 15 to 20 PJ by 2020, assuming that this corresponds to a reduction of 1.3 to 1.7 Mton compared to the trend-based forecasts for 2020.

The third basic component of the Energy Agreement is *the decentralised generation of renewable energy* by people themselves and by cooperative initiatives. People will be given more options for generating renewable energy themselves, with local and regional initiatives being supported – where necessary and possible – by municipalities, provinces, and central government. With effect from 1 January 2014, tax relief of 7.5 eurocents per kWh will be introduced in respect of renewable energy generated by a cooperative or by an association of owners if the energy is then also utilised by small-scale consumers, and if the members of the cooperative or association and the installations are located within a "postcode rose" (a four-digit postcode plus adjoining postcode areas). The parties agree that this arrangement should be made as simple and efficient as possible, with energy providers making arrangements with central government to ensure this. The parties have agreed that the costs incurred by providers in implementing this tax relief arrangement can be charged on to energy cooperatives, associations of owners, or their members that have benefited from the arrangement. Should the tax relief arrangement be modified with a view to investment certainty, continuity for existing users will be guaranteed by means of a transitional arrangement. The tax relief will be covered by an increase in the energy tax. The arrangement will be evaluated in four years' time on the basis of usage.

The fourth basic component of the Energy Agreement deals with *energy transmission* network and ensures that the energy transmission network is ready for a sustainable future. The parties have agreed that they will prepare thoroughly for this changing future so that changes can be made quickly when they are necessary and desirable.

Measures that will make the energy system (gas, electricity and heat/cold storage) more flexible include the following.

- The development and introduction of smart grids and the introduction of demand-side management in order to shift the pattern of demand.
- The development of storage capacity, for example by continuing to encourage electric transport and the infrastructure of charging stations it requires. Another possibility is to convert electricity into gas, which can then be stored. Such measures could make power-to-gas and/or dual firing more attractive (the choice for electricity or gas would depend on the price of energy).
- It is crucial to conduct experiments to study the impact of these innovations on the energy infrastructure. Such experiments should be aligned as closely as possible with the government's policy on key economic sectors.

In the context of European cooperation, the Dutch government, energy companies, grid managers and businesses have committed themselves to:

- Closer international cooperation within the pentalateral Energy Forum (Benelux, Germany, France, Austria and Switzerland), with other countries in the North Sea region (United Kingdom, Denmark, Norway, Sweden and Ireland) and bilaterally with Germany. Such cooperation is needed to properly coordinate national plans for the large-scale generation of renewable energy and the related commercial and grid development.
- Promoting an effective, supportive regulatory EU framework that will provide for a sound investment climate in Europe. That will require the scrupulous implementa-

tion of measures under the EU's Third Energy Package. TenneT and Gas Transport Services will take up this challenge where possible in ENTSO-E and ENTSOG respectively.

- An effective regional approach towards integrating the electricity and gas markets. The investments needed in production facilities and grids will also require the efficient deployment of capital and resources and a large enough return on investment to attract investors.
- Transparent procedures in international projects, in particular when issuing permits and inviting tenders for large-scale offshore wind farms and the construction of cross-border grid infrastructures. The focus on a more European regulatory framework will encourage more coherence in investment and a more effective cost-benefits analysis per investment.

The Climate Agenda: resilient, prosperous and green, outlines a climate approach focused on assembling a broadly based coalition for climate measures and on a combined approach to climate adaptation (by designing a resilient physical environment and preparing society for the consequences of climate change) and mitigation (by reducing greenhouse gas emissions). Within the EU the Cabinet is pressing for at least a 40% reduction of emissions in 2030 compared with 1990. The European Commission will distribute the non-ETS goal across the member states in 2016, after setting down the Energy and Climate Package. The Cabinet is considering setting approximate sectoral goals for 2030 in accordance with the 'Cabinet Approach to Climate Policy on the road to 2020' published in 2011. By way of indication the Netherlands Environmental Assessment Agency has calculated the reduction that may be required for 2030: a maximum non-ETS emission of 71 – 75 Mton for the Netherlands for 2030. Another study will be conducted to identify measures needed in each sector. Together with partners the Cabinet is linking to the European emission reduction goal some concrete actions that will lead to green growth, stimulate our economy, reduce energy consumption and meet the demand for energy as far as possible from renewable sources. This will assure that the average global temperature will not rise by more than two degrees and will enable us to keep the risks of climate change within acceptable levels.

This Climate Agenda builds further on the Energy Agreement for Sustainable Growth and focuses on 2030, which has been chosen as a reference point towards 2050 for the forthcoming international climate action negotiations. The agenda also addresses some sectors not covered by the SER agreement, such as agriculture and other greenhouse gasses, and formulates measures that overarch sectors.

NEW ZEALAND

DSM Developments and Priorities in New Zealand

General statement:

- New Zealand has a population of just over 4.4million with the majority living in 3 or 4 of the country's largest cities and the remainder being relatively dispersed.
- Following radical free-market oriented reforms in the mid-1980's, successive New Zealand governments have taken a relatively non-interventionist approach to markets, reflected in bullet point 5 below for example. Intervention is usually triggered by evidence of a market failure.

Roughly 75% of electricity generation is from renewable resources (eg hydro, geothermal and wind). The remainder is from thermal (gas and coal).

- Installed electricity generation capacity is currently in excess of demand which has been steady for several years and is predicted to remain fairly constant for the next 10 years.
- The government has a target for 90% of electricity to be generated from renewable sources by 2025. However, there are no specific plans on how this will be achieved.
- New Zealand's consumption of liquid fossil fuels (mainly for transport) is relatively high when compared with other OECD countries and is rising steadily year-on-year. The vast majority of these fuels are imported.

Specific areas of priority

In the context of the above, New Zealand's focus when it comes to DSM is primarily in 2 areas:

- Electrical energy: Use of smart technology and techniques across the grid to manage load variations due to both demand fluctuations and the introduction of increasing variable sources of generation.

  However, there are very significant variations in the way the 28 lines companies and the national grid company view the concept of smart grids and take-up has been very patchy and poorly coordinated.

  There is an increasing view that DSM is important as a way of extending the life of expensive infrastructure assets and the national grid operator, Transpower, has a relatively newly appointed DSM Manager who is looking at a range of initiatives.

  There is an interest in learning from other countries as well as contributing expertise.

- All energy forms and uses: Behaviour change across all areas of energy consumption is a high priority and growing in profile and importance. This applies especially to the transport sector but is also of importance in, for example, the built environment.

  The CEO of the Energy Efficiency and Conservation Authority (EECA) stated in a recent media release: "Improved energy use could help us solve what has been described as New Zealand's productivity puzzle".

  EECA has been a strong supporter of New Zealand's role in the DSM IA Task 24 and is specifically looking for tools and techniques which can be applied to changing energy consumption behaviour. Whilst recognising this is a highly complex area, it is seen as a primary tool in managing the energy security risk posed by the increasing importation of liquid fossil fuels.

Finally, the National Infrastructure Advisory Unit of the New Zealand Treasury has recently raised the profile of DSM by issuing a think piece from the National Infrastructure Advisory Board (NIAB, September 2013) on Demand Management, "to consider the big issues facing New Zealand infrastructure ... and to provide advice on these to Ministers ...". It considers DSM to be "one of the most appropriate and effective options". This cuts across all infrastructure and, therefore, all aspects of DSM. Consequently, it is expected that New Zealand will wish to increase its engagement with all infrastructure-related aspects of the DSM IA.

NORWAY

DSM Developments and Priorities in Norway

General statement

- The primary energy production in 2012 was 2 385 TWh, predominantly oil and gas.
- The total production of electricity was 144 TWh, of which 98 % renewables (97 % from hydro, 1 % from wind)
- Norway has total final energy consumption of 217 TWh in 2012 of which 58 TWh within transportation.
- The final consumption of energy for stationary use was 159 TWh if which 108 was electricity.
- The renewable share of final energy consumption according to the EU renewable energy directive was in 2011 65 %. The target for 2020 is 67.5 %
- In normalized years Norway has a surplus production of electricity.
- Electricity is used for heating purposes to a large extent in households; 90 % has direct electric heaters installed. On average Norwegian households has a final energy consumption of 21 000 kWh of which 80 % is electricity

Specific areas of priority

Norway has two main demand side priorities

- Reduce the dependency on electricity for heating purposes.

  This is approached in two ways. First, a general reduction in heating needs can be obtained by reducing the heat loss from buildings (improved heat insulation). This improved "passive" quality of the building stock is approached through regulations (building codes) and support programmes for building rehabilitation. The second approach is to replace direct electricity based heating systems with alternative systems, such as biomass, heat pump systems, solar panels, etc. These energy technologies may be distributed or part of the growing Norwegian district heating infrastructure, the latter being an important part of this strategy. A successful implementation of this strategy will, over time, reduce the demand both for energy and power (peak) loads in the grid.

- Increased efficiency in energy end use

  One part of this strategy is to focus on the efficiency of the individual appliances, products and components making up the energy use environment of the different users. User habits and energy management systems are part of this approach. The other part of the strategy is the smart grid concept, which entails an optimized management of the electricity grid as an integrated system. A more even load distribution over time and integration of distributed generation are important components of this strategy.

DSM issues in Norway are framed by these strategies. Identifying and addressing barriers to an energy-related upgrading of the building stock and a more efficient energy management in buildings is one important policy area.

REGULATORY ASSISTANCE PROJECT (Sponsor)

DSM Developments and Priorities

DSM Resources for European Power Systems: Lowering Costs, Improving Reliability, and Advancing Renewables Integration

The current depressed economic context means that many European Member States are extremely concerned about high energy prices and the impact on competitiveness and the power bills of their citizens. Politicians are nervous to introduce any regulatory change that might increase energy prices. Carbon pricing is the flagship decarbonisation policy of the EU. The EU ETS is an important tool to guide power markets and investments. Carbon pricing alone, however, will not deliver the greenhouse gas emissions reductions needed in the power sector. This is largely because consumer energy demand is price inelastic and wholesale power markets can multiply the true impact of carbon prices to consumers leading to increases in power bills that appear politically unacceptable in the present climate.

Energy efficiency not only reduces power bills directly for the consumers involved but also, at the same time as reducing emissions, reduces the carbon price and wholesale electricity prices which benefits all electricity consumers. As energy efficiency programmes are specifically designed to overcome obstinate market barriers, they can reduce several times more carbon per consumer Euro spent than would carbon prices alone. A modelling study recently commissioned by RAP[2] illustrates how recycling revenues from the auctioning of ETS permits into energy efficiency programmes can drive emissions reductions through a tighter carbon cap while minimising windfall profits for generators, and lessening power bill increases and negative impacts on the economy more generally.

Shifting load over time can also have a powerful downward effect on wholesale electricity prices but at present European consumers are largely prevented from responding to real time power prices. This is because many barriers to participation of the demand side in power markets exist across Europe. Implementation of the Third Energy Package, the Energy Efficiency Directive and the new Network Codes will be crucial with respect to ensuring that demand-side energy resources and their aggregators have access to electricity markets. In the United States, FERC has taken steps to remove those market barriers and some regional market operators have made significant progress in integrating demand response and energy efficiency resources in energy and capacity markets. In many regions across the US, demand response has proven that it can reliably provide energy in times of high prices or high loads, and deliver reserves to support contingencies as well as balancing services. For example, many regions have acquired in excess of 5 percent of their resource adequacy requirement from demand response resources with some regions reaching near 10%.

Given the much wider use of demand response as a resource in US power markets compared with Europe, the Regulatory Assistance Project (RAP) commissioned a study[3] to review lessons learned from the US with consideration for how this learning

[2] "Investing EU ETS auction revenues into energy savings", ECN and Cambridge Econometrics, May 2013, commissioned by Regulatory Assistance Project http://www.ecn.nl/docs/library/report/2013/e13033.pdf

[3] "Demand Response as a Power System Resource: Program Designs, Performance and Lessons Learned in the United States". Hurley, D., Peterson, P. & Whited, M. (2013) commissioned by Regulatory Assistance Project, http://www.raponline.org/document/download/id/6597

could be applied in Europe. A key conclusion of the study is that regions that allow demand response to deliver multiple types of services (energy, reserves, capacity) have demonstrated greater participation by demand response resources. Demand response providers or aggregators need multiple and steady revenue streams to ensure a robust business case. In the first instance, it is necessary to ensure that the demand side can compete on a level playing field with the supply side in providing services to the power system. Translated to European markets, this requires effective implementation of EU competition rules.

Demand Response is the Essential Complement to Renewable Power Generation

Looking to the future, the needs of the power system will change as the share of variable renewable energy sources (RES) in the power mix grows. Growth in variable RES will lead to an increased demand for energy resources capable of cost-effectively providing services for which most system operators have traditionally had very limited need. As the share of wind and photovoltaic generation in the power mix grows and replaces conventional thermal capacity, system operators will have greater need for:

- new very fast reserve products/requirements to substitute for lost system inertia;
- a greater amount of slower ancillary services (secondary and tertiary reserves) to provide back-up; and
- greater additional system *flexibility* as *net energy demand* (i.e. total energy demand minus the available renewable energy) will become increasingly variable and more challenging to balance.

The demand side could potentially contribute very effectively and cost-efficiently to the above three categories of service. Energy resources with very flexible capabilities (e.g. hot water heaters; electric vehicles) have high potential value but realising this value depends on how market rules are reformed. In the absence of regulatory reform, there is a high risk that investment will continue to flow to conventional supply-side resources that are inflexible and therefore ill-suited to a power system with a high share of variable RES and at cross-purposes with Europe's long term decarbonisation and competitiveness goals. Several RAP publications[4] explain how traditional capacity market designs, existing in many European countries today, run this risk and set out how power market rules, including those of existing ancillary services markets or capacity markets where they exist, can be adapted to properly value the flexible capabilities of energy resources.

Electricity users providing demand response services, including industrial and commercial companies but also house owners, tenants or electric vehicle owners, will be financially rewarded by aggregators who can provide services to markets on their behalf. This revenue stream could help close the cost of ownership gap that currently exists between passenger cars with internal combustion engines and those with electric powertrains. All electricity users could benefit from demand response's downward

[4] "Beyond Capacity Markets – Delivering Capability Resources to Europe's Decarbonised Power System", Gottstein, M. & Skillings, S.A. (2012), http://www.raponline.org/document/download/id/4854; "What Lies "Beyond Capacity Markets"? Delivering Least-Cost Reliability Under The New Resource Paradigm, A "Straw Man" Proposal For Discussion", Hogan, M., August 2012, http://www.raponline.org/document/download/id/6041; "Capacity Mechanisms for Power System Reliability", Sarah Keay-Bright, October 2013, www.raponline.org/document/download/id/6805

effect on retail electricity prices. In addition, RAP analysis [5] shows the benefits to society of both demand response and energy efficiency are even wider than previously mentioned, for example, to name just a few: reduced need for generation capacity and transmission infrastructure; reduced line losses; reduced water and air pollution.

SPAIN

DSM Developments and Priorities in Spain

Current Situation of Demand Side Management in Spain

The European electricity sector is evolving towards a new energy model with new energy resources and new demand types. The main challenges of the electric system in Spain due to this new energy model are:

- *Load shape sharpening:* Spanish load curve profile shows higher demand at noon and evenings, while lower electricity consumption occurs during the night. Peak demand reduction is required to optimize the electric system infrastructure because, otherwise, a surplus of energy generation occurs just in order to cover those hours with higher levels of demand. This constraint implies that the grid must be prepared to cover that demand level, even if there would be only a small number of hours in the whole year in which this happens. The evolution towards a flatter load curve is needed in order to reach efficiencies in the use of electric infrastructure.
- *Integration of renewable energy resources:* Spain has a great percentage of renewable generation. In some occasions, renewable generation has covered 70% of demand. On a yearly basis, it represents 30 % of demand. Due to its intermittency, new flexible resources, such as DSM measures are required. The expected increase in renewable capacity in the following years could intensify situations in which wind and solar generation cannot be integrated in the system (losses from 1 to 7 %, especially during valley periods). The electric system must be prepared for a higher integration of smaller scale and intermittent generation from renewable energies. Also, the fulfillment of the 20/20/20 European Strategy implies that 40% of electricity will be from renewable sources by 2020.
- *Regulatory issues:* Due to the transition towards a new energy model, regulation must be developed in different fields, such as storage, electric vehicles, smart grids, etc. The way in which this regulatory framework is created will impact on the success of the new initiatives in the electric system.

In this new context, demand will play a key role supplying additional flexibility to manage the system. Red Eléctrica promotes strategies in demand side management field, defined as "the planning and implementation of measures aiming to impact in the way that energy is consumed, with the objective of changing the demand load shape".

The current demand side management measures are the following:

- The interruption service is a service provided by end users to the System Operator consisting on a reduction of the "active power" to a level required by the System Operator. The supply of the service and its economic issues are previously agreed

[5] "Recognizing the full value of energy efficiency", Jim Lazar and Ken Kolburn, September 2013, ttp://www.raponline.org/document/download/id/6739; See RAP presentation (Richard Cowart), "Demand Response as a Power System Resource", http://www.raponline.org/document/download/id/6821

in the current regulation and in the contract signed by the two parties. It is a service oriented to the big industrial consumer that have to accomplish strong requirements and that improves the security and reliability of the electricity supply as well as the modulation of the daily load shape.

- The time of use tariffs consisting in the establishment of different static prices depending on the hour of the day. This tariffs are more expensive for the peak hours than for the off peak hours. It can be applied to all the end users but its implantation in the residential sector is currently very limited.
- The limitation on the power consumed by end users, with a "power control switch" (general case for residential sector) or with economic penalty when consumption is higher than the contract's power.

DSM Priorities in Spain

New demand response mechanisms are expected to be developed in the following years. Historically, the pioneer Demand Side Management measures have been mainly oriented towards the industrial sector regarding different initiatives such as peak reduction, load shifting or efficiency.

In the following decades, new measures will be developed taking into account several current pilot/demo initiatives. These mechanisms are expected to be developed mainly on the residential and commercial sectors.

- On the one hand, residential customers are evolving towards a new role in the system, with higher involvement and knowledge of the electric system, and the foreseen massive penetration of smart appliances and electric vehicles.
- On the other hand, the commercial sector has not been fully analyzed yet and new mechanisms reducing the peak periods and improving efficient consumption will be developed.

Both sectors are characterized by including a higher number of consumers with lower consumption levels than industrial ones.

Successful future DSM measures will need to be accompanied by appropriate incentives and communication actions, oriented towards overcoming existing barriers (economic, social, technological, regulatory) and developing attractive mechanisms focused on the different demand sectors.

A set of demand response potential measures are being analyzed nowadays in Spain:

- Flexibility of the industry and services: the aggregation of a large number of small and medium customers will provide a reduction in peak which will contribute to a considerable flattening of the load curve.
- Modulation of the industry: large industrial consumers could provide a shift of consumption from peak to valley managed by the own customers and giving a service to the TSO.
- Smart Grids development: the residential sector will provide flexibility (direct control by TSO/DSO) or modulation (Indirect/automatic control) resources due to manual or automatic home management under Smart Grids schemes, providing a considerable peak reduction and also a significant shift from peak to valley hours thanks to the Smart meters installation in Spain.

- Introduction of Electric Vehicles: EV penetration will allow the shifting of consumption to valley hours, with indirect or automatic management by consumers, providing an important increase in valleys and peaks. For 2030, 2 million of EVs which are expected to be achieved.
- Renewable energy & final customers: the evolution towards the integration of renewable production and demand consumption in the three demand sectors is expected to offer a new potential resource able to supply a significant amount of MW in both the summer peak (solar energy) and the winter peak by 2030 (micro-cogeneration). This resource would be managed in an indirect way by consumers.
- New buildings and efficiency standards: a reduction in consumption during peak hours could be provided by energy efficient buildings at the residential and service level or by public bodies, with automatic control management.

This measures aiming at increasing DR enrolment, raising public awareness and influencing consumer behavior will serve to the system security improvement, infrastructure optimization, market cost reduction and integration of renewable energy.

SWEDEN

DSM Developments and Priorities in Sweden

Examples of Demand Side Management related activities in Sweden 2013

The Swedish Energy Agency is a government agency that works for a safe, environmentally sound and efficient energy system. The Swedish government has commissioned the Swedish Energy Agency be responsible for, and manage the National Energy Research program. The Agency therefore finances various R&D and demonstration projects with an annual budget of 1.3 billion SEK, focusing on renewable energy sources and energy efficiency. Additionally a number of private companies and organizations co-finance these projects.

Demand side management related research and development are of interest from a Swedish perspective. Both more technical ones as well as behavioural/social science issues related to load level and load shape (energy efficiency as well as flexible use of renewables).

In 2013 the Swedish Government proposed a tax credit of up to 12 000 SEK/per year for individuals from 2014. This means that micro-producers of renewable electricity may make a deduction in its tax return for up to 20 000 kilowatt-hours (per taxable and connecting point) annually for the electricity that is sent out on the public grid. A prerequisite for the deduction is that the micro-producer must buy at least as much electricity from the grid as they feed into the grid during a year. The deduction is based on the electricity tax per kilowatt-hour times two up to a maximum 20 000 kilowatt-hours.[6]

The Swedish government has during 2012 appointed the Swedish Coordination Council for Smart Grid with representatives from authorities, organizations, the business com-

[6] The tax reduction will correspond to twice the energy tax. Above that, the micro-producers can receive compensation from their power companies for the electricity produced and delivered to the grid (how large the compensation will be depends on the agreements they have reached). If (counted rather low) assuming that the power company will pay 30 cents/kWh, this could mean at least another 6000 SEK in revenue for a full-sized photovoltaic facility. It is thus possible with this reform (if fully utilized) for micro-producers to earn at least 18 000 SEK/a year, if they start to produce their own renewable electricity. The Government's intention is that the tax credit for electricity generated from renewable electricity is to come into force on 1 July 2014. (from press released 2013/09/11 at Ministry of enterprise, energy and communication.)

munity and various research settings. The Council's role is to inform, encourage, and plan for the development of Smart Grids that contribute to more effective and more sustainable energy use. One important task for the Council is to develop a road map (for the years 2015-2030), with recommendations on how to stimulate the deployment of smart grids. http://www.swedishsmartgrid.se/

The Swedish Energy Agency co-finances three smart grid pilots in Sweden (were for example possibilities for demand side participation are investigated.) You can find information on these projects by using the links below:

- http://www.malmo.se/English/Sustainable-City-Development/Climate-smart-Hyllie.html
- http://www.stockholmroyalseaport.com/en/
- http://www.smartgridgotland.se/eng/about.pab

The energy research, funded by the Swedish Energy Agency, spans from fundamental research, technological development to demonstration activities as well as business development. These activities include some 40 programs and 700 projects. The work is currently organized in six thematic areas, these are: Energy System Studies, The Buildings as an Energy System, Energy-intensive Industry, The Power System, The Transport system and Fuel-based Energy Systems.

Examples of R&D activities initiated 2013 that relates to DSM issues

During 2013 the Swedish Energy Agency has, together with different stakeholders,[7] initiated several programmes and activities. Some of them are of more relevance for DSM related issues:

The Swedish Energy Agency has allocated 140 million SEK (2013–2017) for a new research and innovation program together with the building sector, which will allocate at least the same amount of money during the period. This program is concerned with both energy efficient buildings as well as the inhabitants and their lifestyles related to energy use.

Another research programme covering demand side management issues, is a programme where the Swedish Energy Agency collaborates and co-finances R&D with the solar energy sector, it has a total budget of 21 million SEK (2013–2017).

Fjärrsyn is a research programme to strengthen district heating and cooling. The programme is interdisciplinary as well as multidisciplinary and encourages competitive business and technology and efficient and flexible solutions for future sustainable energy systems (for example improved knowledge of customer expectations). It is co-financed by the Swedish Energy Agency and the Swedish District Heating Association. The programme has a total budget of 66 million SEK (2013-2017).

Energy, ICT and Design is a research and development programme were the Swedish Energy Agency has allocated 60 million SEK (2013–2017). The programme combines behavioural science, design and information technology (ICT) to meet the challenges in the future energy area and in particular stresses the importance of interdisciplinary collaboration, design elements – such as ease of use and attractiveness.

[7] For example, the Swedish District Heating Association, the Solar Energy Sector and the building sector.

Smart cities – R&D examples

Nordic Built – initiated by the Nordic Ministers for Trade and Industry – is a Nordic initiative [8] to promote the development of sustainable building concepts. The programme will combine key Nordic strengths, provide attractive and effective arenas for collaboration and realise concrete projects that demonstrate world-class scalable solutions. The Swedish Energy Agency is, together with the Swedish research council Formas, the funding partners from Sweden.

http://www.nordicinnovation.org/sv/nordicbuilt/

Through *JPI Urban Europe,* member countries of the European Union [9] can generate European solutions by means of coordinated research. The aim is to create attractive, sustainable and economically viable urban areas, in which European citizens, communities and their surroundings can thrive.

http://jpi-urbaneurope.eu/

SWITZERLAND

DSM Developments and Priorities in Switzerland

The Swiss energy policy is in an interesting and turbulent phase. The old power grid needs upgrading, the electricity market is gradually opening, discussions are taking place with the European Union about an integrated electricity market, and after the grave nuclear accident in Fukushima, Japan, the Swiss government has decided to phase out nuclear power and is developing a new energy strategy, where demand-side management will play an important role.

Energy Strategy 2050

After the severe nuclear accident in Fukushima, Japan, the Swiss government decided that existing nuclear power plants should be decommissioned at the end of their operational lifespan and not be replaced by new nuclear power plants. In order to ensure the security of supply, the Federal Council, as part of its new Energy Strategy 2050, is placing emphasis on the expansion of hydropower and new renewable energies, and, if necessary, on fossil fuel-based electricity production (cogeneration facilities, gas-fired combined-cycle power plants) and imports. Beside these goals on the supply side, the main focus will be put on increased energy savings (energy efficiency). In the medium term, energy consumption per capita shall be reduced by 43% and the electricity consumption by 13% by 2035 compared to 2000. Furthermore, Switzerland's power grid is to be expanded without delay and energy research strengthened.

The Federal Council intends to encourage the economical use of energy in general, and of electricity in particular. Enhanced efficiency measures include minimum requirements for appliances (best practice, energy label) and other regulations, bonus-malus mechanisms (efficiency bonus), measures to raise public awareness (strengthening of the program SwissEnergy), incentives to retrofit the building enveloped, and measures regarding the production of heat.

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[8] Sweden, Norway, Iceland, Denmark and Finland are involved as partners.

[9] Currently, JPI Urban Europe has 13 members: Austria, Belgium, Cyprus, Denmark, Finland, France, Ireland, Italy, Malta, the Netherlands, Norway, Sweden and Turkey. Funding agencies from six countries participated in the first JPI Urban Europe Pilot Call (Austria, Denmark, Finland, Netherlands, Sweden and Turkey), resulting in a total budget of more than 9 million euro. http://jpi-urbaneurope.eu/

Electricity Network

The ageing Swiss transmission and distribution networks face new challenges. On the one side, the flow with the neighbouring countries is increasing, and on the other side, the grid has to be adjusted to the new renewable energy goals of the Energy Strategy 2050. The rapid expansion of the electricity transmission grid and the transformation of transmission networks into smart grids are absolutely essential for future domestic production infrastructures and electricity imports. These 'intelligent' grids allow direct interaction between consumers, the network and power producers and offer great potential with regard to optimizing the electricity system, delivering energy savings and consequently in bringing down costs. Switzerland's power grid should optimally be integrated into the European grid and the future European 'supergrid'.

The Role of DSM

Besides regulations and efficiency standards for home-use appliances, there exists a wide spectrum of different measures on the federal level to promote energy efficiency and CO_2-emission reductions on the demand side in Switzerland:

- SwissEnergy conducts activities on awareness rising, information, consulting, (further) education, quality control, and networking and promotion in the fields of energy efficiency and renewable energy.
- The building program gives financial incentives to retrofit buildings and install efficient and renewable heating systems.
- In yearly public calls for tenders, companies and individuals can apply for financial support for electric efficient projects.
- Energy labels for cars, buildings and appliances inform customers about the energy efficiency and other attributes of the product.

On the cantonal and municipality levels there are additional, complementary attempts to improve energy efficiency, for example, the label EnergyCity for municipalities with a sustainable energy policy or the 2000 Watt-society, an attempt to reduce per capita energy consumption to 2000 Watt or one ton of CO_2.

The demand-side plays an important role in the new energy strategy. The increase of decentralized power plants and stochastic energy production demands an optimal interaction between production, storage and (flexible) end-user. Energy efficient appliances and intelligent steering of consumption through smart meters and smart grids make only sense if the end-user is aware of the technology, trusts in it and is willing to use it appropriately.

Therefore, besides research in specific technology areas to improve energy efficiency and renewable energy, the socio-economic interdisciplinary research program Energy - Economy - Society (EES) of the Swiss Federal of Office of Energy focuses on economic, psychological, social and environmental issues relating to the extraction, distribution and use of energy.

Conclusion

Although the Swiss Energy Policy is well developed, the decision to phase out nuclear power bears new grave challenges. Improvements in energy supply and technological progress in the energy efficiency of appliances combined with the development of soft measures on the demand side – the Demand Side Management – will play an indispensable role.

UNITED KINGDOM

DSM Developments and Priorities in the United Kingdom

Demand Side Management Developments and Priorities

The Green Deal was launched in early 2013 to deliver improvements in the UK's inefficient building stock. It enables the take up of energy efficiency improvements offered by the market. The Green Deal is available to both domestic and non-domestic consumers. Green Deal assessments carried out by authorised assessors provide consumers with recommendations for improvements and indicate whether those improvements are likely to pay for themselves through reduced energy costs. .

At the core of the Green Deal is a new financing mechanism of up-front private capital which enables the bill payer to pay back the finance for the improvement measures through their electricity bills. The financial obligation is then transferred automatically from one bill payer of the property to the next so they benefit from any savings resulting from the energy efficiency improvements that have been installed. Strict consumer protection standards have been put in place to provide quality assurance for all advice and installations, and ensure consumer confidence.

The *Energy Company Obligation (ECO)* has replaced the existing UK supplier and generator obligations (The Carbon Emissions Reduction Target (CERT) and the Community Energy Saving programme (CESP)) and works alongside the Green Deal to provide additional support for vulnerable consumers and installation of packages of energy efficiency measures, particularly those which are unlikely to be fully covered by Green Deal finance.

The UK Government continues to prepare for the *roll-out of smart metering* to householders and business which will be a major national project involving the replacement of around 53 million gas and electricity meters between 2015 and 2020. All domestic customers will be offered an In-Home Display (IHD) enabling them to see what energy they are using and how much it is costing to put them in control and avoid wasting energy and money. The roll-out will help drive innovation in products and services that use the smart metering system to help consumers manage their energy demand and bills, for example, through increased use of time-of-use tariffs. The introduction of smart meters will also mean energy networks will have better information upon which to manage and plan current activities, and assist the move towards smart grids which support sustainable energy supply.

An important element of *Electricity Market Reform* in the UK is the ability to introduce a financial incentive to encourage permanent reductions in electricity demand to be delivered through the capacity market. This represents a novel approach within the market so we will be running a pilot scheme to explore how it could most successfully work in Great Britain. Under the pilot, businesses and other organisations, which install measures that deliver verifiable reductions in electricity demand, will receive a financial incentive. More efficient motors, air conditioning and lighting are examples of the kinds of measures that could receive support. The pilot will be backed with at least £20million of funding and we expect that it will be launched in Summer 2014.

Further Details at: www.decc..gov.uk

UNITED STATES

DSM Developments and Priorities in the United States

The U.S. is a large, diverse country. That diversity occurs in many ways, including culturally, geographically, weather, and on well reflected by being a federal system with 50 individual states, each with their own set of laws.

That diversity affects the U.S. electric industry as well, as it is just as diverse for those reasons, but also with 3,200 total electric utilities, of many different sizes-big and small, types of ownership – private, public, and cooperative, how they are regulated – by state public utility commissions or by local elected and appointed governing boards for publicly-owned and cooperatively-owned utilities. Thus with such diversity in the electric utility, it can be hard to make generalized statements about DSM in the U.S. electric industry.

However even with the quite diverse U.S. electric utility industry and the diverse country it serves, there is no mistake that DSM, whether it is ratepayer-funded energy efficiency, demand response, and now the growing deployment of end use information technology by electric utilities, known as smart grid, is enjoying record levels of success in the U.S.

Thus it can be said that much of the current and near-future priorities, perhaps challenges, for DSM in the U.S. are those caused by success. Let's review that success, first, for energy efficiency that is funded by electricity ratepayers (consumers).

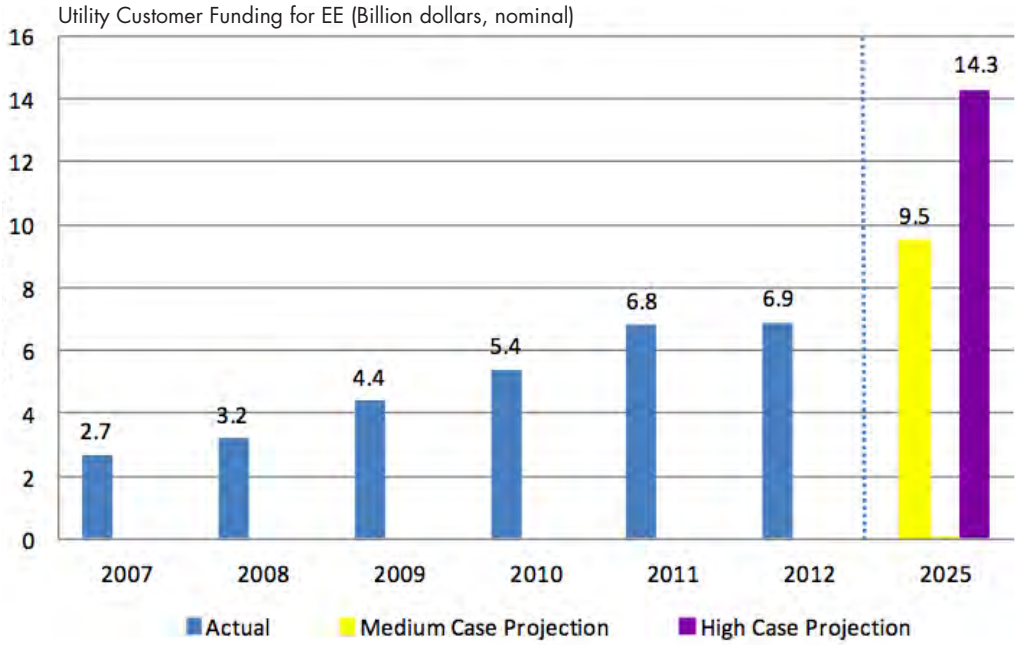
This energy efficiency component of DSM continues to see record growth, whether in terns of savings, spending, or budgets. Data collected by IEE, affiliated with the trade association of the nation's privately-owned utilities that is the Edison Electric Institute, shows that spending and budgets for energy efficiency programs at its member private electric utilities, that serve about 75% of the nation's electricity customers, continues to grow substantially. Those budgets in 2012 were in total $6.9 billion, which is 27% greater than 2010 levels. IEE predicts those budgets will exceed $14 billion by 2025. Similar increases are occurring as well in publicly-owned and cooperatively-owned electric utilities that together serve about the remaining 25 % of U.S. consumers.

IEE also finds that for the last five years, these budgets have doubled, with a nationwide increase of 55% for energy savings from 2007 to 2011 from the utility programs these budgets fund.

Much of the growth is due to the number of states that have enacted laws that mandate increasingly higher levels of ratepayer-funded energy efficiency. These laws, called energy efficiency resource standards, exist in 24 U.S. states. The most stringent laws are in Massachusetts and Vermont, which require almost 2.5% savings annually. Growth is also due to the continued adoption by states of regulatory frameworks that support utility investments in energy efficiency. These measures include performance incentives, direct cost recovery, and fixed-cost recovery. Finally, energy efficiency continues to be the cheaper resource for an electric utility to acquire, far cheaper than any new generation resource. As a result, typical is PacifiCorp, whose latest integrated resource plan is to use energy efficiency to meet 75% of future load growth.

The second component of DSM, demand response, also is seeing record levels.

Electric Efficiency Budgets: 2007–2012 and 2025 Forecast



Source: IEE Summary of Customer-Financed Electric Efficiency Savings, Expenditures, and Budgets (2013), http://www.edisonfoundation.net/iee/Documents/IEE_EEaGrowingUtilityBusiness_0913.pdf

Demand response, measured as the "demand response potential", or the potential peak reduction attributable to demand response resources participating in a demand response program, continues to increase substantially in the U.S.

The Federal Energy Regulatory Commission, which regulates the interstate (wholesale) sales of electricity (states regulate retail, intrastate sales), reports in its 2013 Assessment of Demand Response and Advanced Metering that the available demand response potential in the seven wholesale regional transmission operator (RTO)/independent system operator (ISO) markets was in 2012 an average of 6.0% of peak load. The lowest level was 3.1% in the Southwest Power Pool and the highest was 10.7% in the New England ISO region.

An example of the use of demand response to maintain grid reliability was in its crucial use on several unusually hot days in September by the PJM RTO that is in 13 U.S. eastern and mid-western states. On September 10, 2013, the consumers among PJM's member utilities together caused a record-setting (for September) peak demand of 144,370 MW, which coincided with unavailable utility equipment in four of PJM's more western states. PJM thus called on and received about 5,949 MW of demand response resources, which is the largest amount of demand response PJM has had to use to date. Thanks to demand response, PJM was able to keep the grid stable, reliable, and thus help its member electric utilities keep the lights on and air conditioning going for the region.

Elsewhere, a key continuing trend in the U.S. is the continued deployment of smart meters by the electric power sector. As a July 2013 report from IEE shows, almost 40% of U.S. households now have a smart meter, for a total of 46 million smart meters. This is an increase from about 33 % of households in May 2012.

So what are the priorities for DSM in the U.S. going forward, given the continued deployment of record levels?

For energy efficiency, new measures besides the very easy to deploy lighting programs are being developed. U.S. law soon will ban the sale of many incandescent light bulbs. Measuring and verifying energy efficiency savings, to ensure the programs can be relied upon by utility operators and planners, and in an inexpensive manner, continues to be an area of work, as it does for demand response. Various voluntary protocols and standards are being developed and used for both efficiency and demand response.

Behaviour-based energy efficiency programs increasing are a quick and simple way for electric utilities to get in the energy efficiency game. As this type of energy efficiency is still new, independent evaluation is still needed to verify that behavioural energy efficiency will last, just as equipment change-outs do.

For demand response in wholesale markets, adopting to the explosive growth can be a challenge, as FERC has had to take several enforcement actions against demand response providers for claimed violations of market rules.

Lastly, there are large amounts of customer-facing smart grid, particularly smart meters, now deployed. Many of these meters are only currently used for outage detection, with the other possible uses to better enable energy efficiency, and particularly demand response, not yet determined let alone deployed. Utilities are conducting experiments and vendors are developing methods to someday deploy what is called by some "demand response 2.0". One analogy is to the status of software, say 25 years ago, on the then newly deployed office desktop computers. Consider today's suite of software available to us on our office computers today to back then, and one can see perhaps this is similar to the current use of smart meters and other enabling technologies for DSM.

CHAPTER III

Task 16

Competitive Energy Services – Phase III
Energy Efficiency and Demand Response Services

Operating Agent: DDI Jan W. Bleyl-Androschin

Background and Motivation

Introduction and Participating Countries

The IEA DSM Executive Committee originally initiated Task 16 in 2006. It is currently in its third three-year-term until June 2015.

This Annual Report focuses on content and key results of the previous Task work as well as the future work including demand response services (chapters 5 and 6). A summary activity report is given in chapter 7.

As of November 2013 the following countries have confirmed participation in the IEA DSM Task 16 – Phase III (in alphabetical order) and have delegated experts:

- Belgium
- Korea
- Netherlands
- Sweden
- Switzerland

Furthermore, Austria is currently preparing to participate in Subtask 15 "Demand Response Services".

Regularly, Task 16 also welcomes guest experts from non-participating countries, e.g. GIZ, the German Development Cooperation. In case of interest please contact the Operating Agent (EnergeticSolutions@email.de).

For contact details of current and previous financing partners, experts and institutions, please refer to pages 74–75.

Towards the Energy Policy Goals

The success of further increasing energy efficiency in all sectors of consumption plays a vital role in coping with the challenges of our common energy future. Avoiding energy consumption by increasing end-use efficiency is a highly effective way to meet all three key targets of energy policies: Security of supply, affordable costs of energy services and environmental soundness.

Energy Efficiency has finally found its way up on the political agendas over the course of the last few years. Worldwide, concrete saving targets have been declared. But what are the appropriate 'delivery mechanisms' to bring energy efficiency and demand response to the end-users? Now and for the foreseeable future there is an urgent need to conclude and support all suitable political, regulatory and market based instruments

for the implementation of Energy Efficiency, Demand Response and Renewables. This is where the Task 16 extension wants to pay its contribution.

Furthermore, the increasing integration of fluctuating renewable supply sources into ('smart') electricity networks will need to be accommodated by growing balance energy/capacity markets, which may possibly in part be provided by demand response sources.

Win-Win-Win through Energy-Contracting

Energy-Contracting - also labeled as ESCo or Energy Service (ES) – is a many times proven DSM 'delivery mechanism' to implement energy efficiency measures for lighting, heating, ventilation and air-conditioning (HVAC-technologies) or even comprehensive refurbishment of buildings. An Energy Service Company (ESCo) takes over the technical and commercial implementation and operation risks and has to guarantee for its cost and results. ES are also well suited to implement renewable energy systems and possibly to provide demand response services.

Energy-Contracting models focus on implementation of existing or innovative energy efficiency and renewable energy technology. They take an interdisciplinary approach, incorporating many aspects of the implementation process such as economical, financing, organizational, legal and technological issues in order to achieve guaranteed performance and results of the efficiency technology deployed.

The ESCo industry is an expanding business throughout the world contributing to the improvement of energy efficiency, control of energy costs and reduction of greenhouse gas and other emissions. The models of offering these services can get various forms like Energy Supply Contracting (ESC) or Energy Performance Contracting (EPC) resulting in diverse contract models and financing arrangements. Lately also integrated models (IEC), as developed within Task 16, can be observed.

If designed and implemented properly, Energy-Contracting creates a Win-Win-Win-situation: Installation of up to date (saving) technologies as well as guaranteed and long term energy and cost savings for the facility owner, a business opportunity for energy service companies (ESCOs) and less emissions into the environment. Realized energy supply contracting projects typically achieve 15–20 % efficiency improvements on the supply side. Energy performance contracting projects have realized efficiency gains of 20–30 % and the integrated contracting approach or comprehensive refurbishment model achieves 30 to 50%. CO_2-Emission reductions are in many cases above 50 % because of a change of energy carriers to lower carbon content or renewables.

Task 16 "Competitive Energy Services" serves as a Think Tank and forum for the experts and stakeholders of the participating countries to advance ESCo models and markets and to openly exchange information and experience of all aspects of the energy (efficiency) services and demand response business.

Issues for the Extension of Task 16

There is a broad spectrum of reasons to take the work of Task 16 further on the way towards more developed energy service markets:

- The Task 16 Energy Services Expert Platform has worked successfully over the last seven years. The platform will continue to serve the national experts and their stakeholders for exchange and networking, to support national implementation

activities and communication with their stakeholders and to provide access to innovative and competitive Energy service models and tools from the Think Tank.

- A new topic will be Demand Response Services as a possible answer to cope with an increasing demand for network capacity services induced by the increasing integration of fluctuating renewable supply sources into the electricity networks. We will investigate, if Demand Respond Services can be implemented through ESCos and create an additional income stream in their projects and business models.
- Further research is needed in a number areas on the way to more competitive energy service products and market development, which are listed in the Think Tank description (Subtask 14).
- Task 16 has received considerable interest in its previous work, expressed in a wide variety of invitations to conferences, workshops to more than fifteen IEA as well as non-IEA countries. Also the Task work itself benefits from feedback on its publications. This international and national dissemination activity of IEA DSM work should be taken further and will also enhance the visibility of the DSM Programme as a whole.

Energy-Contracting activities have grown in different segments of final energy consumption in different countries. White areas on the market map are gradually being covered by existing and new enterprises. Nevertheless ESCo services still are comprehensive and complex products, which cannot be sold or procured easily. As it is the case with energy efficiency projects in general. National implementation activities of energy efficiency still face numerous obstacles. As indicated earlier: There is an urgent need to support all suitable political, regulatory and market based instruments for the implementation of Energy Efficiency and Renewables. This is where the Task 16 extension wants to pay its contribution.

Objectives of Task 16 Extension

The goals of the Task 16-extension are, to contribute to the development and implementation of innovative and competitive energy efficiency and demand response services. Thus we want to:

1. Continue the IEA DSM Energy Services Expert Platform
2. Support and follow up country specific national implementation activities in order to foster ESCo market development
3. Design, elaborate and test innovative Energy-Contracting and financing models and publish them
4. Elaborate and assess the feasibility of business models for Demand Response energy services
5. Use the expert platform as a competence centre for energy and demand response services for international and national dissemination and assistance services (e.g. coaching, training courses, publications) in the field of Energy-Contracting and to contribute to an "IEA DSM Centre of Excellence"

The underlying goal is to increase understanding of Energy-Contracting as a tool to implement energy efficiency projects: Pros and cons, potentials, limits and added values of ESCo products in comparison to in-house implementation.

Expectations and Results

The benefits for the participating countries and for the DSM agreement will encompass:

- Know-how and capacity building on innovative and competitive Energy-Contracting and financing models and support tools from the Think Tank
- Mutual feedback, coaching and experience exchange for country specific market development activities (NIA's)
- Participation in the IEA DSM Energy Services Expert Platform and communicating with external stakeholders
- Developing and assessing the feasibility of business models for Demand Response energy services
- Demanding the OA to prepare selected Energy-Contracting issues of interest
- Task 16 plays an active role in the international and national dissemination of competitive ES and offers assistance services for the market development in other countries
- Contributions to an IEA DSM competence centre
- Enlarging national and international markets for ESCo and demand response services and developing business opportunities for nationally and internationally acting ESCOs

Last but not least networking with innovative ESCo market players may be considered as an added value.

Structure of the Work and Subtasks

The proposed Task 16 Work Plan extension will continue to work with its well established structure and add demand response services as an additional Subtask (depending on the participation of Spain or another party, who initiated this Subtask). The five operational Subtasks are:

1. IEA DSM Energy Services Expert Platform (ES-Platform, Subtask 13)
2. Innovative and competitive Energy-Contracting Think Tank (Think Tank, Subtask 14)
3. Demand Response services business models (DR, Subtask 15)
4. Coaching of individual National Implementing Activities (NIAs, Subtask 16)
5. Dissemination (Subtask 17)

The scheme in Figure 1 illustrates the general structure and workflow of the Task extension:

In the left pillar, the national implementing activities (NIAs) such as market development and capacity building activities take place according to the individual needs and resources of the participating country. In the other two pillars, "Think Tank" and "DR-services", the experts will discuss new developments and elaborate innovative energy and demand response service and business models.

The IEA DSM Energy Services Expert Platform (ES platform) serves as the link between the two pillars, as the communication tool internally and externally and as the starting point for developing services like coaching and training for the outside world (towards a "Centre of Excellence").

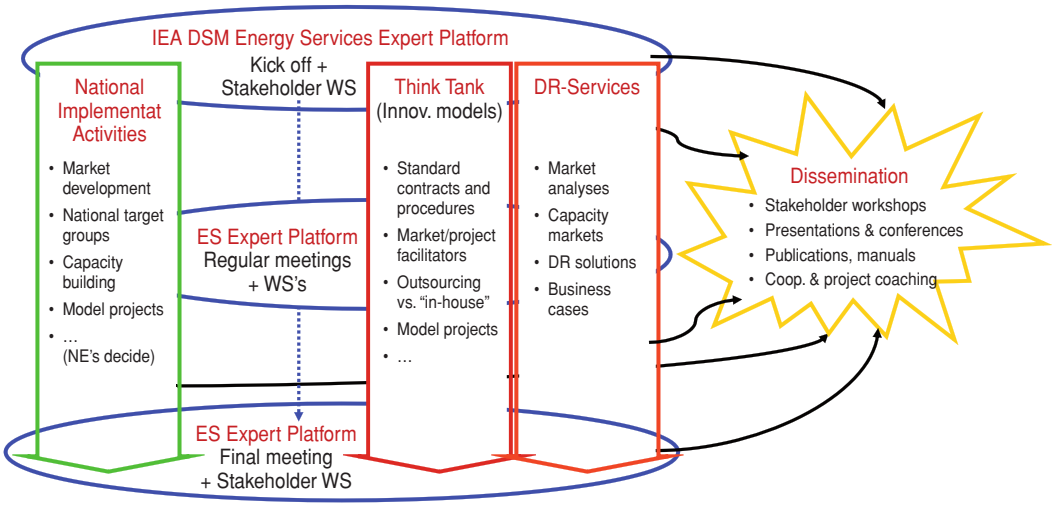


Figure 1: Task 16 – Phase III: Work structure and Subtasks

The results of Task 16 are disseminated in a series of stakeholder workshops, presentations at conferences, workshops and through publications. Additionally co-operations with international organizations and assistance services may be offered.

What is Energy-Contracting (ESCo Service)?

We focus on some key features here, assuming that the reader has a basic knowledge of the Energy-Contracting (EC) concept and energy efficiency.

Most existing EC definitions [1] fall short with regard to important properties of "real", performance based EC projects such as outsourcing of risks to the ESCo, guarantees for "all inclusive" cost and results of the measures implemented, modularity of the service package or optimization according to project cycle cost. These features constitute important quality attributes of "real" ESCo products as opposed to simple energy services. And they constitute an added value compared to in-house implementation models.

Also the two basic business models – either delivery of useful energy (Energy Supply Contracting – ESC) or energy savings (Energy Performance Contracting – EPC) and their implications are not distinguished well enough. Likewise the modularity of the components of an ESCo service according to the needs of the customer deserves more attention.

Differentiation of Energy Services

In EE policy discussions or the energy service industries (ESPs, ESCos) but also in the academic literature, a wide variety of energy service definitions are used. These may reflect different interests of a broad spectrum of stakeholders involved, but they also reflect a lack of clarity, conceptualization and taxonomy in this field.

However for clarification and structuring purposes, it is helpful to classify different *groups of energy services*. Besides the *nature and content* of the services, the *distribution of risks* and the *remuneration schemes* are important differentiation criteria.

[1] cf. [2006/32/EC], [Bertholdi et.al. 2007], [CEN/CLC/TF 189], [DIN 8930-5], [GEFMA 540], [UZ 50], [VDMA 24198] this list is not exhaustive

We propose to distinguish between three main groups of services[2] (without any intention to value them):

1. *Consultancy services* such as energy audits, feasibility studies, engineering solutions, M&V reports, draft contracts, financing models or project facilitation. These consultancy based services are typically provided by planning engineers, CMVPs, bankers, accountants, lawyers and others, who basically provide analyses and advice.

   The consultant's risks are typically limited to his or her professional indemnity insurance, while the project performance risk remains with the client. Decision

   Payments for consultancy-type services are commonly agreed based on their inputs (hourly rates or lump sum). Sometimes consultants may also have a performance based component (e.g. share of savings achieved in first year or other success fees) in their remuneration scheme, but this is rather an exception.

2. *Technical services* for (and often in combination with) EE or RE *hardware* or *software* equipment and products. Examples are operation and maintenance services, technology maintenance services like servicing of burners or software updates with or without service level agreements.

   The provider's risks are typically limited to service or product warranties and vendor liabilities, but the equipment or project performance risk remains with the client.

   Remunerations are normally paid for the delivery of individual components and related services, but not tied to the performance or outputs of an equipment, system component or even an entire project.

3. *Performance-based energy services* also labeled as Energy-Contracting or ESCo services. An integrated energy service package (often a turnkey solution) with outsourcing of performance risks and guarantees to an ESP/ESCo.

   The two basic business models are: 1. *Energy Supply Contracting* (ESC), which delivers measured units of useful energy and 2. *Energy Performance Contracting* (EPC), which delivers energy savings measured in comparison to an ex-ante energy cost baseline.

   The ESCo's remuneration depends on the respective outputs of the services provided and not the inputs (like fuels, technology cost or person-hours) consumed, thus introducing an intrinsic interest for the ESP/ESCo to increase performance of the technologies deployed and to reduce cost, final-energy demand and related emissions.

All three groups of services are needed in energy efficiency markets. At the same time their function in the value added chain, their scope of service, their degrees of risk acceptance as well as their business models and remuneration schemes are notably different. Furthermore, different ES could be distinguished by what kind of decision and follow up they require in order to achieve EE or RE goals.

By distinguishing between these groups of services, the analysis and recommendations can be targeted much better. As a matter of course, there may be some overlaps between these categories in 'real world' projects.

[2] The *provision of information*, e.g. by energy agencies or market facilitators is sometimes also labeled as an energy service category, e.g. in Sweden

In many studies and statistics these groups of services are mingled, which may lead to rather unspecific findings and recommendations. Also in terms of reporting, e.g. in NEEAPs or ESCo registers, the numbers are not very meaningful, if not distinguished between the groups of service providers proposed above. Otherwise there is a risk to have high numbers of so-called ESCos registered, which do not correspond at all to the number of EPC projects implemented or the number of offers a RFP for an ESCo project will induce.

The different categories of services also reflect different client preferences, weather to buy individual components of an EE project (e.g. separate planning, construction, maintenance contracts) or to outsource a comprehensive package to one service provider.

And last but not least this differentiation allows delimiting "real", performance based services, which includes assumption of technical and economical risks by an ESCo against standard, non-performance based services.

In the subsequent sections we focus on performance-based services.

Definition and Concept

In a narrow sense we define Energy-Contracting as:

- *Energy-Contracting* – also labeled as *ESCo- or Energy Service* – is a *comprehensive energy service concept* for executing *energy efficiency* and *renewable projects* in buildings or production facilities according to *minimized project cycle cost*.
- An *Energy Service Company* (ESCo) typically acts as a general contractor and implements a *customized efficiency service package* (consisting of e.g. design, building, (co-) financing, operation & maintenance, optimization, fuel purchase, user motivation).
- As key features, the ESCo's *remuneration is performance based*, it bears the *commercial* as well as the *technical implementation and operation risks* and *guarantees the outcome* and *all inclusive cost* of the services for the duration of the project

[after Bleyl+Schinnerl 2008]

The Energy-Contracting concept shifts the focus away from selling units of final energy (like fuel oil, gas or electricity) towards the desired benefits and services derived from the use of the energy, e.g. the lowest cost of keeping a room warm, air-conditioned or lit.

Energy-Contracting (EC) is not about any particular technology or energy carrier. Instead EC is a flexible and modular "efficiency tool" to execute energy efficiency projects, according to the goals of the facility owner. It is an instrument to minimize life- or project cycle cost,[3] including the operation phase of the building. The ESCo acts as coordinator and manager of interfaces towards the customer and has to deliver the commissioned energy service to the customer at "all inclusive" prices as displayed in Figure 2.

ESCo products provide either useful energy (Energy Supply Contracting – ESC) or energy savings (Energy Performance Contracting – EPC) to the end user. And they achieve environmental benefits due to the associated energy and emission savings as well as non-energetic benefits such as increase in comfort or image gains.

At Energy Supply Contracting efficient supply of useful energy such as heat, steam or compressed air is contracted and measured in Megawatt hours (MWh) delivered.

[3] Here the sum of investment, operation and maintenance cost over the project term, also labeled as total or life cycle cost. E.g. capital-, consumption- and operation cost according to [VDI 2067] or [ÖNORM M 7140]

The model usually includes purchasing of fuels and is comparable to district heating or cogeneration supply contracts. The scope of energy efficiency measures is limited to the energy supply side, e.g. the boiler house (cf. chapter 5.3).

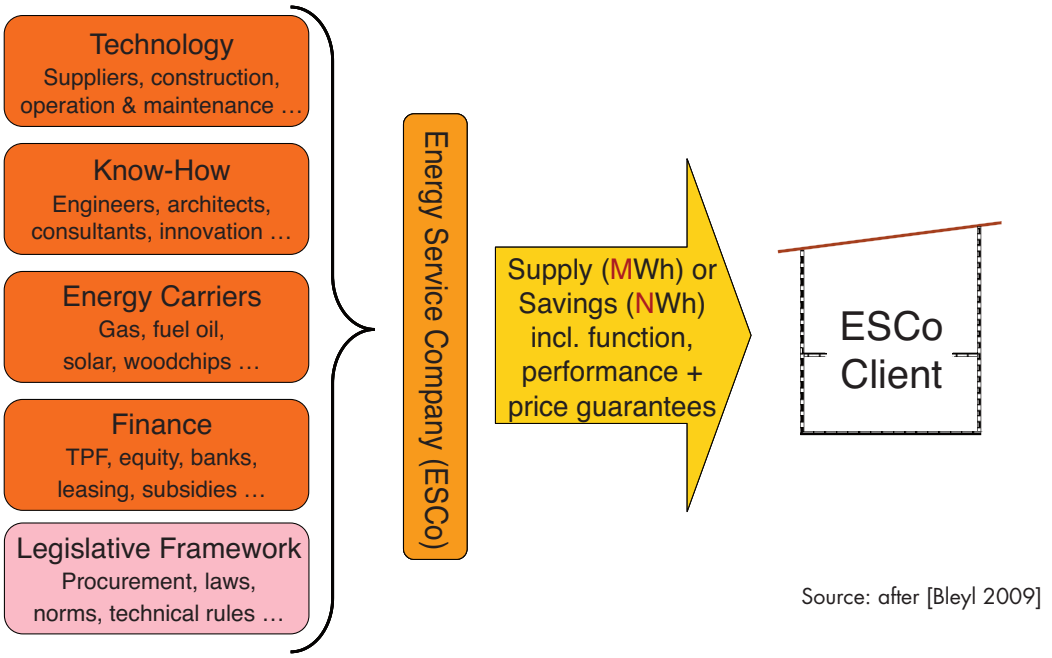


Figure 2: What is Energy-Contracting? An integrated service with guaranteed results

As for Energy Performance Contracting, the focus is on reducing final energy consumption through demand side energy efficiency measures. The scope is extended to the entire building including measures such as technical building equipment (e.g. HVAC), user behavior or the building envelope insulation as indicated in 0. The business model is based on delivering savings compared to a predefined baseline, also labeled as Negawatt hours (NWh).

Two Basic Business Models

Two basic business models can be distinguished, cf. Figure 3.

1. At *Energy Supply Contracting* (ESC) efficient supply of useful energy such as heat, steam or compressed air is contracted and measured in Megawatt hours (MWh) delivered. The business model usually includes purchasing of fuels and is comparable to district heating or cogeneration supply contracts. The scope of energy end-use efficiency measures is usually limited to the energy supply side of the building or enterprise, e.g. the boiler room. It can also be applied to energy supply from renewable sources, e.g. solar ESC.
2. As for *Energy Performance Contracting* (EPC), the focus is on reducing final energy consumption through demand side energy efficiency measures. The scope is extended to the entire building or enterprise including measures such as technical building equipment, user behavior or the building envelope insulation as indicated in 0. The business model is based on delivering savings compared to a predefined baseline, also labeled as Negawatt hours (NWh).

Figure 3 illustrates the typical scope of services of the above mentioned Energy-Contracting models.

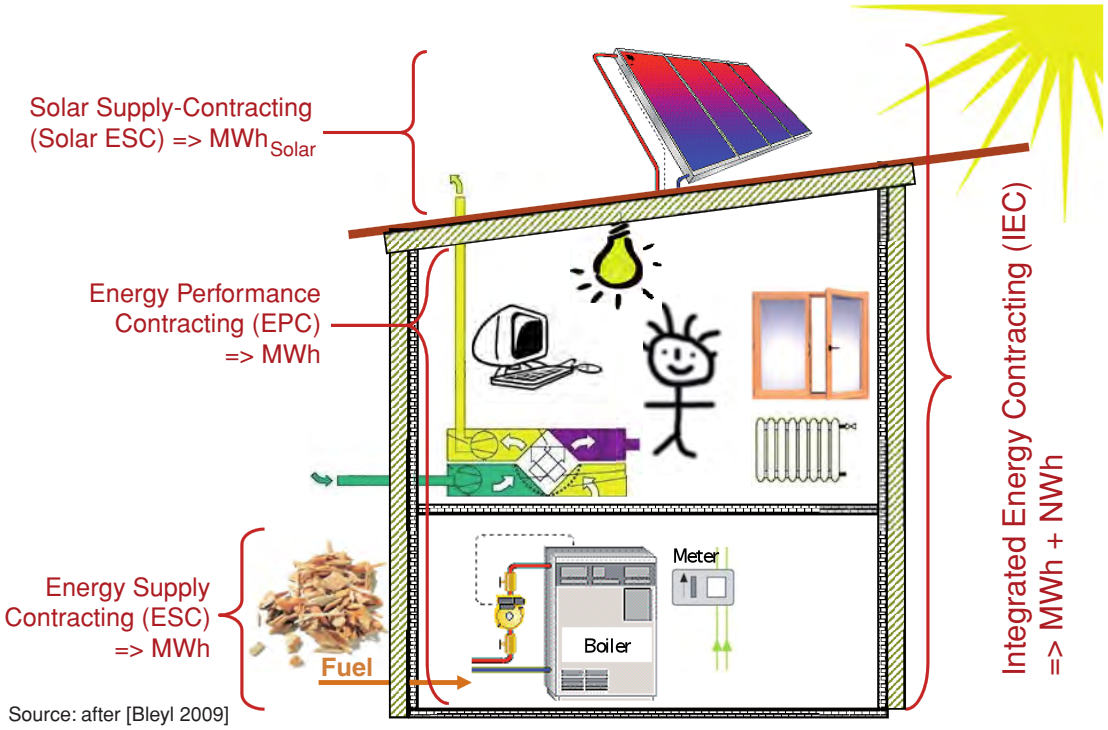


Figure 3: Scope of services of two basic ESCo models (left side), Integrating Energy-Contracting (right side)

Most "real" ESCo products are based on either one of the above business models.

The *Integrated Energy-Contracting* model (IEC), which was developed within Task 16 combines supply (preferably from renewable energy carriers) with energy conservation measures in the entire facility, while simplifying measurement and verification procedures e.g. through quality assurance instruments.

Modular Scope of Services

Most energy efficiency projects differ in their contents and general conditions. Therefore, it has proved to be necessary and sensible to adapt the scope of services specifically to the individual project. This also means the building owner can – depending on his own resources – define what components of the energy service will be outsourced and which components he or she carries out in-house (e.g. financing [4] or ongoing on-site maintenance provided by a caretaker).

The necessary components for implementing energy (efficiency) projects are summarized in an energy service package with result guarantees given to the client as displayed in Figure 4.

All the tasks shown in the figure, such as planning, construction and financing, as well as all the ongoing components of the service, such as operation and maintenance, optimization, purchasing of fuel and quality assurance, have to be covered by the building owner or the ESCo throughout the contractual period.

[4] In contrast to widespread opinions, the ESCo service package does not automatically need to include financing. Financing can be provided by the building owner, the ESCo or a third financing partner, depending on who can offer the better conditions. In any case, the ESCo can be used as a vehicle and facilitator for financing. This topic has been elaborated in more detail in [Bleyl+Suer 2006] or [Bleyl+Schinnerl 2008a].

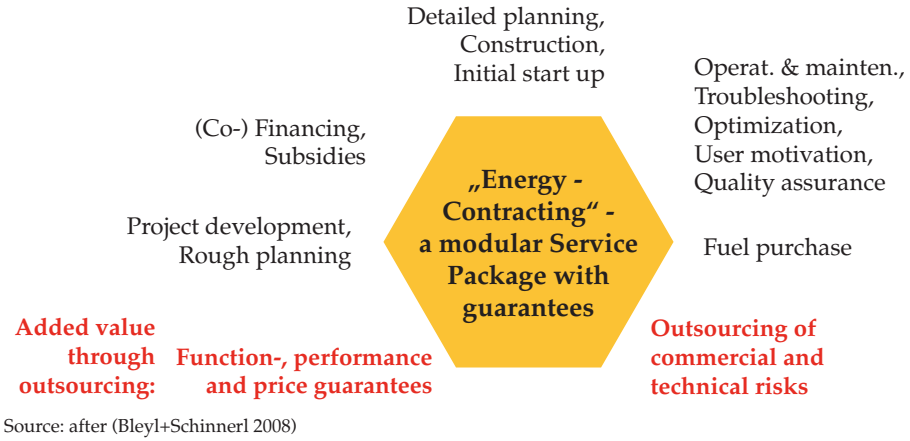


Figure 4: Energy-Contracting: A modular energy service package with guaranteed results for the client

In the ESCo's prices, all the expenditure items for the defined scope of services throughout the contractual period must be included ("all inclusive prices"). Correspondingly, project or life cycle costs (LCC) are calculated at the Energy-Contracting model.

The functional, performance and price guarantees provided by the ESCo and the outsourcing of technical and economic risks to the ESCo constitute an added value for the client, which should be considered at the comparison with an in-house implementation.

Think Tank Key Results and Plans

The Think Tank has worked on a variety of topics, which have led to publications and presentations at various national and international events (cf. section 7). Some of it is new work and still in progress. The following subchapters provide abstracts and outlines of current or planned Think Tank topics.

If you have questions or remarks to the Task 16 work, your feed back is highly welcome. You can reach the authors at Energetic Solutions, attention to Jan W. Bleyl (EnergeticSolutions@email.de).

On the Role of 'Facilitators' to Enable Energy Efficiency Projects (Abstract)

This abstract has been submitted to "The Energy Conference 2014" (http://www.theenergyconference.org.nz/).

Energy-Contracting is a many times proven 'delivery mechanism' to implement demand side energy efficiency and (renewable) supply projects in buildings and industries. However market volume is behind expectations in comparison to market potential forecasts and its contribution towards energy policy goals.

There is plentiful empirical evidence (e.g. from public institutions putting out tenders for ESCos to bid on) and growing awareness among stakeholders in particular in Europe, that successful energy service market development requires a strong commitment and a 'driving position' on the client side. In this paper we want to find out, what the challenges and barriers are on the client side of the energy service market, when setting out to procure comprehensive, performance based energy services? Which know-how, procedures and organizational change processes are needed? And how can potential clients be enabled to do so?

The analyses reveals a need for a broad and interdisciplinary range of activities and know-how such as project development and communication skills, interdisciplinary feasibility studies, life cycle cost analyses, "make or buy" decisions, structuring of business and financing models, procurement specifications and procedures, legal advice and contracts up to quality assurance, measurement and verification (M&V) of the project performance.

As a solution, we have found that so called 'Facilitators', who mostly consult on behalf of a client, can play an important and enabling role and have successfully done so. Besides enabling project development, another important advantage of this buyer-led approach is to foster competition between ESCos, other EE suppliers but also financiers. Likewise important, the Facilitator approach provides a fair and level but also knowledgeable playing field for this competition. Another Facilitator role is to serve as an intermediary between clients and ESCos '(corporate) cultures', interests and expectations in different phases of the project cycle.

The goal of this paper is to introduce the Facilitator concept outside of Europe and to discuss the added value of a wider application of Facilitators for the development of ESCo markets and comprehensive, performance based demand side EE and RE projects in general. And to provide guidance for facilitation services and activities as well as policy recommendations.

However we also want to raise awareness among Facilitators and other stakeholders, that the identified organizational needs for change require approaches beyond economic rationale or environmental awareness. Instead psychological and organizational change processes need to be put on the agenda, even though this may be new territory for most energy efficiency professionals.

Methodically, the research builds on an analyses of a typical energy services project life cycle, primarily from the perspective of a client, taking a 'negotiated procedure' as the procurement model. Existing 'Facilitator' services and activities were identified through interviews with ESCo clients, Facilitators and ESCos in six European countries and Korea. This was also the source for an economic analyses of project facilitation cost, which relies on empirical data from 32 "real world" projects. For the analyses of change processes, we refer to Kurt Lewin's model of change and take a first approach to apply it to client organizations and its individuals who want to outsource demand side energy projects.

This paper will build on a previous Task 16 paper called "ESCo Market Development: The Role of Market and Project Facilitators", which was published at the eceee 2013 Summer Study.

Simplified Measurement & Verification in combination with + Quality Assurance Instruments Options for Energy Savings in ESCo Projects

The following abstract has been submitted to the eceee Industrial Summer Study 2014 for peer review and publication. The full paper is work in progress and is available as of June 2014.

M&V of saving methodologies (if pursued at all) are mostly based on utility meters and invoices – at least in most European countries. In practice, M&V often encounters difficulties with data availability or accuracy, e.g. lack of comparability between baseline and reporting periods or the savings are small in relation to overall consumption. Sometimes M&V is driven by engineers, who thrive to be exact but lose sight of the

overall business case. All this results in insecurity for (potential) customers, financiers and ESPs on verifiable future energy savings cash flows, which may lead to risk surcharges or no project implementation at all. A full scale IMPVP M&V plan is often not applicable or desired, due to its (perceived) complexity, lack of resources or its cost are prohibitive for smaller projects.

This paper will introduce simplified M&V procedures for individual or groups of electricity and heat saving measures (ECM), which can be backed by so called quality assurance instruments (QAI). QAIs shall verify the functionality and performance of ECMs, but not necessarily their exact quantitative outcome over an entire project cycle. We start with the key saving measurement basics and options including formulae to than introduce QAIs for saving measures. Before the conclusions we provide examples both for electricity as well as thermal saving measures with a specific focus on industrial applications.

Methodologically, the paper is based on practical experiences with realized Integrated Energy Contracting (IEC) projects, which apply simplified M&V in combination with QAIs for their saving measures [Bleyl_2011]. It is supplemented with expert inputs from IEA DSM Task 16 [Task 16 2013], the ESCo competence center of the German Energy Agency dena [dena 2013] and inputs from further colleagues. And off course we draw on the "International Performance Measurement and Verification Protocol" [IPMVP_2012] and other literature sources.

Demand Response Services - Business Cases and Development as Energy Services. An Opportunity for ESCos?

The goal of this new work will be to identify business cases for additional revenue streams for ESCos by tapping into the added value of dynamic pricing of electricity, efficiency and CO_2-reduction. As a first step, we will investigate the feasibility to integrate demand response business cases into energy service business models.

Demand response (DR) can be defined as "changes in electric usage by end-use customers from their normal consumption patterns in response to changes in the price of electricity over time, or to incentive payments designed to induce lower electricity use at times of high wholesale market prices or when system reliability is jeopardized." (U.S. Dept. of Energy).

Generally DR is seen as one of the key elements of the future "smart grid" in order to cope with the fluctuating supply of renewables into the grid, leveling peak and base loads and other electricity network system operation challenges. In spite of this generally acknowledged importance, there is very little practical experience with demand response in most parts of the world. Most notably there is a need for the development of economically viable business models for DR aggregators and the identification of suitable service providers such as ESCos, utilities or independent entities.

With this background, the Subtask aims at investigating the feasibility of demand response energy services business models in particular from an ESCo perspective: Can ESCos be a driver and player for DR services? We will also look at the options to integrate demand response into existing energy service packages provided by ESCos and potential synergies through a more comprehensive full service package.

Planned activities:

1. (Potential) customer market analyses: Identification of suitable electricity customers and DR-potentials in industry and other large customers in the commerce and tertiary sector (based on existing national and international studies)
2. Balancing power/capacity markets: Analyses of existing markets and products and their regulatory environment as well as measurement and verification issues
3. Technical DR-solutions: Availability, feasibility and standard calculation/cost
4. Preparation of feasibility project cycle cost calculations and assessment for DR and DG business cases with a particular focus on ESCos (based on the previous three tasks)

In particular for Subtasks 1, 2 and 3, the new Task shall build on existing resources such as previous IEA DSM Tasks (e.g. 8, 15, 17, and 19) and other national and international work such as EU-DEEP or KONDEA (Austria).

The planned activities and research questions will need to be answered individually for the national markets participating. Possible solutions will most likely need to be adapted to national specifications and culture. We will focus on a cooperative research based on national experts work with a high task sharing allocation. Since demand response services may not be on the agenda of every participating country, the participation in this Subtask is not mandatory.

This Subtask was originally initiated by Spain, which unfortunately has not been able to confirm its continued participation. As of November 2013, Austria and Korea have committed themselves to start this Subtask (Thank you very much!).

All parties interested in further shaping and defining this Subtask are cordially invited to contact Jan W. Bleyl (EnergeticSolutions@email.de).

Integrated Energy Contracting (IEC): A New Energy Service Business Model to Combine Energy Efficiency and (Renewable) Supply (revised Abstract)

The Integrated Energy Contracting paper has been revised and will be submitted to either the journals Energy Policy and Energy Efficiency for publication.

There is an urgent need to increase market penetration of energy-efficiency measures in buildings and production plants. Here we present for discussion a new business model, Integrated Energy Contracting (IEC), as an innovative "delivery mechanism" for energy-efficiency and renewable-energy projects. IEC is intended not as a replacement for existing business models, but as an additional product approach to help spread energy-efficiency and renewables initiatives into new market sectors and smaller projects. Here are the three core ideas of IEC:

1. Combination of energy-efficiency measures at any point in the facility (building and/or production plant) with energy supply in one service package, following the "energy efficiency first" paradigm.
2. A flexible, pragmatic and case-by-case approach to measurement and verification (M&V) of energy-efficiency measures.
3. Avoidance of any incentive for the ESCo to deliver more energy.

We developed the IEC model out of the context of experience with the existing Energy Contracting (EC) basic business models, Energy Performance Contracting (EPC) and

Energy Supply Contracting (ESC). Both of these models have their strengths. EPC is a proven and effective framework for driving comprehensive energy savings in large facilities, especially where the utilization of these facilities is relatively constant or predictable over time. ESC has a larger market volume and has been successful in penetrating a variety of markets and improving energy efficiency on the supply side.

On the other hand, these two models also have limitations. ESC has, in practice, hardly moved "out of the boiler room" to include energy-efficiency improvements that reduce demand, and indeed it does not strictly exclude incentives for the ESCo to sell more energy. EPC is restricted to projects with very high energy cost baselines and uses relatively complex M&V methods, which are only affordable in rather large projects. IEC proposes ways to overcome these limitations.

IEC builds on the ESC model, which in many markets is more widely applied. Compared to ESC, IEC expands its scope to include energy efficiency measures in the entire facility in the areas of building technologies (e.g. controls, HVAC, lighting), building envelope, and the behavior of the users. To avoid incentives to supply surplus energy, the energy price is fixed at the profit-neutral marginal price.

Compared to EPC, IEC promotes simplified M&V methodologies. Particularly for smaller projects, we propose calculated (or computed) verifications in combination with quality assurance instruments (QAIs), which result in (penalized) flat-rate charges for the energy-efficiency measures. For bigger projects and M&V budgets, a fully IPMVP-compatible M&V regime can be applied to verify savings.

With these features, IEC should provide a framework for performance based energy-efficiency projects in a variety of market segments, and especially for finding economically viable solutions for smaller project volumes. In addition we present experiences from some pilot projects which confirm that IEC can work in practice.

Subject to further experiences, the IEC model might be a solution, which is more widely applicable to combine energy supply and delivery of EE potentials in buildings and enterprises. Perhaps energy efficiency will achieve higher market diffusion in combination with renewable energy supply? And maybe a less technical approach to verify savings and thus a simplification of (pseudo-)exact, indirect saving measurements, would serve the purpose of establishing EE as a resource well?

Dissemination of Results and Discussion with Stakeholders

Task 16 has produced a number of publications and given presentations at various conferences and workshop to disseminate and discuss the Task results. Furthermore stakeholder workshops were organized in conjunction with each project meeting to discuss Energy-Contracting topics relevant to the host country of the meeting.

Task 16 Publications (selection)

2013 Task 16 publications:

Bleyl, Jan W. et.al *ESCo Market Development: A Role for Facilitators to play* in eceee Summer Studies, paper ID 3-472-13, Belambra Presqu'île de Giens, France June 2013

Bleyl, Jan W. et.al *What is Energy-Contracting? Categories of Energy Services, Concept, Definition and Two Basic Business Models* Revision 3. IEA DSM Task 16 Discussion paper

Previous Task 16 key publications (selection):

Methodological comparison of ESC and EPC ESCo business models – three presentations: in Graz, June 2012, in Bremen September 2012 and Berlin October 2012

Bleyl, Jan W.: *How to unite energy Conservation and (Renewable) Supply? The new Integrated Energy-Contracting Model*. In: In memoriam Prof. Manfred Heindler. Graz, July 2011.

Bleyl, Jan W. *Conservation First! The New Integrated Energy-Contracting Model to Combine Energy Efficiency and Renewable Supply in Large Buildings and Industry* in ECEEE Summer Studies, paper ID 1-485, Belambra Presqu'île de Giens, France June 2011

IEA DSM Task 16: *Final Task Report (Phase 1: 2006–2009)* Graz, February 2010, download available from www.ieadsm.org

Bleyl, Jan W.; Schinnerl, Daniel, Task 16 Experts: *Comprehensive Refurbishment of Buildings through Energy Performance Contracting. Good Practice Examples Amended. A Guide for Building Owners and ESCos*, Graz June 2010, download available from www.ieadsm.org

Bleyl, Jan W.; Schinnerl, Daniel, Task 16 Experts: *Opportunity Cost Tool, Comparison and Evaluation of Financing Options for Energy Contracting Projects. Good Practice Examples Amended. A Manual for ESCo, ESCo customers and ESCo project developers*, Graz July 2010, download available from www.ieadsm.org

Bleyl, Jan W.; Seefeldt, Friedrich; Eikmeier, Bernd: *Energy Contracting: How much can it Contribute to Energy Efficiency in the Residential Sector?* In Proceedings of ECEEE 2009. Nice, June 2009, download available from www.ieadsm.org

Bleyl, Jan W.; Schinnerl, Daniel: *"Energy Contracting" to Achieve Energy Efficiency and Renewables using Comprehensive Refurbishment of Buildings as an example* in: Urban Energy Transition edited by Peter Droege, Elsevier 2008

Task 16 key publications in German language (selection):

Bleyl, Jan W.; Schinnerl, Daniel: *Finanzierungsmodelle für Energiedienstleistungen (Contracting). Ein Leitfaden für Gebäudeverantwortliche, Contracting-Unternehmen, Projektentwickler und Finanzierungsinstitute*, Graz Jänner 2008, download available from www.energytech.at

Bleyl, Jan W.; Schinnerl, Daniel: *Umfassende Gebäudesanierung durch Energie-Einspar-Contracting. Ein Leitfaden für Gebäudeeigentümer und Contractoren. Vorläufige Endversion*, Graz August 2009, download available from www.energytech.at

Bleyl, Jan W.: *Ganzheitliche Gebäudesanierung mit dem integrierten Energie-Contracting Modell am Beispiel der LIG Steiermark. Ein neues Geschäftsmodell zur Umsetzung von Energieeffizienz und (erneuerbare) Energielieferung für große Gebäude und Gewerbebetriebe*. IEA DSM Task16 Diskussionspapier. Graz, September 2009, download available from www.energytech.at

Meetings held in 2013

Date	Place	# of Experts	Type of meeting	Government	Industry	Academic
June 1st – 4th	ECEEE, France	13	Experts meeting	4	7	2
October 23rd – 25th	Graz, Austria	12	Experts meeting	4	6	2

Seminars and/or Conferences held in 2013

Date	Place	# of Experts	Type of meeting	Govern-ment	Industry	Academic
June	ECEEE, France	80	Stakeholder workshop	40	10	20
October 24th	Graz, Austria	16	Stakeholder workshop	4	9	3

Furthermore, Task 16 experts have given presentations at about 30 national and international conferences and seminars in 2013. The estimated outreach to stakeholders in numbers of participants is about 800 stakeholders.

Positioning of the Task – vs. other bodies

Task 16 "Competitive Energy Services" is a unique Task in providing an international expert platform for Energy-Contracting experts, developing innovative energy service models, initiating and mutally supporting national implementation activities and disseminating results to national and international stakeholders.

The members of the Task work and cooperate with their respective national bodies and projects and are involved in a variety of other international projects, dealing with the implementation of energy efficiency, ESCo market development and related topics. E.g. Task 16 has established cooperations with ESCo Europe, the ESCo Industry conference with an outreach even beyond Europe, the European Energy Service Initiative (EESI, www.european-energy-service-initiative.net) carried out in the framework of the Intelligent Energy Europe programme as well as with IEA EBC Annex 61 on "Business and Technical Models for Deep Energy Retrofit in Public Buildings" (http://annex61journal.com/annex-61) with a focus on business models.

New cooperation activities are envisaged with the IEA IETS (Industrial Energy Related Technologies and Systems) implementing agreement (www.iea-iets.org/), specifically its Annex 16 "Energy Efficiency in SMEs" with a focus on Integrated Energy Contrating models for SMEs.

Technology development success stories?

Task 16 is dealing with innovative Energy Service models to implement and deploy any kind of efficiency technology with market based instruments. Task 16 is not developing any particular technology itself.

ESCo services apply whatever (innovative) efficiency technology is available on the market. Accordingly, succesfull expamples are available in all sectors of efficiency technologies such as street lighting, heating, ventilation and air conditioning (HVAC-technologies), combined heat and power systems (micro-CHP) or comprehensive refurbishment of buildings and others. Good practice examples of Task 16 experts can be found in the Final Task Report.

Reports and Publications planned for 2014

The following publications and reports are planned for 2014:

- "Simplified Measurement & Verification + Quality Assurance Instruments for Energy Savings" applied for peer reviewed publication at ECEEE industrial summer study June 2014

- "What is Energy-Contracting? Categories of Energy Services, Concept, Definition and Two Basic Business Models". Revision 4. IEA DSM Task 16 Discussion paper
- "On the Role of 'Facilitators' to Enable Energy Efficiency Projects", applied for publication at the Energy Conference in New Zealand in March 2014
- "Integrated Energy Contracting (IEC): A New Energy Service Business Model to Combine Energy Efficiency and (Renewable) Supply" will be submitted to the peer reviewed journals Energy Policy or Energy Efficiency for publication
- "Demand Response Energy Services and possible business models as an additional source of income for ESCos". Publication of a preliminary discussion paper

Additional Think Tank topic publications may be decided by the country experts.

Meetings planned for 2014

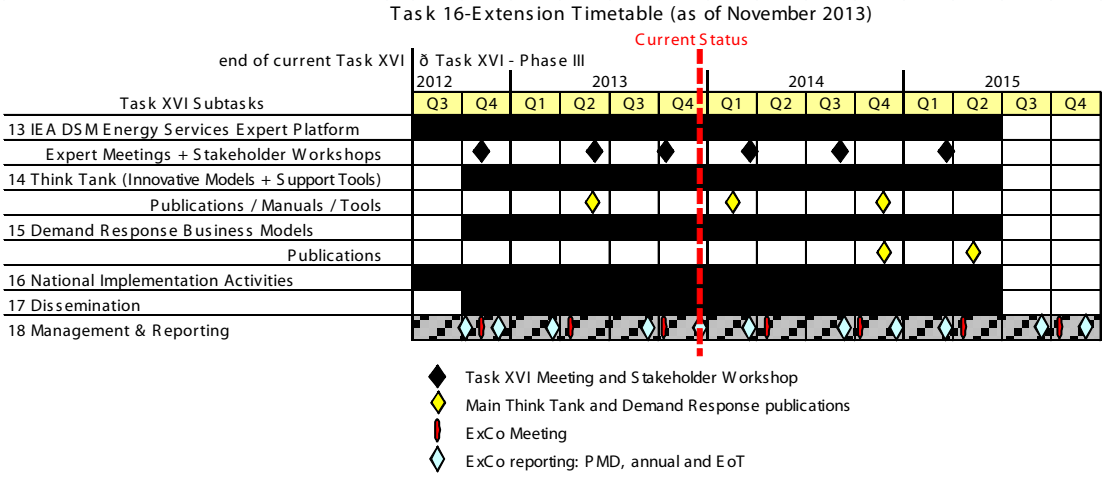
Two meetings of the IEA DSM Task 16 Energy Services Expert Platform are planned for the first and second half of the upcoming year. The 16th Task 16 expert platform meeting will be hosted by Factor4 & Energinvest on May 7–9 in Belgium. The 16th stakeholder workshop will be organized in cooperation with 'EESI 2020'. The fall meeting will be held in Seoul, Korea (exact dates will be announced). For requests please contact EnergeticSolutions@email.de.

In conjunction with each meeting, a stakeholder workshop will be organized to discuss Energy-Contracting topics relevant to the host country of the meeting and to present and disseminate results of Task 16. The workshops are open to guests from stakeholder organizations like ESCos, real estate owners, financing institutions and project developers like energy agencies. The stakeholders will be invited by the country experts hosting the workshop.

Task 16 will also be present at the ESCo Europe conference 2014 (www.esco-europe.eu) to take place in Barcelona on January 21st – 23th, giving presentations, chairing sessions and co-host a pre-conference ESCo university.

Activity Time Schedule

The project time schedule and current status is shown below:



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The project partners wish to *explicitly thank the IEA DSM ExCo members of the participating countries* and their *financing partners* for their support.

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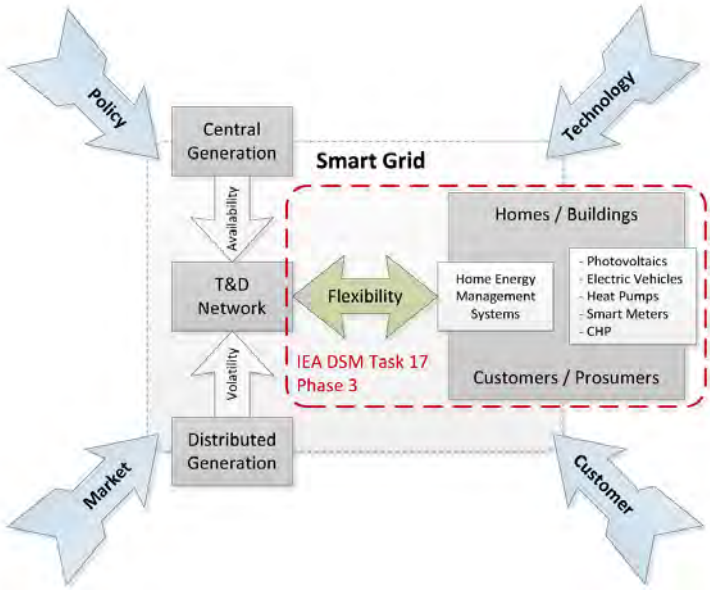
Task 17

Integration of Demand Side Management Distributed Generation, Renewable Energy Sources and Energy Storage

Operating Agents: Matthias Stifter, AIT/Austria, René Kamphuis, TNO/the Netherlands

Objectives of the Task

The main objective of Task 17 is to study how to optimally integrate flexible demand with Distributed Generation, Energy Storages and Smart Grids. Thereby increasing the value of Demand Response and Distributed Generation, decreasing the problems caused by intermittent distributed generation and reduction of the emissions of the system. The Task will look at integration issues from the system point of view on the grid, market, customer and communities.



Renewable energy sources are difficult to forecast because of their volatility. Therefore electrical networks and energy markets are considering flexibility by integration of demand response with distributed energy resources and energy storage as a solution to these challenges. By combining distributed generation with energy storage and demand response, on the nationwide market level and the regional distribution level these problems caused by distributed generation can be diminished and the value of intermittent energy in the market can be increased.

House and building energy management systems can enable the flexibility which is needed to integrate renewable energy resources. Current activities concentrate on technical standardisation and harmonisation of systems and preparing the way how flexibility can be delivered using smart, ICT-based, solutions.

The continuation of Task 17 in Phase 3 will concentrate on the impact of such flexibility on various stakeholders and focuses on the lessons learned by evaluating the benefits and costs of existing pilot projects.

Content of the work in Phase 3

Phase 3 of IEA-DSM Task 17 will address the current role and potential of flexible buildings (residential and commercial) equipped with Distributed Energy Resources – DER (Electric Vehicles, Photovoltaic, electricity and heat storage, heat pumps) and their impacts on the grid and markets. The scalability and applicability of already completed and on-going projects will be explored, especially in the context with of specific regional differences and requirements.

Subtask 10: Potentials of Flexible Prosumers

This Subtask will compile and evaluate the concepts and implementation of automated customer and home/building energy management systems (CEMS/HEMS):

- Controllability requirements
- Opportunities, challenges and barriers
- Energy and power balancing potentials
- Smart technologies: Smart Meter, CEMS, Virtual Power Plants, distributed generation and electrical storage, heat pumps
- The impact of these developments on existing metering, trade and billing processes

Subtask 11: Impact on stakeholder

The introduction of DER into competitive energy markets and 'fit-and-forget'-based distributions systems has non expected effects. Information from various sources will be analysed. A framework and a methodology will be developed for assessing impact on

- Grid, market and prosumers operation
- Sharing common benefits/losses
- Societal optimization potential
- Regulatory and legislative requirements
- Comparison costs vs. delayed investments

Subtask 12: Sharing experiences

Based on the results of collected pilots and case studies from the previous Subtasks the results and findings of the finished projects in term of successful implementations, barriers and effectiveness will be analysed:

- Collection of data / Workshops
- Extrapolation from previously collected projects and applicability

Subtask 13: Conclusion and Recommendation

Recommendations will be based on the experts' opinion and will provide a ranking based on impacts, costs and likely future penetration.

Activities planned for 2014 and 2015

IEA-DSM TASK XVII - Phase 3	Q1 14	Q2 14	Q3 14	Q4 14	Q1 15	Q2 15	Q3 15	Q4 15
Subtasks								
Subtask 10 - Role and potentials of flexible consumers								
Subtask 11 - Changes and impact on the grid and market operation								
Subtask 12 - Sharing experiences and finding best practices								
Subtaks 13 - Conclusion and recommendations								
Expert meetings								
Biannual country expert meeting								
Workshops								
Workshops with stakeholders and experts								
Reports								
Subtasks reports								
Final report								

Currently Phase 3 of the Task is planned to be launched in 2014.

Involvement of industry and other organizations

On a per country base, national stakeholder groups, the utility industry (DSOs, traders and retail companies) are represented amply. On the overarching level, currently the Copper Alliance has shown interest to join the initiative.

Reports produced in 2013

In 2013 a detailed project plan has been prepared.

Task meetings/Seminars/Conferences held in 2013

On 12 and 13 September in Delft, the Netherlands a definition workshop was held, which resulted in an extensive Task description.

Positioning of the Task – vs. other bodies

Internally there is a connection to Task 16, 23 and 24. There is also a link to ISGAN to tune working programs specifically with the technology and systems development and user and consumer engagement topic areas.

Participating countries

A minimum of 5 countries is required. Switzerland, Austria and Copper Alliance have committed. The Netherlands and Finland have shown strong interest.

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Task 21

Standardisation of Energy Savings Calculations

Operating Agent: Harry Vreuls, Netherlands Enterprise Agency, the Netherlands

Objectives of the Task

The overall aim of Task 21 is to identify basic concepts, calculation rules and systems for Energy Savings Calculations (ESC) standards. Both energy savings and emissions avoidance calculation methods and standards will be evaluated for efficiency activities. Additional a methodology will be developed to nominate and describe the several Demand Response products.[5] The Task will also explore how and by what type of organisations these draft standards could be used (and improved) to increase international comparable evaluation of policies and measures.

The three primarily objectives of this Task are to:

1. Summarize and compare the current methods and standards used for determining energy use, energy demand and energy and emissions savings from energy efficiency actions and policies;
2. Identify the organizations that are and could be responsible for use and maintenance of such methods and standards; and
3. Recommendations how existing methods, standards and resources can be expanded and/ or used for comparing different countries' and international efficiency policies and actions.

While this project may recommend future efforts to develop international energy efficiency EM&V standards and/or resources, this Task does not involve efforts to produce harmonized standards among the countries involved with this Task.

Organisation of the work

The actual research work will be carried out by a combination of the country experts, the Operating Agent, inputs from (experts involved in) standardisation bodies and from Operating Agents and reports for other relevant IEA DSM Tasks. In general the experts are responsible for identifying and obtaining information on ESC standards in their countries. The Operating Agent is responsible for mobilising inputs and comments from standardisation bodies, from other IEA Tasks, and for analysing and drawing conclusions for the information provided by the experts.

At least one but preferable two regional (Europe, North America, Asia, Pacific region) workshops will be organised. Additional to mobilise input for standardisation bodies the developed work will be presented, if possible in a form that could be used for training purposes.

[5] Demand response programs are designed to reduce short-term capacity needs and/or transmission constraints and can includes permanent peak reduction efforts. Task 13, Demand Response Resources, prepared already a range of DR products

Subtask 1: Existing energy savings calculation (ESC) standards and standards under development, and use of most relevant reports for ESC

Subtask objectives

The objectives of Subtask 1 are following. To identify national and regional existing energy saving calculation (ESC) standards and standards under development, to identify and asses the most relevant evaluation and monitoring reports for ESC and to identify basic terms and definitions, calculation rules and systems. Additional is to identify the key elements to structure Demand Response products.

Subtask Deliverable

A draft report summarising the most relevant guidelines and standards – national and international – on ESC, with a focus on identifying common approaches for determining savings and terminology as well as key elements to structure Demand Response products.

- A draft common template for energy savings calculations, to be used for national case applications.
- Drafts on case applications for selected technologies.
- National overviews on the most relevant guidelines and guidelines for monitoring and evaluating energy savings programmes.

Work to be carried out

The country experts will identify national standards and indicate regional standards and also what barriers exist for transforming energy savings calculations into agreed standards. As far as possible these barriers will be researched for different parties (governmental organisations, producers, consumers, scientific groups). The country experts, as well as the Operating Agent, will identify the most relevant evaluation and monitoring reports for ESC. They will assess these reports for use to define basic terms and definitions (concepts), calculation rules and systems. In this process the country experts and the Operating Agent will also investigate key elements in existing DR products in the participating countries. The experts summarise the outcome of the work in a country report.

The Operating Agent will ensure (in co-operating with the participating national experts) that the international standards will be included. He will include experiences from other Tasks within the IEA DSM Agreement, from the finalised Task 14 White Certificates, Task 1, Evaluation guidebook and Task 13 Demand Response Resources and on-going Task 16 on Competitive Energy Services and Task 18 DSM and Climate Change. He will also take care of knowledge development in other IEA Implementing Agreements as the 4E for Efficient Electrical End-Use Equipment. He will ensure that existing knowledge from the UNFCCC (e.g. CDM projects) is included.

The Operating Agent will review the DR products, as indicated by the country experts for the potential to develop a methodology to structure the DR products. He will also take into account the products from Task 13 Demand Resources. The work is restricted to key elements and is focussed on how definitions as used in DR products could come more in line with those used for energy efficiency improvement programs and definitions use in electric system operation as well as in the ESCO´s business (Task 16).

He will organise the country experts' assessment of the most relevant documents and review the draft country reports. Once all the information is collected, the Operating Agent will summarise the results and draft a report summarising the most relevant guidelines and standards on ESC and barriers to realise standards as well as key element to structure DR products. The country experts will discuss and comment the draft report.

Subtask 2: Basic concepts, rules and systems for ESC standards

Subtask objective

The objectives of Subtask 2 are the following four: To draft the basic terms and definitions, calculation rules and systems are in use in ESC and how these are transformable to (draft) standards. To develop a methodology to structure Demand Response products, including 'general accepted' criteria. For existing standards or standards under preparation to identify how and why these standards are or could be used in impact evaluation for policies and measures. To provide comments to organisations those have draft ESC standards or standards under development.

Subtask Deliverables

A draft report on Energy Savings Calculations holding the main (basic) terms and definitions, calculation rules and systems for energy savings calculations, and related greenhouse gas emissions. This report also presents the harmonised energy savings calculations for selected technologies as well as Demand Response case applications.

- National case applications for selected technologies, using the common template for energy savings calculations
- Draft case applications for Demand Response projects and energy savings.

Work to be carried out

The country experts will contribute and comment on updated versions of the report on the basic concepts, calculation rules and systems as well as on the section dealing with a methodology to nominate Demand Response products. They will give attention to the opportunities to implement the common elements in the national and regional standards for energy savings calculations and report on the (potential) usefulness of the three level approach and the harmonisation of energy savings lifetime. Related to on-going or planned standardisation work for energy savings calculations they will consult the national standardisation bodies and – if applicable – draft comments on (selected) national standards.

The country experts will also collect information on potential 'general accepted' criteria to be included in a methodology to structure Demand Response products. The Operating Agent will draft a report on the terms and definitions, calculation rules and systems for experts' discussion. He will co-ordinate the improvements of this draft report ensuring input from on-going relevant work in other IEA-DSM Tasks. He will take care that definitions, originating for DR products, will be compatible with relevant existing terminologies, especially the system operation and the market operation terminology as used in energy companies. He will draft the method to structure the DR products and the general accepted criteria that could be used to make the products of

IEA DSM Task dealing with DR more comparable and useful to combine by organisations acting in the energy field (e.g. aggregator and ESCO´s).

The Operating Agent will draft comments on regional standards while the country experts will do this for the national standards. The Operating Agent will be responsible for organising the process of discussion on these drafts (using a restricted section of the IEA DSM Website) and the co-ordination of the reactions to and from the standardisation organisations.

The Operating Agent will consult the international standardisation organisations and is responsible for the co-ordination of the country experts' consultations He will also ensure that there is a good communication process with the Operating Agents for other relevant Tasks within the IEA DSM Agreement, for ESC as well as for DR definitions. He will present preliminary conclusions from the work on international meetings to get involvement from as broader range of market organisations.

Subtask 3: Potential for use and continue development and maintenance of ESC standards

Subtask objectives

The main objective of Subtask is to explore potential use: to what extent the basic terms and definitions, calculation rules and systems could be organised in such a way that (inter)national standards organisations can use these to improve international comparability of energy efficiency impacts; how these standards can ease international more comparable evaluations of policies and measures and how the methodology to nominate and describe the Demand Response products, including 'general accepted' criteria could be used by other IEA DSM Tasks and relevant (inter)national organisations.

Additional to identify what organisations could be the main actor to continue the development, the maintenance and future development of these standards and finally to how the information in the report could be used as training material

To finalise the report on the basic terms and definitions, calculation rules and systems including related GHG emissions and Demand Response products

Subtask Deliverables

The final report on Energy Savings Calculations holds the main (basic) terms and definitions, calculation rules and systems for energy savings calculations, and related greenhouse gas emissions. This report also presents the harmonised energy savings calculations for selected technologies as well as Demand Response case applications.

A report summarising the most relevant guidelines and standards, national and international, on energy savings calculations. The focus in this report will be on common approaches for determining energy savings and for common terminology. Additional key elements for energy savings and Demand Response products will be presented.

A report showing roadmaps along which ESC standards could be further developed, by e.g standardisation organisations or organisation dealing with guidance for energy efficiency impacts, emissions savings or evaluation of energy policies and measures.

Country reports holding the national case applications, the most relevant national guidelines and standards, Demand Response case and the on-going work for standards.

Work to be carried out

The country experts will research, using the (draft) reports from Subtask 1 and 2, the national organisations responsible for the further development of the results of the IEA work into official ESC standards, the working processes and the planning. They will asses the expected use of existing and future ESC standards in evaluation of policies and measures and meta-evaluation and/or reports. They will take into account the relations with (inter)national estimations of GHG emissions. They will consult relevant national organisations for commenting to the draft methodology to structure Demand Response products, including 'general accepted' criteria.

The experts will give input to and comments on the drafts of the final report and the report on roadmaps. They will give special attention to the potential of the draft report for use as support material for training.

The Operating Agent will organise the communication with the international standardisation organisations. Two regional workshops could be organised assuming that one workshop will be hosted and one organised from the Task' budget.

The Operating Agent will contact (international) organisations that could be the main actor to continue the work and research how the reports should be organised to fit with the work processes in (inter)national standards organisations. In these contacts he will also explore whether the information for improved international comparability of energy efficiency impacts and international more comparable evaluations of policies and measures as well as definitions for Demand Response products should be presented all together or in different ways.

The Operating Agent will finalise the report on the basic terms and definitions, calculation rules and systems including the section on DR product. For this report he will draft the conclusions and recommendations for maintenance of ESC standards and results from discussion with country experts and relevant market parties and Operating Agents for relevant IEA DSM Tasks.

Subtask 4: Communication and information

Subtask objectives

This Task is targeted to inform experts and engage stakeholders and communicate the on-going work in the Task on ESC standards, to provoke the Reference manual for DR products and discuss this with other IEA DSM Tasks and to stimulate adoption of the concepts and terms by IPEEC and other international institutions on policies, research, trade and education.

Subtask Deliverables

There will be a range of products. Task leaflets and newsletters will be produced and distributed. At least one presentation on a relevant international conference will be given and one and potential two regional workshops on ESC standards (and relevant DR products) will be organised in co-operation with the country experts.

Status reports for the Executive Committee meetings and a final report to the Executive Committee will be prepared.

In relevant workshop related to the Executive Committee meetings will be participated and the work from the Task will be presented.

Contributions will be made to the IEA DSM Annual Reports and editions of the Spotlight Newsletters.

Work to be carried out

The Operating agent will be responsible for the communication and information distribution. For the follow up of the Task it is important that the information is presented clearly and that the wording is correct. The draft final reports for experts' approval will be edited by an experienced English writer. The draft-final and final Task reports for Executive Committee approval will be (re)edited to ensure that it clearly presents the information and recommendations developed under the Task.

The country experts will be involved in drafting the newsletters and the regional workshop(s).

Involvement of industry and other organisations

The national and international standardisation bodies will get involved in the work. nput was provided to the European standardisation body CEN, which published end of 2012 the standard on energy savings calculations.

Reports produced in 2013

Harmonised Energy Savings Calculations for selected end-use tehcnologies, key elments and practical formulas . This holds the main (basic) terms and definitions, calculation rules and systems for energy savings calculations, and related greenhouse gas emissions. This report also presents the harmonised energy savings calculations for selected technologies as well as Demand Response case applications.

Guidelines for Harmonised Energy Savings Calculations The focus in this report I on common approaches for determining energy savings and for common terminology.

Roadmaps for improved Harmonised Energy Savings Calculations. This report contains an overview on recent developments and potential future actions by e.g standardisation organisations or organisation dealing with guidance for energy efficiency impacts, emissions savings or evaluation of energy policies and measures. It also holds potential additional work for Task 21. But such work was not approaved by the Executive Committee.

Paper presented at the IEPEC conference 2013: Energy savings calculations and EE Obligation schemes.

Reports planned for 2014

- The final management report to the Executive Committee.
- Leaflet for IEA DSM Task 21, Task closing version 2014.

Meetings planned for 2014

No meetings as the Task will be closed by April 2014.

Positioning of the Task – v.s. other bodies

Information on DR programmes included in the publications produced for the Task 15, Network driven DSM case studies and Task 18, DSM Projects database has been used as input in the country reports, where relevant.

Information on Energy Efficiency Obligation Schemes included in the publication produced for the Task 22 has been used as input for the report guidelines on energy savings calculations.

On-going work on standards dealing with energy savings in CEN and ISO are take into consideration for the reports on energy savings calculations.

Activity Time Schedule

The Task entered into force on 1 April 2009 and will remain in force until 1 April 2014.

Subtasks	2010	2011	2012	2013	2014
Subtask 1 Existing energy savings calculation (ESC) standards and standards under development, and use of most relevant reports for ESC	—				
Subtask 2 Basic concepts, rules and systems for ESC standards	—	—	—		
Subtask 3 Potential for use and continue development and maintenance of ESC standards		—	—	—	
Subtask 4 Communication and information	—	—	—	—	—

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Task 23

The Role of the Demand Side in Delivering Effective Smart Grids

Operating Agent: Linda Hull, EA Technology, United Kingdom

Description

The owners and operators of electricity systems are facing significant challenges due to the unprecedented changes in the way that electricity is generated and the demands for electricity. These changes are driven by a variety of factors, but especially important is the focus on reducing carbon emissions and the move towards a low carbon economy. Generation mix is becoming increasingly characterised as one with a significant amount of renewable generation which is less predictable and flexible than the large power stations more typical of today's networks. The move towards the de-carbonisation of end use applications of energy, particularly heating and transport, which are occurring alongside these changes in the generation mix, results in the introduction of significant new electrical loads onto already constrained networks. These effects combine to make the challenge of balancing the supply of and demand for electricity increasingly demanding and complex.

No longer is it considered viable for electricity to be provided 'on demand' in response to the requirements of end-users. Rather, a co-ordinated approach is required whereby the actions of all energy producers and consumers are integrated to ensure the use of renewables can be optimised whilst also minimising the use fossil fired generation and optimising the use of the existing network. Such an approach is the essence of the Smart Grid concept.

Whilst there is considerable focus on the technological aspects of delivering Smart Grids, little is understood of the extent to which consumers are willing and able to embrace new technologies and initiatives that enable their use of energy to be actively managed. Therefore, there is a risk that if consumers do not adopt new approaches to the way that they consume electricity, Smart Grids may not be able to achieve their full potential.

Therefore, Task 23 was established to explore how customers interact with Smart Grid related initiatives.

Task aims and objectives

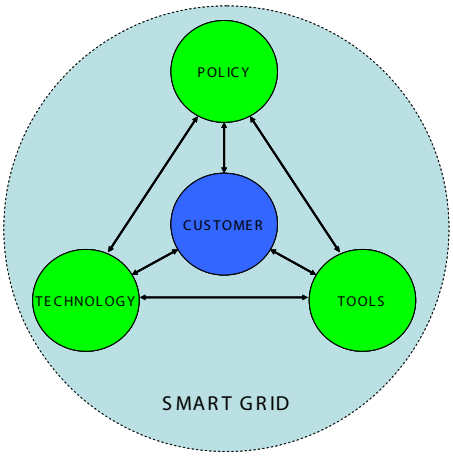
The aim of Task 23 is to identify and where possible quantify the risks and rewards associated with Smart Meters and Smart Grids from the perspective of the consumer, both now and in the future. By identifying the potential risks and rewards the Task would seek to identify best practice guidelines in order to ensure the demand side contributes to the delivery of effective Smart Grids.

Specific objectives of Task 23 are to:-

- Understand the impact of the structure of energy markets on the interactions of consumers with Smart Grids;
- Explore the impact of technologies on the ability of customers so that they are able (and willing) to contribute towards the successful implementation of Smart Grids;

- Identify the risks and rewards associated with Smart Grids from the perspective of customers;
- Understand the opportunity for stakeholders to influence these risks and rewards;
- Identify tools to minimise the risks and maximise the rewards associated with the Smart Grid from the point of view of the consumer, whilst still satisfying the needs of other stakeholders;
- Understand customer reactions and preferences to offers and opportunities that a smart grid might provide (including local supply); and
- Understand regulatory options, practice and consequences.

The Task focuses on the interaction of policies, technologies and tools with customers, and examines the impact of these interactions on the effectiveness of Smart Grids, as indicated below.

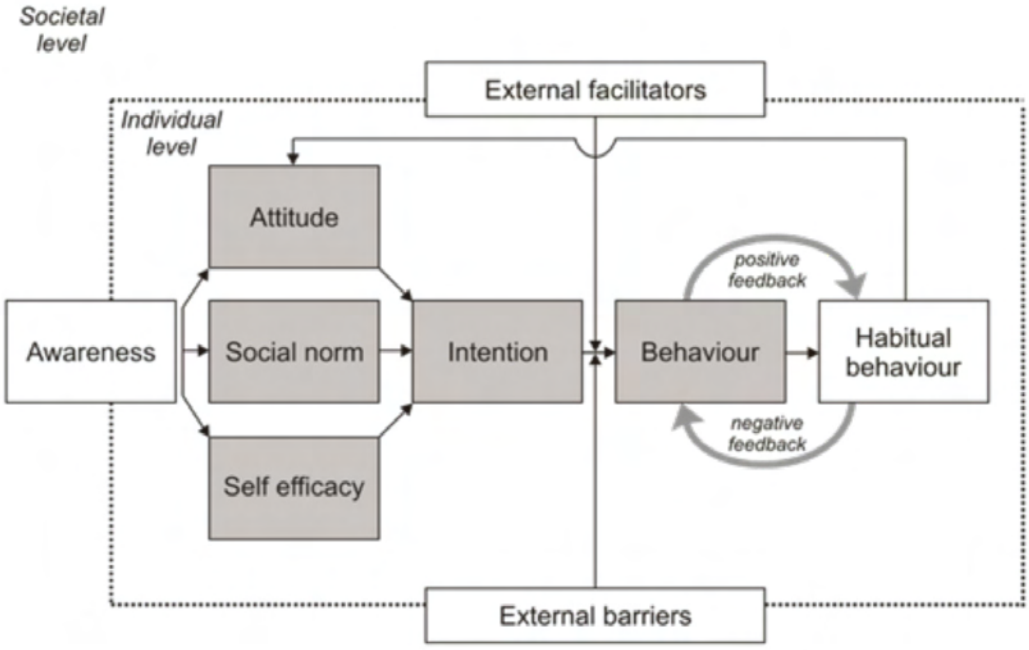


Interaction of Policy, Technology and Tools with Customers and the Impact on the Implementation of Smart Grids

Smart Grid initiatives endeavour to achieve energy efficiency and/or load shifting by enabling or stimulating certain energy behaviours. Once that behaviour is well defined, a behavioural model can be used to help explain the factors that influence the decision maker's choice over whether or not to perform the behaviour.

Some energy behaviours may be best discussed using an individualistic approach, whilst others are best understood using a systemic approach. Some focus on one-off behaviours whilst others focus on habitual actions. The starting point for the present Task 23 is that valuable insights can be found using all approaches, and therefore the model outlined below has been selected to provide theoretical guidance for the research of Task 23.

This framework is considered to be particularly suited to the purposes of Task 23 because it reflects that different people will react differently to a situation because of their own attitudes, self-efficacy and the social norms relevant to them. Likewise, people with similar attitudes and subject to similar social norms may react differently due to the influence of external factors. In this case, this includes the opportunities / barriers created due to the impact of the electricity market structure.



Theoretical model of energy behaviour

Subtask 1: Impact of energy markets on the role of customers (completed)

Subtask Objectives

- This Subtask considers the societal level of the energy behaviour model, particularly the impact of energy market on the potential role of customers, i.e. the external facilitators and barriers that arise as a direct result of the structure of the electricity market.

Subtask Deliverables

- Market map for each participating country
- Analysis of impact of different market structures on Smart Grid implementation from the perspective of customers

Work Carried Out

There are many stakeholders in the energy market with different interactions with consumers and different responsibilities. This Subtask maps the interactions of different stakeholders in a 'market map' for each participating country, with the consumer as the central focus. This could include power and information flows and responsibility (e.g. for billing and metering). Ownership of data may also be an important issue from the consumer perspective and so the current situation in each country will be shown on the map.

The 'market map' provides an overview of the situation in each country to allow similarities and differences to be identified. The differences in markets between countries influence the opportunities and barriers impacting on consumers. For example, a market that is not fully unbundled makes it difficult for new entrants to enter the market and offer innovative new products and services to consumers, thus limiting choice to consumers. Similarly, a retail monopoly may have little incentive to provide increased

choices to consumers, for example due to concerns over ensuring they can maintain their allowed level of regulatory return. They may also have little or no flexibility over the way tariffs are structured, and changing tariff structures may be difficult.

However, whilst the lack of competition is generally regarded to be a barrier to the introduction of new innovative products, including those relating to Demand Side Management and Integrated Resource Planning, there are specific aspects of a fully unbundled market that make it more difficult for consumers to become active participants in the implementation of Smart Grids. Some of these are highlighted below.

Broken value chain

In an unbundled electricity market, the value chain for demand side management products and services is 'broken', i.e. the benefits of particular actions are distributed amongst a number of disparate stakeholders. A market mapping exercise conducted by each of the participating countries demonstrates unbundled electricity markets do not provide for a co-ordinated approach for the supply of and demand for demand side management services and products.

Consumer understanding of market stakeholder roles

There are many stakeholders in the energy market, each having specific roles and responsibilities. These differing roles and responsibilities are not necessarily well understood by consumers, and thus it may not be a straightforward process for consumers to be able to define the impact of their energy end use on the different stakeholders. For example, consumers may not understand the significance of the pattern of their electricity consumption on the local network company (or indeed have an awareness of their local network company and its responsibilities).

Too much consumer choice

The increasing move towards competition in electricity supply means more choice for consumers who can (in theory at least) choose when to purchase, how much to purchase and from whom. The need for Electricity Companies to retain existing consumers and attract new business ensures they focus on ensuring cost effectiveness and consumer service. This leads to the introduction of innovative and new products and services. However, whilst this is important, it does not always help consumers become active participants. For example, too much choice can make it very difficult for consumers to compare offerings and select the one that is best for them.

Subtask 2: Interaction between technology and customers (completed)

Subtask Objectives

- This Subtask focuses on the individual elements on the energy behaviour model, focusing on customer attitudes, social norms and self-efficacy and how these impact on customer intention to participate.

Subtask Deliverables

- Overview of Smart Grid experiences from the perspective of customers
- Analysis of Initiative and Market Readiness levels

Work Carried Out

This Subtask considered the interaction of customers with a range of Smart Grid related interventions (control technology, tariffs, information and feedback). A number of case studies and consumer surveys have been reviewed in order to understand the ways in which customers interact with different technologies/ interventions and their attitudes to them. The Subtask specifically focused on evaluating the readiness of the initiatives themselves, and the readiness of the market to accept them.

The consumer surveys provide an overview of customers' attitudes towards Smart Grid concepts, and other closely related subjects (e.g. climate change and sustainability). These results highlight that customers claim to be willing to engage in Smart Grid related activities, particularly those that promise a financial benefit. The review of case studies demonstrates that whilst there is a large amount of activity ongoing, these often involve small groups of customers that may not be representative of the population as a whole. In addition, information relating specifically to consumer attitudes is often poorly reported within the project results. The case studies demonstrate that whilst many Smart Grid interventions can be considered technically mature, the market readiness (i.e. the degree to which the market understands and accepts them) often lags behind.

Subtask 3: Identification of Risks and Rewards associated with Smart Grids (completed)

Subtask Objectives

- Identify the possible risks and rewards relating to the Smart Grid concept from the customer perspective. This element of the project focusses on the individual element of the energy behavioural model, in particular customer attitudes towards risk and rewards and how this impacts on the decision making process (i.e. intention).

Subtask Deliverables

- Assessment of how risk and rewards impact on the decision making process
- Report chapter(s) detailing risks and rewards from perspective of customers

Work Carried Out

This Subtask explored how customer attitudes to risks and rewards impacts the decision making process. It demonstrates that customers do not make decisions on solely on an economic basis, but rather a range of factor influence the decision making process. That is, consumers do not make decisions based on whether or not the economic gains outweigh the losses.

A methodology for quantifying risks and rewards has been developed, which demonstrates how the concerns of customers can be quantified and compared with the potential rewards. The application of this methodology to a case study demonstrates that quantifying costs and benefits does not always provide a good prediction of the way that customers behave. However, it can be a valuable tool to assist implementers to design solutions that are acceptable to consumers.

Subtask 4: Defining offers and programmes (tools) to help ensure Smart Grids meet needs of customers (ongoing)

Subtask Objectives

- To identify tools and measures to ensure Smart Grids meet needs of customers.

Subtask Deliverables

- Guidance to implementers of Smart Grid related initiatives to ensure Smart Grid initiatives are more likely to be accepted by consumers.

Work to be Carried Out

It is believed that the effectiveness of the Smart Grid can be improved by engaging with the demand side. However, in order to engage with consumers and achieve their "buy-in", the Smart Grid should provide tangible benefits to customers themselves. This could include direct benefits associated with Smart Grid deployment, or additional functionality or services which represent "added value" to the consumer.

Therefore, this Subtask will draw upon the findings of Subtasks 1 to 3 to identify tools and measures that could be deployed to ensure that Smart Grids meet the needs of customers, whilst also meeting the needs of other industry stakeholders who stand to benefit from Smart Grids.

Subtask 5: Helping customers to actively engage with Smart Grids – Synthesis and Dissemination of Findings

Subtask Objectives

- To bring together the results of Subtasks 1 to 4 and ensure that the results can be disseminated effectively via a series of regional workshops organised and delivered by the Task participants.

Subtask Deliverables

- Dissemination materials

Work to be Carried Out

This Subtask will identify the key issues that impact on the way customers interact and view Smart Grids. This will include the impact of market structure, the role of technology, the ability for customers to realise any potential rewards whilst minimising the risks, and the effective deployment of tools and measures indentified in Subtask 5. Thus this Subtask will focus on disseminating the factors that need to be addressed in order to ensure that Smart Grids are able to achieve their full potential by ensuring that all industry stakeholders, including customers, benefit from their deployment. This Subtask would include an industry workshop, to which a wider group of cross-industry stakeholders could be invited to discuss the results and findings of the Task.

Activities completed in 2013

Activities completed during 2013 include:

- A number of consumer surveys were reviewed to gauge consumer reaction to Smart Grid related initiatives and other related activities. The consumer surveys cover a range of aspects of energy consumption and attitudes towards sustainable behaviour.
- A number of case studies of Smart Grid related pilots have been provided by the Task Experts. These have been analysed to provide an overview of willingness and engagement in Smart Grid related activities.
- The analysis of the consumer surveys and case studies has been collated into an report that represents the output of Subtask 2. The report highlights that the customers in the consumer surveys and case studies evaluated display a range of attitudes and behaviours; initiatives that are successful in one context may not work in another context – even with individuals with similar attitudes and beliefs. Similarly, an initiative that works with one group of individuals will not necessarily be successful with another group of individuals. This is particularly pertinent in terms of rolling out Smart Grid initiatives to the wider population, as many of the trials and pilots reviewed involved small groups of individuals. These are likely to be innovators and early adopters, and keen to try new technologies. The results will, therefore, not necessarily translate to the wider population.

Activities planned for 2014

- The Task is scheduled to be completed in 2014.
- Development of guidelines to assist Smart Grid implementers help ensure that customers are able and willing to play a role in the successful implementation of Smart Grids. This will entail drawing on the results of Subtasks 1, 2 and 3.
- Development of a matrix to enable the interrelationship between industry stakeholder benefits and consumer benefits to be identified and quantified.

Involvement of industry and other organisations

Industry is actively involved in the project, through National Teams formed by the National Experts. This includes representatives from one or more:

- Network Operators
- Energy Retailers
- Manufacturers
- System Operators / Market Operators
- Regulators
- Government

Reports produced in 2013

- The Subtask 1 report showing the impact of markets on customers' willingness and ability to participate in Smart Grids
- The Subtask 2 draft report showing the interaction of consumers with a range of Smart Grid related initiatives. This report also includes a summary of 23 surveys of consumer attitudes towards Smart Grid related initiatives and 27 case studies are also presented.
- The Subtask 3 draft report which provides an overview of the way that risks and rewards are perceived by consumers, and how these perceptions impact on the decision making process.

Reports planned for 2014

- Subtask 4: Report on designing Smart Grid Initiatives to maximise customer engagement
- Subtask 5: Production of dissemination materials

Meetings held in 2013

Date	Place	Type of meeting	Total Experts	Government	Industry	Academic
3–5 July	Steinkjer, Norway	XM	6	1	6	
9–10 Oct	Seoul, Korea	XM	5	1	4	

XM = Expert meeting

Meetings planned for 2014

None

Technology development success stories

Nil

Positioning of the Task vs. other bodies

Whilst there is considerable focus on the technological aspects of delivering Smart Grids, for example through the development of new technologies and initiatives to enable the demand side to become active participants in the market, little is understood of the extent to which customers are willing to embrace these new technologies and initiatives. However there is a risk that if customers are not willing to adopt new approaches to the way that they consumer electricity, Smart Grids may not be able to achieve their full potential. Task 23 will explore the potential risks and rewards associated with Smart Grids from the perspective of customers.

This Task is also closely aligned with the work of Task 24. In particular, Task 23 is a user of behaviour change research, and will therefore, liaise closely with Task 24 to gain best practice and share experiences.

This Task will be of interest to other Smart Grid initiatives including:

- The International Smart Grid Action Network (ISGAN)
- Directorate of Sustainable Energy Policy, IEA work on regulatory, market and consumer policies needed to ensure Smart Grid deployments are carried out with adequate consideration of the risks to and rewards for all stakeholders.

Activity Time Schedule

It is anticipated that the Task entered into force in June 2012 and will remain in force until end of May 2014.

Subtasks	2012	2013	2014
Subtask 1: Impact of energy markets			
Subtask 2: Interaction between technology and customers			
Subtask 3: Identification of risks and rewards			
Subtask 4: Tools to help ensure Smart Grids			
Subtask5: Synthesis and Dissemination			

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Task 24

Closing the Loop – Behaviour Change in DSM: From Theory to Practice

Operating Agent: Dr. Sea Rotmann, Sustainable Energy Advice (SEA), New Zealand and Ruth Mourik, DuneWorks, the Netherlands

Background and Motivation

Introduction and Participating Countries

The IEA DSM Executive Committee originally initiated Task 24 in 2012. It is currently in its first term until end of December 2014.

As of November 29th 2013 the following countries have confirmed participation in IEA DSM Task 24 – Phase I (in alphabetical order) and have delegated experts:

1. Austria (contract not finalised)
2. Belgium (contract not finalised)
3. Italy (contract not finalised)
4. Netherlands
5. New Zealand
6. Norway
7. Sweden
8. Switzerland
9. South Africa (contract not finalised)
10. UK (in kind, contract not finalised)

For contact details of current and future financing partners, experts and institutions, please refer to end of document.

A proposal for extension to December 2017 has already been presented to the Executive Committee and the Netherlands have indicated financial support for the Task 24 extension. The Task also welcomes experts and case studies from other countries and currently has almost 200 experts from 21 countries on the invite-only expert platform (www.ieadsmtask24.ning.com).

This Annual Report focuses on content and key results of the 2013 Task work as well as the future work programme.

Why study behaviour change in DSM?

There is great opportunity for Demand Side Management programmes if the behavioural potential (estimated to be as vast as 30% of total energy demand – Dietz et al, 2009) could be easily accessed and directed. However, as many other IEA DSM Tasks have discovered, the 'market failure' of energy efficiency is often due to the vagaries of human behaviour and choice. The best ideas, policies and programmes have been shown to fail again and again in achieving their desired outcomes. The current social and policymaking norm is still NOT to see energy saving behaviour as a major priority in achieving a transition to a sustainable energy system.

There are several reasons for these challenges and this Task sets to uncover, unravel and define them in order to provide clear recommendations to policymakers and DSM implementers. One of the main challenges is that humans are often still regarded as economically rational actors whose behaviours can be influenced by fiscal incentives alone. However, the complexities influencing human behaviour are so vast and manifold that such simplistic approaches almost invariably fail. It is imperative to uncover the context-specific factors (from infrastructure, capital constraints, values, attitudes, norms, culture, tradition, climate, geography, education, political system, legislature, etc) that influence human behaviour in specific sectors (the factors that influence our transport behaviours often differ from the ones driving our hot water usage, for example).

In addition, there are a large variety of research disciplines that endeavour to study human behaviour (social and environmental psychology; environmental and behavioural economics; anthropology; science technology studies; practice and innovation diffusion theory etc), each with their own models and frameworks, advantages and disadvantages. Unfortunately, they usually do not communicate well – not with each other and not with the end users of their research – the policymakers, technology developers, and DSM programme designers and implementers. This leads to confusion and lack of context- specific programme or policy design that is based on the best behavioural information or models.

Another crucial issue relates to monitoring, understanding, learning about and adapting initiatives in a more systematic manner. DSM projects demonstrate a great diversity of goals, scope, participants, resources, etc to meet the diversity of implementing environments. As a consequence, developing a generic evaluation and monitoring framework that is widely applicable and does justice to this diversity is difficult. However, there is a real and urgent need for more appropriate and effective monitoring, evaluation and learning of successful DSM implementation. The fact that there is little robust and concrete evidence on the contribution of DSM to a more sustainable energy system is not helpful when trying to garner support and demonstrate value to investors, policymakers and other relevant actors – especially when different actors are likely to be interested in different contributions and outcomes. Currently, DSM policymakers and other relevant stakeholders fund and/or support DSM programmes on a rather ad-hoc basis because they lack the means of assessing their impact on contributing towards a more sustainable energy system.

In conclusion, there is no behaviour change 'silver bullet', like there is no technological silver bullet that will ensure energy efficient practices. Designing the right programmes and policies that can be measured and evaluated to have achieved lasting behavioural and social norm change is difficult. We believe that this Task, and its potential extension, will help address these difficulties and come up with guidelines, recommendations and examples of best (and good) practice and learnings from various cultures and contexts. We rely on sector-specific experts (researchers, implementers and policymakers) from participating and interested countries to engage in an interactive, online and face-to-face expert platform and contribute to a comprehensive database of a variety of behaviour change models, frameworks and disciplines; various context factors affecting behaviour; best (and good) practice examples, pilots and case studies; and guidelines and examples of successful outcome evaluations. The Task has several deliverables, the most important being the expert network and platform for continued

exchange of knowledge and successes and the large-scale analysis of the helicopter overview and case studies.

Task aims and objectives

The main objective of this project is to create a global expert network and design a framework to allow policymakers, funders of DSM programmes, researchers and DSM implementers to:

I. Create and enable an international expert network interacting with countries' expert networks

II. Provide a helicopter overview of behaviour change models, frameworks, disciplines, contexts, monitoring and evaluation metrics

III. Provide detailed assessments of successful applications focussing on participating/sponsoring countries' needs (smart meters, SMEs, transport, building retrofits)

IV. Create an internationally validated monitoring and evaluation template

V. Break down silos and enable mutual learning on how to turn good theory into best practice

Subtask 5 Expert platform			
Subtask 1 Helicopter overview of models, frameworks, contexts, case studies and evaluation	**Subtask 2** In depth analysis in areas of greatest needs	**Subtask 3** Evaluation tool for stakeholders	**Subtask 4** Country-specific project ideas, action plans and pilot projects

Expectations and Results

This Task is quite unique both in its scope and in its approach:

- We regard the most important component of the energy system to be the 'human' component. We believe that wasteful and inefficient energy use is a human problem with a largely human solution (technology design, uptake and use; and design and sucessful rollout of policies and business models also falling into this). We also believe that communicating these solutions need a more 'human' touch in order to translate between the many different disciplines, sectors and their associated jargons.
- We translate relevant knowledge from research and theory to policymaking and practitioners.
- We engage our huge expert network to support our work in the various Subtasks.
- We bring together these highly experienced experts from every sector involved in changing energy-using behaviours ('the behaviour changers'): research, government (local, regional, national, international), industry, intermediaries, and the third sector.
- We 'match-make' behaviour changers from different sectors, countries and interests and help them find ways to collaborate, understand, support and learn from each other.
- We will give them tailor-made recommendations of to do's and not to do's, based on their specific country, sector and domain of interest.
- We widely publicise our Task, importance of behaviour change and the IEA DSM Implementing Agreement in person, in conferences and via social media.

- We develop creative ways of disseminating our work. We tell some great stories to illustrate the many examples where behaviour change approaches have worked - and where they have failed and why.
- We have a very wide scope, befitting the complexity of the topic. Our case studies encompass 4 main domains: transport, smart metering/feedback, building retrofits and SMEs.
- We ask the difficult questions, and try to find the right answers.

Deliverables are broken down in Table 1 (revised and based on 8 participating countries).

Table 1

Phase / Duration of the action (in months)	Preparation	1–2	3–4	5–6	7–8	9–10	11–12	13–14	15–16	17–18	19–20	21–22	23–24	25–26	27–28	29–30
Subtask 0: Management of the task																
Set up an advisory board.																
Workshops to finalise task definition in Austria/New Zealand, plus VC, 6-monthly ExCo meetings. Annual Advisory Board (AB) meetings. Task outcome presentation in South Africa?	Kick-off WS AUT/NL			ExCo		ExCo			AB ExCo			ExCo		AB	ExCo	
Subtask 1: Helicopter overview of models, frameworks, contexts, case studies and evaluation metrics																
1.0 Development of template to analyse models, frameworks and evaluation metrics.																
1.1 Inventory of available models,frameworks and disciplines and analysis of applicability of models in differing contexts.																
1.2 Deliverable on definitions of models and frameworks and their contextual applicability.																
1.3 Build-up and continuous updating of database (wiki style).																
Workshops in Belgium (August 2012) and UK (October 2012), summary in New Zealand workshop (February 2013).			WS Bel/UK	Web	WS NZ		WS NO									
Subtask 2: In depth analysis of topics of particular interest to participating countries																
2.1 Detailed characterisation of targeted cases and development of case study template																
2.2 Collection and analysis of case studies for different selected sectors, themes and countries with inventory of key context factors and success stories and learnings. Insert in database developed under ST 1.3 (Note: extra length of time due to logistics of collecting case studies in countries when national expert workshops are held.																
2.3 Development of deliverable on context factors influencing DSM activities in topics of particular interest to participating countries.																
Workshops and webinars in Belgium and UK (same as in ST 1), New Zealand (February 2013) and Norway (May 2013).			WS Bel/UK	Web	WS NZ	Web	WS NO		WS CH			WS NZ	WS Swe			
Subtask 3: Evaluation Tool																
3.1 Identyfying relevant indicators/metrics/tools for monitoring and evaluation of DSM projects and programmes.																
3.2 Assessing context sensitivity of indicators/metrics/tools, dependent on stakeholder needs.																
3.3 Developing and testing monitoring and evaluation tool.																
Workshops in Norway, Switzerland, Sweden (and Italy if it joins).							WS NO	VC	WS CH		Web	WS NZ	WS Swe	VC	WS Ita	
Subtask 4: Country-specific project ideas, research priorities, to do/not to do lists and ideas for pilot projects																
4.1 Development of stakeholder-tailored to do's and not to do's for successful context (country) sensitive implementation, monitoring and evaluation of DSM projects on selected topics and target groups (i.e. smart metering, SME's and transport).																
4.2 Development of country specific research priorities, project ideas and pilot plans – to be put in practice if task extension is approved.																
4.3 Dissemination of to do's and not to do's.																
Workshops in Switzerland, Norway, New Zealand and others if other countries become participants.					WS NZ		WS NO		WS CH		Web	WS NZ	WS Swe	VC	WS Ita	
Subtask 5: Social media expert platform																
5.1 Overall coordination of the project.																
5.2 Design of a Stakeholder Engagement Plan.																
5.3 Design of the online platform and specification of its individual components in consultation with experts.																
5.4 Utilisation of ongoing expert platform.																
Workshops to finalise task definition in Austria/New Zealand plus VC. ExCo meeting sign-off in Norway (April 18, 2012). Ongoing omline interaction.	Kick-off WS AUT/NZ	Web	Web	Web	Web	Web	Web	Web	Web	Web	Web	Web	Web	Web	Web	Web

Detailed Deliverables (based on 8 participating countries)

Sub-task	#	Deliverable name	Type of deliverable	Month of completion
0	D0	Advisory committee, Task Management	- Network, annual meetings, governance - Annual reports, ExCo updates, flyers, Spotlight articles, conference presentations, scientific papers, blogs, columns, tweets, publicity, networking, engagement with IEA Secretariat and other DSM groups and implementing agreements	ongoing
1	D1	Database/wiki listing collected models, contexts, evaluation metrics and a list and short descriptions of DSM policies, programmes and projects	- Database/wiki with an inventory of what diverse (sub) disciplines have to offer both empirically and theoretically; and an inventory of evaluation metrics and contexts affecting behaviour change - An overview of different definitions used in the field - List of experts working with different models of understanding - A template that has been filled in with > 20 'models' and > 40 descriptions of DSM work in 4 themes - Framework/navigation tool for stakeholders to evaluate models for diverse uses - Filmed interviews with DSM experts highlighting issues central to diverse models of understanding - Filmed short presentations by national experts on models of understanding they have provided - 'Tweetable' (ie 140 characters or less) definitions of each model of understanding - Positioning papers for Brussels and Oxford workshops - Stories of 40+ case studies using models of understanding behaviour in practical applications	12 but continuing thereafter
1	D2	Final 'report' on work in ST1	Interactive format, including film, graphics and interviews, tweets and podcasts as well as framework, tables and lists	18
2	D3	Surveys and post-evaluation of detailed case studies in 4 topics of particular interest to participating countries	- Report/interactive feedback - List of interview questions for case study surveys - Filmed interviews with some case study stakeholders - List of detailed case studies in participating countries and how certain models have contributed to a better understanding of DSM and behaviour change - Special attention will be put on evaluation to be fed into Subtask III - Best practices of participating countries will be publicised - Country-specific context factors and key approaches to solving contextual issues on the local, regional and national level	24
3	D4	Tool to evaluate 'successful outcomes' of DSM programmes	Interactive tool based on what works best for various stakeholder needs	24
4	D5	To do's and not to do's, priority research areas and ideas for pilots and projects for participating countries and stakeholders	- Country-specific briefs and other formats - Stakeholder analyses in participating countries	30
5	D6	Social platform and meeting place for DSM and behaviour change experts and implementers	- Online social media platform for collaboration and dissemination - List of global experts, their bio, field of expertise and ability to engage with them - Face-to-face workshops in participating countries publicising countries' DSM successes and sharing learnings	ongoing

Reports, films and publications produced in 2013

Reports and publications:

- 'The Monster' Task 24 Subtask 1 analysis (https://bit.ly/task24monster)
- eceee Summer Study 2013 peer-reviewed conference paper (http://proceedings.eceee.org/visabstrakt.php?event=3&doc=1-183-13)
- ELCAS conference paper by Carabias-Hütter, Lobsiger-Kagi, Mourik and Rotmann (2013)
- NZ stakeholder analysis from Wellington workshop
- Task 24 updated IEA DSM flyer
- eceee and EEIP columns
- 3 Spotlight articles
- Dr Ruth Mourik Green Growth article
- 'The Little Monster' http://bit.ly/littlemonster

Presentations of Task 24:

- Definitions for Task 24 (http://www.slideshare.net/drsea/definitions-for-task-24)
- Task 24 presentation at the NERI conference in Wellington, February 2013 (http://www.slideshare.net/drsea/neri-conference-task-24)
- Task 24 Pecha Kucha (http://www.slideshare.net/drsea/iea-dsm-task-24-pecha-kucha)
- Presentation to Energy Savers Dubai, UAE June 2013 (http://www.slideshare.net/drsea/task-24-behaviour-change-presentation-to-energy-savers-dubai-23602026)
- Presentation and 3 informal workshops at eceee June 2013
- Informal Task presentations at RSE (Milan, Italy); Leeds University (UK); Stockholm Technical Institute (Sweden); Grazer Energy Agency (Austria); Energy Efficiency and Conservation Authority and Ministry of Business, Employment and Innovation (New Zealand); BECC (USA)
- Conference and workshop presentations at Utrecht DSM workshop (NL); eceee (France); ELCAS (Greece); IEEE ISGT (Denmark); Luzern DSM Workshop (CH); BECC conference (USA)

Films/podcasts:

- Overview of the various models of understanding and theories of change from the Wellington Task 24 workshop (http://www.youtube.com/watch?v=DOTkdA97Woo&feature=c4-overview&list=UU_p3PlWDpLyDBh8TwUBmVHQ)
- Overview of implementation bloopers in policy and practice (http://www.youtube.com/watch?v=O0F-8lQZvaM&feature=c4-overview&list=UU_p3PlWDpLyDBh8T-wUBmVHQ)
- New Zealand's energy story (http://www.youtube.com/watch?v=jyYyDXhErjE&feature=c4-overview&list=UU_p3PlWDpLyDBh8TwUBmVHQ)
- Ruth Mourik's own energy story (http://www.youtube.com/watch?v=GTZ205rf8UE&feature=c4-overview&list=UU_p3PlWDpLyDBh8TwUBmVHQ)
- Podcast interview with energynet.de

All outputs are collected on the Task 24 invite-only expert platform (www.ieadsmtask24.ning.com).

Online sharing and administration of Task 24:

- Widely disseminated via @IEADSM on Twitter (also @DrSeaRotmann and @RuthMourik), IEADSM LinkedIn and Facebook groups; eceee and EEIP columns and various energy and behaviour LinkedIn groups
- Weekly publication of News by Dr Sea Rotmann. www.ieadsm.org/viewNews.aspx?id=12
- Expert platform www.ieadsmtask24.ning.com
- Mendeley (www.mendeley.com) Task 24 Group and bibliography database of >400 behaviour change and energy publications
- CRM Capsule (www.crmcapsule.com) contact relationship management system, collects all emails and contact information related to the Task
- Behaviour change and energy pearltree (www.pearltree.com) to collect and manage related websites etc
- Task 24 dropbox (www.dropbox.com) to share templates and collected models etc
- Task 24 wikipedia (www.ieadsmtask24wiki.info)
- Task 24 youtube channel (http://www.youtube.com/user/DrSeaMonsta/videos?flow=grid&view=0)
- Task 24 slideshare (http://www.slideshare.net/drsea)

Activities planned for 2014

- Subtask I – Helicopter Overview report finalised with new participating countries
- Subtask I – Interactive wiki
- Subtask II – Analysis of case studies and best practice in four overarching themes
- Subtask III – Tool to enable better evaluation of successful behaviour change outcomes depending on the stakeholder point of view
- Subtask IV – Country-specific recommendations, to-do's and plans going forward
- Subtask V – Continuing expert platform and analysis of success of expert platform
- Spotlight issues and blogs/columns on various aspects of the Task
- Task experts, sector experts and case study stories have been collected via films, cartoons and short stories. A collection of all these stories will be presented in an interactive 'storybook'
- Start of work for extension of Task 24

Involvement of Industry and other organisations

A number of industry players, NGOs, intermediaries and consultants are actively participating in Task 24, including providing case studies, being represented on our Advisory Board and coming to Task 24 workshops. The Task attempts to capture all sectors of 'behaviour changers' to include a wide variety of approaches and learnings from real-life interventions.

Positioning of Task vs other bodies

Task 24 has started conversations around collaborations with the IEA Secretariat (Sara Pasquier and Steve Heinen), ISGAN (Annex 2 Operating Agent Dong-Joo Kang) and EBC Implementing Agreements (Michael Donn, NZ Expert). The IEA DSM workshop in New Zealand in March 2014 will include experts from other IEA Implementing Agreements New Zealand is part of. We also work closely with organisers of the eceee, ACEEE, BECC and BEHAVE conferences, including being on steering committees and review panels and running informal sessions and workshops at conferences. We were invited to discussions around forming an international behaviour change society at the BECC conference in Sacramento in November. We presented Task 24 at the transport panel organised by our Australian expert Kevin Luten after the BECC conference. We chaired the Consumer Behaviour panel at the IEEE ISGT conference in Copenhagen and are giving a keynote address at the German Development Insitute conference in Bonn. First talks have happened with the new BECC Japan conference organisers and we are involved in discussions with an Australian University and Queensland Government about how our findings can be used in practice. The Energy Savers UAE have organised a conference for Task 24 and are continuing to involve us in conversations around behaviour change in the Middle East.

Technology development success stories

Task 24 is not developing any particular technology itself, however it is examining the interaction of behavioural practices and technology, especially related to feedback. To this end, several multi-national technology developers are interested in, and contributing to the Task. The Task is particularly engaged with the Spanish (in-kind) expert, Juan Pablo Garcia, who is developing several key pieces of feedback technology, particularly in the IT sector. Task experts and Operating Agents are providing support and recommendations towards these developments, as requested. The Spanish expert also designed a new App to be used during (filmed) workshops, which was beta tested in Task 24 workshops in Trondheim and Luzern.

Task 24 expert meetings held during last 12 months

Date	Place	Total # Experts	# of countries	Type of meeting	Government	Business and NGO	Academic
12/11/12	online	6	5	Expert Webinar		2	4
20/12/12	Utrecht, NL	22	1	Stakeholder Meeting NL	1	14	7
7/2/13	online	6	5	Expert Webinar		2	4
15/2/13	Wellington, NZ	50	4	Expert Workshop	15	15	20
22/5/13	Graz, AUT	10	2	Social Media in Task 24		10	
27–29/5	Trondheim, NO	20	8	Expert Workshop	1	3	17
10/10/13	Stockholm, SE	12	2	Expert Workshop	4	1	7
15/10/13	Luzern, CH	30	9	Expert Workshop	3	12	15

Seminars and/or Conferences where Task 24 was presented in the last 12 months

Date	Place	Total # Experts	# of countries	Type of meeting
17/12/12	Wellington, NZ	10	1	Stakeholder update NZ Government
13-14/2/13	Wellington, NZ	100+	6	National Energy Research Institute conference 'Energy at the Crossroads'
13/3/13	Paris, FR	30+	28	Presentation to IEA Secretariat Behaviour Workshop 'Choices, Decisions and Lifestyles Roundtable'
24/4/13	Utrecht, NL	50+	12	DSM Workshop 'The NL Polder Model', 2 presentations
7/6/13	Hyéres, FR	450+	45	eceee summer study, 1 presentation, 3 informal sessions
15/6/13	Milan, IT	15	2	presentation to RSA – Italian stakeholders
17/6/13	Dubai, UAE	30+	3	Task 24 Presentation at UAE Energy Savers
8/7/13	Nisyros, Greece	100+	10+	Task 24 presentation by Swiss expert at ELCAS
21/8/13	Wellington, NZ	6	1	Stakeholder update NZ Government
7/10/13	Copenhagen, DE	100+	15+	IEEE ISGT conference – also leading Consumer Behaviour panel
16/10/13	Luzern, CH	30+	10+	IEA DSM Workshop
8/10/13	Stockholm, SE	8	2	Presentation at Technical Institute Stockholm
11/10/13	Brisbane, AUS	25	2	Skype lecture to Qld University energy efficiency course
27/10/13	Brisbane, AUS	12	2	Presentation to Queensland Government
20/11/13	Sacramento, US	500+	15+	BECC Conference presentation
20/11/13	Sacramento, US	25+	6	Transport panel at BECC conference
2/12/13	Flanders, BE			Smart Grid conference
12/12/13	Bonn, DE			Expert Roundtable on Energy Efficiency & Behaviour in Developing Countries, German Development Institute
19/12/13	Wellington, NZ	30	1	Stakeholder update NZ Government

Meetings planned for 2014

Several meetings, both face-to-face and online, are planned for 2014. We will have several webinars with our national experts to discuss ongoing work and any potential issues or questions. Our next face-to-face expert workshop will be in New Zealand on March 17, followed by the ExCo meeting and a 2-day conference by the NZ ExCo member, the National Energy Research Institute (www.neri.org). Further expert workshops are planned for Austria and South Africa later in the year. In each expert workshop, hosted by a participating country, the country will get to tell its unique behaviour change and DSM 'story'.

Activity Time Schedule

Task 24 started its operation in January 2012, although its final work programme was not officially balloted by the ExCo until July 2012. The ExCo has agreed in Espoo Nov 2012, to take the official Task starting date as July 2012, which will mean it will finish in end of December 2014 as there are now 8+ countries participating (at no extra cost to participating countries). A 3-year Task extension is planned to turn theory into practice by more in-depth work with experts from participating countries. Particular emphasis will lie on evaluation methods of ongoing, long-term behaviour change outcomes which can be linked back to specific DSM interventions.

Subtasks	2012		2013		2014	
Subtask 0 – Administration						
Subtask 1 – Helicopter Overview						
Subtask 2 – Case Studies						
Subtask 3 – Evaluation Template						
Subtask 4 – Recommendations						
Subtask 5 – Expert Platform						

Participation

Ten countries expressed strong interest in the Task, and the Netherlands, Norway, Belgium, New Zealand, Sweden and Switzerland have confirmed their participation. We await contracts from South Africa, Italy and Austria. The UK has participated with so much in-kind (financial and expert time) support that the ExCo decided to ask the UK for official (in-kind) participation in the Task. Several non-DSM countries have also expressed interest and provided support, including Germany, Canada, the US, Denmark, Australia and UAE. In addition, we have countries that have suported the Task with significant in-kind expert time (Spain and Portugal).

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