

2014

Annual Report



International Energy Agency

Implementing Agreement on Demand-Side
Management Technologies and Programmes



iea dsm
energy efficiency

International Energy Agency

**Implementing Agreement on
Demand-Side Management
Technologies and Programmes**

2014 Annual Report

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

January 2015

Foreword

This report is the twenty-first Annual Report of the IEA Implementing Agreement on Demand-Side Management Technologies and Programmes, summarising the activities of the twenty-first 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 2015

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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 (IA) 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 14 member countries, and two Sponsors have been working to identify and promote opportunities for DSM during 2014:

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

The Programme’s work is organised into two clusters:

- The load shape cluster, and
- The load level cluster.

The “load shape” cluster includes Tasks that seek to impact the shape of the load curve over very short (minutes-hours-day) to longer (days-week-season) time periods. The “load level” cluster includes Tasks that seek to shift the load curve to lower demand levels or shift loads from one energy system to another.

A total of 24 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, NL 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
Matthias Stifter, AIT, Austria
- 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 – *Completed*
Balawant Joshi, ABPS Infrastructure Private Limited, India

Task 21 – Standardisation of Energy Saving Calculations – *Completed*
Harry Vreuls, NL 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
– *Completed*

Linda Hull, EA Technology, United Kingdom

Task 24 – Closing the Loop – Behaviour Change in DSM: From Theory to Practice
Sea Rotmann, New Zealand, and Ruth Mourik, the Netherlands

Task 25 – Business Models for a More Effective Uptake of DSM Energy Services

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

CHAPTER I

Chairman's Report

Styling DSM

The IEA DSM Programme has a new strategy. This is a part of the process to extend the term for the Programme and requires moments of consideration over what has been achieved in the past and what is required for the future. A process that is necessary and useful but not entirely pleasant! Just as we all, with growing age, do not always find it pleasant to see ourselves in the mirror in the morning.

DSM is (still) the essential part to enable a change of energy systems to be sustainable. And DSM is (still) exiting, maybe even more today than in the past.

Our new strategy is (still) aimed at maximal Energy Efficiency of end users, but the mix of technology- and social sciences, and the mix between changing of equipment and changes of behaviour has become more pronounced and balanced. There is now a unique blend of these two elements that are both beneficial for our participants and for the entire IEA Technology Network.

There is also a more obvious recognition of the mutual dependence between energy efficiency improvements on one hand and use of primarily local and renewable energy supply resources on the other hand. A dependence that is mostly codified in the expressions "Distributed Energy Systems" and "Integrated Demand Side Management".

The energy system of the future will be very different from the past and this will require not only technical and behavioural changes but also institutional changes for regulation and management.

Our research area contains four topics:

- *Distributed Energy Resources in (smart) cities*
With a higher degree of decentralisation more of the crucial developments in the building of systems will take place in municipalities, cities and regions.
- *Market Design to enable DER-systems (IDSM)*
Institutional settings are important to improve and make use of the flexibility of systems and the integration of resources depends on how responsibilities and incentives need to be designed.
- *Market design to incentivise industry compliance*
Both utility and industrial customers will be more active in dissemination of DER systems. This deals with both business models and rules for trading of obligations.
- *Utilities' best practices to develop DER business*
Utilities develop new business activities that may be very different and would be worth to analyse and compare

In each of these topics we have, or are developing specific Tasks.

Sceptics might repeat the initial question even stronger "So you do have a new styling, but what did you actually achieve?"

Well we finalized three Tasks:

- Standardisation of Energy Savings Calculations;
- Branding of Energy Efficiency; and
- The Role of the Demand Side in Delivering Effective Smart Grids.

You will find more information on this work in this Annual Report. The reports from the Tasks are also available on our new website. www.ieadsm.org

But there is much more. Our running Tasks are having workshops and producing articles and reports as well.

In these new Tasks we see an increasing role for ICT. In some cases as a tool, for instance for the modelling work of the Task that looks at the Integration of Demand Side Management, Energy Efficiency, Distributed Generation and Renewable Energy Sources. In other cases we use it as a platform to link experts; our behavioural oriented work is an example.

Still we strongly believe our reports are excellent, but still not the best we have to offer. Participation in our work will guarantee you will get the most out of the DSM Implementing Agreement.

That can be done by participating as a country, or as a sponsor in our work. But as we realise we can't reach "the masses" by participating in our Executive Committee we are now creating the DSM University to allow more people to take part in our quest for energy efficiency. Almost every month you can join our webinars. These webinars have high attendance and appreciation. They are the basis of a new way to communicate results.

And finally there is a new website to provide you with everything you want know. www.ieadsm.org

Well we said that restyling and looking at the old face in the mirror is not always pleasant. Neither is the process of coming up with a revised strategy. The discussions involving the Secretariat and the EUWP have sometimes been tense but rewarding. We maintain the view that the Technology Network could benefit much more if the Secretariat would put more focus on crosscutting advise and support than they can do today. The participation and dialogue with Desk Officers is of greatest importance for the joint impact of the Technology Network and the Secretariat analysis and publications.

So I hope this will challenge you to learn and practise more when it comes to energy efficiency with the Demand Side Management Implementing Agreement.

And that you can spread the message: there is much more change in and by DSM than only a nice new styling.

Rob Kool, Chairman

Highlights & Achievements

During 2014 the following Task were completed:

- Task 20: Branding of Energy Efficiency;
- Task 21: Standardisation of Energy Savings Calculations; and
- Task 23: The Role of the Demand Side in Delivering Effective Smart Grids.

Additional details can be found below and in Chapter IV.

Task 16 – Competitive Energy Services (Energy Contracting, ESCo Services)

Phase 3: Energy Efficiency and Demand Response Services.

Task 16 Phase 3 started in July 2012 and will be finalised in June 2015. The goals of Task 16 – Phase 3 are to contribute to the development and implementation of innovative and competitive energy efficiency and demand response services.

Objectives

Task 16 is working to further contribute to the know-how, project and market development of performance-based energy services by:

1. Sustaining a well established IEA DSM *Energy Service Expert Platform* for exchange and mutual support of experts, partners & invited guest,
2. Supporting and following up *country specific National Implementation Activities (NIAs)* in order to foster ESCo project and market development,
3. Designing, elaborating and testing *innovative energy and demand response services and financing models* and publish them (Think Tank),
4. Using the Task's Energy Service Expert Platform as a competence center for *international and national dissemination and assistance services* (e.g. workshops, coaching, training ...) and
5. Contributing to the “*DSM University*”

The underlying goal is to increase understanding of ES as a 'delivery mechanism' to implement energy efficiency policy goals and projects: Pros and cons, potentials, limitations and added values of ESCo products in comparison to in-house implementation.

During 2014 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 and still in progress.

For 2015, the following Think Tank activities are planned:

- Continue work on a Task 16 discussion paper *Simplified measurement & verification + quality assurance instruments for energy, water and CO₂ savings. Methodologies and examples. Including examples and national perspectives of Task 16 experts*
- Continue work on business models for comprehensive building refurbishment ('deep retrofit') in cooperation with IEA ECB Annex 61: Further development of an *economic investment grade and financing evaluation tool including sensitivity analyses* for deep retrofit application
- Drafting of a *Taxonomy paper on Energy Services* to be published in a peer-reviewed journal in cooperation with Linköping university
- Finalization of a full paper *Economic feasibility of DR business models* for publication at Internationale Energiewirtschaftstagung (IEWT 2015)

During 2014, 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.

For [more information on Task 16](#), See also Chapter IV.

Task 17 – Integration of Demand Side Management, Distributed Generation, Renewable Energy Sources and Energy Storages – Phase 3

Task 17 Phase 3 started in May 2014 and addresses the current role and potential of flexibility in electric power demand and supply of systems of energy consuming/producing processes in buildings (residential, commercial and industrial) equipped with DER (electric vehicles, PV, storage, heat pumps ...) and their impacts on the grid and markets. The interdependence between the physical infrastructure of the grid, governed by momentary power requirements, and the market side, governed by energy requirements, will also be looked upon. The scalability and applicability of conducted and on-going projects with respect to specific regional differences and requirements will be explored.

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.

The Subtasks in Phase 3 (following Subtasks 1–4 in Phase 1, and Subtasks 5–9 in Phase 2 will be:

Subtask 10: Role and Potentials of Flexible Prosumers

Subtask 11: Changes and Impacts on grid and Market Operation

Subtask 12: Sharing Experiences and Finding Best Practices

Subtask 13: Conclusion and Recommendations

For [more information about Task 17](#), See also Chapter IV.

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. A 3-year Task extension will commence in January 2015. Participating countries are: Austria, Belgium, Italy, Netherlands, New Zealand, Norway, Sweden, and Switzerland.

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 2014

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

- All information from the “Monster: have been put on a wiki (www.ieadsmtask24wiki.info)
- A storybook of the most outstanding examples and recommendations have been developed and printed
- The energy experts own energy stories have been edited into a short film and presented at workshops in Wellington and Oxford
- More case studies have been added
- Detailed case studies and best practices in four overarching themes have been collected
- Analysis of collected case studies
- Reports to enable better evaluation of successful behaviour change outcomes have been developed
- Report based on “Beyond kWh has been developed
- Report titled ‘Did you behave as we designed you to?’, based on a review of evaluation literature and the Oxford workshop was developed
- Country-specific recommendations were collected

For [more information about Task 24](#), see also Chapter IV.

Task 25 – Business Models for the Effective Uptake of DSM Energy Services

The Task will focus on identifying existing business models and customer approaches providing EE and DSM services to SMEs and residential communities, analysing promising effective business models and services, identifying and supporting the creation of national energy ecosystems in which these business models can succeed, provide guidelines to remove barriers and solve problems, and finally working together closely with both national suppliers and clients of business models. The longer-term aim of the Task is to contribute to the growth of the supply and demand market for energy efficiency and DSM amongst SMEs and communities in participating countries.

This Task was given the go-ahead and started in November 2015.

Objectives

The following objectives have been identified:

1. Reviewing existing business models/ customer approaches targeting EE and DSM for SME and community clients and developing a list and or mapping of categories of existing business models/ approaches for each country and a selection of non-participating countries.

2. Analysing and identifying effective business models (in achieving significant EE and DSM) in the different countries, including the sociotechnical socio-economic and political framework conditions they need (different conducive market dynamics and policies in different countries).
3. Performing a cross-country comparison of the different existing business models and their frameworks.
4. Performing a cross-country knowledge exchange and capacity building about effective business models and services, and iterative feedback for country specific market development activities within and between the participating countries. In order to feed in the SME- and supplier perspective, the task will include participants representing the supply and client side. Such actors will be identified either network (e.g. an energy service association), by establishing contact with relevant suppliers, (or by creating a network).
5. Creating a set of guidelines and advice supporting the creation of policies to encourage market creation and mainstreaming of best practice business models in different countries; based on a cross-country comparison.
6. Providing a (digital) platform for shared learning, best practices, relevant documentation and frameworks and know-how. This will be achieved through the use of existing platforms such as the expert platforms of other tasks and the DSM University.
7. Contribute to both the energy efficiency field and the academic discussions on effective business models and services aimed at Energy Efficiency and DSM.

For [more information about Task 25](#), see also Chapter IV.

New Work

The DSM University is now established and has begun its activities by arranging webinars. These webinars are the "heartbeat" of the IEA DSM University. During 2014, 8 webinars have been arranged with approximately 1400 registered and roughly 800 participants attending altogether.

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 2013 was produced and distributed to approx. 250 recipients in January 2014. 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 2014 and included articles on:

Issue 52 – February 2014

- ECI: Flexible Industrial Processes: A Valuable Tool to Accommodate Big Scale Variable Renewables

- Note from the Chairman: Inspiration from a Legend
- New Work: Business Models for a Better Uptake of DSM Energy Services
- Finland: Demand Response in Finland: A Retail Perspective
- New Zealand: The New Zealand Treasury looks to the Demand Side
- Task 16: ESCo Project and Market Development: A Role for 'Facilitators' to Play

Online version of the Spotlight Newsletter – Issue 52

<http://www.ieadsm.org/ViewNewsletter.aspx?id=27>

Issue 53 – May 2014

- Task 24: Is Storytelling The Answer to Many of Our (Translation) Problems?
- Note from the Chairman: The Dawn of Information
- Energy Services Stakeholder Day
- A Task for the DSM University
- Task 21: Harmonisation of Energy Savings Calculations
- The Energy Conference 2014 (NERI)

Online version of the Spotlight Newsletter – Issue 53

<http://www.ieadsm.org/ViewNewsletter.aspx?id=28>

Issue 54 – October 2014

- Task 24: Storytelling Illustrates How We Are Changing Our Energy Path
- Note from the Chairman: Demand Side Management is Getting Back on Track
- DSM Programme: The Times They Are A-Changin'
- Task 17: DSM Workshop @ Austria's Smart Grids Week
- IEA DSM Publications

Online version of the Spotlight Newsletter – Issue 54

<http://www.ieadsm.org/ViewNewsletter.aspx?id=29>

Issue 55 – December 2014

- Task 20: Branding Energy Efficiency
- Note from the Chairman
- DSM University Webinar: Taking Stock – 40 years of Industrial Energy Audits
- Task 23: Smart Grids from a Consumer Perspective
- Task 24: The hard life of ESCo Facilitators – If only the client knew, understood, trusted, cared and engaged ...

Online version of the Spotlight Newsletter – Issue 55

<http://www.ieadsm.org/ViewNewsletter.aspx?id=30>

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.

Participation in the IEA DSM Programme as of December 2014

| Task | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | |
|-------------------------|---------|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|
| Country | ST8 ST9 | | | | | | | | | | | | | | | | | | | | | | | | |
| 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
 Co-operating Agent and participating country
 Participating country
 Completed Tasks
 ST = Subtask

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 2014 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 2015.

During 2014, Dr Sea Rotmann, Visibility Committee Chair, 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 dissemination plans for all current Tasks (with Task Operating Agents). The plan was presented in October 2014 and will be finalised by March 2015.

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 specialization. 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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Living in an invisible powerhouse

Snug and cosy but poor and expensive

Energy efficiency is a long-time favourite in rhetoric and speeches. It has been praised over and over again for its characteristics in terms of cost and abundance. “The best and cheapest kWh is the one that we save” is a phrase repeated over and over again.

Unfortunately the story often stops there. Asking the speaker what there is to do to save this kWh the answer is mostly – “Awareness”. An answer that reveals that energy efficiency is invisible to most of us. We know about it but we cannot easily put our finger on it.

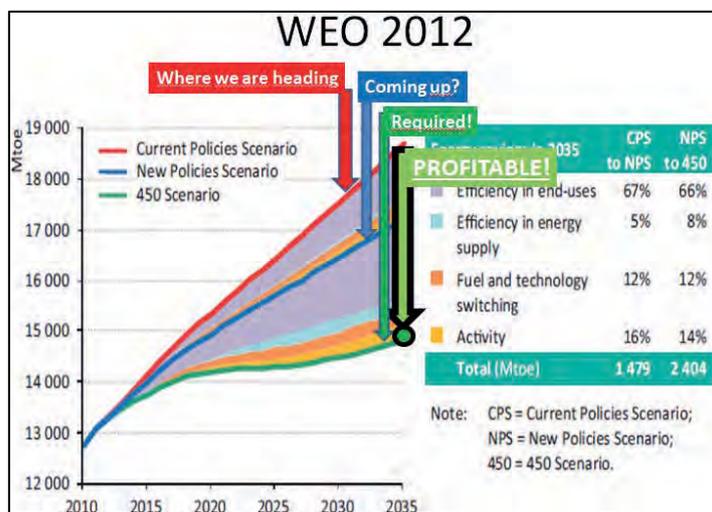
We know that energy efficiency has something to do with lighting, with insulation, with motors and with air-conditioning, but exactly what and how much? How much of each is needed to make us energy efficient? We should compare the kWh to the “Negawatt-hour”, but since the latter cannot easily be bought over the counter we seem to be chasing a ghost. Energy efficiency continues to hide in the dark (the pun is intended!).

So when world leaders make decisions on energy issues they are following the “same procedure as last year”. We need more energy, they think, and then the debate is over fuel and siting of the power stations. Energy efficiency remains the marginal issue. Some NGOs claim that energy efficiency is a resource to be accounted for and harvested, but responsible decision makers dare not take the risk.

Game changers

... from the top floor

The IEA World Energy Outlook 2012 was a game-changer when it showed the “Efficient World Scenario” as a complement to the traditional ones. In particular as it shows that the potential for profitable measures for energy efficiency improvements is of a size that is almost sufficient to reach the 2-degree target for global warming. In other words: “Acting in our own best economic interest we can fix the climate at the same time”!

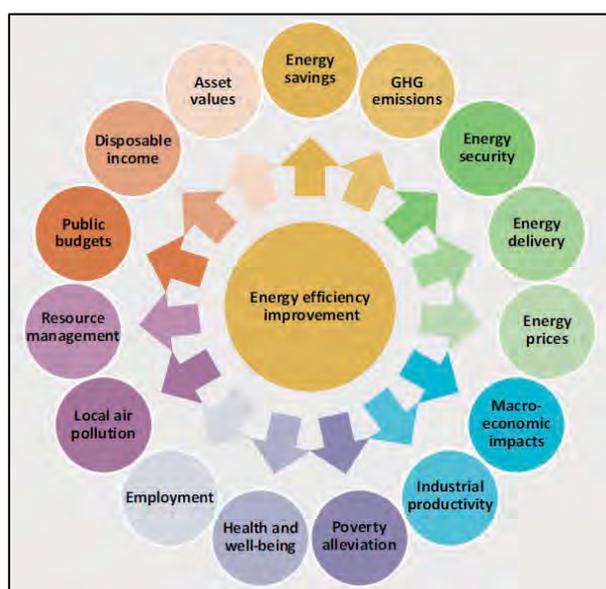


The sad part of this message is however that only a small part of this potential will be realised unless new policy measures are undertaken.

This message from the WEO 2012 has been further elaborated and underscored by the two energy efficiency market reports 2013 and 2014. These studies have shown both that energy efficiency is a sizeable resource and has contributed tremendously to the development of our societies up till today but also that the full resource is not used by far.

The 2013 report named energy efficiency “The first fuel”, which is quite an improvement for us who have said that it is the fifth fuel for a long time. Working with the issue we only aspired to be on the agenda and now the IEA has put us on top of the agenda. The 2014 report took yet another step by calling energy efficiency “The invisible powerhouse”. This is important since IEA reports catch the eyes and ears of decision makers.

Yet another game changer is the report on Non-Energy Benefits (NEB), where the IEA has counted 15 different benefits from energy efficiency and of which mostly only one, the savings, is used in calculations, even when it turns out that some of the others could be bigger. The work to structure and determine these benefits is a huge step forward for the energy efficiency community.



Typically in calculations of energy efficiency and because invisibility costs are over-estimated and benefits are underestimated, this needs to be changed and the IEA contributions mentioned here are of great importance.

... and in the workshop

If the IEA analysis mentioned are essential to operate on the mind-set of decision makers and national policies still very little will happen unless the craftspeople in the workshop know how to make the necessary changes. Here we face other problems.

The staff tasked to make energy efficiency are basically the default option and most of them are trained with the old fashioned linear energy system. The system where energy is “produced” in a remote place, transported across the country to be used in industrial centres and in cities where people live. Now we meet a new reality. Technology for energy “production” is miniaturised and more and more often made to harvest renewable resources in small scale. Grids and equipment are redesigned to be

“intelligent” in the sense that they can be monitored and controlled in greater detail to achieve desired performance criteria.. ICT is available and enables smarter use and to be smart not only for the experts but also for the user who can remotely switch things with his/her mobile phone. And even the things start to work silently and discretely in the background. We have got the Internet of “things”.

This is a totally new world with opportunities and challenges that were not taught in schools and universities even a decade ago. Here we all have a tremendous task to keep ourselves up to date not only with technologies but with something that is even more complicated – humans! How can we ensure that we can serve with the knowledge that takes into account that energy is delivered for a purpose that is defined only by the individual behaviour?

The IEA DSM IA tries to provide tools to change the game in practical applications with:

- *Business models* where Task 16 (Competitive Energy Services (Energy Contracting, ESCo Services) and Task 17 (Integration of Demand Side Management, Energy Efficiency, Distributed Generation and Renewable Energy Sources) looks at both how energy services are delivered and how all new parts can be integrated in the new energy systems configuration.
- *Behaviour* where Task 20 (Branding of Energy Efficiency) has outlined how DSM can be branded and attractive even for people who have only remote interest in efficiency and Task 24 (Closing the Loop - Behaviour Change in DSM: From Theory to Policies and Practice) have recorded a huge number of examples on how behavioural change can be realised.
- *Behavioural economics* where Task 23 (The Role of Customers in Delivering Effective Smart Grids) have dived deep into how people act and react on offers to change habits and make best use of available resources.
- *Regulation* where Task 22 (Energy Efficiency Portfolio Standards) have mapped out the use of Energy Efficiency Obligations around the globe and Task 21 (Standardisation of Energy Savings Calculations) have tried to find common grounds for comparing calculations and evaluations to establish better practices.

With these two bases covered it seems plausible that we may get the high-level support needed and at the same time provide the tools for the changes envisaged. Third and final base is the customer!

Retooling the instruments for energy efficiency

The IEA is a remarkable institution with its two-pronged approach to deal with the energy issues. On one hand a high-level analytical resource, the secretariat based in Paris, that has the convening power, and attracts decision-makers and ministers, that gets the attention and the ear of those who decide upon the future. On the other hand there are the Implementing Agreements that gather practitioners from industry and administration for research and to implement the technologies that are needed for the future.

Together these two parts of the same body can make a difference between a sustainable and liveable future and a miserable one.

It is however no big secret that these two parts have not always lived in harmony. When the IEA was formed it had a primary focus on oil. How to make oil last longer

and how to prevent that it became unaffordable. The Implementing Agreements were doing their job with the alternatives to oil and the secretariat focused on analysis that was rather narrow in scope. There was quite a chasm between the two parts. Cooperation between them was scarce and formal.

During the last few years the perception of a common task has however grown and become obvious, in particular in the area of energy efficiency. We may have to admit that the tools for efficiency improvements have been a bit dull and with little edge. There is a need to retool!

The IEA DSM Programme stands prepared both to sharpen the old instruments and to develop new ones that take the full size of Distributed Resources into account including human behaviour that develops suitable models for business and regulation.

CHAPTER III

DSM Priorities in Participating Countries 2014

AUSTRIA

DSM Developments and Priorities in Austria

General statements:

Austria has a population of 8.5 million living on 83,879 km² in the heart of Europe. Austria's terrain is highly mountainous.

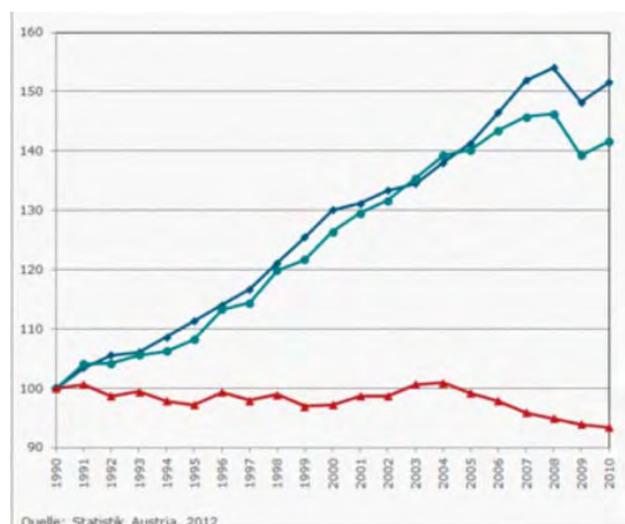
Final energy consumption increased in 2013 to 1,119 PJ by 1.8 % compared to 2012. Main reason was the growth of the transport sector by 4.8%. Since the year 2005, all in all a stabilization at a level by approx. 1,100 PJ could be achieved, which is in line with the EU 2020 policy goals for Austria and Austria's energy strategy.

The share of renewable energies in total final energy consumption is 32.5% (calculation according to EU Directive, 23.9% in 2005). Austria is close to its target of 34% in 2020 already now.

The country is one of the foremost producers of hydroelectric power in Europe. The energy markets for electricity and natural gas were liberalized in the beginning of the last decade. However, the most important power facilities are still owned by energy companies with a public majority.

The share of all renewables in total electricity production is approx. 76% in Austria. Whole sale electricity prices are very low and still falling. This means that gas fired power plants have been shut down and a lot more electricity is imported, mainly from Germany.

Energy efficiency plays a vital role in Austria's energy strategy and energy research strategy. During the last few years since 2004 the energy intensity could be lowered by approx. 8%, as the following figure shows (Statistik Austria 2012):



Blue: gross domestic product (real)
Green: final energy consumption
Red: energy intensity

Specific areas of priority:

The new *Federal Energy Efficiency Act* is the main issue at the moment. On 9 July 2014, the law was passed in the Austrian parliament by a two-thirds majority. The main parts are set into force on 1 January 2015.

It is designed to reduce energy consumption by 2020 in line with European Union “20-20-20 energy targets” (directive 2012/27/EU on energy efficiency). Austria’s obligation under this Act aims to achieve cumulative energy savings from 2015 to 2020 totalling 310 PJ and the achievement of an energy efficiency benchmark of 1,050 PJ in 2020. This goal state will be reached through strategic federal energy efficiency programmes like grant schemes, tax incentives etc. (cumulative 151 PJ) and the so-called supplier obligation (cumulative 159 PJ).

The main pillars of the law are:

- *Energy suppliers* have the statutory obligation to improve energy efficiency on their own – or other – end users. All suppliers delivering more than 25 GWh per year to Austrian customers must initiate energy efficiency measures and declare and proof energy savings of 0.6% of their previous energy sales.

The basic idea is that the energy companies develop to energy services companies and no longer devote themselves exclusively to the distribution of energy. As energy savings can also be bought, sold and traded, it is anticipated that a market for energy savings will develop.

If the energy suppliers do not meet their commitments, they can alternatively make a compensation payment (currently 0.20 €/kWh), which will flow into a fund for supporting energy efficiency measures.

- *Large companies* are obliged to introduce an energy management system or to carry out energy audits every 4 years. The energy audits must comply with the EN 16247 and additional requirements in the law. An obligation to implement the measures does not exist.
- Finally, there is an obligation for the *federal government* to perceive its role as a model, especially to renovate 3% per year of the building area falling within its property. Also, Improvements in facility management, behavioral changes of building users or savings through energy performance contracting etc. are allowed.

Compliance with these obligations will be reviewed by a national energy-efficiency monitoring agency, which is not yet established. In addition, the responsible Federal Ministry is going to formulate quality criteria for energy auditors and create a registry for certified auditors.

This new Federal Energy Efficiency Act creates the need for cost effective measures and programmes on the demand side, for new business models and for effective energy efficiency market mechanisms.

Strategy Process Smart Grids 2.0: Austria is among the forerunners in Europe in the development of smart energy systems. It tries to take a leading role in the cooperative implementation of demonstration projects by energy suppliers, industry and research.

Through the strategic process Smart Grids 2.0 the federal ministry “bmvit” actively supports this development in cooperation with the actors from energy companies,

industry and research. The objective is to evaluate the recent results of research and demonstration together and to derive medium-term strategies and concrete action plans for Austria.

The main elements of the strategy process Smart Grids 2.0 are:

- A technology roadmap for Smart Grids in and from Austria
- A strategic research agenda for smart energy technologies
- A series of expert workshops to develop an implementation strategy

In addition, 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.

The strategy process Smart Grids 2.0 is part of the wider strategy process smart energy of the bmvit, which includes, among other things, the innovation area Smart Cities and the results will feed into the federal RTI strategy.

Smart Cities: The research program “*City of the Future*” and the support of *Smart Cities demonstration projects* are continued and set priorities in smart city developments. 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 above mentioned, several other *research activities* and programs are going on in Austria which are of importance with regard to fostering DSM applications. The *Federal Ministry for Transport, Innovation and Technology* (bmvit) and the *Climate and Energy Fund Austria* (KLIEN) conduct important research programs relevant to energy efficiency and DSM, like:

- „e!Mission.at“ for energy technology innovations
- Lighthouse projects for electro mobility and e-mobility model regions
- Climate and energy model regions

Austria is also coordinating the “*ERA-Net Smart Grids Plus*” programme – from local trials towards a European knowledge community – started in 2014. ERA-Net Smart Grids Plus is an initiative of 20 European countries and regions. The aim is to enable the development of appropriate technologies, market designs and business models as well as customer adoption in order to achieve the European Smart Grids vision and goals.

ERA-Net Smart Grids Plus promotes applied research, piloting and demonstration in the field of smart grids, with a focus on validation, scaling-up and replication. Projects shall not only focus on technical aspects, but integrate aspects of Technology, Market-place and Stakeholders/Adoption in an interdisciplinary and transsectoral approach. The total available budget for the first call for RD&D projects in 2015 is approx. €40 million.

The *Austrian Climate Initiative “klimaaktiv”* was extended until the year 2020. It offers information and consultancy, works on quality standards and helps to build up networks for a climate friendly future.

BELGIUM

DSM Developments and Priorities in Belgium

The need to integrate a growing share of renewables, combined with a stable demand and an external dependence for energy supply that has become structural, with an ageing park of production and a lack of investment in new capacities, are the driving forces of a necessary market transformation. In this context, promoting and developing DSM (and demand flexibility) has become an absolute necessity.

Transmission/Distribution network

The Belgian transmission network, confronted with a comparable situation (increase of needs, driven by the development of renewable production, and decrease of classic flexible resources), efficient stream balancing can be achieved through 3 streams of action:

- incentives and tools for market parties to self-balance until as close as possible to real-time (e.g. specific supply and BRP contracts, imbalance price)
- cross-border synergies (e.g. by netting imbalances with other countries or by pooling the least used volumes), and
- diversification of resources (e.g. thanks to new contracting parties and new balancing services, including participation of demand).

In this regards, new products have been developed. For example:

- interruptibility contracts have been adapted in order to allow aggregation
- primary reserves have been adapted to allow a combination of symmetric and asymmetric products and allow access to the market to (single or aggregated) grid users ;
- flexibility resources located on the distribution network can now participate to the balancing market (« R3 Dynamic Profile ») ;
- a strategic demand reserve has been introduced (starting 1st November 2014) serving a different purpose (adequacy) but targeting new flexibility.

But the real challenge is at the distribution level, where the DR potential is very high, and demand flexibility can be considered as an opportunity to limit grid investments. And it goes hand-in-hand with the growth of renewables. But the DSO should therefore have the right to activate flexibility of grid users directly when network security is at stake. Projects and discussions are ongoing with all stakeholders in order to allow such flexibility and unleash the DSM potential at the distribution level (e.g. through sub-metering, specific contracts, ...)

Smart metering and smart grids

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.

For example, a large-scale pilot project is on-going in the Flemish Region, with the deployment of 50.000 smart meters. It consists of a logistical and technical test for smart meters but also for DSO's internal procedures, market procedures and communication protocols.

The Flemish Region is also working on a « smart conversion » of networks, aimed at a better coordination between distribution network development and decentralised production units development. This project has multiple aspects: definition of indicators, study, action plan set up in close coordination with the different stakeholders.

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Power System Flexibility in a Low Carbon World

Maintaining reliability in a near carbon-free power system: the emerging role of demand side resources

By: Ken Dagoon, Georgios Papaefthymiou, Hans De Keulenaer and Roman Targosz

Power system flexibility is a key enabler for a transition towards a carbon-free power system. This paper discusses the steps for this transition in two key regimes: firstly, looking at the today's system, we identify the options available to uncap untapped existing flexibility, enabling reaching renewable energy penetration levels of 40%–70%; secondly, looking at the future, we discuss the further actions needed for reaching near-100% penetration levels. In both regimes, demand side management is a game changer, being a key 'new' untapped option in the current system, and dictating the transition to Smart Grids when looking to the future.

Transitioning to low carbon energy sources has become an economic and technological possibility, as the cost of wind and solar power sources begins to match traditional technologies. Depending primarily on these renewable resources, however, also means relying on variable and less predictable energy sources. An important question is how power systems depending primarily on such resources can operate safely and reliably.

Balancing supply and demand

Power systems are designed to ensure that generation and demand are matched at all times. Flexibility options are used to maintain system stability and service, even in cases of rapid and large swings in supply or demand, and in a cost-efficient manner.

Electric power production and consumption occur simultaneously. Any mismatch between electric power production and demand risks wide-scale power system outages. Balancing supply and demand has historically been accomplished by adjusting the output of certain controllable power plants to maintain the system frequency in some predefined acceptable band. This practice largely continues today, except that variable output of wind and solar plants increases the need for flexibility in the power system to respond.

Broadly speaking, *flexibility is the ability of controllable power system components to produce or absorb power at different rates, over various timescales, and under various power system conditions*. To date, controllable power plants used to address load variability have done double-duty to cover the additional variability from renewable resources. The stresses from this business-as-usual approach are already being felt as conventional generators become unable to provide the needed flexibility. Although it is tempting to think that the solution to this issue is energy storage, the tableau of solutions is much broader (and less expensive!) than simply adding batteries or other storage technologies.

Moving toward a low carbon economy implies a transformation in how power grids operate, with much greater emphasis on accommodating the unique characteristics of wind and solar power. It is perhaps not surprising that power systems optimized

to use flexible generation to meet variable demand are not optimally designed in the case where both demand and supply are variable.

Despite the apparent challenges, sources of power system flexibility are available to accommodate very high levels of variable renewable generation at modest costs. This paper explores the flexibility options necessary to usher in the new low carbon energy world.

Flexibility Today

Power systems historically matched a relatively uncertain and variable demand by adjusting the output of power generating plants. Power system operators keep a close eye on demand, adjusting generation up or down to ensure parity between the two. Some uncontrolled variability and uncertainty exist on the generation side as well, largely due to unexpected power plant outages.

As wind and solar resources are added to power systems in relatively small increments, system operators initially treat the added variability similar to demand variability. Conventional generation is controlled to accommodate the joint variability of demand and renewable generation. For most systems, this strategy is effective where wind and solar provide up to perhaps 10% of the total generation.

Given that the variability of new renewable resources can outpace demand variability at higher penetration levels, new strategies for accommodating the new resources are needed. At these larger renewable penetration levels, several challenges become apparent, including: rapid changes in wind due to the passage of large-scale weather fronts that can outstrip controllable generators' ability to respond quickly enough; rapid changes of solar output in large penetration areas on partly cloudy days that could harm distribution system equipment; so-called "hot spots" of generation in geographic areas where available transmission might not be sufficient to move the power out; and generation of large amounts of power when demand is low, causing energy to be dumped as unusable. Additional flexibility is needed to address these challenges.

More Efficient Use of Today's Power Systems to Provide Flexibility

Power systems have traditionally been planned primarily to reliably meet peak demand for power, with flexibility being a secondary issue. As variable renewable resources become a larger part of power system resources, flexibility takes on a more central role. At *very* high penetration levels it may be necessary to add dedicated energy storage to power systems. However, the first and most economic steps involve maximizing the use of untapped existing flexibility and developing strategies for minimizing the need for flexibility.

A wide range of actions can be taken in most power systems to better accommodate variable renewable resources. These actions fall into four categories:

1. *Supply* options include making better use of conventional generation. In many systems only a fraction of available controllable resources are used to provide flexibility, or may be limited to providing flexibility in hourly increments. Changes in operating rules and markets may be needed to bring all available flexibility into play. Surprisingly, variable resources themselves are often treated as uncontrollable, but sophisticated controls (e.g., limiting ramping under selected circumstances) can reduce the need for flexibility from other sources. As new variable generation is

added to power systems, new economic incentives may need to be established that recognize the variability and diversity of the added resources, as well as remuneration for providing flexibility services.

2. *Demand side* flexibility options include controlling demand, especially in applications that have a storage component. Opportunities for controlling demand exist in many energy-intensive industrial processes, irrigation and municipal water pumping, wastewater treatment, air and water heating and cooling (HVAC) systems, and electric vehicle charging. Energy efficiency can also be an important source of flexibility by freeing up traditional resources to contribute flexibility. Historically utilities are accustomed to working with end users as paying customers and not partners in supplying services to the grid, so new relationships must be formed to accomplish this change in a mutually satisfactory way.
3. *Network*: Power system transmission and distribution networks allow the sharing of flexibility resources between and among different regions. Although large-scale investment in new transmission infrastructure is one avenue for enhancing flexibility, more flexibility can be obtained from the existing transmission system. For example, in many power grids the maximum allowed transfer capability is computed based on assumed conditions—situational awareness allows real-time dynamic assessments of transmission capability, potentially increasing the ability to transfer power over the existing network. Other enhancements include dynamic reactive control needed to accommodate rapidly changing transmission loading, and power flow control technologies that allow grid operators the ability to better direct power flows over the network.
4. *System Operation and Markets* options include a number of important changes that may have significant potential to improve power grids' ability to accommodate variable resources. These include automating market trading at the sub-hourly (e.g., 5-minute) level, opening markets for grid support services (e.g., balancing, reactive, and frequency support services) to all resources and loads; so-called "capacity payments" to resources for their ability to provide needed flexibility service; and other technical market issues such as "gate closure times" that can help access available flexibility, or reduce the need for it. One feature of large penetration renewable energy systems is occasional large supplies of renewable energy that drive wholesale electric market prices near, or below, zero. These events need to be reflected at the retail level so that markets can develop around making more efficient use of the sporadic availability of low cost electric energy (e.g., to displace fossil boilers).

Supply and network options are the flexibility enablers traditionally used in power systems, while changes in the system operation and the respective market arrangements are the natural next steps for uncapping system flexibility. Demand side flexibility options are the key 'new' options that are generally poorly exploited in current systems. Higher renewable energy penetration levels will translate to demand having an increasingly important and active role for maintaining system operation stability and reliability. Generally, accessing the untapped flexibility in today's grid is a far lower cost means of accommodating variable resources than other infrastructure investments. For most systems, these adjustments will likely be sufficient to accommodate penetration levels efficiently up to 40–70% of electric power coming from variable renewable resources.

Flexibility in Near-100% Renewable Energy Systems

Additionally, more costly actions will likely be needed to reach the highest levels of renewable energy penetration. The main reason for that is that there will be times when there is simply not enough wind or sunshine to meet demand. For example, large-scale high-pressure weather systems can be many hundreds of kilometres across, idling virtually all wind turbines within their reach. This may occur at night and are often accompanied by temperature extremes (high in the summer or low in the winter). Reaching the highest levels of renewable energy penetration would require some means of bridging even these relatively infrequent events, and will involve large infrastructure investments.

There are four main approaches to addressing the highest levels of renewable energy penetration:

1. Transmission infrastructure investments to connect across greater distances, reducing the frequency and intensity of low renewable energy events;
2. Dynamic demand management;
3. Smarter development and deployment of renewable resources; and
4. Dedicated energy storage.

Transmission Infrastructure

Transmission infrastructure investments to bring distant resources to markets, and to bring distant markets together can help bridge periods of low productivity in a given system. These infrastructure costs need to be compared with other options, such as dedicated energy storage. Consideration needs also to be given to the potential risks of depending on large amounts of energy from great distances; both political security and the risk to power system reliability from power line outages must be weighed carefully in these situations. Nevertheless, judicious use of transmission infrastructure can also reduce political and reliability risks and should be given serious consideration.

Dynamic Demand Management

Power systems developed assuming that generators produce power to supply customers' "demand" for power, whatever that demand might be. Customers are charged at least somewhat in proportion to the costs incurred in meeting their consumption of power. It has become increasingly apparent that this relationship could change because many customers have significant capability to adjust consumption patterns in ways that can provide economic benefit to the entire system. A typical example is residential air conditioner cycling programs in which utilities send a signal to participating customers to temporarily cycle off air conditioners for a few minutes during extreme load events. In many cases, these programs do not noticeably affect participating customers' comfort level.

Most existing demand management programs are limited to reducing demand over a few hours a day on a few days each year. Dynamic demand management means accessing flexibility of demand resources on an on-going basis, using demand as another resource in many ways similar to power generators and energy storage.

There is a wide range of opportunities for accessing demand side flexibility that could be exploited, potentially at relatively low costs compared with other flexibility options such as energy storage and limiting renewable generation. It hasn't been historically

necessary to make greater use of demand management opportunities because ample flexibility has been available at low cost from conventional generating resources. This is expected to change significantly in systems with high levels of variable generation as conventional generation is retired in favour of greater reliance on variable resources.

A key feature of demand side resources is that they are smaller than typical conventional generating plants, and greater in number. Controlling those resources for the benefit of a diverse set of interests (customer, distribution grid operator, transmission grid operator) with multiple objectives is a significant challenge of its own. Communicating, controlling, and optimizing with potentially many millions of small demand resources is the objective of the so-called Smart Grid.

Smart Grid seeks to perform the coordination task for energy consuming devices providing power system flexibility along with other distribution system resources such as locally sited generation and energy storage. The cost of power system flexibility in systems with very high levels of variable generation will depend significantly on the success of the Smart Grid efforts.

Smarter Renewable Resources

Today's solar and wind generators are designed to maximize economic benefit by maximizing their energy output. In systems with very large renewables penetration, renewable resources will need to provide grid support services that are now provided by traditional power plants. Providing such services will come at the expense of using renewable generation to supply loads but it is likely unavoidable at the highest levels of penetration, except to the extent that demand side options can provide those services.

Grid support services include outage reserves, frequency response, and balancing services. There are also turbine and generator design choices that affect the resulting flexibility on the system that are not generally reflected in the economic valuation today. For example, oversizing wind turbine blades would result in longer periods of stable operation at or near the turbine's maximum output level—effectively reducing the overall variability. This would be done at the expense of capturing less than the available wind energy, however. If wind generation valuation took account of the cost of variability, less variable renewable resources might be developed instead. A similar situation exists for solar resources where inverters are downsized, both to save costs and to flatten the output of generation over daylight hours.

Similarly, co-siting renewable power plants can result in highly correlated changes in output, increasing the overall variability. Today, few regions acknowledge the relative value of generation from more diverse (i.e., less correlated) renewable energy projects. As utilities and markets gain understanding of the value of diversity, the resulting values need to be reflected in prices.

Dedicated Energy Storage

The need for electric energy production to meet demand calls for some means of energy storage even in today's power system. For the most part, that storage exists in coal piles, natural gas fields and pipelines, hydro reservoirs, and fuel tanks. It is this system of energy storage that allows power systems to deliver differing amounts of energy from day to night, from weekday to weekend, and from season to season. As mentioned above, certain electric power end uses entail inherent storage capability

that can, and ought to be exploited. However, reaching near 100% reliance on variable renewable energy means largely doing without the fossil fuel storage we rely on today.

Well known energy storage technologies such as batteries, pumped hydro storage, and (the lesser known) compressed air energy storage are capable of supplying some of this need. However, pumped hydro and compressed air storage are inherently limited by the availability of suitable physical reservoirs. Today's battery technology is still too costly to use for longer-term (weeks or months) energy storage.

The most likely scenario for filling this need with technology that exists today is to rely on standard generating technology fuelled by synthetic, renewable energy-derived fuels. Although it may be relatively expensive to produce such fuels, they would likely be limited to providing 10–20% of the energy consumed, depending on the character of the renewable resources employed. Biologically derived fuels are one possibility, but fuels can also be manufactured using renewable energy-sourced electric power. Manufactured fuels include hydrogen and methane. An advantage of manufactured methane is that it can be stored and burned in existing natural gas storage and electric generation infrastructure with little to no modification. A utility-scale methane production plant went into operation in 2013 in Germany.

Conclusions

The increasing contribution of variable renewable energy sources in meeting demand increases the need for power system flexibility. Many options are available for improving the ability and cost in today's power grids to accommodate these resources. These incremental options should be pursued prior to implementing costlier measures that will likely be required to reach renewable energy penetration levels above about 50%. Many of the opportunities for new flexibility exist today and are attainable at relatively low costs, but are simply under-exploited (e.g., participation of demand in providing flexibility services). The role of demand is key for reaching higher renewable energy penetration levels: it is the key 'new' option that needs to be uncapped in today's system and adds greater pressure on the move to Smart Grids as key to reaching near 100% variable generation penetration levels.

The biggest flexibility challenge to reaching very high levels of variable renewable generation is how to deal with extended periods when, on occasion, the renewable resources are not available for several days or weeks. Although bridging those extended periods of low renewable production represents a significant challenge, it appears that it would be manageable with technology that is deployed (albeit at a low level) today.

For More Information:

[Flexibility Options in Electricity Systems](#), Ecofys, 2014.

[The Power of Transformation: Wind, Sun and the Economics of Flexible Power Systems](#), IEA, 2014.

[Economic Grid Support Services by Wind and Solar](#), REservicesS, 2014.

FINLAND

DSM Developments and Priorities in Finland

There has been recent significant development regarding demand response (DR) so this situation review focuses on it. In 2014 the development regarding energy efficiency

(EE) situation and the integration of DR and EE has been slower. Especially improving the integration may become the big DSM issue in the coming years.

Demand Response

In the Finnish electricity system and electricity market price area demand response is very important. Much of the generation is based on base load nuclear (2.75 GW in 2013) and thermal load driven CHP (7.3 GW in 2013). There is only about 3 GW on hydro power and about 3.2 GW on condensing power. The penetration of intermittent generation from renewable energy sources was about 250 MW in 2013 but is rather rapidly increasing. More accurate figures for each year are available from the Finnish Energy Market Authority. Even 15–20% of the electricity is imported and during 1/1/2014 – 10/5/2014 Finland was a separate price area nearly 50% of the time. Thus on the supply side there is rather limited flexibility and this flexibility is concentrated to too few actors. Without demand response such a system would run an unacceptably high risk of high price peaks, market failures and resulting blackouts.

The Nordic whole-sale market Nordpool www.nordpoolspot.com allows demand side participation and has products that can be used for the purpose. There are some needs and initiatives to develop products in order to even better cover the properties of demand side flexibilities. Entry fees and minimum sizes of transactions limit out the direct participation of small actors. In Finland the electricity retail market also supports demand response even for the small customers, because practically all customers are settled based on their hourly measured consumption. Thus it is easy to use dynamic pricing and verify and the responses and take them into account in the settlement.

The price variations in the Nordpool have recently been reasonably modest and thus participation in the reserves markets has been more profitable for those resources that meet the tighter requirements. This situation is expected to vary with the expected changes in the electricity market and system. Also balancing market accepts and draws some demand side flexibility. The reserves markets and the balancing market are operated by the system operator Fingrid (www.fingrid.fi) and accept demand side resources that are aggregated to meet the minimum requirements for response regarding size etc. Depending on the type of the reserves market the minimum size varies from 0.1 MW to 10 MW and maximum response latency from seconds to 15 minutes. According to the system operator Fingrid the amount of dynamic demand response in Finland in 2014 comprised the following: day ahead market Elspot 200–600 MW (estimate), balancing power market 100–300 MW (estimate), frequency controlled disturbance reserve 70 MW, fast disturbance reserve 385 MW and power reserve 40 MW. In addition to that there is over 1 GW of static time of use control. In 2014 Fingrid has three pilots, each with a different aggregator. The aggregators are SEAM, Energiakolmio and There Corporation.

Large energy intensive industries already participate in demand response. Questionnaires in 2005 indicated that short time (lasting 1 to 3 hours) Demand Response without an advance warning amounts to about 1060 MW, which is 7.5% of the one-hour peak average power (14 040 MW) experienced up to 2005. 755 MW of the demand response potential of large industry is already reserved for the system operator, to be used as disturbance reserves etc., when the new nuclear unit starts. This comprises 385 MW fast disturbance reserves, 70 MW frequency controlled disturbance reserves and 300 MW nuclear power plant specific system reserve. When the advance warning time

for carrying out the demand response action is increased to 2 to 24 hours the potential increases by about 220 MW.

Demand response of services, commerce and small and medium size industry is slowly proceeding but there is very little reliable public information about this heterogeneous segment. The providers of DER flexibility aggregation services focus mainly on this segment. SEAM provides such customers with DR services in combination with the other end use energy management services.

Energiakolmio provides energy market services such as DR aggregation and balance management. Empower IM provides information services for DR aggregation for balance management etc. Electricity retailers, large consumers and possibly some other competitive actors of the electricity market are aggregators in that sense that they include DR in their market portfolio.

Electrical heating is very common in small houses and vacation houses. There is about 1 GW of electrical heating loads in time-of-use control. Smart metering based dynamic demand response is applied in two field tests that each have 10–15 MW controllable power during winter, see /Koponen, Pekka; Takki, P; Huusko, R. 2014. Smart Metering Based Demand Response in Finland. Proceedings, Elforsk rapport 14:32, paper 9.6. NORDAC. NORDAC 2014, The 11th Nordic Electricity Distribution and Management Conference 2014, Stockholm, Sweden, 8–9 September 2014.

Residential demand response based on a Home Energy Management System (HEMS) and dynamic price control is commercially available for consumers in Finland from several electricity retailers and it is slowly increasing in penetration and may soon reached significant quantities. In these systems the technology is provided by There Corporation.

There reasons for the slower progress of dynamic demand response in the residential segment as compared with the segments of bigger customers include the following:

1. Although the legislation requires load control outputs in all the compulsory smart meters, very many outputs were not connected to any loads during the meter rollout. Not even in situations where the old meter was connected to loads. Thus about one third of the time-of-use loads are not controllable via the smart meters.
2. The electricity retailers and DR-aggregators have learned that large amounts of purely reactive DR will cause high balancing errors that are costly and thus reactive DR becomes unprofitable; it is instead necessary to forecast the responses and bid them to the spot market. Response forecasting models are missing and need to be developed.
3. Most (but not all) smart metering systems have communication latencies of several hours and are thus unsuitable for the provision of DR to the faster electricity markets. Accurate response forecasts are also needed in the faster markets.
4. All smart metering systems claim to support demand response and load control, but only some of them support automated dynamic demand response. Without fully automated operation the small customer demand response is not feasible.
5. Home and building automation systems are for most modern houses too expensive to be paid back mainly by DR. Forecasting the responses of price control is even more challenging than with direct load control.

In Finland demand response is market based, because 1) the distribution networks are relatively strong and 2) the rules are missing on how to combine the network DR interests and the market DR interests. But increasing penetrations of DG, RES, EV and DR will make it necessary to solve this challenge, but not as soon as in some other countries. Around the world some solutions have been developed and demonstrated, but the regulators have not accepted them.

The Smart Energy Demand Coalition (SEDC) reviewed the situation of aggregated demand response in Europe, see http://sedc-coalition.eu/wp-content/uploads/2014/04/SEDC-Mapping_DR_In_Europe-2014-04111.pdf. It considered that in Europe there are only Finland and 5 other countries where aggregated demand response is commercially active.

Energy efficiency

There is not much to add to the situation review of 2013. The energy efficiency law HE 182 was given on 9 October 2014 to implement the energy efficiency directive by the European Commission. Large enterprises are required to have energy audits every 4 years. The law addresses also energy measurement, settlement and feedback information.

INDIA

DSM Developments and Priorities in India

Background

Demand-side management (DSM) has been recognized as a means of reducing peak electricity demand. DSM has a major role to play in deferring high investments in generation, transmission and distribution networks. In this context, Bureau of Energy Efficiency (BEE). has initiated following DSM measures in India for energy conservation and reduction in peak demand.

a) Municipal Demand Side Management (BEE's Mu DSM programme)

The cost of energy constitutes up to 50% of the municipality's budget and implementing efficiency measures could reduce it by about 25%. The Mu DSM Programme can improve the overall energy efficiency of the Urban Local Bodies (ULBs), which could lead to substantial savings in the electricity consumption. Under Mu DSM, 134 bankable Detailed Project Reports (DPRs) in 134 ULBs were prepared after taking up Investment Grade Energy Audit (IGEA). Implementation of the project at the ground level is highly necessary which will create a market transformation among technology provider, implementing partners, financial institutions etc. Implementation of demo projects in 15 ULBs is being undertaken on pilot basis during XII plan.

b) Agricultural Demand Side Management (BEE's Ag DSM programme)

India's Agriculture sector consumes 18% of total electricity consumption in India with about 19 million pump sets in the country. The studies reveals that there are 30-40% energy saving potential exist in agriculture sector. In order to tap the energy saving potential, Agriculture Demand Side Management (Ag DSM) program initiated in XI plan by Bureau of Energy Efficiency. Under Ag DSM, 11 Detailed Project Reports (DPRs) have been prepared covering 20,750 pump sets. These DPRs indicates average 40% (96

MU) energy saving potential. The first pilot Ag-DSM project was implemented in the Solapur District of Maharashtra, under which more than 2200 pumps were replaced with star rated energy efficient pump sets resulting into energy savings of 6.1 MU. In XII plan, BEE will facilitate states to implement state-wide regulatory mechanism to mandate the use of BEE star labelled pump sets for every new connection and will provide financial assistance to farmers for adoption of star rated EEPS. BEE will also facilitate DISCOMs to implement DPRs prepared in XI plan.

c) Energy Efficiency and Technology Up-gradation in Small and Medium Enterprises (BEE's SME Programme)

BEE has conducted a study to assess energy use and technology gap assessment at unit level, development of the cluster specific energy efficiency manuals, preparation of DPRs on energy efficient technologies and capacity building and knowledge enhancement of man-force involved in SMEs. BEE has proposed a programme based on the four major components which include showcasing of the energy efficient technologies through demonstrations, technical assistance, capacity building, SME Product Labelling Promotion scheme and energy mapping, which shall overcome the identified technological and other barriers. To accelerate this, SME Programme will have an aggressive awareness and outreach program across the stakeholder covering ESCOs, Manufacturer and other Local Service Providers to consumers, Bankers/FIs, State Designated Agencies, NGOs to R&D institutions and others.

d) Capacity Building of DISCOMs

The objective of the programme is capacity building of DISCOMs for carrying out load management programme, energy conservation programme, development of DSM action plan and implementation of DSM activities in their respective areas. The following activities are being carried out by BEE and DISCOMs under this programme.

- BEE selected 30 DISCOMs for participating as beneficiary DISCOM under this programme.
- Memorandum of Understanding (MoU) signed between BEE and selected DISCOMs under which targets for the DISCOMs have been incorporated.
- Manpower support is being provided to each DISCOM for facilitation of DSM related activities and support to DISCOMs.
- Consultancy support is also being provided to each DISCOM for load survey and development of DSM action plan.
- Master trainers would be created under "Training of Trainers" activity and further training to the DISCOM's officials would be imparted by the Master Trainers. The training need assessment completed for the DISCOMs and training programmes would be commenced within 1-2 months.
- National level workshops would be organized by BEE for dissemination of DSM activities at DISCOM level.

(e) DSM based Efficient Lighting Programme (DELP)

BEE together with Energy Efficiency Services Limited (EESL), have worked with electricity distribution companies (DISCOMs) to develop a business model called DSM based Efficient Lighting Programme (DELP) under which EESL procures LED bulbs in bulk and sells them to households at Rs.10 instead of the market price of Rs.400.

The electricity distribution companies then repays EESL, over a period of 5 to 8 years from the savings that accrue due to use of this energy efficient lighting technology. EESL has already completed a number of projects to retrofit existing streetlights to energy efficient LED streetlights as well as a 6.2 lakh LED bulbs replacement project for households which resulted in reduction of cost of LED bulbs from Rs.400/- to Rs.310/-. Recently, EESL completed the procurement process of 20 lakh LED bulbs under DELP programme for the state of Andhra Pradesh. The lowest quoted price was Rs.204/- per LED bulb. This is almost 50% below the price at the beginning of the year.

ITALY

DSM Developments and Priorities in Italy

The mechanism of Energy Efficiency Certificates (EEC – also known as “White Certificates”) has been running in Italy for ten years. This mechanism involves an official assessment/certification of the energy savings produced by eligible energy efficiency projects. There is also a market to trade these certificates in a dedicated market.

White Certificates offer a number of practical benefits for all parties involved. For regulatory authorities, they can be an easily-verifiable way to track compliance with policy targets. For parties obliged to comply with targets, they offer a means to achieve compliance at least cost, and also offer the flexibility to comply either through ‘in-house’ action, by contracting with other obliged parties or with other market parties for their supply. For those able to create and sell certificates, they offer an additional revenue stream which is independent of their other business activities, thus offering hedging and risk-management benefits in addition to direct financial rewards.

The main attained results through the use of the White Certificate mechanism are at present:

- about 40 pre-defined procedures to evaluate the eligible savings of end-uses in the household, service, industry, agriculture and transport sectors;
- allowance for projects not considered by these procedures (but they need a preliminary appointment by the scheme administrator);
- a global quantity of 20 Mtoe of saved primary energy by means of the above EE measures;
- about 4,300 accredited Energy Service Companies authorized:
 - to present energy efficiency projects,
 - to apply for their certification,
 - to gain corresponding amount of White Certificates
 - to negotiate them with the operators obliged to own assigned EEC volumes in order to fulfill the energy saving targets

A target of additional 15 Mtoe of primary energy savings by means of EEC is required within 2020.

RSE has been involved in the national scheme on White Certificates since the beginning (2004), supporting the Regulatory Authority for Electricity and Gas in charge of its definition and management. RSE has been entrusted of the appointment of the eligible energy saving projects and related EEC since 2012, on behalf of the present scheme administrator (GSE).

KOREA

Developments and Priorities in Korea

Since Korea is one of the top energy importers relying 96% of country's primary energy supply from overseas, energy security has always been the significant issue in energy policy. As the country has been seeing the tremendous growth in energy consumption since the '90s, various energy efficiency measures in different sectors were developed and implemented, with a hope to reduce the nation's growing energy consumption and greenhouse gases.

In January 2014, with the approval of the National Assembly, the Korean government finalized the nation's Second Basic Energy Plan, which is revised every five years and incorporates the government's long-term energy policy framework for 2014–2035, in order to achieve early conversion to a highly energy efficient structure. It pursues the policy of controlled energy demand and breakaway from the conventional supply-driven energy policy. There is noticeable change in energy mix: the proportion of nuclear energy is aimed at 22–29%, reduced from 41%, and more new and renewable energy. Also it indicates the important paradigm shift, which changes attention towards demand instead of supply and mainly economic and market driven instruments used for driving change.

The government expected the total energy consumption to increase by an annual average of 0.9%, reaching 254 million tonne of oil equivalent(toe) by 2035. The demand for electricity is projected to be the fastest growing energy sources with an annual average increase of 2.5%.

Energy demand forecast in the Second Basic Energy Plan in Korea (unit: million toe)

| | Electricity | Oil | Coal | City Gas | Heat | NRE | Total |
|------|--------------------|------------|-------------|-----------------|-------------|------------|--------------|
| 2011 | 39.1 | 102.0 | 33.5 | 23.7 | 1.7 | 5.8 | 205.9 |
| 2035 | 70.2 | 99.3 | 38.6 | 35.3 | 3.3 | 7.4 | 254.1 |

The target of this plan is to reduce the final energy consumption and electricity demand by 13% and 15% respectively from the business-as-usual level by 2035. The fundamental notion of this plan is to promote the DSM. Taking the advantage of the advanced ICT industry in Korea will be the key approach to achieve the goal. Some of the DSM measures that are set out in the plan are as follows. Incentives for SMEs will be expanded with tax and loans, and industries will be compensated for the higher cost by subsidies of ESS(Energy Storage System). Also building codes will be strictly reinforced, and all new buildings should be "zero energy" by 2025. 15% of electricity from distributed generation by 2035 is also another goal to achieve. Transportation is expected to reach the level of advanced countries in terms of fuel efficiency by 2020. Overall, the government will pursue an energy policy focused on controlling demand so that energy efficiency can be enhanced in a creative and voluntary manner in our daily lives of the people along with industrial and economic activities.

Under the Rational Energy Utilization Act in Korea, energy suppliers should establish and implement annual DSM investment plans to increase energy efficiency in production and usage of energy and reduce its demand. Their plans should be submitted to the government, and KEMCO, Korea Energy Management Corporation, has been evaluating reports on plans and results of energy utility DSM. It is expected to achieve

energy efficiency and load management with the investment of total 405 billion KRW from energy utilities in 2014.

With regard to the recent demand side strategy, there has been significant growth of interest in implementing DSM measures based on ICT technology. Since this new paradigm of energy policy announced in August 2013, with great emphasis on the importance of demand side management, public and private sectors are encouraged to invest in related fields, such as ESS, EMS, Smart plugs, and energy efficiency equipment with ICT technology. In accordance with this plan, the electricity utility plans to expend 625 billion KRW in introducing the frequency regulation ESS by 2017, and several electricity intensive companies have plans to invest in ESS as well.

As a subsequent measures to reduce the energy demand and tackle the climate change, the government announced the following plan to support several new businesses, in which ICT converges with the energy business as Korea's next growth engine of economy, and develop them into a market of 2 trillion KRW(US\$ 1.9 billion) by 2017.

Most of those businesses that have been taken into account to develop DSM include the following.

- Demand Response business: Implement energy saving systems for businesses in their buildings and plants, collecting unused power for profitable sale in the energy market. Through this scheme, 1.9 million kW of DR resources will be secured by 2017
- Integrated energy management service business: Build ESS, EMS, and LED systems combining finance, insurance and energy management technology, and provide maintenance services. It is planned to disseminate ESS across the 100 entities and replace the lighting systems with LED in 1,000 units by 2017.
- Independent micro-grid business: On islands with a high unit price for power generation, replace diesel generators with a hybrid micro-grid combining new and renewable energy with ESS.
- Electric vehicle servicing and charging business: Install systems and provide charging for electric car service providers including electric taxi service providers. The pilot system called Vehicle-to-Grid(V2G), which allows plug-in electric vehicle owners to sell electricity saved in their car batteries, is planned to be adopted by the end of year 2014.

NETHERLANDS

DSM Developments and Priorities in the Netherlands

The Dutch energy policy is strongly interrelated with the climate change policy and concentrates its 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 2000 renewable energy accounted for just 1.4% of total Dutch energy consumption; by 2013 this was 4.5%. In 2020 this percentage must have risen to 14. This increase must however take place in an 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.

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.

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.

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.

Since January 2014 a National Energy Savings Fund (NEF) is operational: it holds 300m euro, of that the government provided 75 m euro, while two commercial banks put in 225 m euro. House owners can get an attractive loan from this fund for implementing energy savings measures. In the summer of 2014 a subsidy of 400m euro for investment in energy savings measures in social housing started for the period 2014–2017.

In 2014 an indicative label, based on a uniform method applying to the whole country, became available to be assigned to all houses in 2014 and 2015. This label indicates the home's energy performance and serves to raise awareness.

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.

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 is in progress in 2014. These will focus on improving the energy efficiency and competitiveness of the companies concerned.

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 CO₂-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.

In 2014 the number of CHPs in industry and horticulture continue to decrease, and it is expected that this process will continue.

Traffic and transport should become more efficient and mobility more sustainable. The parties have agreed on ambitious targets, namely a 60% reduction in CO₂ 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. In 2014 the parties produced 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 CO₂.

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 is 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 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 pentilateral 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 implementation 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.

NEW ZEALAND

DSM Developments and Priorities in New Zealand

General statement:

- Information and analysis regarding New Zealand's energy sector is published annually on the website of the Ministry of Business, Innovation and Employment (see: <http://www.med.govt.nz/sectors-industries/energy/energy-modelling/publications/energy-in-new-zealand>). This includes statistics on supply and demand by fuel types, energy balance tables, pricing information and international comparisons.
- Information updated on a quarterly basis can be found under the heading Energy Data at: <http://www.med.govt.nz/sectors-industries/energy/energy-modelling/data>
- From an electrical energy perspective, the summary of electricity supply and demand at the June quarter 2014 states (from New Zealand Energy Quarterly, Issue 26, September 2014):

Generation

- The amount of electricity generated in the June 2014 quarter was 0.7% lower than the same quarter last year. New Zealand's share of electricity production from renewable resources rose to 78.5% from 68.1%, when comparing this quarter with the June quarter 2013. Renewable generation rose due to increased geothermal and hydro generation.
- Geothermal generation increased by 17.9% in the June quarter 2014 when compared with the June quarter 2013. This was mainly due to Contact's new Te Mihi geothermal plant operating at full capacity. Quarterly hydro generation was up 14.7% from the last June quarter. Quarterly thermal generation continues to decline, down 33.0% from the same quarter last year.

Consumption

- New quarterly consumption data from June 2013 onwards is presented in the graph below. Total consumption increased 0.4% in the June quarter 2014 when compared to the June quarter 2013. Over this period, residential consumption increased 3.3% while commercial consumption decreased 4.3%.

Specific areas of priority

Demand-side management continues to be an area of focus in New Zealand, with initiatives including:

- New Zealand Smart Grid Forum: The NZSGF was established in early 2014 with its first meeting being held on 3 April 2014. The Forum has a total of 22 members drawn from across all aspects of the electrical energy sector from generators to consumers. Its objective is *to advance the development of smart electricity networks in New Zealand through information sharing and dialogue, supported by analysis and by focussed work-streams where these are considered to be appropriate*. Further information about the Forum and its workplans can be found on the website at: <http://www.med.govt.nz/sectors-industries/energy/electricity/new-zealand-smart-grid-forum>

In addition to the NZSGF, the Green Grid Project, a government-funded research project, ...

is a wide-ranging investigation into how New Zealanders use power, how this demand can best be met using renewable sources, and how the national grid can be made smarter and

more efficient. This involves measurement of current household energy use and renewable generation, as well as extensive modelling and simulation of future power systems and demand. In particular, research will be carried out into the impact of increased levels of wind and solar generation on the grid, and how their variability can best be managed.

Further details of the Green Grid Project can be found at: <http://www.epecentre.ac.nz/greengrid/>

- Demand Response: The New Zealand System Operator, Transpower, trialled a commercial demand response programme in the second half of 2013, involving 8 participating companies with 134 MW of demand response registered. Following this successful pilot, Transpower is running a further programme in 2014 which is now in its fourth registration cycle. Full details can be found at: <https://www.transpower.co.nz/projects/demand-response-project/demand-response-programme-2014>.
- In addition to Transpower, the company EnerNOC has a major DR programme in New Zealand. Further information is available on the EnerNOC website at: <http://www.enernoc.com/for-businesses/when-you-use-it/demand-response/in-new-zealand>
- Energy Efficiency: Greater efficiency remains a priority in New Zealand, with the government's Energy Efficiency and Conservation Authority (EECA) estimating that across all energy forms *New Zealand spends approximately \$18 billion on energy each year. We estimate that annual savings of around \$2.4 billion could be realised from targeted energy efficiency programmes.* (EECA Annual Report 2013/14. See: <http://www.eeca.govt.nz/sites/all/files/eeca-annual-report-web-2013-2014.pdf>).
- The National Energy Research Institute focused its annual conference in 2014 on energy efficiency and dovetailed the event with the March 2014 meeting of the IEA DSM Executive Committee in Wellington. The Committee members were able to learn more about initiatives in New Zealand as well as present work being done in other member countries.
- Behaviour change: Linked to the work of EECA as reported above, behaviour change across all areas of energy consumption remains a high priority, with particular focus on the transport and domestic housing sectors. New Zealand has recently confirmed its participation in the extension of Task 24 of the DSM IA, and is seeking to develop tools and approaches specifically targeted at changing energy consumption behaviour.

NORWAY

DSM Developments and Priorities in Norway

The structure of stationary energy use in Norway is the result of a strategic utilization of the country's rich waterfall resources. This is reflected in the build-up of a power-intensive industry and a buildings sector where heating solutions traditionally have been based on the availability of inexpensive electric energy. Industry represents around 45% of the net electricity consumption, while households and the services sector represent 55%. The perhaps most principal characteristic of the Norwegian stationary energy use is the high dependence on electricity use for heating purposes, both hot water and space heating.

In a typical year, the consumption of electric energy in the Norwegian power system is around 120 TWh. More than 96% of the electricity production is based on hydropower. The main source of risk in the primary production system lays in the variations in reservoir inflows, which depend on seasonal precipitation (snow- and rainfall). In a normal year, domestic production capacity covers national demand for electric energy. With the introduction in 2012 of the Norwegian/Swedish green certificate system, the goal is to expand the Scandinavian production capacity for green electricity (e.g. hydro, wind and bio) with 26 TWh by 2020. The main market response in Norway to this program, is an addition of hydropower capacity to the current supply structure. Even with the predicted population growth, the expected normal market situation in the coming years is therefore one of surplus production and relatively low prices. There are, however, challenges related to network capacities, particularly energy transmission between geographical regions of the country. These issues typically arise in cold periods with high heating needs.

Current policies for stationary energy use reflect this situation. Programs dedicated to energy efficiency in industry and the built environment have been in operation during the last decade and half. Energy efficiency has primarily been stimulated in terms of measures to reduce heating needs in buildings. Investment subsidies to improve existing buildings and efforts to prepare the construction industry for increasingly strict building codes have been central elements. In addition, there have been programs for conversion from direct electrical and fossil fuels based heating to non-electric renewable heating systems. Looking forward from this situation, we see the following DSM issues from a Norwegian context:

1. *From load level to load shape.* The combination of public programs addressing electricity demand (energy efficiency and non-electric heating) and the expanded supply through the green certificates, are now showing results. As a consequence, the total supply is expected to more than cover demand. However, given the spatial “mismatch” between supply and demand and the uncertainty regarding winter temperatures, the load shape remains an issue. Network capacities and power management are becoming relatively more important issues in the discussion of national energy security. Balancing grid expansions with demand side management to optimize the grid is thus a key strategic issue.
2. *Deployment of metering infrastructure (“smart meters”).* Rollout of smart meters for all customers has started. The new metering infrastructure must be in place before 2019. A few pilots are underway to gain experience with the new metering technology and the smart grid applications it enables, however the majority of grid companies have not yet initiated the mass deployment. Experiences from other countries suggest that both technical issues and consumer concerns related to this technology could become important in the coming years.
3. *New generation and loads.* Heat pumps and electrical vehicles are examples of new loads increasingly entering the grid, and potentially adding to the challenge of the power capacity. Solar energy (photovoltaics) is an example of a small-scale technology that could contribute to supply security. Given the establishment of the metering infrastructure, which mix of “smart grid technologies” are best suited for the Norwegian situation is far from clear. The design of the future electricity grid, particularly the demand side of it, is therefore a necessary strategic debate involving both policy makers, research and market actors.

4. *Adapted market mechanisms.* New technology enables new ways of managing the grid. It is not granted that the end users behave accordingly. The creation and distribution of benefits from the new technologies must be considered. End user actions creating disproportionate benefits for the grid owner is not a viable solution. Tariffs, pricing mechanisms and other incentive structures – business models – that motivate “efficient” end user behaviours and choices need to be developed to match the technology. Our smart grid pilot projects indicate that much development work remains in this respect.

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

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 DSM-related activities in Sweden 2014

The Swedish government has commissioned the Swedish Energy Agency to 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.

The Swedish Energy Agency handles about 40 R&D D programmes and around 900 projects. The work with R&D is currently organized in six thematic areas: 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 running R&D programme activities with DSM-oriented perspectives

The Swedish Energy Agency has together with different stakeholders, initiated several programmes, here are some examples:

- The Swedish Energy Agency has allocated 140 million SEK (2013–2017) for a research and innovation program together with the building sector, called *Energy Efficient Buildings and inhabitants*, and the building sector 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.
- Swedish Energy Agency collaborates and co-finances an R&D programme 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. 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 where the Swedish Energy Agency has allocated 60 million SEK (2013–2017). The programme combines behavioural science, design and information technology (ICT) in order 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.
- SweGRIDS (Phase 2) has been approved in 2014, to run for 4 years, with an expected cost of around 206 million kronor. SweGRIDS is a programme for driving Electric-Grid oriented energy research at KTH and Uppsala. The sponsors are the Swedish Energy Agency and the industry partners, which also are involved actively to the research projects.
- *Energy efficiency in the transport sector* (2014–2017). The programme's overall goal is to contribute to the build-up and development of knowledge regarding energy efficiency mainly in land and sea transport by supporting research and development concerning energy efficiency relating to the transport system and its actors (and aspects such as logistics, transport integration, planning, organization, IT, influencing behaviour).

Smart cities – R&D examples

- Nordic Built – was initiated by the Nordic Ministers for Trade and Industry – is a Nordic initiative to promote the development of sustainable building concepts. 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 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/>

Other news of interest for DSM

- *Smart grid Coordination council*. The Swedish government has since 2012 appointed the Swedish Coordination Council for Smart Grid with representatives from authorities, organizations, the business community 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) that is to be presented the 8th December this year, with recommendations on how to stimulate the deployment of smart grids. <http://www.swedishsmartgrid.se/>
- The Swedish Energy Agency co-finances, at the moment, three smart grid pilots in Sweden (were for example possibilities for demand side participation are investigated.) For further information on these projects use 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>

SWITZERLAND

DSM Developments and Priorities in Switzerland

As described in the last IEA DSM Annual Report, after the grave 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, developed a new Energy Strategy 2050 which is currently discussed in the Swiss parliament. Beside the expansion of hydropower and new renewable energies, and, if necessary, on fossil-fuel-based electricity production and imports, energy efficiency and demand-side management play an indispensable role in the Energy Strategy 2050. The medium term goals are to reduce energy consumption per capita by 43% and the electricity consumption by 13% by 2035 compared to 2000. A further essential step is the transformation of transmission networks into smart grids for future domestic production infrastructures and electricity imports.

In order to reach these goals the Swiss Federal Government provides amongst others the following measures to promote energy efficiency and CO₂-emission reductions on the demand side:

- **SwissEnergy:** Swiss Energy is operated by the Swiss Federal Office of Energy (SFOE) and has the role of an Energy Agency to conduct activities on awareness rising, information, consulting, (further) education, quality control, and networking and promotion in the fields of energy efficiency and renewable energy. Further information: www.energieschweiz.ch
- **Consumer Information:** Energy labels for cars, buildings and different appliances inform customers about the energy efficiency and other attributes of the product.
- **Buildings Program:** The Swiss federal and cantonal buildings program promotes the energy-efficiency renovation of buildings and investment in renewable energies, waste heat recovery and the optimization of building utilities.
- **ProKilowatt – Competitive calls for tenders:** Parts of the grid levy on electricity is used to help finance selected energy efficiency measures that would not pay for themselves purely through the energy savings made. A series of tender calls for projects and programs for more efficient use of electricity in industry and households has been launched by the Swiss Federal Office of Energy since 2010. Companies and organizations may apply for the implementation of efficiency measures within the scope of an annual call for tenders. The main criterion is the cost-benefit ratio (promotion funding per saved amount of energy).
- **Target agreements:** Companies can get exempted from the CO₂ levy on heating and process fuels but need to reduce their CO₂ emissions and increase the level of energy efficiency through the implementation of economically viable measures.
- **Reimbursement of the grid levy on electricity:** Large-scale consumers (= electricity costs of more than 5 percent of the gross value) can be (partly) relieved of the grid levy. These consumers need to have a target agreement and spend at least 20 percent of the reimbursements on energy efficiency measures which are not part of the target agreement.
- **Smart grid:** The SFOE is working hard on the future of the power grid. It is drawing up both a smart grid strategy and a smart grid roadmap for Switzerland. In addi-

tion the SFOE will outline a schedule and the available options for developing the power grid in Switzerland, and establish when and where action needs to be taken.

- Research: Besides pilot and demonstration projects and research in specific technology areas to improve energy efficiency and renewable energy, the socio-economic interdisciplinary research program Energy – Economy – Society (EES) of SFOE focuses on economic, psychological, social and environmental issues relating to the extraction, distribution and use of energy.

In addition the Swiss cantons and municipalities implemented measures to promote energy efficiency on the demand side, too. Further incentives like for example the development of a stronger energy performance contracting market or the implementation of a white certificate scheme are under discussion.

Further details on the different measures and projects can be found on www.bfe.admin.ch or www.energieschweiz.ch

UNITED KINGDOM

DSM Developments and Priorities in the United Kingdom

Demand Side Management Developments – Electricity Demand Reduction (EDR) in the UK

What is EDR?

Electricity Demand Reduction (EDR) is a term that is used to describe electricity savings that are achieved through the installation of more efficient electrical equipment. For example, if an old electrical pump is replaced with a new more efficient electrical pump it will deliver savings by reducing the amount of electricity that is used at any time compared to if the original pump remained in operation.

Savings cannot be directly measured because they represent the absence of electricity use. Instead savings are calculated by comparing energy use before and after a project, whilst making appropriate adjustments.

EDR and the British Capacity Market

A Capacity Market is being introduced in Great Britain to ensure that consumers continue to receive reliable electricity supplies at an affordable cost at times of very high electricity demand. It will provide regular monthly payments to capacity providers during the delivery year. In return, they must be available to produce electricity or shift demand when demand is close to exceeding supply, or face penalties if they fail to deliver the capacity. At present, the Capacity Market will be open to capacity providers in the form of new and existing power stations, electricity storage providers and those who can shift or switch demand to other times (demand side response).

EDR could reduce the level of demand placed on the system and, in turn, lower the amount of other types of capacity that need to be provided.

The Capacity Market will operate as an auction, with participants bidding in the amount of capacity they are able to offer and a price at which they are willing to provide it. The first capacity auction will take place in December 2014 for delivery four years ahead. In addition, the Government will run transitional arrangements for demand side response capacity in 2015 and 2016.

What is the EDR Pilot?

The EDR Pilot has two objectives:

- To examine the viability of electricity demand reduction in the Capacity Market; and
- To learn lessons for Government and wider stakeholders on the delivery of EDR schemes.

In order to test whether EDR could form part of the Capacity Market, the EDR Pilot is designed to reflect as closely as possible the potential requirements EDR would have to meet to participate in the Capacity Market. Also, in order to maximise the learning both on the role of EDR in the Capacity Market and more widely, the EDR Pilot will include a number of activities which are primarily for evaluation purposes.

The Capacity Market is based around auctions and so the EDR Pilot is also based around an auction format. The EDR Pilot is expected to consist of at least 2 auctions – with the first auction for a total of around £10 million being held on 12 January 2015 and the second scheduled for the following year.

The EDR Pilot auction process invited participants to submit an Expression of Interest Form, and to subsequently submit an application to qualify for the auction. Expression of Interest and Application Forms are assessed to ensure that they meet the requirements of the EDR Pilot and are for projects that we expect should be able to deliver the expected capacity savings. If successful, participants will then be invited to submit a bid into the auction on a £.pence per kW basis for the average amount of capacity reduction their project is expected to deliver in the specified winter peak period. A maximum price will be set at £300 per kW. Winning bids will be selected on a £/kW ranking up to the total budget available in the auction.

Winners will be required to sign a Participant Agreement, which will commit the participant to a number of obligations, including installing and reporting Operational Verification for the measures they bid into the auction, measuring and reporting the capacity savings delivered and participating in the evaluation of the EDR Pilot. In exchange for full compliance, the Department of Energy and Climate Change will pay participants their winning bid price multiplied by the average capacity savings committed to in their successful application.

The evaluation of the EDR Pilot is intended to provide a robust evidence base so that the Government is able to make such decisions on EDR in the longer term. Learning from the evaluation will underpin the design of any enduring scheme.

Further Details at: <https://www.gov.uk/government/policies/reducing-demand-for-energy-from-industry-businesses-and-the-public-sector--2/supporting-pages/electricity-demand-reduction-project>

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 as 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 at the retail electricity level – by state public utility commissions or by local elected and appointed governing boards for publicly-owned and cooperatively-owned utilities. Wholesale electricity matters, as well as environmental laws, are regulated at the Federal level. Thus, with such diversity in the electric utility and how it is regulated, 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.

Last year's annual report from the U.S. documented the continued aggressive expansion of all these types of DSM in the U.S.

Two major events have occurred in the U.S. in the last year that effect this trend of high DSM growth in the U.S.

The first is the June 2014 issuance by the U.S. Environmental Protection Agency (EPA) of a proposed rule for public comment, for the cutting of carbon emissions from power plants that would occur under the existing Clean Air Act law, first enacted in 1970 with major additions in 1977 and 1990. Use of energy efficiency is prominent in the June 2014 EPA proposed carbon rule. The second is a May 2014 decision by a U.S. court to declare the promotion of demand response by the Federal Energy Regulatory commission in wholesale electricity markets to be not legal under the Federal Power Act.

EPA's June 2014 proposed rule, known as the "Clean Power Plan", would cut carbon emissions from power plants by 30% by 2030 from 2005 levels. Power plants are about 1/3 of U.S. carbon emissions. Using existing law, the proposal requires states to file a compliance plan with EPA on how the emissions from power plants in that state will be reduced by 2030, with an interim requirement for 2020, to meet a custom target proposed for each state by EPA.

EPA used a mix of assumptions to set the custom emission reduction targets for each state that were issued in the proposed rule. The assumptions, called "four building blocks", are improving existing fossil fueled power plant efficiency, increased use of generation at existing and under-construction combined cycle natural gas-fired power plants, greater use of renewable energy coupled with counting of new nuclear plants under construction and continued use of existing nuclear power plants, and increasing ratepayer-funded energy efficiency to achieve an annual reduction in electricity demand by 1.5% savings in each state. Several leading states have achieved the 1.5% level. EPA believes all states can reach or exceed that same level.

States can use these same four "building block" methods, or other zero and low carbon supply or demand-side options, and at levels of their choice, to come up with a flexible compliance plan to meet its assigned target. To use energy efficiency, states would have to adopt credible and verifiable methods of measurement and verification of claimed savings if they have not done so yet.

As proposed, EPA's Clean Power Plan would further accelerate the growth of U.S. customer-facing energy efficiency. The process in the U.S. for national regulations requires EPA to first issue a proposed rule for public comment, then to consider the

submitted public comments as it turns the proposed rule into a final rule that is enforceable under Federal law. EPA has stated its intention of issuing a final rule by June 2015. Under U.S. law, legal challenges to a rule are allowed, with observers expecting several years of likely court challenges.

The second major DSM event in the past year in the U.S. involves a 2012 rulemaking concerning demand response by the Federal Energy Regulatory Commission (FERC), who has sole jurisdiction under U.S. law to regulate interstate electricity commerce, which in practice means wholesale electricity. States are given sole jurisdiction over retail electricity matters under Federal law.

FERC's 2012 rule, called "Order 745", allows wholesale electricity markets operated by regional transmission operators (RTOs) and independent system operators (ISOs) to include demand response, in addition to supply resources. RTO and ISO electricity markets cover much of the U.S., except for the western U.S. outside of California and the South Eastern U.S. If RTOs/ISOs chose to allow demand response, they must pay full market price in the wholesale electricity markets they operate, i.e. the same as is paid supply side resources.

As a result of FERC Order 745, some RTOs/ISOs have been procuring substantial levels of demand response for their region through wholesale markets they operate, in addition to demand response that is used by retail-level electric utilities elsewhere. For example, PJM announced in May that it had 10 GW of demand response clear its latest capacity market auction.

The 2012 FERC Order 745 was however challenged in court, and in "EPSA v. FERC", the U.S. Court of Appeals, District of Columbia Circuit (May 23, 2014, No. 11-1486), found that the FERC lacked authority to regulate the role of demand response in centrally-organized wholesale electricity markets on the grounds that demand response is an action taken by retail customers and is therefore under the jurisdiction of retail regulation, which is under the sole jurisdiction of states, not FERC. The ruling thus says that FERC overstepped its legal jurisdiction and that the decision of demand response payments should lie with states as part of their retail electricity oversight.

The court's decision may be appealed by the U.S. government's executive branch U.S. Department of Justice to a higher court, with a decision to do so not yet made as of November 2014. Nevertheless, the court decision has put a halt to a large deployment underway of demand response. PJM and other RTOs/ISOs with demand response in their markets are considering ways to include demand response in their wholesale electricity markets that would allow compliance with the court ruling. Some states, such as New York with its announced-in-2014 "Reforming the Energy Vision" are considering large redesigns of their retail electricity regulation to allow new large amounts of demand response, among other goals.

CHAPTER IV

DSM University

The DSM University is now established and has begun its activities by arranging webinars. These webinars are the “heartbeat” of the IEA DSM University. During 2014, 8 webinars have been arranged with approximately 1400 persons registered and roughly 800 participants attending altogether. The presentations are on the following themes.¹

| Title | Task/Operating Agent/Presenter | DSMU-# |
|--|--|--------|
| Theme 1 – The logic of DSM | | |
| Impact evaluation of Energy Efficiency and DSM programmes | 1/9, Harry Vreuls | 5 |
| Theme 2 – Governance | | |
| Customized, Systemic, Strategic – the way to succeed with energy efficiency in industry | Catherine Cooremans, Business School of Geneva | 7 |
| Taking Stock – 40 years of Industrial Energy Audits | Peter Mallaburn, UCL (eceee) | 8 |
| Theme 3 – Energy use (load level) | | |
| Best Practices in Designing and Implementing Energy Efficiency Obligation Schemes | 22, David Crossley (RAP) | 4 |
| ESCo market development: A role for Facilitators to play | 6, Jan Bleyl | 1 |
| Theme 4 – Flexibility (load shape) | | |
| Using Demand-Side Management to Support Electricity Grids | 15, David Crossley | 3 |
| ISGAN Annex 2 Spotlight on Demand Management | ISGAN | 2 |
| Managing Variability, Uncertainty and Flexibility in Power Grids with High Penetration of Renewables | Lawrence Jones, Alstom | 6 |

The main source is Task material and the main resources for delivering are the Operating Agents (OAs), but others should be invited to allow a more complete coverage of all aspects, i.e. specialists from other Implementing Agreements and others.

The Copper Alliance has developed a web-platform that will allow us to manage the material in a structured way and to provide more formal training material as it develops, see link below. This web platform is based on Moodle and allows for a wide variety of interactive services that could be further explored in the future.² This page can be accessed via www.dsmu.org after registering to obtain data to login.

¹ These webinars are recorded and available on <http://www.leonardo-academy.org/totara/program/details.php?id=10>

² Moodle interactive services include forum, chat, wiki, survey, test, glossary, ...

Task 16

Competitive Energy Services (Energy Contracting ESCo Services) – Phase 3 – Energy Efficiency and Demand Response Services

Operating Agent: Jan W. Bleyl, Energetic Solutions, Austria

Summary

In Task 16 “Innovative Energy Services (Energy-Contracting, ESCo services)”, energy service experts from countries around the world join forces to advance know how, experiences and market development of (mainly performance-based) energy services.

Main subtasks are country specific National Implementation Activities, an Energy Services Expert Platform for mutual exchange and support as well as national and international dissemination activities including the DSM University. The Think Tank is the common research platform with publications like the ‘Integrated Energy-Contracting’ business model, the ‘Facilitator’ concept, Comprehensive Refurbishment (‘deep retrofit’) business models or ‘Simplified Measurement & Verification’ of energy savings.

Task 16 is working since July 2006 and is currently preparing a three-year extension from July 2015 to June 2018 (Phase IV). This annual report focuses on content and key results of the current task work as well as the future work planned. For a more detailed activity and management report, please refer to the bi-annual Task Status Reports.

For more information or to explore options how to collaborate, please feel free to contact the Operating Agent Jan W. Bleyl under +43 650 7992820 or EnergeticSolutions@email.de.

Energy Services: A ‘Delivery Mechanisms’ for Energy Policy Targets

The success of further increasing energy efficiency in all sectors of consumption will play 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 means to meet all three key targets of energy policies: Security of supply, affordable costs of energy (services) and environmental soundness.

Energy Efficiency (EE) has found its way up on the political agendas over the course of the last few years and is now often referred to as a ‘first fuel’. Worldwide, concrete saving targets for CO₂, Renewables and Energy Savings have been declared, although often indicative in the case of energy efficiency.

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 join forces and to conclude and support all suitable political, regulatory and market based instruments for the implementation of Energy Efficiency, Renewables and CO₂-reductions.

Performance-based energy services (ES) – also referred to as Energy-Contracting or ESCo service – is not a ‘silver bullet’ but one and a many times proven ‘delivery mechanism’ for implementing energy efficiency measures such as lighting, HVAC or building refurbishment. An ESCo takes over the technical and economical implementation risks and provides performance and output guarantees for the results. ES are also well suited to implement renewable energy systems with guaranteed outputs as displayed in the following figure. Yet Potentials but also limitations, pros and cons and added values of ESCo products in comparison to in-house implementation are often not very well understood.

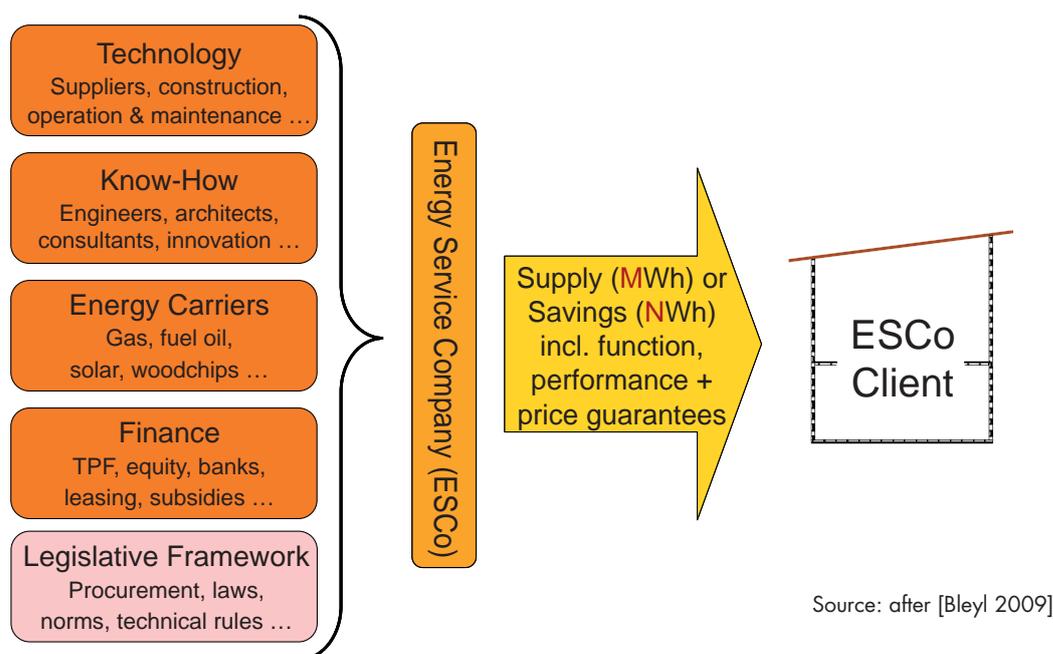


Figure 1: What is Energy-Contracting/ESCo?
An integrated service package with output and performance guarantees for the client

Furthermore, the increasing integration of fluctuating renewable supply sources into (‘smart’) electricity networks will need to be accommodated by growing balance energy/capacity or other types of markets, which may in part be provided by demand response sources provided by energy service providers (ESP).
Task objectives

Task 16 is working to further contribute to the know how, project and market development of performance-based energy services. Thus we:

1. Sustain a well established IEA DSM *Energy Service Expert Platform* for exchange and mutual support of experts, partners & invited guest,
2. Support and follow up *country specific National Implementation Activities (NIAs)* in order to foster ESCo project and market development,
3. Design, elaborate and test *innovative energy and demand response services and financing models* and publish them (Think Tank),
4. Use the Task’s Energy Service Expert Platform as a competence center for *international and national dissemination and assistance services* (e.g. workshops, coaching, training ...) and

5. Contribute to the “DSM University”

The underlying goal is to increase understanding of ES as a ‘delivery mechanism’ to implement energy efficiency policy goals and projects: Pros and cons, potentials, limitations and added values of ESCo products in comparison to in-house implementation.

Structure of the Work and Subtasks

Task 16 continues to work with its well-established structure and has added demand response services as an additional 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 following scheme illustrates the general structure and workflow of the task extension:

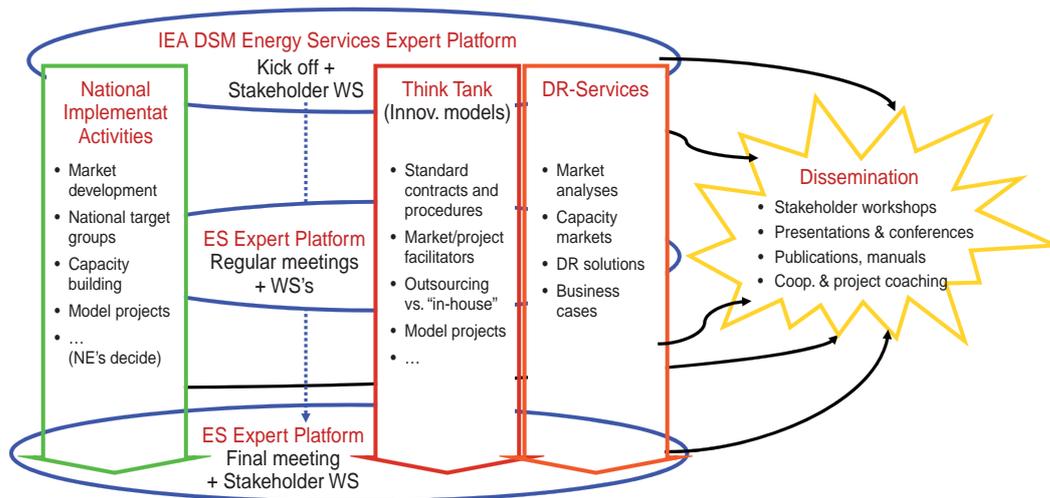


Figure 2: Task 16 – Phase III: Work structure and subtasks

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 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 three pillars, as the communication tool internally and externally and as the starting point for developing services like coaching and training for the outside world.

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 or other bodies and assistance services are offered.

Think Tank and Key Results in 2014

The Think Tank has worked on a variety of topics, which have led to publications and presentations at various national and international events. Some of it is work in progress. The following subchapters provide abstracts and outlines of current and planned Think Tank topics. If you have questions or remarks to these topics of Task 16 work, your feedback is highly welcome. You can reach the authors at Energetic Solutions, attention to Jan W. Bleyl.

Simplified measurement & verification + quality assurance instruments for energy, water and CO₂ savings. Methodologies and examples (Abstract)

The full paper has been published at eceee Industrial Summer Study 2014, paper ID 1-088-14, Arnhem, the Netherlands June 2014.

Measurement & Verification (M&V) is a prerequisite to assess the quantitative outcomes and performance of energy, water or CO₂ saving measures and to translate these into savings cash flows for energy efficiency financing and other purposes.

In practice M&V – if pursued at all, particularly in the case of in-house implementations – is often complicated by limited data availability or accuracy, a limited comparability between ‘Baseline’ and ‘Reporting’ periods or a lack of a clear M&V plan and having the resources to follow it up. If accomplished, understanding M&V reports requires expertise, which is not necessarily available with a facility owner. To make things worse, exercising M&V often is a rather boring topic – even within the professional energy community.

Furthermore, at least in many European countries, commonly acknowledges methods for M&V of energy, water or CO₂ savings are mostly based on utility meters and invoices – whereas in Anglo-Saxon influenced markets ‘retrofit isolation techniques’ for individual saving measures are accepted as good practice for the verification of energy savings cash flows (e.g. IPMVP Options A or B).

All of the aforementioned adds to the inherently complex nature of energy efficiency projects. And it often results in insecurity for energy managers, project developers, energy service providers (ESPs) and their (potential) ESP customers and financiers on verifiable future energy savings cash flows, which may lead to risk surcharges or no project implementation at all. Yet a full scale M&V plan is often not applicable or desired, due to its (perceived) complexity, lack of resources or its cost is prohibitive for smaller projects.

As a possible solution and often feasible compromise between no M&V at all and the effort and (perceived) accuracy of a full scale M&V approach, this paper proposes simplified M&V approaches for individual or groups of electricity, heat, water or CO₂ saving measures (ECM) in combination with so called quality assurance instruments (QAI). QAIs shall verify the functionality and quality of ECMs, but not necessarily their exact quantitative outcome over an entire project cycle. In many cases the simplified M&V approaches proposed are combinations of savings calculations to determine savings cash flows backed up by QAIs.

We start with the key saving calculation basics and methods including formulae to then introduce the concept of QAIs to back up the quality of 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 Energy-Contracting competence center of the German Energy Agency dena [dena 2013] and examples from colleagues in the field. And off course we draw on the „International Performance Measurement and Verification Protocol“ [IPMVP_2012] and other literature sources.

ESCo project and market development: A role for ‘Facilitators’ to play.

Including national perspectives of Task 16 experts (Abstract)

The full Task 16 discussion paper is available for download from www.ieadsm.org/

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, 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 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.

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.

Project facilitation cost in the more developed facilitation markets turned out to be on average at about 3 % of the investment cost for the demand side measures, decreasing with project sizes. In a first approximation this is about one half order of magnitude below standard engineering cost. However this up-front investment often constitutes an obstacle for project development and we would like to raise the attention of policy

makers to this opportunity to support market development. Clients also repeatedly mentioned it and Facilitators, that through an intensive (but fair) competition between suppliers, the advantages achieved with regard to prices and quality outweighs the initial facilitation cost by far.

To our knowledge, the figure of the Facilitator is hardly mentioned outside Europe or in the literature. The goal of this paper is to create a scientific reference of the project and market Facilitator case for further discussions. Furthermore we want to demonstrate the added value of a wider application of Facilitators for ESCo market development and provide guidance for facilitation services and activities as well as policy recommendations.

Methodically, the research builds on 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 our 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.

We believe the Facilitator approach will need to be multiplied and better funded to foster ESCo market development. It will also need to become a standard procedure in public and private sector administrations in order to support structuring and procuring of comprehensive energy service projects. This is particularly true, if the market is to develop from individual projects, led by highly motivated individuals, to mass rollouts of comprehensive building refurbishment portfolios. Only then will the energy services industry be able to provide more significant contributions towards energy policy goals.

Demand Response Services: Economic Feasibility Model and Case Study for Austria (Abstract)

The following abstract has been accepted at IEWT 2015 for publication. The full paper is work in progress and will be available as of April 2015.

Increasing shares of fluctuating supplies from renewable energy sources in our electricity networks will result in higher demands for balancing energy, power and related services from different sources [EDRC 2014]. On the demand side, Demand Response (DR) resources can stem from either distributed generators or switchable loads in various end-use sectors.

For Energy Service Providers (ESP) this may open up additional business opportunities through higher dynamic electricity prices in balancing energy or capacity markets compared to revenues just from or in addition to energy savings. But what is the economic rationale in balancing electricity markets? What are the key parameters to assess economic feasibility as a first step to explore these options? And how do such new business models comply with the existing regulatory framework?

To find answers to the above questions, we have developed a simplified DR revenue model of the tertiary balancing electricity market (RR – replacement reserves) in Austria, which was identified as suitable for DR-resources, mainly due to the required maximum response times [e-control 2013]. To calculate potential revenues we have identified i)

availability of DR-potentials, ii) typical capacity prices and iii) revenues from energy as main independent variables. This results e.g. in specific DR-revenues between 15.000 and 28.000 EUR/MW/a for a DR resource with an availability of 50%/a. These potential revenues can then be compared to implementation cost and for revenue sharing between end-users and ESP to assess and to pre-structure possible business models.

As a next step we apply the model to a case study in the cement industry in order to assess economic feasibility and minimum requirements like DR-potential and availability based on a practical example. The analysis is supplemented with expert inputs from IEA DSM Task 16 [Task 16 2013], regulation authorities and further literature sources.

Further results

Task 16 has commissioned a discussion paper on practical guidance for Change Management from Task 24 titled: *The life of ESCo Project Facilitators. If only the client knew, understood, trusted, cared and engaged ...* The discussion paper is available for download from www.ieadsm.org/

Also work continued on business models for comprehensive building refurbishment ('deep retrofit') in cooperation with IEA ECB Annex 61: Further development of an economic feasibility evaluation tool including sensitivity analyses for deep retrofit application.

Think Tank Activities planned for 2015

For 2015, the following Think Tank activities are planned:

- Continue work on a Task 16 discussion paper Simplified measurement & verification + quality assurance instruments for energy, water and CO₂ savings. Methodologies and examples. Including examples and national perspectives of Task 16 experts
- Continue work on business models for comprehensive building refurbishment ('deep retrofit') in cooperation with IEA ECB Annex 61: Further development of an economic investment grade and financing evaluation tool including sensitivity analyses for deep retrofit application
- Drafting of a Taxonomy paper on Energy Services to be published in a peer-reviewed journal in cooperation with Linköping university
- Finalization of a full paper Economic feasibility of DR business models for publication at Internationale Energiewirtschaftstagung (IEWT 2015)

Meetings held in 2014

Experts meetings

| Date | Place | # of Experts | Type of meeting | Government | Industry | Academic |
|---------------|-----------------|--------------|-----------------|------------|----------|----------|
| 8–9 May 14 | Antwerp Belgium | 12 | Experts meeting | 4 | 6 | 2 |
| 22–24 Oct. 14 | Seoul, Korea | 14 | Experts meeting | 6 | 6 | 2 |

Seminars/Conferences/Workshops

| Date | Place | Participants | Type of meeting | Government | Industry | Academic |
|------------------------|--------------------------------|--------------|--------------------------|------------|----------|----------|
| 04 April 14 | Vienna, Austria | 14 | Seminar | 5 | 9 | 0 |
| 7 May 14 | Brussels Belgium | 50 | T16 Stakeholder workshop | 10 | 35 | 5 |
| 11–13 March 14 | Lahore Pakistan | 45 | Workshop | 7 | 35 | 3 |
| 04 June 14 | Arnhem, Netherlands | 35 | Summer study | 5 | 15 | 20 |
| 26 June 14 | Gmunden, Austria | 25 | Seminar | 0 | 25 | 0 |
| 18–20 Aug 25–27 Aug | Johannesburg + Capetown, SA | 28 19 | Seminar Seminar | 1 0 | 24 18 | 3 1 |
| 22–25 Sept. 14 | Tallinn, Estonia | 45 | Seminar | 15 | 20 | 10 |
| 22 Oct14 | Seoul Korea | 90 | T16 Stakeholder workshop | 10 | 70 | 10 |
| 12 Nov. 14 | Vienna, Austria | 20 | Seminar | 5 | 15 | 0 |
| 27 Nov. 14 | Gmunden, Austria | 23 | Seminar | 0 | 23 | 0 |
| 2–4 Nov.14 | Lahore Pakistan | 33 | Workshop | 4 | 27 | 2 |
| 17–18 Dec 14 | GIZ-Eschborn, Germany | 29 | Workshop | 23 | 4 | 2 |

Meetings planned for 2015

Planned Experts meetings

| Date | Place |
|----------------------|----------------|
| 30.05–01.06.2015 | Hyères, France |
| Oct./Nov. 2015 (tbd) | Switzerland |

Planned Seminars/Conferences/Workshops

| Date | Place |
|-----------------|---|
| 19–21 Jan. 2015 | Milano, Italy (ESCo Europe) |
| 9–17 Jan 2015 | FH-Pinkafeld, Austria (Lecturing) |
| 09 April 2015 | Vienna, Austria (Seminar) |
| tbd | Pakistan, Caribbean, SA ... (Trainings, workshops, conferences) |

Publications produced in 2014 (selection)

In 2014 Task 16 produced the following key publications:

- *Simplified measurement & verification + quality assurance instruments for energy, water and CO₂ savings. Methodologies and examples* published at ECEEE Industrial Summer Study, paper ID 1-088-14, Arnhem, the Netherlands June 2014
- *ESCo project and market development: A role for 'Facilitators' to play. Including national perspectives of Task 16 experts_* IEA DSM Task 16 discussion paper
- *The life of ESCo Project Facilitators. If only the client knew, understood, trusted, cared and engaged ...* Task 24 discussion paper commissioned by Task 16

Task 16 also contributed to the DSM University with a Leonardo ENERGY Webinar, which is available through this link: www.leonardo-energy.org/webinar/esco-market-development-role-facilitators-play

Publications planned for 2015

For 2015 the following key publications are planned:

- *Demand Response Services: Economic Feasibility Model and Case Study for Austria* for publication at Internationale Energiewirtschaftstagung (IEWT 2015)
- IEA DSM Task 16 discussion paper: *Simplified measurement & verification + quality assurance instruments for energy, water and CO₂ savings. Methodologies and examples. Including examples and national perspectives of Task 16 experts*
- Report on *Economic feasibility of deep retrofit energy services* in cooperation with IEA ECB Annex 61
- Draft for a *Taxonomy paper on Energy Services* for internal discussion and subsequently submission to a scientific journal

Dissemination of results

Results were disseminated through publications, meetings, presentations at seminars and workshops, the IEA DSM Homepage as well as the webinar listed in the previous chapters. Also the experts disseminate the work by applying it in their day-to-day work lives. For a more detailed list of dissemination activities please refer to the Task Status Reports.

Involvement of industry and other organisations

Task 16 closely collaborates with the ESCo industry, e.g. through concrete market and project facilitation activities. Its experts are also engaged with the national and international ESCo associations/initiatives. Experts actively participate in national and international ESCo, Energy Efficiency and Renewable industry conferences.

E.g. Task 16 has established close 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) and TRANSPARENSE (<http://www.transparense.eu/>) both 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 Contracting models for SMEs.

Furthermore, Task 16 collaborates with the following organizations/energy services projects:

- ECB Annex 61 => Deep retrofit: Economic feasibility and business models
- RETD (Re-BIZZ: “Business models for renewable energy in the build environment”)
- Linköping university => ES taxonomy

Also through its regular stakeholder workshops, Task 16 is involved with industries and other organizations. Collaborations with other organizations and projects are welcome.

Positioning of the Task – v.s. other bodies

Task 16 is not developing any particular technology itself. It is dealing with innovative Energy Service business models and market development to implement and deploy almost any kind of end-use efficiency or renewable technology with market based instruments. As a prerequisite, the technology must have reached a commercial development status.

ESCo services apply whatever efficiency and renewable end-use technologies are available on the market. Accordingly, successful examples 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. Future topics also encompass demand response services,

Task 16 is a unique task in providing an international expert platform for Energy-Contracting experts, developing innovative energy service business models, initiating and mutually supporting national implementation activities and disseminating results to national and international stakeholders. Examples for collaboration with other bodies and projects are listed in the previous chapter. Collaborations is open with other bodies and experts.

Outreach of the Task – Success stories

As an example of practical outreach, the four hands-on trainings on 'Investment grade calculation and financing' in South Africa, Pakistan and for GIZ staff were particularly appreciated by the audiences. They were also appreciated by finance corporations (IFC, IDC, State Bank of Pakistan) participating in these trainings and may possibly result in further co-operation.

Also the cooperation with Linköping University has potential for mutual benefit and is a good opportunity to get Task 16 results into Academia.

Activity time schedule

The project timetable and current status is summarized in the chart below:

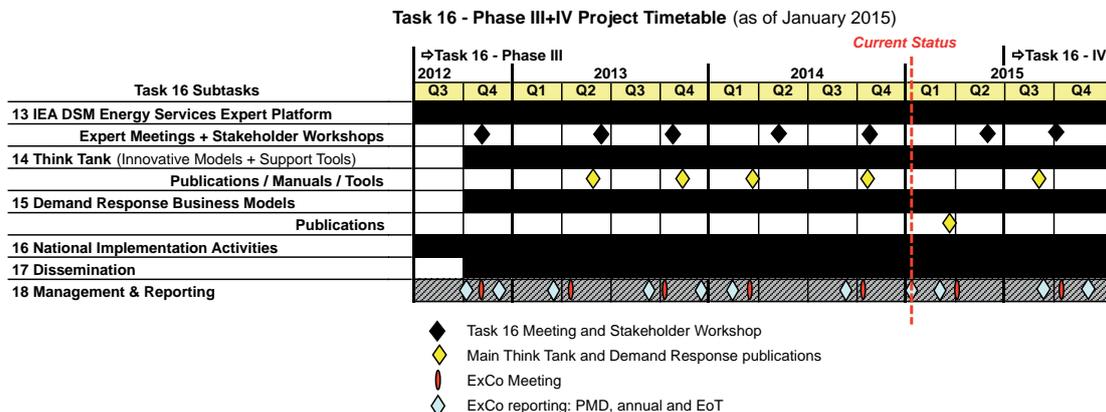


Figure 3: Task 16 – Project timetable overview

Outline of new work (Phase 4, July 2015 – June 2018)

The DSM Programme is currently preparing a 3-year continuation of its work on Innovative Energy Services beginning in July 2015.

During the next phase of the work, the Think Tank will focus on:

1. Comprehensive refurbishment (Deep Retrofit, NZEB) through Energy Services (in cooperation with the IEA Energy in Buildings and Communities Programme, Annex 61), including:
 - Economic feasibility and opportunity cost of delaying retrofit
 - Investment grade calculation and financing of projects and related business cases
 - Business models for deep retrofit and how to factor in non-energy-benefits (NEB)
2. An Energy Services Taxonomy journal paper
3. Demand response business models (continuing current work) + Demand response services and Virtual Power Plants (market analyses, economic feasibility).
4. Knowledge transfer to emerging and developing markets: relevance, methodologies, lessons learned.
5. Financing: Crowd-financing, funds for EE and RES investments, for example:
 - Access to capital expenditure for smaller projects in SMEs and communities
 - How to bridge in particular the mezzanine financing gap

The Task's detailed work program will be adapted to suit the needs of the participating countries. And, National Implementation Activities (NIAs) will be defined for the specific country and market situations. Ongoing activities can be integrated into the NIA's.

In addition, experts will continue their work on know how and market development of ES by:

- Maintaining the well-established IEA DSM Energy Services Expert Platform for the ex-change and mutual support of experts, partners and invited guest.
- Supporting and following up on country specific national implementation activities (NIAs) in order to foster ESCo project and market development.
- Designing, elaborating on, and testing innovative energy and demand response services and financing models and publish them (Think Tank).
- Using the Task's Energy Service Expert Platform as a competence center for international and national dissemination and assistance services (e.g., coaching, training).
- Continuing to contribute to the activities of the DSM University.

Participation is open to two more countries – please contact the Operating Agent

Participating Countries and Contacts Phases I – III

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Essent Retail Services BV (until 06/2012)

Withuisveld 7, 6226 NV Maastricht

www.essent.nl

Spain (until 06/2012)

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www.swedishenergyagency.se

Switzerland (since 07/2012)

Swiss Federal Office of Energy SFOE

Department of the Environment, Transport, Energy and Communications

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www.bfe.admin.ch

Participating Institutions Phases I–III

Austria

Energetic Solutions (*since 07/2012*)

e7 (*since 01/2014*)

www.e-sieben.at/

Grazer Energieagentur

(*until 06/2012 and again since 01/2014*)

www.grazer-ea.at



Belgium

Fedesco

www.fedesco.be

EnergInvest (*since 07/2010*)

www.energinvest.fr

Factor4 (*since 07/2010*)

www.factor4.be



Finland (*until 06/2009*)

Motiva Oy

www.motiva.fi



GIZ Germany (*since 07/2013*)

Deutsche Gesellschaft für Internationale Zusammenarbeit

www.giz.de



India (*until 06/2012*)

Bureau of Energy Efficiency

www.bee-india.nic.in



Japan (*until 06/2009*)

Japan Facility Solutions, Inc.

www.j-facility.com



Korea (*since 07/2012*)

Korea Energy Management Cooperation

www.kemco.or.kr



Netherlands

Essent Retail Services BV (*until 06/2012*)

www.essent.nl

ESCOPLAN (*since 07/2012*)

www.escoplan.nl



Spain (until 06/2012)

Red Eléctrica de España

www.ree.es



Hitachi Consulting (until 06/2012)

www.hitachiconsulting.com



Sweden (since 07/2012)

Swedish Energy Agency

www.swedishenergyagency.se



Switzerland (since 07/2012)

Swiss Federal Office of Energy SFOE

www.bfe.admin.ch



Financing Partners Phases I – III

Austria (until 06/2012 and again since 01/2014)

Federal Ministry of Transport,
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www.bmvit.gv.at

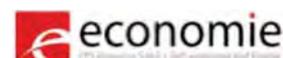
www.energytech.at



Belgium

Federal Public Service
Economy, S.M.E.s, Self-Employed and Energy
DG Energy – External relations

<http://economie.fgov.be/>



Finland (until 06/2009)

Tekes – the Finnish Funding Agency
for Technology and Innovation

www.tekes.fi



GIZ Germany (since 07/2013)

Deutsche Gesellschaft für Internationale Zusammenarbeit

www.giz.de



India (until 06/2012)

Bureau of Energy Efficiency Ministry of Power

www.bee-india.nic.in



Japan (until 06/2009)

Tokyo Electric Power Company

www.tepco.co.jp/en/index-e.html



Korea (since 07/2012)

Korea Energy Management Cooperation
www.kemco.or.kr



Netherlands

Rijksdienst voor Ondernemend Nederland (RVO.NL)
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<http://www.rvo.nl/>



Spain (since 07/2009)

Red Eléctrica de España
www.ree.es



Sweden (since 07/2012)

Swedish Energy Agency
www.swedishenergyagency.se



Switzerland (since 07/2012)

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All Task 16 project partners wish to *explicitly thank the IEA DSM ExCo members of the participating countries and their financing partners* for their much appreciated support.

Task 17

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

Operating Agent: Matthias Stifter, AIT/Austria and René Kamphuis, TNO/theNetherlands

Description

Phase 3 of IEA-DSM Task 17 addresses the current role and potential of flexibility in electric power demand and supply of systems of energy consuming/producing processes in buildings (residential, commercial and industrial) equipped with DER (Electric Vehicles, PV, storage, heat pumps, ...) and their impacts on the grid and markets. The interdependence between the physical infrastructure of the grid, governed by momentary power requirements, and the market side, governed by energy requirements, will also be looked upon. The scalability and applicability of conducted and on-going projects with respect to specific regional differences and requirements will be explored (see <http://www.ieadsm.org/ViewTask.aspx?ID=16&Task=17&Sort=0>).

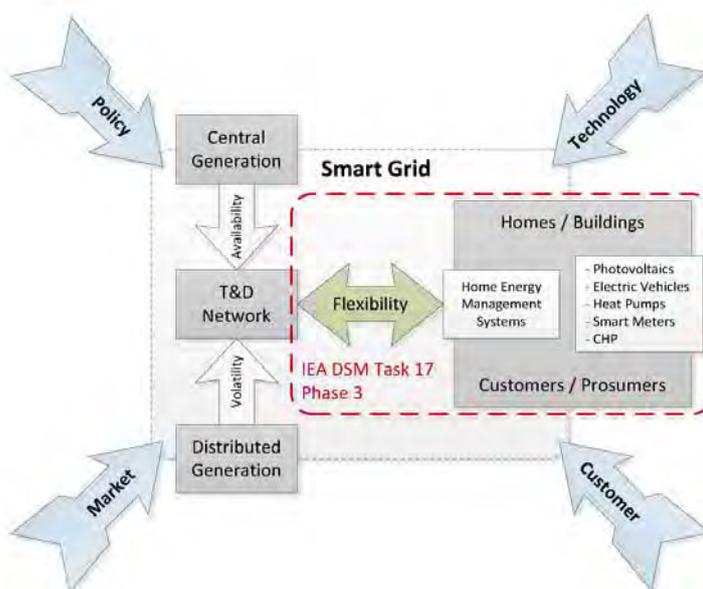


Figure 1 Focus of the IEA DSM Task 17 Phase 3 on enabling the consumption and production flexibility of electricity delivery

Task aims & objectives

Subtask 10 – Role and potentials of flexible consumers

Apart from traditional players in the energy field, also energy communities and energy suppliers in new roles as energy service companies are coming up as stakeholders in the market. The regulatory and market design frameworks in different countries as well as the physical topology of the transmission and distribution networks differ considerably on a country-by-country basis. Therefore, barriers and opportunities also differ on a per-country basis. From the policy point of view currently there is a strong momentum for harmonization; from the technical point of view standardization processes are en-

forced. In this context, the introduction of the ICT-enabled communicating meter for retail consumers can be seen to not only to lead to increased possibilities to provide consumer/prosumer feedback, but also allows for actively monitoring electricity usage and production by stakeholders to optimize operation from a market or electricity distribution point-of-view. Instead of a very loosely-coupled role for retail customers in the market, receiving one overall yearly bill based on a fixed tariff, virtually without any incentive for honoring demand response, a smart meter allows a more direct exposure of this customer category to the commercial electricity market and value creation as an asset in the operation of the physical grid infrastructure becomes possible.

Subtask objectives

- Assess the concepts and implementations of customer and home energy management systems (CEMS/HEMS), possibly linked to the smart meter, in different (participating) countries by:
- Comparing DR and DG specific requirements in households, communities, functional (office) buildings and industrial processes
- Role of Smart Meters (SM), (CEMS/HEMS gateways) and their interaction with flexible demand/supply devices as well as distributed energy resources in the terms of technical concepts
- Role of telemetry and existing process control systems and their interface to the HEMS or SM
- Evaluating strengths and weaknesses of ICT enabled aggregations of flexible demand and controllable DERs in the form of energy communities

Subtask deliverables

IEA-DSM-17.3.10: “Roles and potentials of providing flexibility in production/consumption using CEMS/HEMS systems”

Work carried out

- A metric for assessing projects based on different properties (e.g., TRL) has been developed and will be reviewed by the experts
- An international public workshop (Workshop on DSM: Potentials, Implementation and Experiences) has been organized to discuss potentials and flexibility of consumers

Subtask 11 – Changes and impacts on grid and market operation

Currently, in a number of European countries, connection of large scale and small-scale DG-RES leads to problems on the electricity market (negative prices for electricity in case of massive Wind supply in periods of low consumption) and problems with Voltage level and stability (especially in rural areas with large PV-production and low local demand). Furthermore, substitution of energy transports and storage of gas and liquid fuels by electricity leads to capacity problems in existing electricity grids. Examples of the latter are EVs and heat pumps. This theme has been the subject of a number of national and international research projects. Also, on the EU-level and in the US, inventories of project portfolios have been made. The introduction of renewable energy resources in competitive energy market environments can be seen not to have

the effects originally targeted. Goal in this subtask is combining all this information in a common methodology for deriving quantitative information on these issues and how the flexibility uncovered in subtask 10 can be utilized to counteract inefficiencies. Smart Grid technologies currently are in the infancy phase.

For software engineering in the 70s by the Carnegie-Mellon institute a Capability Maturity Model (CMM) was defined, which was used very extensively in the industry as a yardstick for measuring the software process in an organization. Recently, a similar initiative for assessing the introduction of Smart Grids has been developed, which is also used in ISGAN. Therefore, a link to the work done in ISGAN using the SGMM (Smart Grid Maturity Model) is foreseen.

Subtask objectives

Assess the impact on grid and market operation based on technology penetration scenarios developed in subtask 5 and 9 (developed in phase 2) by investigating the following areas of interest:

- Energy balancing possibilities and potentials for commercial and grid operation optimization objectives of CEMS.
- Optimization potentials from a technical and market point of view using the SGAM framework
- Design a methodology to estimate potential and to cost effective activation in-line with SGAM and SGMM.
- Regulatory and market design issues for grid and (local) market operations

Subtask deliverables

IEA-DSM-17.3.11: “Financial and maturity assessment of technologies for aggregating DG-RES, DR and electricity storage systems”

Work carried out

This Subtask has not yet commenced.

Subtask 12 – Sharing experiences and finding best practices

Subtask objectives

Based on the 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 analyzed.

- Lessons learned from existing pilots derived from workshops (e.g.; E-Energy Germany, EcoGrid-EU Bornholm, PowerMatchingCity-I and -II, USEF, NL-TKI projects, model city Salzburg, Amsterdam SmartCity, ...)
- Innovation projects with large scale demand response in industry
- Comparisons and analysis of country specific differences in the implementation
- Assessment and development of a methodology to apply different demand response mechanism to individual countries.
- Extrapolation of the results from previous collected projects on applicability on a large scale.

Subtask deliverables

IEA-DSM-17.3.12: “Best practices in applying aggregated DG-RES, DR and Storage for retail customers”

Work carried out

- An international public workshop (Workshop on DSM: Potentials, Implementation and Experiences) has been organized to discuss implementations and experiences of DSM and DR projects.
- A comprehensive list of recent studies and project developments has been started and evaluated.

Subtask 13 – Conclusion and Recommendations

Subtask objectives

Recommendations will arrived at in close interaction with the experts’ opinions and will at least provide a ranking based on impacts, costs and likely future penetration of the technologies.

Subtask deliverables

IEA-DSM-17.3.13: “Conclusions and recommendations for applying DG-RES, DR and storage in electricity grids”

Progress towards Subtask objectives

This Subtask has not yet commenced.

Activities completed in 2014

Organisation of Public Workshop jointly organized with EcoGridEU in May in Graz. Contributions as guest speaker in several international events.

Activities planned for 2015

Deliverables for Subtask 10 and 11.

Organize public workshop (autumn 2015).

Organize joint workshop with other related IEA Implementing Agreements.

Meetings held in 2014

Experts meeting/seminars/conferences

Experts meetings

| Date | Place | # of Experts | Type of meeting | Government | Industry | Academic |
|--------------|---------------------|--------------|-----------------------|------------|----------|----------|
| 19.5.2014 | Graz, Austria | 9 | Kick Off ³ | 1 | 2 | 6 |
| 17.9.2014 | WebConf | 8 | Progress | 0 | 2 | 4 |
| 3./4.11.2014 | Leiden, Netherlands | 11 | Project | 0 | 5 | 6 |

³ <http://www.ieadsm.org/Files/Tasks/Task%2017%20-%20Integration%20of%20Demand%20Side%20Management,%20Energy%20Efficiency,%20Distributed%20Generation%20and%20Renewable%20Energy%20Sources%5C2014.05.19%20Kickoff%20Meeting%20Graz%5CIEA%20DSM%20Task%2017%20Phase%203%20Kickoff%20Meeting%20Graz%20Austria%20Meeting%20Minutes.pdf>

Seminars/Conferences

| Date | Place | Participants | Type of meeting | Government | Industry | Academic |
|---------------|-------------------|--------------|-----------------------------------|------------|----------|----------|
| 20.5.2014 | Graz, Austria | 70+ | Public Workshop ⁴ | 20 | 25 | 25 |
| 10.6.2014 | Brussels, Belgium | 50+ | Belgian meeting organized by ExCo | 20 | 25 | 5 |
| 22–23.10.2014 | Berlin, Germany | 45+ | IEA EGRD Workshop | 15 | 15 | 15 |

Meetings planned for 2015

Expert meetings/seminars/conferences

Experts meetings

| Date | Place |
|--------|--------|
| Spring | US? |
| Autumn | Europe |

Seminars/conferences

| Date | Place |
|--------------------------|--------|
| Autumn – Public Workshop | Europe |

Publications produced in 2014

- Article in IEA DSM Spotlight Issue 54: DSM Workshop @ Austria's Smart Grids Week
- Review on the '[Workshop on DSM: Potentials, Implementations and Experiences](#)'⁵ will be proposed for the IEA DSM Spotlight.
- Workshop on '*Smart Cities and Smart Grids*' for Seoul Metropolitan Government (SMG) was organized at AIT and Task 17 was presented (11.6.2014, AIT Vienna).
- Presentation at the congress of Energy-Architecture: Energy management of Building Neighbourhoods – Häuser im Stromverbund., (9.10.2014, Vienna)
- National IEA Networking event – Workshop on Electricity Supply of the Future - Renewable Generation – Smart Grids – Active Customers (15.10.2014, Vienna)
- Presentation about Task 17 at the IEA EGRD Workshop on “The role of storage in energy system flexibility” – DSM – Flexibility Option of the Demand Side (22./23. October 2014, Berlin)

Publications planned for 2015

- Webinar: Contribution to *DSM University* tackling task 17 objectives and previous findings.
- Conference/Journal article about state of the art/projects in DR of participating countries

⁴ <http://www.ieadsm.org/Files/Tasks/Task%2017%20-%20Integration%20of%20Demand%20Side%20Management,%20Energy%20Efficiency,%20Distributed%20Generation%20and%20Renewable%20Energy%20Sources%5CWorkshop%20Graz%5CWorkshop%20DSM%20OSG%20Week%202014-05-20.pdf>

⁵ <http://www.ieadsm.org/Files/Tasks/Task%2017%20-%20Integration%20of%20Demand%20Side%20Management,%20Energy%20Efficiency,%20Distributed%20Generation%20and%20Renewable%20Energy%20Sources%5CWorkshop%20Graz%5CIEA%20DSM%20Task%2017%20Smart%20Grids%20Week%202014%20Workshop%20REVIEW%202014-09-17.pdf>

Dissemination of results

- Organisation of Public Workshops with industry and academics.
- Publication of the "Workshop on DSM" Report on the IEA Website and a short description in the IEA DSM Spotlight.
- Contribution to Flexibility Roadmap (EcoFys/Copper Alliance) as a member of the 'Flexibility in Power Systems Advisory Panel'.
- Presentation of Task 17 and Demand Response on conferences, congresses and workshops.

Involvement of industry and other organisations

- Workshops to involve government in networking events.
- Experts involved in expert meetings are from network operators like Enexis and Stedin.
- National stakeholder groups (industry, utility) are informed by newsletters and in meetings.

Positioning of the Task – v.s. other bodies

Bilateral meetings and conversations with other related Implementing Agreements and Tasks. These are in particular:

- ISGAN – Annex 2
- PVPS – Task 14 – Integration of High PV Penetration
- EBC – Annex 58/Annex 52

Outreach of the Task – success stories

- Workshop on DSM in Graz, Austria organized (70+ participants) à Contacted from ENA, France on behalf of the Seoul Metropolitan Government.
- Member of the 'Flexibility in Power Systems Advisory Panel' for Ecofys study.

Activity time schedule

| IEA-DSM TASK 17 - Phase 3 | Q2 14 | Q3 14 | Q4 14 | Q1 15 | Q2 15 | Q3 15 | Q4 15 | Q1 16 |
|--|-------|-------|-------|-------|-------|-------|-------|-------|
| 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 | | | | | | | | |
| Subtasks 13 - Conclusion and recommendations | | | | | | | | |
| Expert meetings | | | | | | | | |
| Biannual country expert meeting | | | | | | | | |
| Workshops | | | | | | | | |
| Workshops with stakeholders and experts | | | | | | | | |
| Reports | | | | | | | | |
| Subtasks reports | | | | | | | | |
| Final report | | | | | | | | |

Participating countries

| Participants | Yes |
|---------------|-----|
| Austria | X |
| Netherlands | X |
| Sweden | X |
| Switzerland | X |
| United States | X |
| ECI (sponsor) | X |

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Task 20

Branding of Energy Efficiency

Operating Agent: Balawant Joshi, Idam Infrastructure Advisory Private Limited, India

This international project, Task 20, was initiated in October 2009 and was completed in August 2014.

The objective(s) of the Task were to:

“Identify case studies and develop best practices in branding of energy efficiency and to identify the roles of institutional structures and government support in development of successful branding strategies”

Background

The Task built on the achievements of Task 7, to understand and analyse reasons for the failure of branding of EE in the marketplace and to identify ‘ways and means’ by which the potential for branding could be increased. Task 20 was therefore established to identify the barriers for branding of energy efficiency, and evolve strategies to overcome those barriers. The Task was initiated with the belief that it should be possible to reverse the fortunes of energy efficiency products and services, if successful branding is achieved. Branding of Energy Efficiency products and services would increase their visibility and credibility. This Task was also designed to explore the avenues available to the national government to promote branding of energy efficiency.

Organisation of the Task

Scope and tasks

The Participants agreed that the Task would focus on survey of successful efforts in branding of energy efficiency in the participating countries as well as other countries, to study barriers and inter-linkages for different aspects of branding and to identify best practices in energy efficiency. Originally the Task was to consist of the following activities:

- To identify knowledge and attitude of private households in developing electricity markets;
- To identify best practices in definition of suppliers of energy efficiency products and services;
- To identify the potential for energy efficiency products and services in other energy consuming sectors such as agriculture, industrial and commercial, etc.;
- To identify the potential for programmatic approach towards energy efficiency; and
- To identify the barriers to branding of energy efficiency;

According to the original work plan, the Task was to begin in October 2009 and was to be completed within 24 months. The first expert meeting of the Task was held in Madrid on December 7–8, 2009. As per the Work Plan, the Operating Agent initiated Subtask I and carried out substantial research in this regard. However, owing to administrative issues faced by the Operating Agent, he requested the Executive Commit-

tee members to keep the Task in abeyance. The matter was discussed in subsequent Executive Committee meetings.

At the 40th Executive Committee meeting the Operating Agent submitted a proposal to restructure the Task and reduced the Task to Subtask 5. This would mean submission of the “Report on Best Practices in Branding of Energy Efficiency”. The Executive Committee accepted the proposal and asked the Operating Agent to restart the work. The following Subtask was identified to accomplish the objectives:

Identification of ‘Best Practices in Branding EE

In this Task survey successful efforts in branding of energy efficiency in the participating countries as well as other countries was undertaken by identifying and studying inter-linkages for different aspects of branding and the role of institutional structures and government support in development of successful branding strategies. Development of best practices in branding of energy efficiency and key lessons were adopted to develop successful branding strategies.

Participants

The following countries participated in the Task:

- India
- Spain
- United States
- France

While the four countries mentioned above signed National Participation Plans, only Spain made the financial contribution and nominated a National Expert who was continuously involved in the Task. India was the first country to make a financial contribution but never appointed a National Expert. France also made a financial contribution but did not appoint a National Expert. An agreement could not be concluded with the United States due to onerous compliance requirements on the Operating Agent. As a result, the Task suffered a significant handicap.

Work Performed

Task 20 was delivered through various activities performed by the Operating Agent. In this Task, involvement of National Experts was very limited. These activities included:

- Preparation of reference questionnaire for collating information on potential practices in branding of energy efficiency
- Internet based survey and filling of reference questionnaire for successful efforts in branding of energy efficiency in the participating countries as well as other countries
- Preparation and completion of information collected through a survey and reference questionnaire.
- Preparation of case studies in branding of energy efficiency

Preparation report on best practices in branding of energy efficiency

Deliverables and Information Dissemination

Task Products

Task 20 produced two deliverables:

- Report on case studies in branding of energy efficiency
- Report on best practices in branding of energy efficiency

Report 1 identified and evaluated successful efforts in branding of energy efficiency in the participating countries as well as other countries and developed case studies in branding of energy efficiency. A step-by-step approach was adopted while preparing the case studies.

This includes review of the successful effort in branding of energy efficiency in products and services; overview of the programs, institutional structure and their branding efforts; review and analysis of branding strategies, and identification of lessons learned of products and services. Seven case studies are presented in the report, as listed below:

- ENERGY STAR Program, United States
- Standards and Labelling Program, India
- Ecolabel Program, Europe
- Fuel Efficient Car - Maruti Suzuki India Limited, India
- Sustainability Initiatives – ITC Limited, India
- Energy Efficient Lighting Solutions (CFLs & LEDs) – Philips Global
- Energy Efficient Motors – Baldor Electric Company, United States

Report 2 builds upon the baseline information, case studies and lessons learned in the first report to explore the best practices in branding of energy efficiency. This report includes:

- Introduction to Task and Concept of Branding of Energy Efficiency
- Overview of approach and methodology adopted for execution of the Task
- Review of Task 7 on the basis for the Task,
- Review of various studies on consumer behaviour and based on this study characteristics of consumer behaviour energy efficiency
- Governments efforts to influence consumer behaviour towards energy efficiency have also been discussed
- Study of brands and branding aspects is carried out and lessons from the point of view of adoption in energy efficiency have been drawn
- A high level review and analysis of branding strategies adopted in case studies developed in Report 1
- Identification of the best practices in branding of energy efficiency based on review and analysis of branding strategies adopted in case studies
- Lessons learned and conclusion

Information Dissemination

At the Task Level, the main method of information dissemination was the circulation of the Research Report on “Case Studies in Branding of Energy Efficiency” to country experts.

Accomplishments

Task 20 provided guideline information that can be adopted in the development of successful branding strategies. The report provides information on the best practices in branding energy efficiency, which can be developed for large-scale deployment of energy efficiency. The Task developed seven case studies, which provided a huge amount of information and insights into the following aspects of branding of energy efficiency.

- An overview of consumer behaviour towards energy efficiency and governments efforts to influence consumer behaviour
- Study of brand, branding and branding strategies in products and services
- Case studies in branding of energy efficiency, assessment of branding strategies adopted and lesson learned
- Best practices in branding of energy efficiency

Development of two exhaustive reports; one containing seven case studies and another containing detailed analysis of these case studies is the major accomplishment of this Task. These reports provide deep insight to policy makers, program and campaign designers and the private sector on what works and what doesn't when it comes to branding of energy efficiency in real life.

Recommendations for Further Work

Whilst Task 20 provides best branding practices in energy efficiency, it is believed this could help in the development of successful branding strategies for large-scale deployment of energy efficiency and develop energy efficiency as a brand. The branding practices presented, are based on the case studies developed as a part of Task 20.

Although significant information was collected for each case study to ensure that these case studies are in the same format and the reader is able to compare various aspects of the cases in consideration. However, these case studies are on the basis of secondary and publicly available information. Due to insufficient budget and administrative difficulties faced by the Operating Agent, primary research could not be carried out. Hence, it is recommended that case studies may be prepared using primary research. It is also recommended that product manufactures and service providers are involved while preparing these case studies.

As stated, the case studies relied upon the information available in the public domain. Not only that publically available information is limited but also sometimes intentionally designed by product or service providers to influence sales and business. Consumer feed back on energy efficiency performance of a product or service need to be studied in the impact assessment of branding strategies.

Conclusions

The potential for energy efficiency exists in several parts of the energy economy such as products, services, industries, etc., and can be achieved through actions at program and institute level. Given the prospects for energy efficiency, conclusion of study has been categorized in three heads as products and services; Labelling Programs; and Company and Institutions.

Products and Services:

- Branding can be effectively used for wide scale deployment of the energy efficiency product or service. Branding can also help in removing barriers related to lack of information about energy efficiency products and services.
- Credibility of energy efficiency products and services can be increased by labelling programs such as ENERGY STAR, Star Label etc. Labelling instruments have the potential to spread social and/or ethical products and services markets, reflecting a shift in public opinion from blind/purely environmental concerns to a more holistic approach to sustainability.
- Product manufacturers can develop their products as energy efficiency brands like Baldore Electric Company that has developed products such as energy efficient motors as a brand. The concept of energy efficiency in the service sector is still new, however labelling of services from the point of view of sustainability would improve the credibility of the service provider.
- While developing a product or service as a sustainable brand, branding strategies such as advertising can help in building a brand. Maruti Suzuki, through advertising campaigns such as “Petrol khatam hi nahi hota” and “Kitna deti hai” effectively communicated and re-emphasized its leadership in the realm of fuel efficiency. The advertising designed for sustainable products shall emphasize different aspects of product such as – energy consumption and saving compared to substandard product throughout the life of product, reduction in environment impact compared to substandard product at the end of life environment performance, comfort offered by the product & look and should also justify higher cost than substandard product etc.

Labelling Program

- Labelling programs have been identified as one of the most commonly used instruments for influencing sustainable consumer choices. Labelling programs such as Energy Star, Star Label and Eco Label work in mandatory as well as voluntary phases and have expanded to more products and countries in recent years.
- The study of labelling programs show that the sustainability effects of labelling schemes are growing with heightened consumer interest in environmental and social issues across the globe.
- Labels are raising questions among consumers on contributions to sustainability across the life-cycle of products and work as means for attracting the consumer towards sustainable products and services
- Labelling programs designate products and services that protect the environment through superior energy efficiency, without trade-offs in performance or quality and with attractive financial paybacks on any additional initial purchase costs, and also helps in increasing the integrity of the product and services
- Label or symbol to be pasted on products in labelling programs is a simple way for consumers to identify products that are among the most energy-efficient on the market. Consistent messaging can also be used along with label or symbol to communicate clearly to target audiences about qualifying labelled products and services.
- Government supported labelling programs are more successful than labelling programs initiated by the private sector. This is because the degree of random

monitoring is offered by the government or a third-party labelling-agency in order to be credible to consumers.

- Mandatory and Voluntary labelling programs are both efficient tools for promoting sustainability. However we find that the prevalence of one system over the other depends on the relative importance of different groups of producers and consumers. We indeed find that mandatory labelling is likely to result in those countries where highly averse consumers are prevalent and producers are using mainly a non/low standard technology. On the other hand, when consumers are not strongly averse and prefer the price reduction associated high standard producers, a voluntary labelling system is more likely to emerge.

Company and Institutions

- Government programs and policies work as catalysts in making the switch to energy efficient. In case of CFL and LED technologies, it is the thrust given by the government policies and programs such as MEPS, labelling, bulk purchase and distribution, on bill financing, tax waivers, subsidies, awareness campaigns and so on that have played a pivotal role and driven the penetration of CFLs and LED with reduced price in the residential sector rather than any specific branding efforts. These efforts also encourage manufacturers to invest in R&D programs and introduce and push growth of the CFL and LED market.
- Sustainability reporting can be used by companies to inform consumers of their social and environmental values and practices. This approach has been adopted by ITC Ltd., which is a working mechanism by which consumers are informed of the environmental and social conditions under which products and services have been produced in ITC. ITC has adopted a sustainability approach in both goods producing companies as well as the service sector and claims being the only company in the world, for which its totality of operations is positive in respect of all the three dimensions: carbon, water and solid waste recycling positive.
- Companies can work ahead of government policy, rules, regulations and standards in energy efficiency by getting deeply involved in R&D and may pioneer innovations in energy efficiency. Maruti Suzuki has also developed itself as an energy efficiency brand by advertising itself as producers of India's most fuel-efficient cars.
- Beside sustainability reporting and energy efficiency claims, the companies also have to develop their credibility by day-to-day operation by engaging and participating in technology compact. Philips participated in the L Prize competition organized by the U.S. Department of Energy (DOE) and was awarded the L prize, as the solution it offered meant big energy and environmental savings, and also represented a major technological leap forward for LED lamps.
- The companies can also increase their credibility and their product by partnering with government supported labelling programs such as ENERGY STAR. Philips partnered with ENERGY STAR and released a total of 269 ENERGY STAR qualified products in 2012. Considering the efforts of Philips in energy efficiency, Philips has been awarded with the ENERGY STAR partner of the Year, a Product Manufacturer top honours award for 2013. Baldor partnered with NEMA Premium and ENERGY STAR to increase its brand visibility.

Limitations of the Study

- The author has taken due care while collecting data and the written report is part of the study, however the following limitations remain:
- The study is limited to the study of branding practices and strategies adopted for promotion of energy efficiency, eco friendly, sustainable products and most relevant products only.
- The result of the study is limited due to information constraint as secondary and publically available information is the prime source of information.
- The study of branding or brand development strategies involve the study of various components such as background study on brand development, brand and branding strategies, consumer response, and post implementation impact assessment of branding. However such information is brand sensitive and is not available in the public domain, which also limits the result of this study.
- The study covers the effect of branding at a broader level. However no study has been carried out for the assessment of the impact of particular branding strategies on the development of a brand, even if carried out, the development of a brand is not available in the public domain.
- The study of consumer behaviour and response is very crucial while analysing the best branding practices in energy efficiency, however such work is not envisaged in the scope of work and the author relied on studies and research reports available in the public domain. The references of relevant studies have been given at appropriate places.

Lessons learned

The results of Task 20 have shown that various branding strategies need to be considered while developing campaigns for the promotion of energy efficiency. Each of the factors identified below need to be considered in the light of cultural and market context.

- Design and development of logo/label
- Branding message
- Multimedia marketing
- Marketing campaign
- Partnership with government institutes, energy programs/initiatives and supply chain
- Partnership with labelling programs
- Government regulations and regimes
- Sustainability initiatives

While none of the case studies discussed in Task 20 have made effective use of Social Media, it is envisaged that future branding efforts, would also involve the effective use of Social Media. All these factors impact branding and its effectiveness in the marketplace. It will be useful, if we have tools to assess or evaluate the impact of each factor. However, it is not always possible to quantify benefits from individual factors.

The Task concluded that branding can be effectively used for the promotion of energy efficiency in a country's energy market provided appropriate strategies are developed. Branding can eliminate the information barrier about energy efficiency and can also encourage consumers to adopt energy efficiency in day-to-day life. It can work as a market transformation tool for large-scale deployment of energy efficiency.

The adoption of branding strategies depends on business development strategies and the consumer market. The individual and umbrella branding approaches can be adopted for products and programmes respectively. While adopting branding strategies for energy efficiency programmes and initiatives administered by Government organization or government entities, umbrella-branding approaches are more effective. Whereas manufactures' and service providers' promoting their individual energy efficiency products and services may adopt individual branding approaches. The manufactures and service providers can also adopt umbrella branding approaches while promoting their business and business strategies as energy efficient product manufacture or service provider.

Government may adopt regulatory instrument for promotion and adoption of energy efficiency in the country. Energy efficiency initiatives such as the development of regulation and program framework have been identified as most effective tools, which result in the large-scale deployment of energy efficiency. Such regulatory instruments not only helps the energy efficiency initiative to be viable but also helps other stakeholders such as manufacturers and consumers in their own marketing strategies.

It has also been noticed that effective branding strategies improve return on investment in research and development by manufactures and service providers thereby helping them make further investments in more efficient products. This could help them in becoming pioneers in energy efficiency.

Sustainability is a composite concept, which involves not only energy efficiency but also environmental and social aspects. The companies that promote energy efficiency, also provide a sustainability concept while developing branding strategies. However, the impact of using sustainability concepts in branding is not known.

Reports produced in 2014

1. Report on case studies in branding of energy efficiency
2. Report on best practices in branding of energy efficiency

Meetings planned in 2014

The Task was completed in August 2014

Activity Time Schedule

The Task was entered into force in October 2009 and was completed in August 2014.

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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 was to identify basic concepts, calculation rules and systems for Energy Savings Calculations (ESC) standards. Both energy savings and emissions avoidance calculation methods and standards were evaluated for efficiency activities. Additionally a methodology was developed to nominate and describe the several Demand Response products.⁶ The Task also explored 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 were:

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.

Organisation of the work

The actual research was 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 were responsible for identifying and obtaining information on ESC standards in their countries. The Operating Agent was responsible for mobilising inputs and comments from standardisation bodies, from other IEA Tasks, and for analysing and drawing conclusions from the information provided by the experts.

Two regional (Europe, North America, Asia, Pacific region) workshops were organised. Additional to mobilising input for standardisation bodies the developed work was presented in a form that could be used for training purposes.

⁶ Demand response programs are designed to reduce short-term capacity needs and/or transmission constraints and can include 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 were: To identify national and regional existing energy saving calculation (ESC) standards and standards under development, to identify and assess the most relevant evaluation and monitoring reports for ESC and to identify basic terms and definitions, calculation rules and systems. Additional was to identify the key elements to structure Demand Response products.

Subtask Deliverable

A report summarised 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 common template for energy savings calculations, was used for national case applications.
- Case applications for selected technologies were developed
- National overviews on the most relevant guidelines and guidelines for monitoring and evaluating energy savings programmes were developed.

Work to be carried out

The country experts identified national standards and indicated regional standards and also what barriers exist for transforming energy savings calculations into agreed standards. As far as possible these barriers were researched for different parties (governmental organisations, producers, consumers, scientific groups). The country experts, as well as the Operating Agent, identified the most relevant evaluation and monitoring reports for ESC. They assessed 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 also investigated key elements in existing DR products in the participating countries. The experts summarised the outcome of the work in a country report.

The Operating Agent ensured (in co-operating with the participating national experts) that the international standards would be included. The Operating Agent also included 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 also included knowledge development in other IEA Implementing Agreements as the 4E for Efficient Electrical End-Use Equipment. He also included existing knowledge from the UNFCCC (e.g. CDM projects) is included.

The Operating Agent reviewed the DR products, as indicated by the country experts for the potential to develop a methodology to structure the DR products, and took into account the products from Task 13 Demand Resources. The work was restricted to key elements and was focussed on how definitions are 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).

The Operating Agent organised the country experts' assessment of the most relevant documents and review of the draft country reports. Once all the information was collected, the Operating Agent summarised the results and drafted 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 discussed and commented on the draft report.

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

Subtask objective

The objectives of Subtask 2 were: To draft the basic terms and definitions, calculation rules and systems that 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 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 was produced. 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
- Case applications for Demand Response projects and energy savings

Work to be carried out

The country experts contributed and commented 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 gave 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 consulted the national standardisation bodies and drafted comments on (selected) national standards.

The country experts also collected information on potential 'general accepted' criteria which was included in a methodology to structure Demand Response products. The Operating Agent drafted a report on the terms and definitions, calculation rules and systems for experts' discussion. The Operating Agent co-ordinated the improvements of this draft report ensuring input from on-going relevant work in other IEA-DSM Tasks. The Operating Agent took care that definitions, originating for DR products, were compatible with relevant existing terminologies, especially the system operation and the market operation terminology as used in energy companies. The Operating Agent drafted the method to structure the DR products and the general accepted criteria that was used to make the products of the 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 drafted comments on regional standards while the country experts did this for the national standards. The Operating Agent was 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 consulted the international standardisation organisations and was responsible for the co-ordination of the country experts' consultations. The Operating Agent also ensured that there was 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. The Operating Agent presented preliminary conclusions from the work on international meetings to get involvement from a 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 were 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 could use these to improve international comparability of energy efficiency impacts; how these standards could 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 identifying what organisations could be the main actors 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 was investigated.

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. was developed. The focus in the report was on common approaches for determining energy savings and for common terminology. Additional key elements for energy savings and Demand Response products were presented.

A report showing roadmaps along which ESC standards were 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 were developed.

Work to be carried out

The country experts researched, 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 assessed the expected use of existing and future ESC standards in evaluation of policies and measures and meta-evaluation and/or reports. They took into account the relations with (inter)-national estimations of GHG emissions. They consulted relevant national organisations for commenting to the draft methodology to structure Demand Response products, including 'general accepted' criteria.

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

The Operating Agent organised the communication with the international standardisation organisations. Two regional workshops were organised.

The Operating Agent contacted (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 the Operating Agent also explored 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 finalised the report on the basic terms and definitions, calculation rules and systems including the section on DR product. For this report the Operating Agent drafted 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 was 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 was a whole range of products that were produced. Task leaflets and newsletters were produced and distributed. Several presentations at relevant international conferences were given and two regional workshops on ESC standards (and relevant DR products) were organised in co-operation with the country experts.

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

Task work has been presented at several workshops in conjunction to the Executive Committee meetings.

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

Work to be carried out

The Operating agent was responsible for the communication and information distribution. The final reports for experts' approval were edited by an experienced English writer. The final Task reports for Executive Committee approval were (re)edited to ensure that it clearly presents the information and recommendations developed under the Task.

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

Involvement of industry and other organisations

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

Reports produced in 2014

- Final Management Report, which was presented to the Executive Committee in March 2014.

Reports planned for 2014

None

Meetings planned for 2014

None. The Task was completed in 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 have been used as input in the country reports, where relevant.

Information on Energy Efficiency Obligation Schemes included in the publication produced for Task 21 have 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 have been taken into consideration for the reports on energy savings calculations.

Activity time schedule

The Task entered into force on 1 April 2009 and remained 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 | | | Finalised October 2012 | | |
| Subtask 2 Basic concepts, rules and systems for ESC standards | | | Finalised December 2012 | | |
| Subtask 3 Potential for use and continue development and maintenance of ESC standards | | | | Finalised March 2013 | |
| Subtask 4 Communication and information | | | | Continued whole year | Finalised April 2014 |

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Task 23

The Role of the Demand Side in Delivering Effective Smart Grids

Operating Agent: Ms. 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 often less flexible than the large power stations more typical of current electricity systems. The move towards the decarbonisation of end-use applications of energy, particularly heating and transport, is leading to the introduction of significant new electrical loads onto often already constrained networks. These effects combine to make the challenge of balancing the supply of demand for electricity increasingly challenging and complex.

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

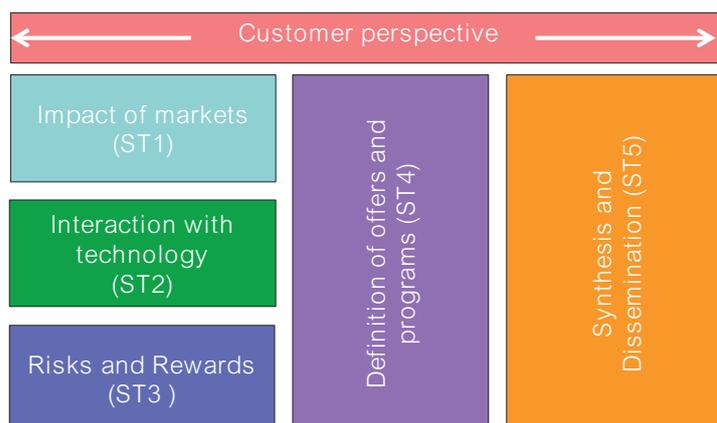
Whilst there is considerable focus on the technological aspects of delivering Smart Grids, little is understood of the extent to which consumers are willing and able to embrace new technologies and initiatives that lead to changes in the way that they consume electricity. Thus, there is a risk that Smart Grids may not be able to achieve their full potential if consumers do not adopt new approaches to the way they consume electricity. Not enough is known about how Smart Grid initiatives should be designed in order to make it more likely that consumers are willing and able to actively engage in them.

Therefore, this Task was set up to explore how consumers interact with Smart Grids and Smart Grid related initiatives.

The scope of Task 23 would be focused on end-consumers who are, or are expected to be, participants of a Smart Grid initiative. Specifically, the Task focussed on consumers with Smart Meters, or likely to have Smart Meters in the coming years, and are thus expected to play an important part in the future of Smart Grids as they become deployed. This therefore, included:

- Residential consumers (i.e. households)
- Small commercial and business consumers that are treated in a similar way to residential consumers (i.e. they have similar metering arrangements or have similar access to the energy market).

The Task was organised into five Subtasks, as illustrated below.



Task 23 Overall Work Programme

Task aims & objectives

The aim of Task 23 was 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.

Subtask 1 – Impact of energy markets on the role of customers

Subtask objectives

There are many stakeholders in the energy market with different interactions with consumers and different responsibilities. This sub-task examined the interactions of different stakeholders, with the consumer as the central focus.

Subtask deliverables

The results of subtask 1 were published in a research report entitled "The Impact of Electricity Markets on Consumers", issued in January 2013.

Work carried out

The factors that influence the energy consumption within a Smart Grid context are wide ranging and complex. Task 23 specifically considered those factors that relate to the consumer, i.e. how individuals interact with Smart Grids. Specifically, the project examined how to ensure Smart Grids deliver energy efficiency and/or cost savings by enabling or stimulating certain energy behaviours. In order to do so, it was first necessary to define what is meant by energy behaviour. More generally, a 'behaviour' can be understood as any activity or decision described in terms of the following elements:

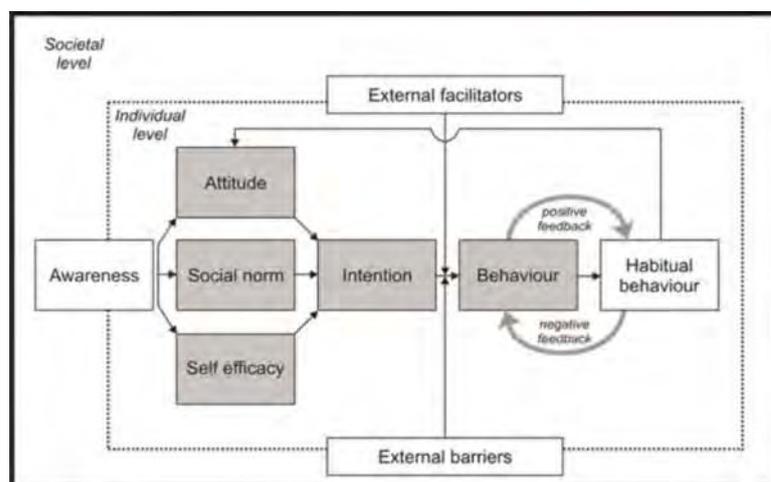
- the 'actor/decision maker' who decides/acts/performs the behaviour (in this context this is the consumer);
- a well-defined 'outcome' or action (i.e. switching off lights, installing a heat pump, keeping a comfortable indoor temperature or washing clothes);
- a 'goal' or object (in this context, this would be within the home or workplace);
- a point in time or a 'time period'; and
- a specific 'context'.

Based on this general concept of 'behaviour', the more specific concept of 'energy behaviour' can be defined as a behaviour that concerned with the energy use of the relevant actor/ decision maker. By considering energy behaviour in this way, it was possible to use a behavioural model to help explain the factors that influence the decision maker's choice over whether or not, or how, to perform the behaviour. It is important to stress here that it is always the individual who makes the decision and performs the behaviour. This approach to energy behaviour is wide, ranging from specific one-off behaviours (such as investment decisions) to habitual daily routines (such as television viewing and washing clothes, often referred to as energy practices).

A number of models or frameworks of understanding exist and these have been used with varying success in an array of situations. Some focus on individuals, whilst others focus on the individual in his/her social environment. Some focus only on behaviour whilst others also focus on the context impacting that behaviour. Some focus on one-off behaviours whilst others focus on habitual behaviours. Where some focus on discrete actions, others focus on a complex inter-related set of actions.

It was recognised that that no single model or framework is considered to be ideal. They are considered to be necessary tools to assist decision makers implement policies, and to support practitioners as they implement technologies and initiatives to help achieve an outcome that depends upon behaviour change. Importantly, these models do not attempt to predict an outcome, i.e. how individuals will behave. Rather, they are used to provide a perspective on energy behaviour and the aspects that influence an individual's decision of whether or not to perform a specific behaviour.

The fundamental academic debate – as indicated above – is whether this choice is best understood by studying characteristics of the decision maker (individualistic approach) or by studying the physical, social and political context within which the decision is made (system approach). Some energy behaviours may be best discussed within the individualistic approach, while others are best understood within the system approach. The starting point for Task 23 was that valuable insights can be found within all of these approaches. Therefore, the model shown below was used to provide theoretical guidance for the research undertaken for this project.



Fishbein, M., I. Ajzen (2010) Predicting and changing behavior: the reasoned action approach. New York: Psychology press.

Egmond, C., R. Bruel (2007) Nothing is as practical as a good theory. Analysis of theories and a tool for developing interventions to influence energy-related behaviour. Senter Novem, 16 September 2007

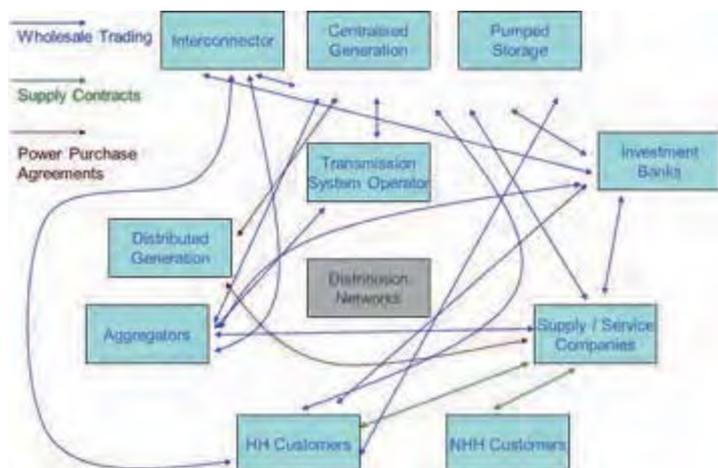
Theoretical model of energy behaviour

The model shown above demonstrates that an individual's behaviour is defined by their own attitudes, their own abilities and the social norms relevant to them. In addition, it is important to also take account of their context and the opportunities or barriers presented to them. Consequently, an initiative that is successful for one group of consumers may not necessarily be effective with another group of consumers in a similar context due to their differing views and beliefs. Likewise, what works for one group of consumers may not work for similar consumers in another context due to the opportunities and barriers that exist.

The drivers for the implementation of Smart Grids differ from one context to another. Therefore Smart Grid initiatives need to be designed with reference to the specific context within which they will be implemented. Subtask 1 therefore contrasted and compared the drivers for Smart Grid development across the five countries participating in Task 23. Understanding these drivers provides a starting point for the design of the Smart Grid initiative; essentially, it defines the problem that needs to be solved.

Market maps, such as that illustrated below, were prepared by each of the participating countries to define the various interactions between the market stakeholders. This is one of three market maps for GB that illustrates the interactions between stakeholders in the current market, and defines the flow of money associated with energy purchasing interactions. Other maps were also produced to show the physical flow of energy and network access charging arrangements. The needs of one stakeholder may not necessarily align with the needs of another. Whilst understanding the needs of a particular stakeholder is important, it is also important to ensure that potential conflicts are identified and managed.

Energy Purchasing (flow of money between stakeholders) in GB



Market Mapping to Understand the Interactions between Stakeholders and Consumers

Understanding these interactions, and the impact of the energy system as a whole, is an important first step in designing Smart Grid initiatives; as it defines the external barriers and facilitators (opportunities) in the energy behavioural model shown earlier.

Managing potential conflicts between the various stakeholders will be an important element in the design of Smart Grid initiatives, particularly where the electricity market

is unbundled. Although such conflicts are not well reported to date, they have the potential to become increasingly relevant in the future as renewable generation accounts for a greater proportion of overall generation capacity.

Subtask 2 – Interaction between technology and customers

Subtask objectives

The way that customers use and relate to technologies such as Smart Meters, electric vehicles, heat pumps and energy storage has a significant impact on their ability to contribute to an effective Smart Grid. This sub-task reviewed a number of Smart Grid related case studies in order to understand consumer attitudes towards Smart Grid related interventions.

Subtask deliverables

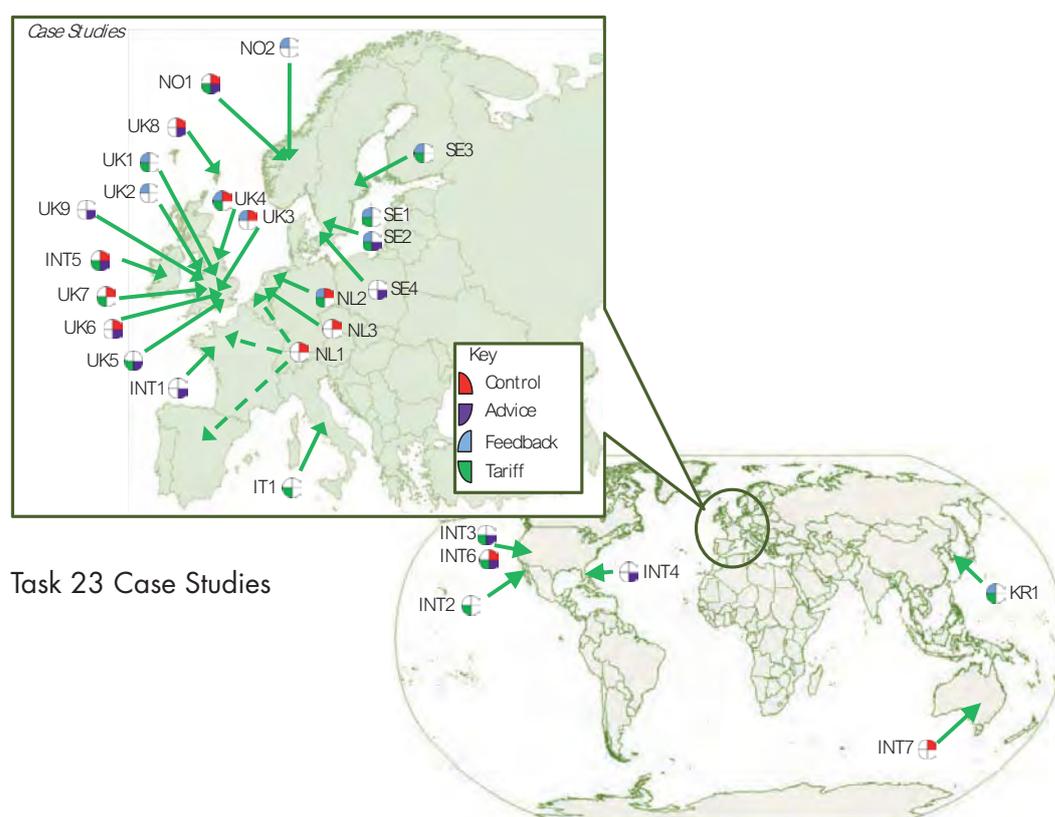
The results of subtask 2 were published in a research report entitled "Interaction between Customers and Smart Grid Related Initiatives", issued in November 2013.

Work carried out

During the project, 23 case studies from around the world were used to explore consumer experiences with one or more Smart Grid related interventions. They provide valuable insights into the individualistic elements of the energy behavioural model presented earlier.

The case studies selected included one or more of the following interventions:

- Any Tariff or pricing incentive to reward consumers that change their pattern of demand. This includes static Time of Use tariffs, Critical Peak Pricing, Peak Time Rebates and Real Time Pricing.



Task 23 Case Studies

- Controls to actively manage demand, including direct/automatic load control, home/building energy management systems, smart thermostats.
- Feedback of energy end use information relying on data collected from the smart meter. Includes in-home displays, web based feedback, billing information and feedback via mobile devices such as phones and tablets.
- Advice to help consumers deliver outcomes that support the effective delivery of Smart Grids, including advice targeted to an individual or general advice distributed to groups.

Subtask 3 – Identification of Risks and Rewards associated with Smart Grids

Subtask objectives

This subtask focussed on the risks and rewards associated with Smart Grids from a consumer perspective, and examined a range of factors that influence the decision making of individuals

Subtask deliverables

The results of subtask 3 were published in a research report entitled "How risks and rewards from the perspective of customers affects the decision to engage in Smart Grids", issued in December 2013.

Work carried out

A methodology for quantifying the losses and gains associated with Smart Grid implementation from the perspective of consumers, i.e. the end-uses of electricity, was investigated. The methodology was used to quantify the potential losses and gains for a case study relating to the offer of free loft insulation. The analysis demonstrates that a traditional neo-classical economic analysis does not provide a viable prediction of customer behaviour. In the example considered, the potential gains more than outweighed any potential losses, but still the offer was not taken up by a sizeable proportion of individuals.

The analysis was supplemented by an examination of the factors that influence the decision making of individuals. Here, the focus was on understanding how consumer attitudes, social norms and capabilities affect an individual's intention (or not) to perform a specific energy behaviour.

This review highlighted that there are many different factors that influence the decision making of individuals. Understanding these helps to ensure that Smart Grid initiatives can be structured to make it more likely that consumers are willing to engage in them. Some examples are listed here:

- Risk aversion, which is the reluctance of a person to accept an offer with an uncertain payoff rather than an alternative with a more certain, but possibly lower, expected payoff. However, the reverse is true where losses are concerned, when individuals more likely to opt for a more risky outcome. This would suggest there may be merit in framing Smart Grid initiatives in terms of "how much is wasted" if a certain behaviour is not adopted, rather than in terms of "how much can be gained" if it is adopted.

- Faulty discounting, whereby an individual is impatient when it comes to decisions that involve benefits that are received in the future, but where the reverse is true where payments are made. Thus, there is a tendency for an individual to prefer to receive an immediate reward and defer any payment, rather than pay up-front and receive rewards at a later date.
- Different treatment of risks and rewards which implies that the pain of losing 1 is twice as great as the 'pleasure' of gaining 1, and therefore, gains need to significantly outweigh any losses.
- Difficulty estimating the probability of events which results in a skewing of the potential risks towards events with a high consequence but a very low probability of occurrence.

Subtask 4 – Defining offers and programmes to help ensure Smart Grids meet the needs of customers

Subtask objectives

This sub task collated the results from sub-tasks 1 to 3 to produce guidance on how Smart Grid initiatives should be designed in order to make them more attractive to consumers.

Subtask deliverables

The results of subtask 4 were published in a guidance document entitled "Smart Grid Implementation: How to engage consumers", issued in July 2014.

Work carried out

The results of the project have been collated to provide general guidance on how Smart Grid initiatives should be designed in order to make them more attractive to consumers. The guidance document is written in the form of 'step-by-step' approach to implementing Smart Grid related initiatives that involve energy behaviour change. The step-by-step approach, has been designed to ensure that all elements of the energy behavioural model (introduced earlier) are addressed in the design of the Smart Grid initiative. The guidance is intended for

- Energy Suppliers, Distribution Network Operators and System Operators who are the main stakeholders responsible for the development of Smart Grids, and thus stand to directly benefit from the engagement of consumers. However, there are many aspects of the design of Smart Grid initiatives that can be directly influenced by other industry stakeholders. These include:
- Government and Energy Regulators who are responsible for setting policy, legislation and the rules defining the way the energy market operates. There are a number of specific areas where they can directly influence the way Smart Grid initiatives evolve.
- Third-party aggregators, who act as intermediaries between consumers and Smart Grid implementers. They have a pivotal role as facilitators, and co-ordinate between multiple Smart Grid implementers.
- Energy service companies, who help consumers manage their electricity consumption, and can design initiatives specifically to meet the needs of the consumers themselves.

- Technology developers / appliance manufacturers, who develop technical solutions that meet the needs of Smart Grid implementers, third party aggregators, energy service companies and the consumers themselves.

The guidance focuses specifically on the design of Smart Grid initiatives from the perspective of the consumers themselves. The diagram below provides a high level overview of the step by step approach.



If any one of the steps is omitted, there is a risk that the initiative will not deliver benefits to the energy system as a whole and/or will not be adopted by consumers.

Subtask 4 – Helping customers to actively engage with Smart Grids – Synthesis and Dissemination of Findings

Subtask objectives

This sub task ensured that the learning points were disseminated amongst the key stakeholders within the participating countries.

Subtask deliverables

The results of subtask 5 were published in the form of a high level Executive Summary providing stakeholders an overview of the Task at the major accomplishments.

Work carried out

Each of the participating countries has implemented its own approach to disseminating the results of the project. This has largely focussed on dissemination to the key stakeholders who have funded the project, via a series of stakeholder workshops and meetings led and organised by the national participants. These have included a diverse range of stakeholders including:

- Distribution Network Operators
- Transmission System Operators
- Energy Suppliers
- A Electricity Market Operator
- National and Local Government
- Appliance Manufacturers

Activities planned for 2015

The Task has been completed. Therefore no activities are planned for 2015.

Meetings held in 2014

Experts meeting/seminars/conferences

Experts meetings/conferences – none held in 2014

Meetings planned for 2015

The Task has been completed. Therefore no meetings are planned for 2015.

Publications produced in 2014

- Smart Grid Guidance Document, which collates the learning from sub-tasks 1 to 3 to produce a guidance document which describes a step-by-step approach to implementing Smart Grid Initiatives that require action from households and small commercial/industrial businesses.
- An Executive Summary that provides an overview of the project and the Guidance Document.
- A 'slide-pack' for the National Experts to use to disseminate the results of the Task to their stakeholders.

Dissemination of results

Each of the participating countries has implemented its own approach to disseminating the results of the project. This has largely focussed on dissemination to the key stakeholders who have funded the project, via a series of stakeholder workshops and meetings led and organised by the national participants. These have included a diverse range of stakeholders including:

- Distribution Network Operators
- Transmission System Operators
- Energy Suppliers
- A Electricity Market Operator
- National and Local Government
- Appliance Manufacturers

A paper on the results of Task 23 was presented at the CIRED Workshop 2014, 11-12 June in Rome. The workshop focussed on the "Challenges of Implementing Active Distribution System Management". The workshop was attended by 360 delegates from 36 countries. Over 483 abstracts were submitted; 222 were selected for presentation during the poster sessions, and only 30 were selected for oral presentation. The conference was very much focussed on technical issues, and it was therefore a privilege to be one of the 30 papers invited to give an oral presentation – especially as the main focus of the conference was on technical issues rather than consumer issues.

A paper on the results of Task 23 has also been accepted for publication by the Journal of Energy and Power Engineering.

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 at Task Meetings and in-country stakeholder meetings:
- Network Operators
- Energy Retailers
- Manufacturers
- System Operators / Market Operators
- Regulators
- Government

Positioning of the Task – v.s. 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 consume electricity, Smart Grids may not be able to achieve their full potential. Task 23 has explored the potential risks and rewards associated with Smart Grids from the perspective of customers.

This Task is 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

The Task entered into force in June 2012 and remained in force until May 2014.

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Task 24

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

Operating Agent: Dr Sea Rotmann, New Zealand

Co-Operating Agent: Dr Ruth Mourik, the Netherlands

Description

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 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.

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

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 successful 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 use storytelling as a methodology 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, SMEs.

Task aims & objectives

The main objective of this Task 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 1

Subtask objectives

- Identify the range of behavioural models, frameworks and disciplines that have relevant insight into human behaviour and energy demand side management in a variety of end-use sectors.
- Create a template for analysis of behaviour change models and disciplines that assess both habitual and purchasing behaviours.
- Understand the benefits and limitations of applying different models/approaches/frameworks to different contexts (target group, targeted behaviour, country, scale, technology, timing etc).
- Select relevant models that can inform DSM initiatives that are focusing on particular topics of interest: e.g. smart metering, SMEs, renovation programmes and transport. This will feed into Subtask 2.
- Collect 3–5 exemplary DSM cases per participating countries (linked to the above identified selected topics), one of which will be analysed in depth in Subtask 2.
- Identify the various available evaluation metrics and their usefulness for different stakeholders (e.g. policymakers, funders, end-users). This will feed into Subtask 3.

Subtask deliverables

This Subtask 1 will produce two deliverables:

- D1: Database and/or Wiki of all experts, collected case studies, best practice, models, frameworks, definitions, contexts, evaluation metrics, references etc.
- D2: A 'report' of which the final format is yet to be finalised with the experts. Most likely it will be highly interactive, easy to access and comprised of easily understandable formats such as infographics, podcasts, webinars, Pecha Kucha slideshows, youtube videos, TED talks etc.

Work carried out

- All information from the 'Monster' put on a wiki (www.ieadsmtask24wiki.info)
- A [storybook](#) of the most outstanding examples and recommendations developed and printed
- The energy experts' own energy stories edited into a [short film](#) and presented at Task 24 workshops in Wellington and Oxford
- More case studies from newly joined countries keep coming in (Austria has now sent all its case studies, we are still waiting for three from Italy and Belgium which we may not receive due to lack of Task Sharing from these countries). Other countries, like Canada, Japan and the UK continue giving us cases as well. The 'Monster' Wiki will be updated and finalised with the remaining case studies.
- Wiki and stakeholder survey to be sent to Advisory Board.

Subtask 2

Subtask objectives

- Develop a template for analysing selected case studies with special focus on stakeholder-dependent definitions of successful outcomes of behaviour change interventions.
- Make a country- and sector-specific inventory of contextual factors influencing the effectiveness of the selected DSM programme topic.
- Identify key approaches to solving, circumventing or using contextual issues on the local, regional and national level and share learnings and best practice.
- Insert the collected case studies to the database and/or wiki developed under ST1.

Subtask deliverables

- D3: Surveys and post-evaluation of detailed case studies topics of particular interest to participating countries. The exact format for this deliverable will be decided upon with the participating countries to ensure the best possible format for different types of stakeholders. The case studies will be fed into the database/Wiki to be developed in the first Subtask.

Work carried out

- Collection of detailed case studies and best practice in four overarching themes
- Includes (filmed) interviews in all participating countries (except Belgium)
- Analysis of case studies so far collected – only Austria and Italy (and Belgium, but this won't be done due to lack of national expert) still outstanding

Subtask 3

Subtask objective

To develop a practical, context-specific monitoring and evaluation tool for DSM projects and programmes, with the specific aim to meet various stakeholder needs for outcome evaluation. This tool will be developed to match with the monitoring and evaluation analysis of the 4 domains (Subtask 2).

Subtask deliverables

D4: Tool to evaluate 'successful outcomes' of DSM programmes for a variety of stakeholders (political, policy, community, industry, end user).

Work carried out

- Reports to enable better evaluation of successful behaviour change outcomes depending on the stakeholder point of view in each of the Task 24 domains (due end of December).
- Report based on 'Beyond kWh' work by Karlin and Ford which is based on a methodological review of how behavioural interventions are (not) evaluated in a standard way that enables comparison (will feed into Subtask 9 which will actually create an internationally validated 'tool'). Due end of December.
- Report based on review of evaluation literature and Oxford Task 24 workshop called 'Did you behave as we designed you to?'

Subtask 4

Subtask objectives

- Development of country-specific:
 - to do's and not to do's for the particular topics of interest identified in ST 2.1
 - research priorities in participating countries
 - pilot project ideas/action plans for participating countries
- Disseminating these guidelines, potentially training stakeholders in using them (this will be part of the Task 24 extension).

Subtask deliverables

D 5: To do's and not to do's, priority research areas and ideas for pilots and/or action research projects for participating countries and stakeholders.

Work carried out

Country-specific recommendations have been collected, in part, via stakeholder feedback questionnaires (both during workshops, with extensive interviews (Netherlands) and as part of [SurveyMonkey](#) polls) and will be pulled together by the end of the year. We have collected country stories from all countries which will inform the individual recommendations reports. Each countries' national experts need to contribute to their specific country reports, which means we may not have in-depth reports for Belgium and Italy.

Subtask 5

Subtask objectives

- Design, develop and run social media expert platform

Subtask deliverables

D 6: Social media expert platform and meeting place for (invited) DSM and behaviour change experts and implementers. This platform will include a wide range of social media tools to foster greatest ability to interact, share and discuss. It is meant to provide a 'matchmaking' service to enable trans-national, inter-disciplinary teams of experts and end users to collaborate and bid for funding. It's current web address is www.leadsmtask24.ning.com

Work carried out

- Expert platform continually growing and getting used
- New content including presentations, videos and reports uploaded
- Continued publicising and dissemination of Task 24, including at international conferences

Activities completed in 2014

See above.

Activities planned for 2015

Finalise Task 24 deliverables and start Task 24 extension.

Meetings held in 2014

Experts meetings

| Date | Place | # of Experts | Type of meeting | Government | Industry | Academic |
|-------------|----------------|--------------|-----------------|------------|----------|----------|
| March 17 | Wellington, NZ | 55 | XM | 25 | 15 | 15 |
| Sept 5 | Oxford, UK | 18 | XM | 2 | 3 | 13 |
| Feb & July | Wellington, NZ | 5 | SHM | 3 | 2 | |
| Oct 3 | Milan, Italy | 10 | XM | 7 | 2 | 1 |
| Oct 13 & 14 | Graz, Austria | 40 | XM | 20 | 5 | 15 |
| Oct 24 | London, UK | 12 | XM | 5 | 2 | 5 |

XM = Experts meeting

SHM = Stake holder meeting

Seminars/conferences

| Date | Place | Participants | Type of meeting | Government | Industry | Academic |
|-------------|-----------------|---------------------|--|------------|----------|----------|
| February 13 | Almere, NL | >50 | Smart Energy Infra-structures conference | >15 | >15 | >15 |
| March 18 | Wellington, NZ | >100 | NERI Conference | >20 | >20 | ~60 |
| May 12 | Brisbane, AUS | 15 | Task 24 presentation | 13 | 2 | |
| May 12 | Brisbane, AUS | 12 | IEC Lecture | | 2 | 10 |
| August 8 | Washington, US | <100 (out of 10000) | APA conference | | | mostly |
| Sept 4 | Oxford, UK | 300 | BEHAVE conference | | | |
| Sept 11 | Berlin, Germany | 180 | IEPPEC conference | | | |
| Oct 10 | Brisbane, AUS | >10 | Skype Lecture IEC | | | mostly |
| Oct 22 | Sheffield, UK | >40 | Lecture at Sheffield Hallam | | | mostly |

Meetings planned for 2015

Experts meetings/seminars/conferences

Experts meetings

| Date | Place |
|------------------|---|
| February 2015 | Wellington, NZ |
| March 2015 | Cape Town, South Africa |
| April 2015 | Eindhoven, Netherlands |
| June – July 2015 | Graz, Austria; Stockholm, Sweden; Sheffield, UK; Los Angeles, USA |
| October 2015 | Beijing, China |

Seminars/conferences

| Date | Place |
|------------------|--|
| January | ESCo conference, Milan |
| 14 January, 2015 | IEA DSM University webinar |
| March 2015 | Post graduate course Lecture on facilitators Belgium |
| June 1–6, 2015 | eceee summer study, France |
| November 2015 | BECC conference, Washington |

Publications produced in 2014

- 2 IEA DSM Spotlight Issues
- Energy Expert Stories short film (youtube)
- Filmed presentations from Storytelling workshop in Wellington (youtube: <http://www.youtube.com/user/DrSeaMonsta/videos?flow=grid&view=0>)
- Storytelling Pecha Kucha presentation (slideshare: <http://www.slideshare.net/drsea>)
- Analysis of Subtask I – ‘the Monster’ (160pp report, wiki)
- The Little Monster storybook (booklet)
- ESCo Facilitators report for Task 16 which has been disseminated widely and will be translated into German

- Article for EE-IP
- Paper for IEPPEC
- Five ST2 country case study reports (NL, NZ, NO, CH, SE)
- Evaluation ST3 Report called 'Did you behave as we designed you to?'

Publications planned for 2015

- At least 1 Spotlight Issue
- Final Task Flyer
- Domain-specific evaluation reports
- Beyond kWh report
- Storytelling paper eceee summer study
- Evaluation of behavioural change paper ECEEE summer study
- Analysis of Subtask I - 'the Monster' finalised
- Article for EE-IP
- Energy Policy paper on 'Behaviour Changer' model
- Energy Policy paper on ESCO facilitators research
- Energy Policy paper on storytelling with Barry Goodchild
- Two more ST2 country case study reports (AT, IT)
- 6 country-specific ST4 reports with recommendations, plus more generic ones for IT and BE

Dissemination of results

Everything will be available on new IEA DSM website and Task 24 Wiki, as well as the Task 24 Ning site. We have widely disseminated our Task results online:

- via @IEADSM on twitter (also @DrSeaRotmann and @RuthMourik), IEADSM linkedIn and facebook groups; ECEEE and EEIP columns and various energy and behaviour linkedIn groups. Tweets by @DrSeaRotmann sometimes have weekly audience reach of over 100,000.
- Weekly publication of [Behaviour Change & Energy News](#) by Dr Sea Rotmann. The paper has 41 subscribers and been viewed over 3000 times.
- Expert platform www.ieadsmtask24.ning.com – 224 members from 21 countries.
- Mendeley (www.mendeley.com) Task 24 Group and bibliography database of >400 behaviour change and energy publications
- 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>) Our slideshare channel with all of our presentations has been viewed and downloaded over 10000 times.

We also presented the Task in many conferences, workshops and seminars as well as various lectures and a webinar for the DSM University. Sea also chaired a BEHAVE session on gamification and social media and was in two summarising panels at BEHAVE and IEPPEC.

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. PowerCo, NZ second largest line's company, sponsored the NZ ST2 report and is co-funding the NZ participation for the Task 24 extension. The Netherlands worked with the retailer Essent, and industry parties such as DNVGL, KEMA and smaller industrial partners also contributed with their case study PowerMatching City.

Several industry organisations expressed great interest in the ESCo Facilitators report for Task 16 which will also be translated into German and showcased on DENA's website. It has also been published by the EE-IP, the largest energy efficient industry social network. Opower came to the Milan workshop and expressed interest to continue providing case studies for the Task 24 extension. The UK's Energy Savings Trust and Sheffield University Hallam both want to bid for Horizon 2020 proposals with Task 24 participating in dissemination work packages. PG&E, one of the largest utilities in the US, is considering co-funding the US participation to the Task 24 extension.

Positioning of the Task – v.s. other bodies

Task 24 was directly mentioned in keynotes by Philip Selwood, Head of UK's Energy Savings Trust (BEHAVE) and Maria van der Hoeven, Head of IEA (IEPPEC). ISGAN continues to be interested in Task 24 work though no specific collaborations have been fostered. Task 24 was asked to contribute to a new Task proposal by the NZ national expert of the EBC Agreement. The Task 24 Warm Up New Zealand case study is very prominently featured in the latest IEA report on Multiple Benefits of Energy Efficiency. Task 24 work is also mentioned in a footnote in the latest EU SET-Plan: The Integrated Roadmap ANNEX I: Research and innovation actions Part 1 – Energy Efficiency.

Outreach of the Task – Success stories

Some of the main success stories were mentioned above, they are mainly related to being asked to chair panels, give keynotes and lectures, get our reports translated and disseminated by major industry bodies, get invited to present at many of the world's largest behaviour and energy conferences (including the APA conference in the US with over 10000 participants), get invited to take part in H2020 bids etc. Personally, some large success stories came from the hugely positive feedback of our experts who we respect so much, at the Oxford and other workshops. Their enthusiastic support showed just how much our Task has grown and achieved since the first Oxford workshop 2 years earlier. The Behaviour Changer model of understanding the energy system, which will be used to run workshops in the Task 24 extension has also received highly positive feedback by academics, policymakers and industry representatives around the world. It has even been called 'revolutionary'.

Our use of narratives and storytelling in its many different forms is being regarded as something of a trailblazer and has been copied by highly reputable experts in research and industry. Hal Wilhite said that our Task was part of the 'new language of energy efficiency' at the ecee 2013 summer study. We often get told that our work and our workshops are a lot of fun and people enjoy taking part in the Task as they can be creative and bring their various interests and expertise to the table. The Task is

very inclusive and brings highly reputable, experienced experts together with young students just starting out in the field. One of the greatest successes of this Task is the many examples of successful matchmaking where we have brought people from all over the world, different sectors and disciplines together to work outside of Task 24, and build strong friendships, collaborations and alliances. We have some highly committed experts (who are not the national experts in most parts) who have done 100s of hours of in-kind work for the Task. Without all of them, this Task would not be what it is.

Activity time schedule

Task 24 started its operation in January 2012, although its final work programme was not officially balloted by the Executive Committee until July 2012. The Executive Committee 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 will commence in January 2015.

| Subtasks | 2012 | 2013 | 2014 |
|-----------------------------------|------|------|------|
| Subtask 0 – Admin | | | |
| Subtask I – Helicopter Overview | | | |
| Subtask II – Case Studies | | | |
| Subtask III – Evaluation Template | | | |
| Subtask IV – Recommendations | | | |
| Subtask V – Expert Platform | | | |

Participating countries

Eight countries have officially participated in the Task, with contracts with South Africa still pending (now too late for Task 24 but we are hoping they will join the extension). The UK has contributed with at least as much in-kind (financial and expert time) support as the financial participation is worth. Several non-DSM countries have also expressed interest and provided support, including Germany, Canada, Finland, Denmark, Australia and UAE. In addition, we have some countries that have supported the Task with significant in-kind expert time (Spain, the US and Portugal). We would like to thank all of our supporters and sponsors.

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Task 25

Business Models for a More Effective Market Uptake of DSM Energy Services

Operating Agent: Dr. Ruth Mourik, DuneWorks, the Netherlands

Co-operating Agent: Renske Bouwknegt, Ideate, the Netherlands

Description of Technical Sector

Worldwide, many studies are being conducted in order to understand what is causing the -apparent – lack of market uptake of energy efficiency and DSM. A growing understanding is that in many business models underlying energy efficiency and DSM services, the supplier perspective is dominant, and too little attention is given to the customer/buyer perspective, their needs. Energy services are increasingly considered to be a good delivery mechanism for EE and it is necessary to understand and what business models would be necessary for potential customers to buy more energy services (make more energy efficient choices).

This Task will focus on identifying existing business models and customer approaches providing EE and DSM services to SMEs and residential communities, analysing promising effective business models and services, identifying and supporting the creation of national energy ecosystems in which these business models can succeed, provide guidelines to remove barriers and solve problems, and finally working together closely with both national suppliers and clients of business models. The longer term aim of this Task is to contribute to the growth of the supply and demand market for energy efficiency and DSM amongst SMEs and communities in participating countries.

Objectives

The following objectives have been identified:

1. Reviewing existing business models/ customer approaches targeting EE and DSM for SME and community clients and developing a list and or mapping of categories of existing business models/ approaches for each country and a selection of non-participating countries.
2. Analysing and identifying effective business models (in achieving significant EE and DSM) in the different countries, including the sociotechnical socio-economic and political framework conditions they need (different conducive market dynamics and policies in different countries).
3. Performing a cross-country comparison of the different existing business models and their frameworks.
4. Performing a cross-country knowledge exchange and capacity building about effective business models and services, and iterative feedback for country specific market development activities within and between the participating countries. In order to feed in the SME- and supplier perspective, the Task will include participants representing the supply and client side. Such actors will be identified either network (e.g. an energy service association), by establishing contact with relevant suppliers, (or by creating a network).

5. Creating a set of guidelines and advice supporting the creation of policies to encourage market creation and mainstreaming of best practice business models in different countries; based on a cross-country comparison.
6. Providing a (digital) platform for shared learning, best practices, relevant documentation and frameworks and know-how. This will be achieved through the use of existing platforms such as the expert platforms of other Tasks and the DSM University.
7. Contribute to both the energy efficiency field and the academic discussions on effective business models and services aimed at Energy Efficiency and DSM.

Means

The objectives shall be achieved by the Participants in the following Subtasks:

Subtask 0: Task Definition Phase

The focus of this Subtask was on making a first inventory of issues of common interest regarding business models and Service Value propositions on Energy efficiency and defining an initial working scope and definition. Success and failure of these services is highly dependent on country specifics. Already many studies are conducted that are valuable for this Task. This Subtask main objective was to map valuable knowledge, identify country specifics and general objectives. After agreement on this task, country expert will be lined up and prepared for their part in this Task.

Activities

- Writing work plan, in close cooperation with interested countries and their experts
- Performing a quick scan of country specifics (relevant policy and regulation, research, business models. Energy targets etc.)
- Attendance (virtual) of Executive Committee meetings in 2014

Subtask 1: Task management

This Subtask is dealing with all management issues.

Activities

- Overall project coordination and management, including contact relationship management
- Attendance at Executive Committee meetings, conferences and reporting to IEA DSM Executive Committee
- Set-up Task Advisory Board (AB) of stakeholders (Executive Committee, IEA, intermediaries from research, industry, government, community sectors)

Subtask 2: Identify proven and potential business models for energy services

There are many energy service business models “out there” and often they are closely linked to existing market structures and policies. In other words, business models are often country and context specific. We will start with an inventory of different existing business models, both in the participating countries and also including global examples of successful business models. In the different participating countries we will analyse what business models exist, and what frameworks (market and policy) accompany them.

Activities

- Identifying country specific suppliers, clients, and their stakeholder networks and trying to establish national advisory expert networks to continue working with throughout the task. These actors will receive frequent webinars, but also quite some face-to-face time and be the first to ask for relevant case studies. Members include policymakers in the field, end-user representatives, collectives, SME suppliers and receivers of energy services, academia, business developers, consultants, technology developers and NGOs in the field. All relevant expertise needs to be present, from economic to policy making.
- Narrowing down the focus of both services, target groups and typology of business models in close cooperation with national experts and other relevant stakeholders.
- Clarifying how the different parameters of success of business models and services will relate to each other in the analysis – economic profitability, scale of impact and real savings, business creation, growth rate, synergies with other values, adoption rate etc.
- Developing a task specific typology or categorisation of business models and services for EE.
- Developing an overview of existing energy service business models in the participating countries and their frameworks/ecosystems and how they meet and incorporate client needs.
- Reviewing global existing business models and their frameworks/ecosystems with a clear focus on quantifying and qualifying effectiveness (e.g. amount of customers reached, market share, savings aimed for, other outcomes, ROI).
- In-depth comparative analysis of around 4 similar business models in different countries and around 12 per country. Determining patterns, drivers and pitfalls.
- Identifying key factors that make services (and their vendors) succeed in the participating countries through an in-depth analysis of country specific markets and policies for energy services and their influences on business models;
- Organising regular country workshops with service providers and clients.
- Creating a report with all the national examples, the best practices and the analysis including useful tips and tricks etcetera.

Subtask 3: Creating potential country specific business models and guidelines for up-scaling

When the key factors that make services (and their vendors) succeed have been identified in the different countries we will need to start applying this knowledge to help creating a mass market for energy services. This will be achieved through the co-creating of potential effective business models and services with national stakeholders, in addition we will define guidelines for policymakers to allow a more effective up-scaling of proven business models and services.

Activities

- Develop frameworks for potentially effective business models and services in co creation with national stakeholders, e.g. suppliers and clients. We will do so in face to face workshops, with the national experts and other relevant stakeholders.

- Creating policy guidelines with necessary policies and strategies of different stakeholders, and their timing, to encourage market creation and mainstreaming of selected business models in participating countries

Subtask 4: Dissemination and expert engagement

This subtask is about creating effective means to disseminate, engage, collaborate and share learnings with the experts and stakeholders from participating or contributing countries and the wider community.

It is both important to disseminate the findings about effective business models and energy services for EE as widely as possible to contribute to a market uptake of EE services, though without the country specific recommendations and foci; and to learn as much as possible from other stakeholders and countries and collect as many relevant best and bad practices as possible.

The connection to existing IEA expert platforms and dissemination channels is aimed to create a learning culture and social network among the experts from various countries, disciplines and stakeholder groups and to foster collaboration within and outside this Task.

Activities

We will disseminate, engage, collaborate and share learnings through two activities:

- Set up a stakeholder communication and engagement plan
- Traditional dissemination to external stakeholders and academia
- Creating and facilitating a good connection to existing digital and off-line expert platforms within the IEA, e.g. the expert platforms of Tasks 16, 24 and other relevant tasks and the expert platforms for other Implementing Agreements. This connection is meant to provide a 'matchmaking' service to enable trans-national, inter-disciplinary teams of experts and end users to collaborate and learn.

Results

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

- Overview of existing business models/ customer approaches in the different countries;
- Insight in best practice business models and comparable best practices based on a comparison of business models in the participating countries;
- Exchange of valuable knowledge and learnings between EE business developers, service providers, researchers, policymakers and clients within and between participating countries;
- Access to relevant stakeholders, documents, and information through participation in a new network of expertise and participation of this network in expert platforms of other tasks;
- Best practice guidelines on how to support the creation of national markets for business models for energy services that effectively achieve load reduction at SMEs and residential communities. This will again be based on a country comparison;
- Contributing to the setting up of piloting activities in each participating country.

The principal deliverables for Task 25 will be:

- *D0*: draft work plan
- *D1*: Advisory committee of stakeholders from Executive Committee, IEA, research, commercial, community, policy and end user sectors providing strategic guidance.
- *D2*: report with typology and description of existing services and business models in each participating country and their framework/ecosystem;
- *D3*: report with review of global business models and services in non-participating countries and their framework/ecosystem;
- *D4*: report with comparative analysis and key factors for success, including overview of success parameters to assess effectiveness of business models and services.
- *D5*: report with repository of potentially effective business models and services in each country
- *D6*: Country specific reports identifying potential barriers and opportunities for up-scaling or mainstream selected potentially effective business models with guidelines/roadmaps for different stakeholders, i.e. policy makers, EE service suppliers and business model developers.
- *D7*: progress report on dissemination activities and outreach activities.
- *D8*: outreach and dissemination material, including at least 2 academic publications, professional journal publications, animations and other outreach material highlighting the Task's work.

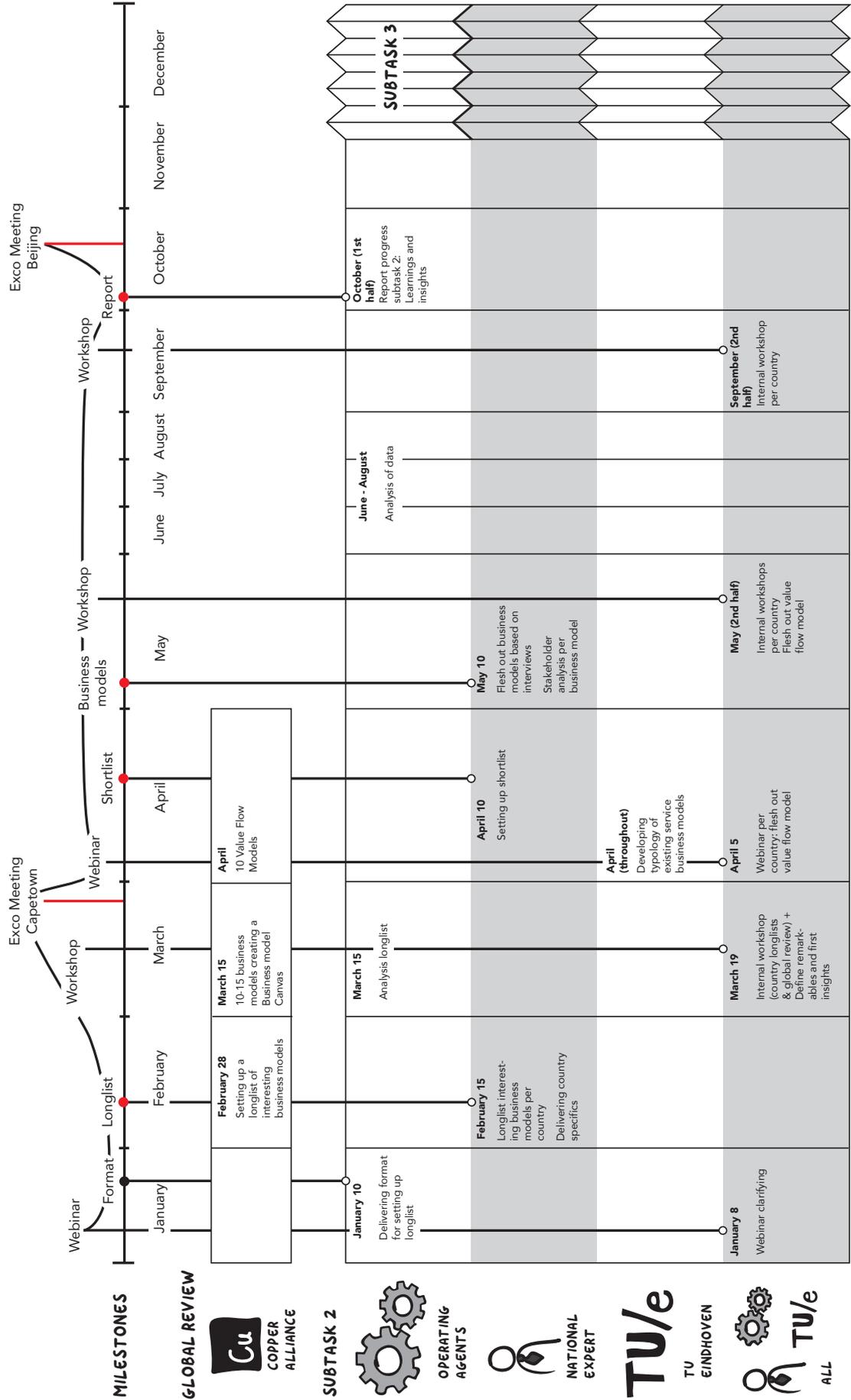
Time Schedule

The Task has entered into force on 1st November and shall remain in force until November 1st 2016, unless 5 or more countries are participating (this will extend the Task without further cost to November 1st 2017).

Overview planning

| | 1-2 | 3-4 | 5-6 | 7-8 | 9-10 | 11-12 | 13-14 | 15-16 | 17-18 | 19-20 | 21-22 | 23-24 |
|---|-----|-----|-----|-----|------|-------|-------|-------|-------|-------|-------|-------|
| Subtask 1: Management of the Task | | | | | | | | | | | | |
| 1.1 Set-up of an advisory board (AB) | | | | | | | | | | | | |
| 1.2 Annual Advisory Board (AB) meetings, Executive Committee meetings | | | | | | | | | | | | |
| 1.3 Overall project management and financial and administrative duties | | | | | | | | | | | | |
| Subtask 2 | 1-2 | 3-4 | 5-6 | 7-8 | 9-10 | 11-12 | 13-14 | 15-16 | 17-18 | 19-20 | 21-22 | 23-24 |
| 2.1 Identifying relevant stakeholders and establishing national advisory expert networks | | | | | | | | | | | | |
| 2.2 Narrowing down the focus | | | | | | | | | | | | |
| 2.3 Clarifying parameters of successful business models and services | | | | | | | | | | | | |
| 2.4 Developing a typology of existing energy service business models | | | | | | | | | | | | |
| 2.5 Identifying existing business models and frameworks in participating countries | | | | | | | | | | | | |
| 2.6 Reviewing global business models and services and frameworks | | | | | | | | | | | | |
| 2.7 In-depth comparative analysis | | | | | | | | | | | | |
| 2.8 Identifying key factors on national level | | | | | | | | | | | | |
| 2.9 Organising regular workshops | | | | | | | | | | | | |
| 2.10 Reporting results | | | | | | | | | | | | |
| Subtask 3 | 1-2 | 3-4 | 5-6 | 7-8 | 9-10 | 11-12 | 13-14 | 15-16 | 17-18 | 19-20 | 21-22 | 23-24 |
| 3.1 Developing potentially effective business models/services for each country | | | | | | | | | | | | |
| 3.2 Creating policy guidelines/ roadmaps for policy makers and stakeholders | | | | | | | | | | | | |
| 3.3 Contributing to setting-up piloting activities | | | | | | | | | | | | |
| Subtask 4 | 1-2 | 3-4 | 5-6 | 7-8 | 9-10 | 11-12 | 13-14 | 15-16 | 17-18 | 19-20 | 21-22 | 23-24 |
| 4.1 Design of a Stakeholder Engagement Plan | | | | | | | | | | | | |
| 4.2 Dissemination to academic journals, participation in conferences, creation of outreach material | | | | | | | | | | | | |
| 4.3 Connection to and utilisation of IEA expert platforms | | | | | | | | | | | | |

Time Schedule



| | |
|------------------|--------------------|
| SUBTASK 1 | Project Management |
| SUBTASK 4 | Disseminate |

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CHAPTER VI

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Task 16

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