

2016

Annual Report



International Energy Agency

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



International Energy Agency

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

2016 Annual Report

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

January 2017

Foreword

This report is the twenty-third Annual Report of the IEA Implementing Agreement on Demand-Side Management Technologies and Programmes, summarising the activities of the twenty-third 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 2017

Table of Contents

	Overview of the IEA and the IEA Demand-Side Management Programme	4
Chapter I	Chairman’s Report	8
Chapter II	What does DSM mean in your country?	24
Chapter III	Task Status Reports	53
	DSM University 2014–2016	53
Task 16	Innovative Energy Services (Energy Contracting ESCo Services)	56
Task 17	Integration of Demand Side Management Distributed Generation, Renewable Energy Sources and Energy Storages	72
Task 24	Behaviour Change in DSM: Helping the Behaviour Changers	85
Task 25	Business Models for a More Effective Market Uptake of DSM Energy Services	99
Chapter IV	Executive Committee Members	111
Chapter V	Operating Agents	115

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, Technology Collaboration projects (TCPs) 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) or Technology Cooperation Projects (TCPs) 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 TCP) belongs to the End-Use category above.

IEA Demand Side Management Programme

The Demand-Side Management (DSM) Programme, which was initiated in 1993, deals with a variety of strategies to reduce energy demand. The following 15 member countries, and three Sponsors have been working to identify and promote opportunities for DSM during 2016:

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

Programme Vision: Demand side activities should be active elements and the first choice in all energy policy decisions designed to create more reliable and more sustainable energy systems.

Programme Mission: Deliver to its stakeholders, materials that are readily applicable for them in crafting and implementing policies and measures. The Programme should also deliver technology and applications that either facilitate operations of energy systems or facilitate necessary 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. Work within this cluster primarily increases the reliability of systems. 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. Work within this cluster primarily targets the reduction of emissions.

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) Phase 3
Jan W. Bleyl, Graz Energy Agency, Austria
- Task 17** – Integration of DSM, Energy Efficiency, Distributed Generation, Renewable
Energy Sources and Energy Storages – *Completed*
Seppo Kärkkäinen, Elektraflex Oy, Finland, Matthias Stifter, AIT, Austria,
René Kamphuis, TNO, Netherlands
- 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 – Phase I: Behaviour change in DSM: From Theory to Policies and Practice
– *Completed*
Sea Rotmann, New Zealand, and Ruth Mourik, the Netherlands

Task 24 – Phase II: Behaviour change in DSM: Helping the Behaviour Changers
Sea Rotmann, New Zealand, and Ruth Mourik, the Netherlands

Task 25 – Business Models for a more Effective Market Uptake of DSM
Energy Services
Ruth Mourik, the Netherlands and Renske Bouwknecht, the Netherlands

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

CHAPTER 1

2016, what can DSM do for you....?

We are living in times of profound changes. The technology provides new opportunities with the rapid development of ICT and with emerging abilities to use of cheaper, smaller and renewable distributed power. The political awareness grows because of the need for improving the use of energy to fight global warming, to avoid depletion of resources and to make electricity available for all.

The understanding that technology is only a means and that behavioural issues needs to be taken into account to make lasting changes is growing. DSM is also changing. It is not only an issue for creating a “level playing field” for the energy companies but even more to enable a large-scale deployment of energy efficient services in the society as a whole.

This year’s annual report will therefore focus on what DSM can bring for the future, rather than giving only a list of what we’ve done.

The year 2016 was a remarkable year for energy efficiency. First of all there was the aftermath of the Paris agreements. Countries had to decide whether or not they would sign the Paris agreements. The targets, both in percentage CO₂ and number of countries that signed the treaty were achieved in a very short time. Further the target to keep the global warming a 2 degrees was significantly sharpened to be “well below 2 degrees” and even stop at 1.5. On a global level the result of all these changes is already beginning to show. For the third year in a row, global CO₂ emissions were kept on approximately the same level. One of the major contributors to this success is China with their strong energy policies.

The IEA has been very clear and instrumental to underpin and facilitate the efforts to change the energy sector. Partly because of the new Paris spirit, partly by the new direction of the IEA. The new director Dr. Fatih Birol made two things very clear: an open collaboration with non OECD members and a much closer collaboration with the Technology Collaboration Programmes, TCP, (earlier known as Implementing Agreements) like our DSM Programme. And it doesn’t stop there. Talks with organizations like IPEEC and the clean energy ministerial have led to a much closer collaboration.

Change can be delayed and rerouted

Success doesn’t mean we are where we want to be. In the energy community in Europe a massive debate is going on about the Energy Union. While most targets seems to be going in the right direction, one isn’t. The most successful piece of legislation, the Labelling and Ecodesign directives seems to be falling from grace, as the leaderships fears the topic might be hijacked by populists, as part their fight against the EU in general. But those who deal with DSM agree that we need the driving force of legislation to push technology development. The market need advice, guidance and targets to perform the way it could and should.

One might argue that the labelling “stuff” is the domain of the 4E TCP, but that would be short sighted. Appliances are getting smart with all ICT achievements. In combination with smart grids and smart suppliers the potential of the sum of the appliances to

deal with load shape and load management is growing rapidly. With our digital options it's no longer a problem to switch them on and off with hundreds and thousands at the same time... and put them back on again. But there is a need for a framework for such operations. This framework is provided within the DSM that requires "least cost planning" and "Demand Response" that stakes out the limits for the capacity of the systems.

But smartness in appliances also have risks. The smart appliances may have too high stand-by power that offsets what they save. Smart systems could be vulnerable to intrusion by hackers.

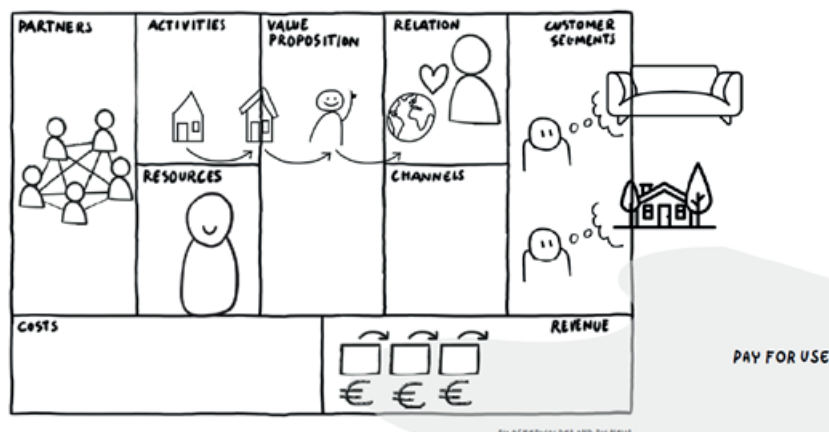
Smartness should be applied with care! DSM cares about system reliance.

Behaviour and business models

DSM will only work, if consumers and businesses agree to a new way of handling consumption, in fact if they do appreciate the service. We in DSM are seriously looking at the behavioural elements of energy use in our tasks on "behaviour change - helping the behaviour changers" and "a more effective uptake of business uptake for energy services".

By asking ourselves what customers need (what service they like) and not what think they should do, we might pave the way for a more effective participation of the consumers. This is summarized in the figure as used by Renske Bouwknecht, the operating agent of Task 25.

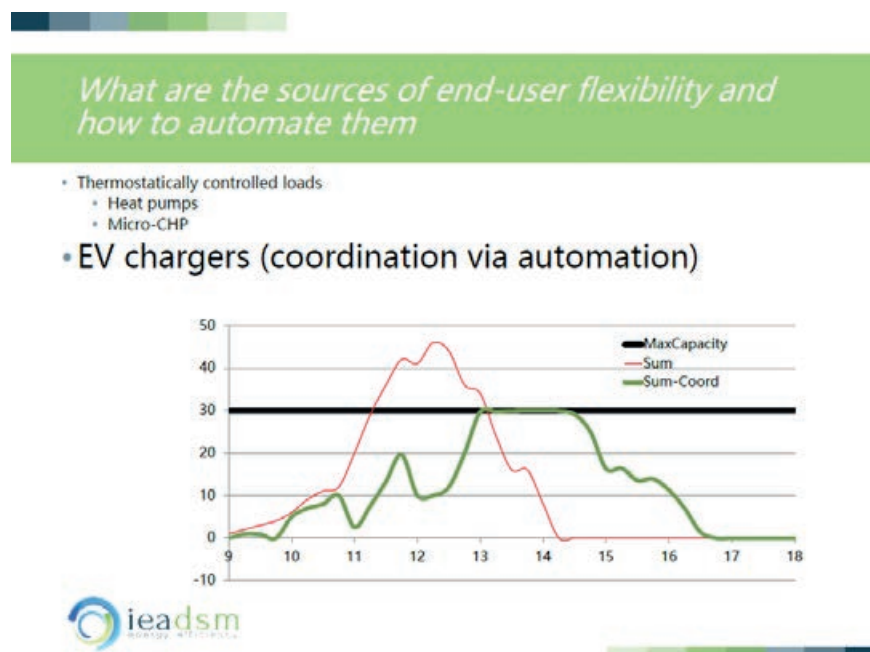
Cosy Living



Most of these interactions between the grid operator and the appliances we be unnoticed, if customers agree to the idea, see what's in it for them and are not confronted with negative side effects. For instance, on a personal note: I simply don't care if my refrigerator cools a little bit more or less, as long as it stays within the limits that ensures a good quality of what is within it. Also the cycle time of our dishwasher has never been a problem. As long as the stuff comes out clean, we're happy. Our espresso however has to be there at the right time, and exactly the right temperature (95o C). But if we can overwrite the influence of the smart operator, we'll sign up for the smart contract.

You might think this is a lot of text for a shot of coffee, but the principles behind it are becoming very important in the immediate future. As electric vehicles (EV) are entering the market in increasing numbers, a substantial influence on the loading peak becomes reality, certainly in Norway and California. This asks for smart charging, and might offer even storage facilities.

The consumers that opts in, simply has to indicate when the car has to be ready again. And then pays a rapid, or slow charge price.



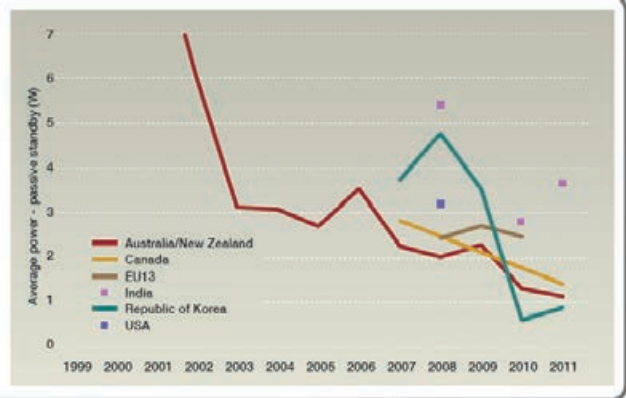
The technical development of the combination of plugged in renewables, appliances and cars is studied in collaboration with the ISGAN TCP. Our task on Integration of Demand Side Management, Energy Efficiency, Distributed Generation and Renewable Energy Sources digs into the consumer side of developing grids. As an example, a graph of René Kamphuis, operating agent of this task, is added. It shows what we can achieve with smart charging.

This example also shows the importance to apply the theories of behavioural economics in the governance of DSM. People cannot be assumed to act thinking about energy efficiency at all times. It is the duty of DSM-managers to consider how systems should be designed to make the choices easy for the customers. How to nudge them to make the favourable and good choice and to get the service that they value?.

And to end this part of the annual report, let's return to the EU policy. The added value of labelling has been shown all over the world. In Asia (Toprunner in Japan, BEE in India), Europe and the US (energy star) this was positive: labelling programmes have pushed down the energy use in appliances. As an example we show one product group, from the 4E publication "Mapping & Benchmarking of set top boxes" (2014). In parts of the world where these programmes are in place, we see a level playing field where industry has a changes to produce slightly more expensive apparatus, but with a much lower lifetime cost. Areas outside the zones, like Africa, the effects are often negative: often these areas become dumping grounds for the appliances the are only cheap at the start. So yes, we at DSM favour smart appliances as an important and effective element of DSM.

Highly variable passive power for home audio products

The standby power of home audio products has fallen in all regions. Since this category includes 18 product types (radios, CD/cassette decks, integrated stereos, etc.) the variation in average standby between regions and over time probably reflects the uptake of different product types in each market. In Australia, trend data shows the average standby consumption has improved from just over 9 W in 2001 to just above 1 W by 2011.



The big unknown at the moment are the policy measures of the US. Will the so called scepticism to global warming kill a fast developing renewable industry by reinstating an obsolete fossil industry or is the already existing and strong forces for DSM already have its own and sufficient momentum?

Or Will these new industries, in collaboration with the ICT sector be able to show they have the best added value?

This TCP is not in macroeconomics. We do however offer a lot of information on business models. In our work on innovative energy services we show how energy contracting can help us realize project that seemed to be out of reach by finance and contract new technology just that little smarter.



All the information in this report might not be enough to satisfy your curiosity to the answer “what can DSM-energy efficiency do for you”. In our member states we organize DSM days, where experts of our TCP and national experts meet to discuss this question. With the help of our sponsor the European Copper Foundation and the Belgian Federal Government, our latest was held in Brussels. Next year we visit Ireland and the Netherlands to discuss added value. But you don’t have to wait until we come along. Our website has all this information and on top of that we’ll have a webinar ten times a year, explaining all aspects of energy efficiency and DSM within the framework of our DSM-University. The total information offered by our TCP will be enough to get you through 2017 to implement everything DSM can bring.

Rob Kool, Chairman

Highlights & Achievements

During 2016 the following Task(s)/Task Phases were completed:

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

Additional details can be found below and in Chapter III.

DSM University

The DSM University is a joint activity run between the DSM TCP and Leonardo Energy where Leonardo Energy is also responsible for the administration and technological support for the webinars and also markets these together with the European Council for an Energy Efficient Economy (eceee) who gives the DSM TCP access to their database of recipients of information.

According to plan, we have organised monthly webinars with speakers both within the DSM TCP and from companies and organisations with interest in energy efficiency. In total 28 webinars have been held by the end of 2016. Over the past three years, DSMU has evolved into a community of practice through which DSM practitioners meet on a monthly basis. So far, DSMU has engaged over 3,300 professionals worldwide.

During 2016, ten webinars were held:

- **DSMU #19:** Energy Efficiency Labels, What can be learnt from the European Success story, Benoit Lebot, IPEEC
- **DSMU #20:** Involving people in Smart Energy: A toolkit for utilities, energy agencies and smart city developers, Ludwig Karg, SC3
- **DSMU #21:** Advancing Utility Sector Energy Efficiency in the U.S.: Highlights of the ACEEE National Conference on Energy Efficiency as a Resource, Martin Kushler, American Council for an Energy Efficient Economy (ACEEE)
- **DSMU #22:** Energy savings and greenhouse gas emissions: international standards & harmonised savings calculations in practise, Harry Vreuls, Task 21
- **DSMU #23:** Energy efficiency: a profit center for companies! A strategic and financial discussion of the multiple benefits of energy efficiency, Catherine Cooremans, Task 26
- **DSMU #24:** Energy Efficiency: A strategy at the heart of the G20, Benoit Lebot and Zoe Lagarde
- **DSMU #25:** Energy Efficiency Obligations – A toolkit for success, Edith Bayer and Eoin Lees, Regulatory Assistant Project (RAP)
- **DSMU #26:** Energy-Intensive Industries – energy efficiency policies and evaluations, Christian Stenqvist
- **DSMU #27:** DSM for the 21st Century, Hans Nilsson
- **DSMU #28:** The IEA Energy Efficiency Market report 2016 – What it means for DSM!, Tyler Bryant, IEA

For [more information on the DSM University](#), see also Chapter III.

For more information about all DSMU webinars www.dsmu.org

Task 16 – Innovative Energy Services – Phase IV Life-Cycle Costing; ‘Deep Retrofit’; Simplified M&V; Crowd-Financing & Energy Services Taxonomy.

Task 16 Phase IV, “Innovative Energy Services” started in July 2015 and will end in June 2018 and is working with energy service experts from countries around the world who have joined forces to to advance know-how, experience exchange and market development of (mainly performance-based) energy services.

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

The underlying goal is to increase understanding of performance-based 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.

Key accomplishments in 2016

The Think Tank has worked on a variety of topics during 2016, which have led to publications and presentations at various national and international events. Some of it is still work in progress.

- Task 16 Phase IV has a focus on Life Cycle Cost Benefit Analysis (LCCBA) and Deep Energy Retrofit of buildings and has submitted an abstract to the eceee Summer Study titled: Deep Energy Retrofits: Using Dynamic Cash Flow Analysis and Multiple Benefits to Convince Investors. The abstract has been accepted and Task 16 expects all participating countries to contribute to the paper;
- Following up on previous work on “simplified M&V and quality assurance instruments”, Task 16 has refined the concept and prepared a submission for an academic journal paper. Co-authors are Mark Robertson and Sarah Mitchel from Efficiency One, Nova Scotia;
- Crowdfunding (CF) for Energy Efficiency (CF4EE) is a new concept. A pre-feasibility study conducted by Task 16 is a first effort to explore the potential of CF for financing cost-effective energy efficiency measures in developing countries, in particular in situations where lack of affordable financing is a main barrier to scaling up energy efficiency measures and a number of research questions were addressed.

For [more information on Task 16](#), see also Chapter III.

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

Task 17 Phase 3 started in May 2016 and was finalised in October 2016. New topics are being discussed for Phase 4 and a proposal (working title) “Active Prosumer Networks” is currently underway.

Task 17 Phase 3 has addressed 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, has also been looked upon. The scalability and applicability of conducted and on-going projects with respect to specific regional differences and requirements have been explored.

The main objective of Task 17 was 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 looked at integration issues from the system point of view on the grid, market, customer and communities.

Key accomplishments in 2016

Four reports were delivered to country participants:

Subtask 10: “Roles and potentials of providing flexibility in production/consumption using CEMS/HEMS systems”;

Subtask 11: “Financial and maturity assessment of technologies for aggregating DG-RES, DR and electricity storage systems”;

Subtask 12: “Best practices in applying aggregated DG-RES, DR and Storage for retail customers”;

Subtask 13: “Conclusions and recommendations for applying DG-RES, DR and storage in electricity grids.

A joint IEA TCP symposium was organised and held with focus on the various technologies related to demand flexibility and renewable integration.

During 2016, Task 17 has produced a number of publications and given presentations at various conferences and workshops to disseminate and discuss Task results. Task 17 has also contributed to the Flexibility Roadmap (EcoFys/Copper Alliance) as a member of the ‘Flexibility in Power Systems Advisory Panel.

For [more information on Task 17](#), see also Chapter III.

Task 24 – Behaviour Change in DSM Phase II – Helping the Behaviour Changers

Task 24 Phase I started its operation in June 2012 and was finalised in April 2015. A 3-year Task extension (Phase II) started in April 2015 and will be finalised in 2018.

The main objective of this Task is to take good theory (from Phase I) into practice to allow 'Behaviour Changers' (from government, industry, intermediaries, research and the third sector) to:

- Engage in an *international expert network* ('THE EXPERTS')
- Develop the *top 3 DSM priorities* to identify the most (politically, technologically, economically and societally) appropriate DSM themes to focus on ('THE ISSUES')
- Identify and engage *countries' networks in the 5 Behaviour Changers* sectors for at least one of the top 3 DSM themes to develop a collective approach ('THE PEOPLE')
- Use and test a *Collective Impact Approach* to develop shared methodologies, guidelines and a common 'language' based on narratives to aid Behaviour Changers' decision making of how to choose the best models of understanding behaviour and theories of change (a '*toolbox of interventions*') ('THE TOOLS')
- Standardise *how to evaluate behaviour change programmes* 'Beyond kWh' and 'Beyond Energy' including multiple benefits analysis ('THE MEASURE')
- *Collate national learnings into an overarching (international) story* to understand, compare and contrast the different behaviour change approaches, risks and opportunities and which recommendations can be universally applied ('THE STORY').

Key accomplishments in 2016

- Progress in the last year was satisfactory, and Task 24 now has >240 experts on the expert platform which has links to any films or presentations from workshops. All reports are on the IEA DSM website, which has been divided into Phase I and Phase II. Task 24 continues to have great success in matchmaking experts with several spending time at each others' Universities.
- Subtask 6 has now been discussed in more than 15 workshops in Canada, Ireland, New Zealand, the Netherlands, Sweden and the US, and Task 24 workshops at BECC, ecee Summer Study, Energy Cultures and BEHAVE conferences. Lists of DSM interventions and energy efficiency and behaviour priorities in each of the participating countries (except Austria) have been collected. All workshops have extensive reports and three draft Subtask 6 and 7 reports have been prepared for Sweden, the Netherlands and New Zealand. In addition, the issues definition in Task 24's Subtask 11 participant, the Carolinas Health Network System (CHS) has been done.
- Behaviour Changers have been identified for the top issues decided on in Subtask 6 for Canada, Sweden, the Netherlands and New Zealand. Ireland has chosen its top issue and is currently selecting the Behaviour Changers. Their sector stories have been told during workshops and we have initiated deep discussions around relationships, mandates, stakeholders, restrictions and value propositions for each of the Behaviour Changers using the 'Behaviour Changer Framework'.

- Storytelling as a tool in Task 24 has been published and presented at the eceee Summer Study. A paper analysing 145 stories we have collected from over 20 countries is currently under review as an extensive social science publication in the Journal of Energy and Social Science Research (ERSS). Dr Sea Rotmann is co-editing the ERSS Special Issue on 'Narratives and Storytelling in Climate Change and Energy' which has attracted over 50 abstracts. This work more than fulfils our deliverables around 'international publications and a Special Edition'. In addition, Dr Rotmann has created the 'A to Z of why using a story spine in energy behaviour research works' and has published two conference proceedings (ACEEE Summer Study and BEHAVE) on the 'magic carpet' Behaviour Changer Framework. She is currently finalising another peer-reviewed single author paper on the various tools developed in Task 24 for the Special Edition on global behaviour research of Energy Efficiency. The Task 24 monitoring and evaluation work was also presented at the 2015 eceee Summer Study by Dr Mourik and further evaluation work has been published by her in Energy Efficiency. A factsheet on multiple benefits in the building retrofit sector has been created by Dr Mourik (in Dutch).
- Karlin (the Principal Investigator of this Subtask) et al have published a paper at the IEPPEC conference in August that outlines the basics of the Beyond kWh toolkit they are developing for ST 9. There are now three peer-reviewed papers and a report on the toolbox on the IEA DSM website. The Subtask is co-funded to the tune of US\$100,000 by PG&E and Southern California Edison. Rebecca Ford from Oxford University presented the toolbox at the Task 24 BEHAVE workshop and garnered feedback from the 70 participants. Unfortunately, the fact that both Austria and the Netherlands chose to not join Subtask 9 means it will not be validated as a standardised tool in 2017 (as we only have 3 countries). We are working with Karlin et al to still test the toolbox outside Californian utility customers, for example, in Ireland where we focus our case study on the residential sector.
- We have contracted our first voluntary participant to this Subtask, the second-largest hospital network in North America (CHS). We have started the work with a workshop in October 2016 where we finalised the issues definition. In February 2017, we will participate in an international evaluation panel convened by the hospital network and hold another workshop. A third workshop will take place in May 2017, with final report-back expected end of 2017. The draft workshop report will be available early 2017 to participants.

For [more information about Task 24 Phase II](#), see also Chapter III:

Task 25 – Business models for a more Effective Market Uptake of DSM Energy Services

Task 25 focuses 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.

The objectives of Task 25 are:

1. Identify proven and potential business models for energy services in different countries, with special focus on (how to create conducive) market dynamics and policies in different countries
2. Analyse acceptance and effectiveness of these energy services and their business models in creating lasting load reduction, shifting or generation and other non-energy benefits and in creating a market
3. Research success and failure factors in 9 building blocks of business models + market dynamics and policies
4. Develop a canvas for energy service business models able to mainstream and up-scale and disseminating it through national workshops
5. Creating roadmaps with necessary policies and strategies of different stakeholders to encourage market creation and mainstreaming of business models in different countries
6. Creating and maintaining a digital platform for shared learning, best practices and know-how with national sub departments focused on bringing knowledge to the national market, including banks and other funders!
7. Develop a database including useful contractual formats, business plans etc.

Key accomplishments in 2016

- Country specific suppliers, clients, and their stakeholder networks for NL, SE, CH, AT and NO have been identified and where relevant established national advisory, expert networks;
- The focus of services, target groups and typology of business models was narrowed down and how the different parameters of success of business models and services will relate to each other in the analysis was clarified and a selection criteria toolkit was developed;
- A long list overview of existing services and business models was completed for all countries except South Korea, who joined later;
- A shortlist overview of services was completed for all countries except for South Korea, who joined later;
- A global analysis was performed by CREARA, hired by the ECI partner.

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

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 2015 was produced and distributed electronically to approx. 250 recipients in January 2016. 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 2016 and included articles on:

Issue 60 – March 2016

- Note from the Chairman: Billiards
- Task 16: Three more years of energy services work given thumbs up
- Task 25: You have to re-invent yourself several times
- Demand Response – New opportunities for energy service providers?
- Sweden – On the way to a fossil-free future

Issue 61 – June 2016

- Note from the Chairman
- Task 24: A beautiful behaviour collaboration is taking place in the IEA
- DSM University
- South Korea – Energy paradigm shift means a bright future for the economy and the environment

Issue 62 – September 2016

- Note from the Chairman: Sharing what we know
- Towards 100% renewable energy supply – strategic development of power system flexibility
- Ireland – The home energy efficiency conundrum
- Task 25 – Towards a service supporting business model
- Task 17: International symposium – demand flexibility and RES integration

Issue 63 – December 2016

- Note from the Chairman: Sharing what we know
- Puang Sanook – The 1st energy efficient community in Thailand
- An international day for DSM
- DSM University: 2016 webinars
- IEA's energy efficiency market report
- Task 17: New reports on integration of DSM now online

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.

The DSM Programme introduced social media to their website in 2010. The number of members on the DSM Facebook group and the Twitter account is increasing on a daily basis. Strong relationships with other social media energy efficiency mavens have continued to build in 2016 including the DSM Programme being showcased in 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 2017.

Participation in the IEA DSM Programme as of December 2016

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	ST 8	ST 9													IV	I-III							I + II		
Australia		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Austria			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Belgium	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Canada	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Denmark	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
EC	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Finland	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
France	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Greece	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
India																									
Ireland																									
Italy	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Japan	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Korea	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Netherlands	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
New Zealand																									
Norway	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Spain	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Sweden	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Switzerland	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
United Kingdom	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
United States	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
World Bank/ Tanzania					*																				
RAP																									
ECI																									
EfficiencyOne																									

Operating Agent and participating country
 Co-operating Agent and participating country
 Participating country
 Completed Tasks
 ST = Subtask

Benefits of participation

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

Enhances national R & D programmes. National researchers involved in international projects are exposed to a multiplicity of ideas and approaches.

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

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

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

Reflects latest trends and issues. New areas of work are continually added to the programme's scope to address changes in the energy market.

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

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

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

Increases the size of the technology database. Collaboration among multiple countries creates a pool of information much larger than a single country could assemble by itself.

Permits national 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 TCP)

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 DSM TCP 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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The efforts of the following people continue to be essential to the Programme's success. The Operating Agents, who are identified in Chapter V, the Executive Secretary, Anne Bengtson, and the Newsletter Editor, Pam Murphy.

CHAPTER II

What does DSM mean in your country?

AUSTRIA

Austria – The role of DSM

Strategic Research Agenda and Technology Roadmap

In the summary statement of the strategy finding process for tomorrow's sustainable energy system, keywords of DSM – energy-efficiency, integration of renewables and flexibility – are put into spotlight:

“The energy system for 2050 is based on an infrastructure integrated across all domains of energy technologies, with an extremely large share of energy from renewables, taking social justice in a changing society into account. Many users of the energy grids do play an active part as providers of energy or of storage and flexibility services. Once pioneering solutions for designing energy-efficient, sustainable, resilient energy systems have been introduced in the Austrian market, there is a demand for them in many other countries.”

Vision for tomorrow's intelligent energy system in Austria, Strategic Research Agenda

The extent of the long-term need for research toward a sustainable, optimized energy infrastructure has been worked out. The relevant topics for the transition to integrated energy and ICT infrastructures are viewed in a comprehensive perspective, and synergies identified. With a focus on interdisciplinary and systemic issues, the extent of the necessary research has been defined in detail for the following four areas: developing spatially specific infrastructure covering all sources of energy, the governance of the energy turnaround, the electricity system and grid-bound provision of heat and cold. Information and communication technologies (ICT), storage technologies and aspects of energy efficiency, which are relevant for all energy networks and for developing new business models, have been grouped together as cross-cutting issues.

>> www.nachhaltigwirtschaften.at/e2050/results.html/id7500 (in German)

Key messages from the strategy finding process Smart Grids 2.0

Decentralizing and participation need an interactive power system – smart grids must provide an arena for citizen involvement.

Smart energy strategies make sense for the economy as a whole – provided that costs and benefits are assigned in the right way.

Flexibility options for a dynamic energy system exist – we must tap them cost-effectively.

Smart services bring the smart grid to life – we must cooperate on digging up the “buried” data.

Reliability of supply, resilience and data privacy have top priority – they must be integral design parameters for smart grids.

Austria is exceptionally good at developing smart grid components and system solutions; we must strengthen Austria's position as an engineering location, so as to take full advantage of international opportunities for Austrian business.

In the Technology Roadmap for smart grids in and from Austria the short and medium term steps for developing and advancing smart grids are described. The individual solutions is viewed along three development axes: grid, system and final customers. A comprehensive ICT architecture provides the foundation for the various technologies and solutions. In the

Roadmap the actions required from the key stakeholders, such as public institutions, network operators, technology providers and research organizations, are specified in detail.

>> www.nachhaltigwirtschaften.at/e2050/results.html/id7489 (in German)

Status and Progress of DSM related projects

In Austria different model regions for smart grids have been established. Among others these are Smart Grids Model Region Salzburg, Upper Austria and Smart City Aspern. Living lab projects are running with different objectives to support the integration of renewables and enable consumer participation.

Besides the already well established direct ripple control, participation of demand to fulfill system services has increased in recent years. The pooling of smaller units and the role of aggregators has been established. First players are already providing flexibility as a service for the secondary balancing market [1]. Costs for the balancing responsible parties are still high and the share of renewables is increasing. In Figure 11 the prices for tertiary reserves markets are depicted (in Euro per MWh¹) over year and respective week number. Different colors are used for different times of the day, which is separated in 4-hour-periods. On the left side, positive prices are displayed, on the right side, negative prices. The upper plots show the prices for weekdays (Monday till Friday), weekend prices are shown in the plots below.

In the recently published Strategic Research Agenda Austria, identified priority topics are storage and flexibility (demand response) as well as the development and integration of new business services.

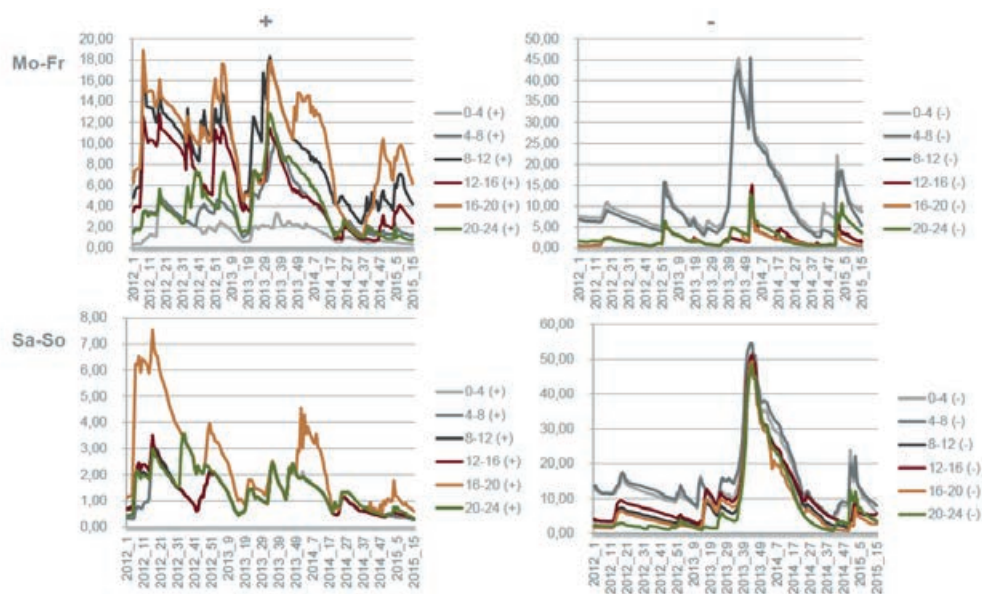


Figure 11: Average positive and negative balancing capacity prices in the Austrian tertiary control market (in Euro per MWh) (Source: APG Ausschreibungsplattform, 2012-2016)

¹ The TSO in Austria reports capacity in MWh, which corresponds to the reservation of 1MW for one hour.

Societal costs and benefits of smart grids [1]

In the Austrian Smart Grids Roadmap [2] the benefits for the industry, network operators and consumers are discussed. From the consumer point of view, introduction of new tariff types and price models as well as insight into the detailed consumption are named as the main advantages. From a societal perspective, the environmental and energy efficiency improvements are dominating the discussions.

While research and demonstration projects on demand-side flexibility are still carried out, some early adopters and new players (like from telecommunication industry and equipment manufacturers) are starting to aggregate and participate with demand flexibility in the markets.

Use Case: Portfolio optimization of the aggregator [3]

Operators of flexible loads optimize the value of flexibility by the participation of this flexibility on different markets. An example for the portfolio optimization using the example of Austria is shown in Figure 27. Thereby, the aggregator is connected via information and communication technology (ICT) with the flexible units of the virtual pool of demand response units. He sets the schedule for the flexible units based on the approximated available flexibility. Especially for the participation in very short-term markets, the aggregator needs feedback from the flexible units on the status. This interaction between the aggregator and the customer is described in [3].

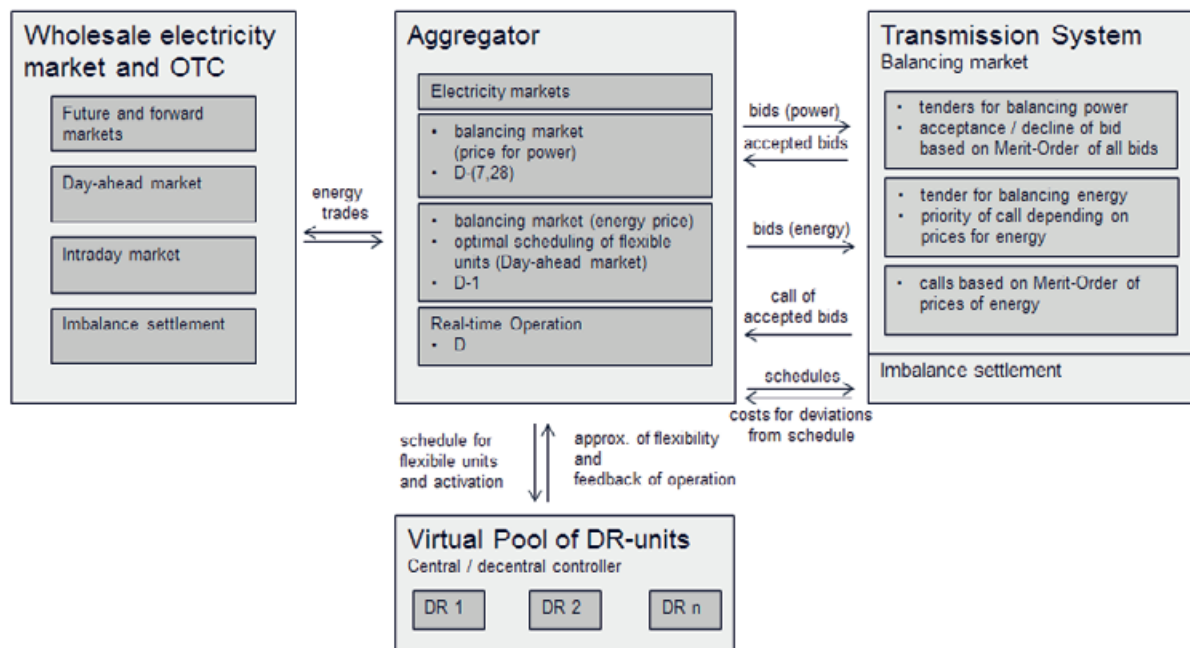


Figure 27: Portfolio optimization for electricity and balancing markets from aggregator perspective using the example of Austria

The aggregator will optimize the market participation of the flexibility based on price forecasts and based on the roles that the aggregator fulfills. When the aggregator is only a BSP and only aggregating flexibility for the balancing markets the optimization will differ from an aggregator that participates as a supplier also on the energy markets. In [3] the different markets and use cases for the aggregator are explained.

Detailed description of demonstrations projects can be found in [4] and summary and recommendations of Task 17 in [5]

References

- [1] IEA DSM Task 17 – Subtask 10: *Roles and Potentials of Flexible Consumers and Prosumers*, www.iea-dsm.org
- [2] “Technologieroadmap Smart Grids Austria,” *FEEI*, 17-Aug-2015. [Online]. Available: <http://www.feei.at/energie/smart-grids-und-smart-metering/technologieroadmap-smart-grids-austria>. [Accessed: 06-Jun-2016].
- [3] IEA DSM Task 17 – Subtask 11: *Valuation Analysis of Residential Demand Side Flexibility*, 2016, www.iea-dsm.org
- [4] IEA DSM Task 17 – Subtask 12: *Best Practices and Lessons Learned*, 2016, www.iea-dsm.org
- [5] IEA DSM Task 17 – Subtask 13: *Conclusion and Recommendations*, 2016, www.iea-dsm.org

BELGIUM

What does DSM mean in Belgium:

Recent developments about demand response and flexibility

In the context of massive integration of growing shares of intermittent renewable energy sources, declining volumes of programmable electricity production, flexibility has become a crucial factor for the design and the management of our power system.

Flexibility refers to the ability of a power system to respond – within economic boundaries – rapidly to fluctuations in demand and supply, both scheduled and unforeseen.

Such flexibility can be provided by different means, either within a certain country or via interconnections, typically:

- Flexible production
- Storage, and
- Demand-side flexibility (Demand Response).

Recent estimates show that the flexibility need of the Belgian – and European – power system will increase dramatically in the coming years.

Among the flexibility options, demand response already plays a significant role in the energy markets and for the balancing services in Belgium.

Indeed, the interest for demand-side flexibility is increasing as it can contribute to:

- Grid security (through the ancillary services)
- Security of supply (e.g. participation to the Belgian “strategic reserve”)A better functioning of the electricity markets by increasing liquidity and reducing market power, to limit price peaks for the benefit of all consumers.

In Belgium progress has been made recently on each of these aspects:

Ancillary services:

Through stakeholder participation the Belgian TSO has historically developed several reserve products open to demand. Not only are several types of interruptible contracts available for clients directly connected to the transmission grid, but clients connected to the distribution grid also have the opportunity to participate. This can happen individually or through aggregators. Discussions were ongoing over the past years to harmonize these products and to evolve towards a common “bid ladder” principle

– whereby these products are ranked according to a merit order – while maintaining diversity as much as possible.

Strategic reserve:

For adequacy reasons Belgium has set up a strategic reserve mechanism, and opened this up to demand in competition with production units planning to leave the market. This provides opportunity for another category of end consumer to offer its flexibility in a market where activation is less likely.

Energy-only markets:

In order to increase the share of flexibility and facilitate the development of flexibility sources in the coming years, the federal government is developing a new legal framework aimed at developing all sources of flexibility while complying with the upcoming European network codes and the so called “Winter Package” aimed at reinforcing the European energy-only market.

The demand-side component of this upcoming (Belgian) legal package is based on a study published by CREG, the federal Commission for Electricity and Gas Regulation.

This study proposes to adapt the legal framework in order to introduce new concepts and new roles with a view to encouraging demand-side participation to electricity markets.

This “DSM package” will be based on a new market model for the transfer of energy, by which the customer would be the owner of his own flexibility, while the use of this flexibility should not adversely affect other market participants.

This market model involves defining new roles (flexibility service provider [FSP], flexibility data manager [FDM]) and is based on several principles, in particular:

- the right for each end consumer to activate his flexibility without opposition of his supplier or his balance responsible party (BRP),
- the responsibility of the FSP for the balance in the activation of flexibility within its demand portfolio,
- the FSP may not act at the expense of other (market) parties,
- the end consumer is the owner of his measuring and metering data,
- confidentiality of commercially sensitive data must be guaranteed.

Such a market model would be introduced gradually.

The final step would be to allow the individual end consumer to participate to the flexibility market.

IRELAND

What does DSM mean in Ireland?

In Ireland, the establishment of the Single Electricity Market (SEM) in 2007 has been key to increasing opportunities for Demand Side Management (DSM). Since 2007 there has been a transformation of opportunities for interconnection, storage and demand side management as SEM has created a capacity market on the island of Ireland, which together with the relative isolation and limited interconnections of the Irish grid and

our increasing amounts of renewable energy, creates unique opportunities for demand response including balancing services.

Advantages for the state owned company (EirGrid) that operate the national grid include improving the ability to manage the power system efficiently; accommodating increased renewable electricity generation and providing enhanced capacity. Outside of the industrial and commercial sectors however, the potential of DSM for homeowners and communities is a concept that has only recently begun to gain traction.

In developing the Demand Side Vision for the Island in 2020, the Commission for Energy Regulation considered a wide range of relevant areas outside of consumer behaviour change which included energy efficiency, smart meters, home and office automation amongst other technological areas.

The role of DSM as part of the overall solution to the energy efficiency problem is illustrated in the figure below which shows that not all solutions are technical in nature; many involve behavioural change and these are not so easy to effect and measure. Policymakers here are also looking at ways to assist communities or groups of organisations to come together to ‘pool’ or aggregate their energy efficiency opportunity to enable them to effectively engage with energy suppliers.

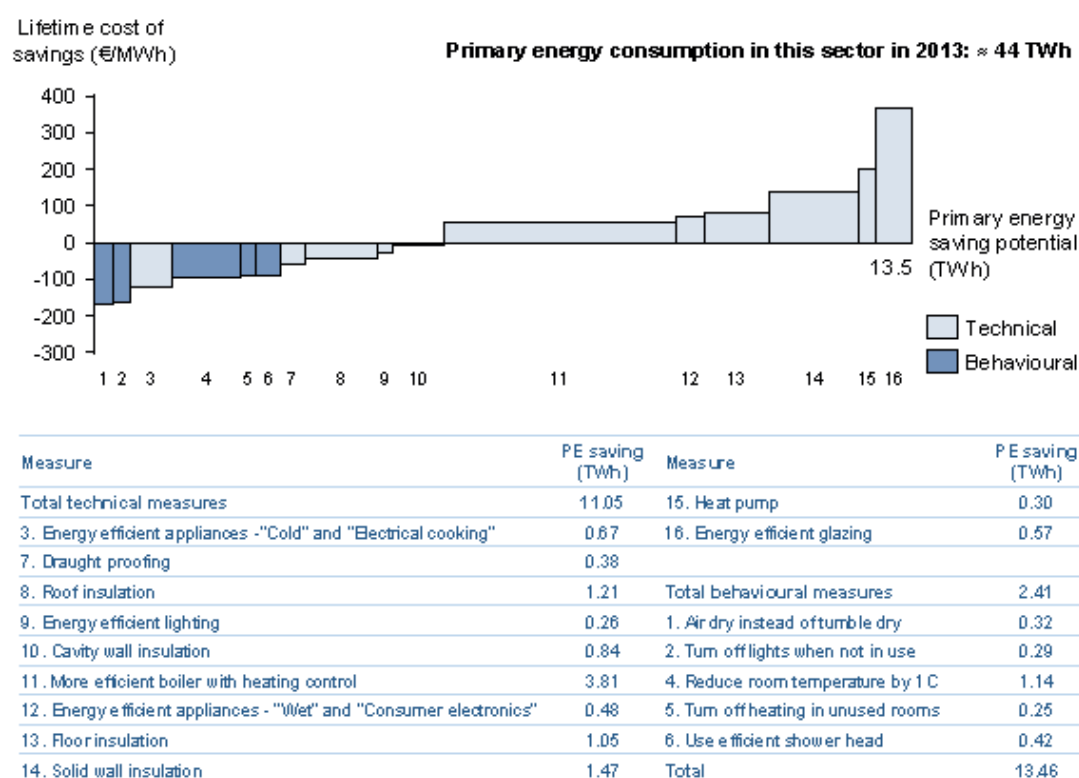


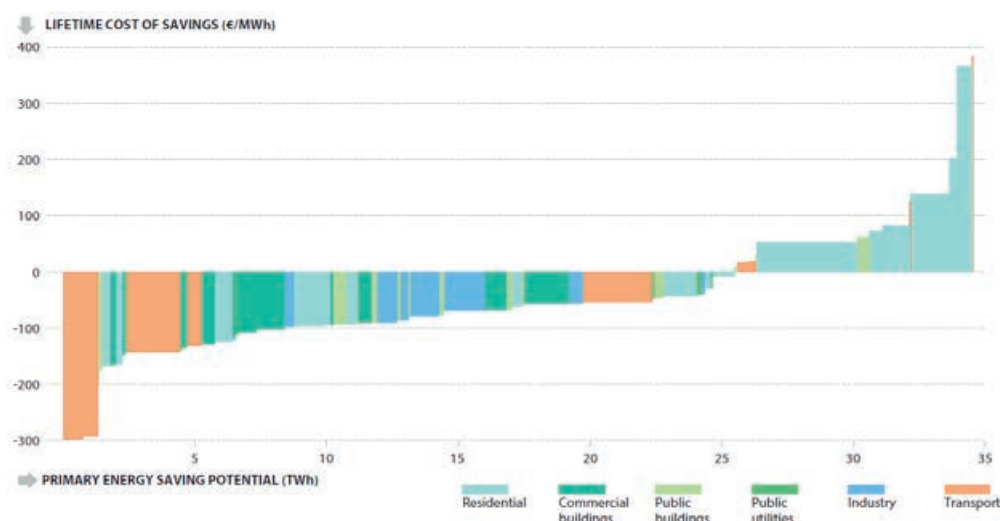
Figure 1: Energy Efficiency cost curve for the Residential buildings sector

Irish Policy Context

The Energy White Paper, published in December 2015 has the strategic aim of “guiding policy and actions in the energy sector up to 2030” and in doing so, puts much emphasis on role of the “active energy citizen”, along with the need for increased community participation in renewable energy generation and more opportunities for community engagement in policy making. It envisages that “the citizen will be at the centre of the

transition and the energy industry, government and public authorities will all contribute to ensuring that citizens are involved in the transition, and benefit from it". The White Paper commits that the State will provide the supports to enable energy consumers to become active energy citizens where individuals and communities will increasingly be participants in energy efficiency and renewable energy generation and distribution.

The National Energy Efficiency Action Plan (NEEAP) required under Article 24 of the Energy Efficiency Directive, reaffirms Ireland's commitment to delivering a 20% in energy demand across the whole of the economy by 2020, along with a 33% reduction in public sector energy use. Although substantial savings have been made in the last three years, a recent SEAI report² for policymakers identifies further potential energy efficiency savings that are both technical and behavioural and which amount to nearly a quarter of Ireland's primary energy demand in 2013 (nearly 35 TWh). Almost 75% of these measures are cost-effective whereby they reduce energy use and bring net financial savings in the long-term – see figure 2 below. Yet despite being cost-effective much of the available energy saving potential remains untapped due to reasons such as market failure and barriers. Unlocking the savings requires a continuation and extension of existing policies and measures, as outlined in NEEAP and suppliers are regarded as "key enablers of behavioural change and energy efficiency".



Those measures that are deemed uneconomic (i.e. above the horizontal axis in the Figure 1), can be delivered with well-targeted support and/or financial incentives. For example, bundling the implementation of uneconomic measures together with economic measures could make the overall investment economically viable. Details of the measures included in Figure 1 are included in the full report at www.seai.ie/energydata.

Figure 2: Ireland Energy Efficiency cost curve in 2020 (Private Perspective)

Other key policy measures include the National Energy Retrofit Programme, the main funding support for retrofitting existing building stock, which was launched in 2011 and the Energy Efficiency Obligations Scheme (EEOS) which came into effect in 2014 and requires energy suppliers to achieve 25% of their target in the residential sector, creating opportunities for community groups to leverage funding by trading their energy credits.

² SEAI Unlocking the Energy Efficiency Opportunity: Summary for Policymakers, June 2015

NEEAP also is the basis for the National Smart Metering Programme which aims to encourage more energy-efficient behaviour by householders through the introduction of smart meters. Part of this strategy is to radically enhance management of energy demand, deliver smart networks and enable greater energy efficiency through the use of cutting-edge technology.

Current and prior studies of DSM

Previous research studies of the potential for DSM in the Irish residential sector have looked at community-led behavioural approaches and smart metering interventions. In 2009 as part of the HOLISTIC FP6 project, one housing estate in Dundalk implemented “No-cost and low-cost energy efficiency measures” across 180 homes including a commitment to save 20% energy using community trainers, basic electricity meters and ‘Be Your Own Energy Managers’ tip sheets. With the support of the resident’s association they achieved an 18% reduction within three months. A similar roll-out was attempted in further estates in other areas of Dundalk however this didn’t work as well there as didn’t have as much community support or buy-in. It was expected that the BYOEM guides and train the trainer packs would be enough but motivation to carry through was lacking.

In 2010, 5,000 households participated in a national consumer behaviour trial with different combinations of interventions for different groups including: time of use tariffs; electricity bills (quarterly and monthly); electricity monitors; weekend tariffs; load reduction incentives and fridge magnets with information on tariffs. Overall usage was reduced by 2.5%, while peak use went down by 8.8%. The trial used a basic format of informative billing but there was relatively little emphasis on habitual behaviour as it was primarily tariff focused and participants did not report an increase in awareness of energy efficiency enhancements and investments. In 2016, an ESRI study³ into this trial found that although average overall electricity usage was reduced, treatment groups were also on average 23–28% less likely to adopt any of the listed energy saving measures during the trial than the control group. The study suggests that it is important to explore how to accompany the National Smart Metering Programme (or indeed other smart thermostat projects) with interventions to promote energy efficiency investment behaviours tailored for the households energy use profiles (e.g. promoting efficient boilers and controls to high users; promoting insulation when heating is used for much of the year; promoting PV panels with high daytime electricity use; promoting SEAI grant programmes through smart metering communications; providing related behavioural tips based on consumption profiles).

In addition to large academic research projects such as ENERGISE and ENTRUST, there are a number of interesting smaller studies ongoing in the area of residential Demand Side Management:

The EirGrid ‘Power Off and Save’ project involves 1,500 customers signing up for an 18 month period; with the aim of providing data for quantitative research with some qualitative dimensions (surveys, interviews, focus groups and ethnography); the focus is on DSM rather than habitual behaviour and participants are asked to reduce usage on 10 occasions over 18 month period with monetary incentive of 100. As with the CER study, it is dominated by ICT and financial incentives for peak load manage-

³ ESRI Research Bulletin: Unintended outcomes of electricity smart metering: trading off consumption and investment behaviour, 2016

ment. Crucially however, there are no interventions on everyday habitual energy use or nominated peers / champions to deliver direct energy advice to householders.

In Co Louth, 2,000 local authority owned homes have been providing data for approximately 18 months as part of a large scale Energy Efficiency Improvement Scheme. There is a potential opportunity for SEAI to engage with these households to explore the potential tension between comfort versus energy saving related to smart thermostats and potential rebound effects. Discussion is ongoing around how or if Climote / Nest / other smart thermostats can harness behaviour change (investment in energy efficiency or reduced energy consumption) through related, bespoke educational interventions and messaging.

The community of Tallaght, under the aegis of South Dublin County Council (SDCC) has established a Smart Micro-Grid cluster. Together with the Micro-Energy Generation Association⁴ ([MEGA](#)) this joint research programme is dedicated to generating and sharing energy within the community using a variety of renewable technologies as part of a micro-generation smart grid trial based on power matching. The Smart Micro-Grid [Cluster](#) aims to examine how community organisations and households can work together within a target area to adapt their energy usage in response to increasing levels of renewable energy while maintaining stability of the electricity grid. The long term aim is to create a cellular smart grid system from clusters of small self-regulating / balancing smart energy cells into a mesh of interlocking and aggregated smart grids connecting right across the national grid. SDCC and MEGA are working with SEAI to deliver this in line with official EU Smart Grid policies.

SEAI has a large suite of industry related programmes that focus on Demand Side management including our Large Industry Energy Network which has 192 of Ireland's largest energy users as members. They account for approximately 19% of the national Total Primary Energy Requirement and for members who joined the Network in 2005, have achieved an improvement in energy performance of 17%, in comparison to the year they joined.

Our public sector programme in its most recent annual report on the energy efficiency performance of public bodies published by SEAI, showed that the public sector avoided €54 million energy spend through improved energy efficiency in 2015. The sector is now 21% more energy efficient, and with concerted effort, is on track to meet the 33% energy saving target.

SEAI is continuing to explore the potential for Demand Side Management within the residential sector by supporting this research, including the experiment being designed specifically for Task 24. This involves community organisations using energy-saving kits to encourage and enable householders to secure energy savings through changes in habitual energy behaviour in the home, and also providing them with a pathway towards home energy upgrades.

SEAI's consumer awareness activities are mainly implemented under the umbrella of Building Energy Rating, Better Energy Homes and Warmer Homes. SEAI maintains an extensive consumer website under the Power of One with supporting awareness and guidance in electronic and printed resource formats for homeowners. The website receives approximately 200,000 visits per year.

⁴ The Micro Electricity Generation Association (MEGA) promotes the development and expansion of a world class state-of-the-art micro electricity generation industry in Ireland

ITALY

Latest news about DSM in Italy

The White Certificates mechanism, enforced since January 1st 2005, is still the main policy instrument through which the Italian Government is promoting energy efficiency in Italy.

It represents one of the first experiences worldwide of implementation of a market-based tool for the promotion of end-use energy efficiency and consists in a mandatory regime for Distributors of electricity and gas serving more than 50,000 customers, where each Distributor must reach every year an energy efficiency target related to the amount of energy delivered. Obligated parties have three options to comply to their obligation:

1. to directly implement energy savings projects on final end users;
2. to develop energy savings projects on final end users in collaboration with third parties;
3. to buy White Certificates from parties whose projects are “producing” efficiency in excess to their targets (market-based component);

Non complying Distributors have to pay a sanction. The rationale for trading is the possibility to guarantee, at least in principle, that savings will occur where it is more economic.

Efficiency projects can be implemented in any end-use sector: Industry, Residential, Tertiary, Transportation, Agriculture and Public Lighting. After an evaluation procedure is carried out, every eligible project is awarded with a number of White Certificates which depends on the acknowledged energy saved (1 white Certificate = 1 toe saved).

The savings are measured according to the principle of “Additionality”, i.e. the projects implemented in the White Certificate mechanisms should realize savings which are in addition to the savings which are realized anyway due to other existing supporting policies and therefore are measured with respect to a defined “Baseline”.

Complying Distributors are also entitled to a reimbursement of the costs sustained which depends on the market price of the White Certificates.

After ten years of enforcement and more than 21,8 Mtoe of certified savings (by the end of 2015) the mechanism is now on the eve of a major upgrade, designed to make it able to achieve at least 60% of the national targets for energy efficiency in 2020, according to the National Energy Strategy.

The whole mechanism is currently undergoing a profound revision due to the entry into force of new Guidelines, expected in the first months of 2017; such a revision aims to strengthen and qualify the mechanism, and, at the same time, to solve some critical issues encountered in the implementation phase, such as:

- risk to count savings and attribute certificates for potential future savings that could not be realized, due for example to closure, relocation or early retrofit of the facilities;
- need to update the role, the resulting responsibilities and rights of the agents involved in the implementation of a project;
- need to timely update the evaluation methodology of projects, so to take into the account the evolution of the technology, of the market and of the regulation;

- absence of an effective way to take account of technological progress in the life of the project, which should lead to review the duration of public support.

Moreover, contacts are under way with the European Commission to investigate the applicability of the new rules on state aid to the promotion of savings through market models such as white certificates, and in order to assess any Reporting requirements attached. All this taken into account, the revised mechanism will:

- promote the skills of the legal entities admitted by foreseen their compliance with the new European Standards for ESCOs and for Experts in energy management;
- eliminate the risks of over-compensation of projects;
- reward the most efficient technologies through a clearer definition of the principle of additionality;
- rationalize, harmonize and differentiate appropriately the tools supporting energy efficiency in force, in order to better direct the resources available;
- review the procedures for the recognition of White Certificates in order to eliminate the risk of recognizing them for savings that may not be realized;
- update the roles of subjects such as the developer of the project and the participant customer;
- specify the procedures for carrying out checks.

NETHERLANDS

What does DSM mean in The Netherlands? Energy Efficiency

DSM is not a word commonly used in the Dutch energy efficiency community. If you would search 'DSM' with the Dutch Google site, you will get a number of pages with references to DSM, a global science-based company active in health, nutrition and chemicals with headquarters in The Netherlands and other references, but nothing that refers to Demand Side Management. This changes if you would use 'energy efficiency': you would get references to Dutch energy policies, energy labels, the implementation of the European Energy Efficiency Directive and energy plans.

Energy Efficiency Policies & Energy Agreement

As in most EU countries, there is a long history of policies and measures to improve energy efficiency. Well known is the approach for voluntary long term agreements for industry and other economic sectors, but also the behavioural change programmes for consumers and decision makers as well as programmes that stimulate innovation and green growth are part of the Dutch energy saving policy. More information on Policies and measures is available in the MURE database <http://www.measures-odyssee-mure.eu/>

The Dutch energy efficiency policies are targeted to achieve the 2020 targets of 20% reduction of greenhouse gases and 14% renewable energy in a cost efficient way. Although energy savings as such are still important, they became more a tool to reduce GHG emissions. A major instrument to implement the policies is the Energy Agreement for Sustainable Growth that started in November 2013. In this agreement 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. The arrangements for saving energy focus both on the built environment and on increasing energy efficiency in industry, agriculture, and the commercial sector as well as for mobility and transport (more information is provided in the IEA DSM Agreement's Annual report 2013).

In the Energy Report 2016 energy targets are set beyond 2020: By 2023 16% renewable energy should be generated and by 2030 CO₂ emissions should be reduced by 40% at EU level, heading for a 80–95% reduction by 2050. The government wants to achieve this by:

- concentrate policies on CO₂ reduction
- additionally reduce energy consumption; and
- increase the share of renewable energy.

Results from the Task 16 on energy services has been used to stimulate the development of a market for ESCO's while the ongoing work on Life-Cycle Cost appraisals and 'Deep Retrofit' of buildings can provide information to support cost-efficient energy saving measures in buildings and influence the decision making process in commercial building. To ensure continue energy savings it is important to research promising effective business models, services and customer approaches which provide energy services to SMEs and residential communities. Research outcomes from Task 25 should provide examples of new and improved business models to increase efficient energy savings as well as examples of guidelines to remove barriers and solve problems in introducing such business cases, especially amongst SMEs.

Energy agenda: CO₂ emission reduction leading for the period up to 2050

In December 2016 the Minister of Economic Affairs sent the 'Energy Agenda' to the Parliament. In this policy paper the transition to a low-CO₂ economy and society by 2050 is presented. The government will use in the transition to 2030 and 2050 one single goal: reducing greenhouse gas emissions (steering on CO₂ reduction). This is seen as the most cost effective way to achieve the objective of the Climate Agreement of Paris. Within this goal it is clear that there needs to be deployed at substantial energy saving and there is also great investments are needed to increase the share of renewable energy in the energy mix.

The government is committed to reducing energy demand through energy efficiency and reducing the use of natural gas by promoting renewable electricity and renewable heat. A broad package of future measures is need to achieve this. For example, look at how we can preserve heating of homes, buildings and greenhouses without the use of natural gas, that nowadays count for about 30% of the heating, and more use of low temperature heat.

The future functionality for electricity (power and light) outlines five directions:

- A low-CO₂ electricity supply;
- Coordinating role of the government for renewable energy;
- Support local energy production;
- Strengthen the electricity market system and ensure delivery of electricity
- Increased flexibility of the electricity system

The ongoing work in Task 17 will provide input related to the fifth direction mentioned ahead. This Task studies 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. Especially results from the interdependence between the physical infrastructure of the grid - governed by momentary power requirements- and the consumer/market side - governed by energy requirements- will be interesting. As part of the study is carried out at TU Eindhoven, in close collaboration with an TCP Isgan annex, it also contributes strongly to the “top-sectors policy” of the Netherlands where industry and research collaborate.

In the 1990s and early 2000s the management of the demand side of the energy use was equal to energy savings and energy efficiency improvement. Although there has been a link with environmental problems and climate change, energy policies had also their own targets. In the coming years (and decennia) climate change will be leading for the Dutch energy policies. The management of the demand-side for energy (DSM) will be more and more be related to reduce greenhouse gas emissions and with more integration of generation and use of renewable energy and a change towards low carbon energy carriers.

NEW ZEALAND

Demand Side Management (DSM) in NZ

The issues NZ faces in its energy management that are particularly susceptible to DSM are:

1. *To reduce peaks loads seen by the electricity grid.* Without these peaks investment in natural gas generation can be curtailed and increases in load can cost effectively be met using renewable hydro, geothermal and wind (currently around 80% of generation).
2. *To shift transport fuels to electricity.* This can be done cost-effectively for the low duty cycle fleet and thereby reduce the level of fossil fuel use.
3. *To encourage weightless transport (telepresence) and better transport optimisation.* This will be more efficient and will also reduce emissions.
4. *To increase the use of biomass for thermal loads in industry.* While likely to be more expensive, in many case there is the potential to capture other benefits. This is particularly true if consumers are willing to pay more for “greener” products, e.g. food (to cite a significant NZ export).

The first and the last are potentially the more complex issues (although the impact and rapidity of arrival of the third is widely underestimated).

Since the peak electricity loads in NZ occur in winter in the morning and the evening and have a significant thermal component to them there are a number of low-cost, low-emissions ways to meet or reduce the peaks seen by the grid⁵.

⁵ PV is counter-cyclic to this load, so requires batteries to contribute, but this makes it a relative expensive source of energy.

There are only a limited number of local loads that are significant enough to warrant managing: Intra-day thermal load shifting (e.g. hot water heating, better building insulation); alternative fuel use for evening and morning heating (e.g. wood fired, low emissions heaters); greater use of time-of-day tariffs for electricity (emerging based on a reasonably efficient NZ electricity market structure); and EVs with batteries and smart charging. Only the last faces any significant cost and/or technological barriers in NZ.

Some electricity storage technologies have economies of scale so storage embedded in distribution systems (and at larger scales peer-to-peer trading) will help manage the peaks. These will be disruptive of existing business models and market structures in the NZ electricity sector that are predicated on just-in-time delivery of both energy and power quality. This is a significant DSM-related issue for NZ.

At the margin biomass for use boilers in industry and commerce can be cost-effective in NZ. However the large loads are serviced by companies with significant sunk cost, and no foreseeable carbon charge is likely to make fuel changes cost effective. However there will be opportunities to shift new investments to other fuels if the market premium is worthwhile. This however requires rethinking the nature of the market being serviced and the products being manufactured. This is a complex issue that demands consideration of the whole value chain, and isn't just limited to DSM and energy inputs. It can only be addressed from a wider perspective.

NORWAY

What does DSM mean in Norway?

Background

Norway is highly “electrified” – the share of electric energy for different end uses in the domestic, business and industry sectors is high compared to other countries. Norway’s per capita electricity consumption is second only to Iceland in Europe. The widespread use of direct electric energy for heating in the built environment is a particular characteristic of this system. This situation is a result of a historical development during the 20th century, where the development of power intensive industries based on the development of hydropower has been a central political strategy. Inexpensive and ample supply of electricity to non-industrial sectors of the society was a beneficial added effect of this strategy.

Variations in supply and demand

There are many factors affecting the balancing of supply and demand in this energy system. The available supply of energy, that is the filling level in the water reservoirs, follows an annual cycle that is dependent on precipitation. Variations in snow- and rainfall over time, and between geographical regions, represents a substantial element of uncertainty (risk) which the system must be designed to handle. Furthermore, variations in weather and temperatures during the cold seasons translates into variability in the heating demand, which adds to the more predictable variations in demand from the daily routine behaviours of households, businesses and industry. We also see a development over time whereby the load structure changes and creates new challenges for the electricity system. Electric vehicles and induction cooktops are examples of this development.

Grid challenges

In most years, the overall supply of electricity is not a major problem. The integration into a common Nordic power market and increased exchange capacity with continental Europe has relaxed this potential constraint. Instead, load variability and peaks has become the largest challenge in the development of the power system. Load peaks stress the electricity system at different levels. The Norwegian electricity system is regionalized, and regional imbalances in supply and demand are corrected by energy flows between regions. In some cases, this balancing flow between regions is restricted by the capacity in the transmission grid. In addition, local capacity limits in the distribution grid are also encountered. Increasing intermittent capacity is expected to add to this grid challenge.

There are two main strategies to deal with these grid issues. Expanding the capacity of the physical grid infrastructure is one, improving the use efficiency of the grid is the other. Both strategies are needed, however a smarter grid management may represent a large potential in terms of averted investment costs. Demand side management (DSM) is becoming an increasingly important element in the efficient management of this electricity system. In the following we give examples of how DSM may play a role in the Norwegian energy system.

The infrastructure

As a first and basic step, it has been decided to establish a basic infrastructure of smart electricity meters. This shall be completed for all electricity customers by 2019, and will form a basis for better information flows about energy consumption, more accurate billing and an improved possibility for automation of load management. The potentials of improved overall efficiency of grid management is the major potential benefit of this smart metering infrastructure.

Load pricing

The metering infrastructure will enable more flexible grid tariffs. Several “smart grid” demonstration projects are now underway, where time of use tariff structures are experimented with, along with other mechanisms to more effectively reduce or move load peaks.

Real time price information

Several technologies are emerging that will enable real time information on energy consumption and costs. Such information increases energy awareness and may trigger actions and changes in behaviour that reduce both load peaks and total energy demand.

Integration of distributed systems

Of particular interest is the development of distributed generation and local system solutions. The technical barriers to distributed generation have been lowered, and we observe increased interest in single home PV systems. There are also examples of local wind and hydropower solutions. Grid owners are increasingly facilitating these solutions through standardization of contractual terms. There is also a development toward community solutions, whereby a neighborhood or a village could coordinate generation and consumption. Parts of this coordination could take place off grid.

Energy storage

Technologies for energy storage represent potentials for evening out grid loads. These could be local solutions, such as batteries (e.g. electric vehicles) or larger scale solutions, such as pumped-storage hydro power or hydrogen based solutions. Storage is expected to become more important as the share of distributed and intermittent electricity increases.

NOVA SCOTIA

Four times DSM has united Canada Contributed by EfficiencyOne

Canada is an expansive country. Each of its ten provinces and three territories are distinct in weather, landscape and people.

We remain united by our national values and by collective challenges, like fighting climate change. What brings us together against this global Goliath is demand side management (DSM).

The ability to unite people in a common goal is one of the things DSM means to Canada and here are four examples of how it has bonded our country.

More perspectives on what Demand Side Management (DSM) means to Canada?

“Along with the IEA, CEEA believes that energy efficiency can achieve a significant amount of GHG reductions targets. DSM is the vehicle by which energy efficiency is delivered – so it is of great importance. DSM creates good customer relations and positive outcomes – reduced consumption, better economics (for the customer), and improved environmental performance. Therefore we believe that DSM will be critical to jurisdictions achieving their climate change goals. The truth is that renewables alone cannot achieve all of the objectives, and can often sacrifice reliability and performance, which may increase costs in other areas. In the end, the most affordable and reliable solution is to not consume energy in the first place.”

Elizabeth A. McDonald, President and CEO, Canadian Energy Efficiency Alliance (CEEA)

“Building comfort and capacity to address the human dimension of energy use through context specific program design results in persistent energy savings across sectors and facility types. The ultimate success of influencing energy actions is a shift in energy culture from negligent to mindful with relevant interventions. Energy decision makers require tools and practice to answer the perplexing question of how humans fit into the energy ecosystem and how to design for human behaviour.”

Kady Cowan, Environmental Scientist and Sustainability Practitioner; Acting Assistant Vice President, Office for a Healthy Environment, Carolinas HealthCare System. She designed, implemented, and evaluated an energy behaviour program for Toronto's University Health Network resulting in \$3.5M in annual savings, or 10% of system wide utilities.

1) Fighting climate change

Canada's federal government [announced](#) its plan of attack on climate change; an accelerated plan to phase out coal-fired electricity by 2030 and make Canada a leader in green energy.

Each province is tackling this with the same mission in mind – reduce greenhouse gas emissions. In Nova Scotia, the [plan](#) includes an equivalency agreement that acknowledges our success to date.

DSM has been a big part of this success. Nova Scotia is the first province in Canada to implement DSM as fuel source. It is the cheapest, cleanest solution to meet energy demands.

2) Creating more leaders

Nova Scotia knows about being a leader in Canada for green energy. It is home to Canada's first independent energy efficiency utility, Efficiency Nova Scotia, operated by [EfficiencyOne](#). This small Atlantic province has earned a reputation by taking actions – big and small – to reduce its demand.

It has experts talking and taking notice. The Pembina Institute, in a report named Race to the front: Tracking pan-Canadian climate progress and where we go from here, named Nova Scotia's work in energy efficiency as an area of excellence stating, "energy efficiency is essential to climate action across Canada – and the unique model of Efficiency NS merits broader consideration."

Larger more populated provinces, like Alberta, have also named Nova Scotia as a "model to follow." They've started the process to launch its own organization, Efficiency Alberta modeled after [Efficiency Nova Scotia](#).

When distinct provinces find a common solution to big hurdles in a race such as this, that's a powerful force.

3) Partnering companies

Since 2008, Efficiency Nova Scotia has helped more than 245,000 program participants and reduced their energy demand. They've done so by upgrading their homes and businesses with energy efficient solutions.

Much of the work has been completed by service organizations throughout the province. This partnership between Efficiency Nova Scotia and other companies is another bond built by DSM.

Nova Scotia's economy is the winner. Outsourcing energy efficiency work to field experts and professionals province-wide has created more than 1,000 full-time jobs, and contributes \$192 Million annually to Nova Scotia's economy.

These partnerships are possible because of DSM and what has worked here can work anywhere.

4) Benefitting from our investment

Implementing DSM requires some investment. Every Canadian dollar invested in energy efficient measures offers a three dollar return in electricity savings.

Efficiency Nova Scotia took a look back at the pay-off of its investments in DSM from 2011 to 2015. The research shows the investment in this province is really paying off –

program participants reduce their consumption, the utility avoids or defers infrastructure costs, and the average rate effect over the lifetime of installed measures is neutral.

For homeowners who have participated in DSM, the average pay-off in 2015 was a 12 per cent reduction in bills. The average reduction in that same year for business is 20 per cent.

The report shows program participants are the biggest benefactors. We're all united by a collective benefit of seeing a return on an investment in DSM.

SOUTH KOREA

The total final energy consumption in Korea was 213.9Mtoe, the ninth largest in the world as of 2014. Energy security is a key issue in Korea since it relies 95% of energy supply on fuel imports due to lack of domestic energy sources.

The energy intensity (energy used per unit of GDP) of the Korean economy is relatively high due to a large proportion of energy-intensive industries compared to other countries.

According to 2nd Energy Basic Plan('14~'35), Transition to Energy Policies Focused on Demand Management to achieve policy objective of 13% reduction in energy demand and 15% reduction in electricity demand by 2035. Target will be achieved by new demand side management (DSM) technologies, market schemes and stronger DSM policies in the electricity sector.

Following the adoption of the Paris Agreement and the new climate regime in 2015, South Korea has to reduce GHG emissions by 37% of the BAU (business-as-usual) level by 2030.

Corresponding to this energy conditions, the paradigm in energy policy shifts from supply side policy to demand side policy. Korea's DSM Policy is divided into 4 major sectors- industrial, building, transport, appliance.

There are a variety of programs to maintain sustainable industrial energy management Since Korea has a high proportion of energy consumption industries.

- Soft Loan & Tax Incentives – Korea has provided long-term and low interest loans for energy efficiency investment since its foundation in 1980, managing a fund worth a 500 billion KRW in 2015. Lately, KEA prioritizes funding SME to strengthen the competitiveness of SMEs. Installation of energy saving facilities, investment in GHGs and energy target management, ESCO facilities and equipment are eligible for the fund.
- Energy Service Companies, ESCO – ESCOs, Energy Service Companies are companies that invest in energy-efficiency facilities and provide maintenance services and energy management monitoring for customers. During the introduction stage of the ESCO program from 1993 to 1997, the average annual investment amounted to 3.7 billion KRW. Due to strong government aid, annual investment has been increasing since 1998. In 2015 the budget grew to 163 billion KRW.
- Energy Audit and Energy Saving Consulting – Since 2007, the government has mandated energy-intensive companies to undertake energy audit on a regular basis in order to respond to high oil prices and climate change. Every three or five years,

companies using over 2,000 toe must discover energy savings potential and take optimal measures to raise energy efficiency.

- Combined Heat and Power & District Cooling Subsidy – Combined heat and power(CHP) was adopted in 1980s as one of energy saving measures in response to the high oil price. Ever since, the CHP has been widely adopted in urban designs for systematic, efficient energy supply to metropolitan areas. The government provides subsidy to installers or designers of district cooling systems that, instead of using electricity, uses energy supplied by integrated energy supply system using absorption chillers.

The main programs to create the market for efficient buildings are building energy efficiency certification of newly built buildings, mandatory purchase of high efficiency products and LED installation for public buildings. Details are as follows.

- Building Energy Efficiency Certification – New and current buildings larger than 500m² designed to save energy are certified according to their energy performance level. New and existing buildings of all purposes are certified for 10 different grades for their energy performance, based on their performance in energy usage and carbon emission in heating, cooling, lighting, ventilation and water supply.
- Building Energy Code Compliance – Building owners who submit applications for new construction permission buildings larger than 500m², must submit the energy saving plan to the local government according to the building energy savings design codes. The building energy savings design code includes recommendations and mandatory requirements in four categories; construction, mechanics, electricity, new and renewable energy.
- Performance Evaluation of Eco-friendly Homes – Property owners who intend to build a residential housing complex with more than 30 households must follow the eco-friendly house code prescribed by the Notification of the Ministry of Land, Infrastructure and Transport, on the construction and performance standard of eco-friendly homes.
- Rational Energy Use in Public Institutions – ‘Guideline of rational energy use in public institutions’ increases awareness of energy savings by encouraging around 20,000 public institutions including ministries, local governments and public bodies in Korea to lead in energy saving practices.

South Korea is operating the several programs to accelerate Energy Efficiency in Transport.

- Vehicle Energy Efficiency Labeling and Standard – Manufacturers must disclose the driving distance per unit of fuel(l) and CO₂ emissions along with fuel efficiency level(1~5 grades), for manufactured or imported cars with a capacity of maximum 15 passengers, light and small truck excluding subtype, using fuels such as gas, diesel, LPG, electricity.
- Tire Fuel Efficiency and Labeling Program – The efficiency grade is determined by rolling resistance and wet grip. It is mandatory to attach a label for sale and production, to help consumers purchase efficient tires. Passenger car tires were mandated since 2012, and minimum efficiency standards was implemented since 2013. From 2014, tires for small trucks are covered by the program.

- Electric Vehicle Battery Lease – The government provides support to battery lessors to purchase batteries for electric cars. Lease companies, bus and taxi companies can save initial investment cost by paying for just the vehicles without batteries, since battery lessors provide maintenance and charging services.

Korea will raise the standards of regulation and management of the energy efficiency program, and set a mid to long term road map for better diffusion of high efficiency equipments such as LED lighting and high efficiency inverters. For Adding vitality to the Energy Efficiency Market, We are operating several programs.

- Energy Efficiency Resource Market Pilot Program – In this program, participants replace their existing equipment with high-efficiency ones and gain compensation if they succeed in shaving off the target reduction during peak load. The program's approach is new in that the compensation is determined by market competition and that M&V is performed using Information and Communication Technology (ICT). ESCOs, DSM companies etc. can apply for the program by replacing equipment that can continuously reduce the peak demand over the life cycle without additional control, during the peak demand period, 2 to 6 p.m. from July to September. LED and inverter have to reduce at least 10kW respectively in order to participate. EER providers must participate within the determined bidding range of each item. Winning bids will be selected on KRW/kW ranking up to the each item's available budget. Although the cleared project should be compensated based upon the actual measurement, considering receptivity to such new pilot program and initial difficulties of M&V, 50% of subsidy is provided after the installation and the rest 50% after the post-installation M&V. But if providers install M&V before joining this Pilot Program, 60% of subsidy is provided after the installation and the rest 40% after the post-installation M&V.
- 3 Major Appliance Efficiency Programs – To boost the market, We are operating Energy Efficiency Labeling and Standard, e-Standby Power, High-efficiency Appliances Certification. Through this programs, South Korea has been raising the standard of energy efficiency.

SWEDEN

What is DSM in Sweden?

Within TCP DSM Sweden is currently participating in several tasks in order to learn from other countries and co-produce knowledge within this important field.

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

Sweden participates in Task 17 through Dr Lars Nordström, professor in Information Systems for Power System Management at the Royal Institute of Technology together with an innovative start-up company Expektra that develops prediction solutions for balancing the power supply and demand.

Task 24 Phase II: Behaviour Change in DSM – Helping the Behaviour Changers

The Swedish Energy Agency participates in Task 24 engaging internal expertise and the networks of companies and decision-makers in the area of energy efficient build-

ing management and renovations. The scope of the Swedish case within the Task are “green lease” rental agreements in the commercial sector.

Task 25: Business models for a more effective market uptake of energy efficiency energy services for SMEs and communities

National expert from Sweden to Task 25 is Lotta Bångens, an energy consultant and managing director of the network organisation for private companies within the energy efficiency field, Energieffektiviseringsföretagen. Within the task Lotta is working with several interesting Swedish companies, from start-ups to the more established ones.

DSM Day in Stockholm

Defining DSM beyond the literal user-end efficiency and flexibility of energy use is a creative task. Throughout the years of the Swedish involvement in the DSM TCP the area has evolved and broadened to an exciting multidisciplinary field. We at the Swedish Energy Agency had a chance to ask ourselves what DSM actually means for us in Sweden when hosting the 47th Executive Committee meeting and arranging a DSM Day in connection to the meeting in March 2016.

DSM, having the users – both as groups and individuals – at its core, is a multidisciplinary field that connects ICT, machine learning, behaviour change, social organisation, design and engineering. It is also a multi-sector area, where academia is closely related to both established companies and innovation-oriented start-up businesses. At the DSM Day we invited researchers, entrepreneurs and practitioners who do interesting work within the different aspects of DSM in Sweden to share their knowledge with each other and the international audience as well as to learn from the work done in the DSM Tasks.

Looking at the strong sides of the Swedish DSM community, three main topic areas were developed during the DSM Day: visualisation and interpretation of energy use, energy demand flexibility and big data applications.

Visualisation and interpretation of energy use

Visualizing and explaining energy use has been shown to stimulate more energy efficient behaviour. Interactive displays have begun to move out in public environments and in to the private homes. But the effects on behaviour have been shown to vary between different types of feedback and decrease over time. This topic area investigates the different ways of how design and ICT can be used in order to ease the understanding of energy use in homes, public spaces and organisations and stimulate a more energy efficient behaviour. Research can help understanding how people interpret energy and relate to activities around energy use, putting energy use into its actual context of everyday routines and activities. This understanding can in turn facilitate better policy decisions and technology choices.

Energy Demand Flexibility

Demand Flexibility or “Flexiwatts” refer to growing ability, through the use of a variety of technologies to determine precisely when during the day the use of energy is most optimal. It is a way to save money and fuel by shifting load away from peak periods, reduce transmission losses and balance renewable sources such as wind and solar power with predictably variable output, in order to keep the energy system running smoothly. One of the challenges within this topic area is that various losses and gains

from the flexible energy use occur in different parts of the system, which often means that they are not properly aligned with the various actors' costs, needs and incentives. This alignment of gains and losses is necessary in order to achieve optimal solutions on the system level.

Big data applications

Big data is big in Sweden and there are many ways companies outside of the energy field work with big data solutions to understand their users and make better system decisions. This topic area covered state of the art in big data analysis and how we could use big data to contribute to a sustainable energy system. The ICT development in the recent decades resulted in tremendous growth in the calculation capacity and the spreading of digital sensors in our most common appliances gives totally new possibilities for identifying, using and creating energy data beyond what smart energy meters can provide us with. So far several Swedish start-ups are exploring big data applications for smart energy meters on the household and appliance levels. At the DSM Day we have however been inspired by the well-known Swedish company Spotify that shared some insights into their methods and processes of working with millions of their end-users directly and continuously, among others through tests and experimentation.

Policy agreements on Energy in 2016

2016 was an exciting year for the Swedish energy policy as the government reached a broad parliamentary agreement on Sweden's long-term energy policy⁶. The agreement consists of a common road map for a controlled transition to an entirely renewable electricity system, with a target of 100 per cent renewable electricity production by 2040.

Pillars in Sweden's energy policy are the same as in the energy cooperation in the EU. The policy aims to combine ecological sustainability, competitiveness and security of supply.

The following targets have been adopted:

- By 2045, Sweden is to have no net emissions of greenhouse gases into the atmosphere and should thereafter achieve negative emissions.
- By 2040 Sweden should have 100 per cent renewable electricity production. This target does not, however, stipulate decommissioning of nuclear power by political means or set a deadline for nuclear power in Sweden.

These ambitious targets are outlining a number of challenges that are addressed in the common road map. The two most important areas identified are a continued expansion of renewable energy in its various forms and more efficient energy use.

Sweden has fantastic conditions for renewable electricity production, and it is reasonable to expect that Sweden can be a net electricity exporter in the longer term. Effective use of existing hydropower and bioenergy, for example, could help increase the power output. A competitive district heating sector and reduced use of electricity for heating are prerequisites if we are to be able to deliver renewable electricity and warmth on cold winter days.

⁶ Framework agreement between the Swedish Social Democratic Party, the Moderate Party, the Swedish Green Party, the Centre Party and the Christian Democrats, Swedish Government Offices, 2016 <http://www.government.se/49d8c1/contentassets/8239ed8e9517442580aac9bcb00197cc/ek-ok-eng.pdf>

Energy efficiency is particularly important to tackle the future challenges facing the Swedish electricity system. Measures for effective demand flexibility, meaning that customers can participate fully in the electricity market, are planned to be implemented as well as investigation of different policy instruments that can promote energy efficiency.

In 2016 the Swedish government has suggested the following energy efficiency goals for Sweden until 2030⁷ (the goals are to be adopted during 2017):

- By 2030 Sweden should have a 50% more efficient energy use compared to 2005. This reduction should be measured as energy supplied relative GDP.
- The Swedish Energy Agency should in collaboration with the different branches develop sector specific strategies for energy efficiency.

The sector specific goals will therefore not be set politically but in cooperation with the industries. The goal of a 50% more efficient energy use is very ambitious and will require policy and implementation coordination on both national and EU levels.

Research and Innovation

Research and innovation in the energy field aims at contributing to the achievement of the climate and energy policy targets as well as promoting economic growth and export. Energy research will continue having a crucial role in ensuring that new, innovative technological solutions emerge for all types of renewable energy. At the same time there is a growing appreciation for the complexity of the energy transition that is required to achieve sustainable development goals both nationally and globally. Therefore, the interdisciplinary and user-oriented research done within the DSM field is getting ever more relevant and important, something we see in the recent R&I policy development.

The Swedish Energy Agency is responsible for the National Energy Research program and finances R&D and innovation projects with an annual budget of approximately 1.3 billion Swedish crowns (~152 million USD). The latest governmental directive on Energy Research and Innovation spanning over 2017–2020 has been launched in December 2016 and opens for a gradual increase in national energy R&I spending with 20% towards 2020. To sum up, the directive stipulates that:

- Energy R&I plays an important role in contributing to climate change mitigation.
- The development needed to achieve climate and energy targets is system-oriented and complex and should be supported by interdisciplinary and cross-sectorial R&I activities. The increased R&I budget is motivated by the willingness to put more effort in areas such as circular and bio-based economy as well as the energy and transport related aspects of sustainable societies.
- Energy R&I should enable possibilities for economic growth and exports of Swedish energy technologies.
- Sweden should take an active part in international work both in R&I activities (as within the for example TCPs, ERA NET etc.) as well as in strategic work on international road maps.
- It is important to keep working on a more equitable energy system and the aspects of gender equality are mentioned as a particularly important area.

⁷ Swedish Government Offices, 2016 (in Swedish)
<http://www.regeringen.se/regeringens-politik/energi/energieffektivisering/mal-for-energieffektivisering/>

We at the Swedish Energy Agency hope that this new directive will open even more doors for the type of topics and approaches that DSM stands for and are looking forward to further developing the DSM TCP cooperation together with our colleagues.

SWITZERLAND

What does DSM mean in Switzerland?

Being part of IEA DSM TCP is important for Switzerland. The TCP is a good platform to exchange, discuss and develop DSM topics further. As written in the Logo and the welcome page of IEA DSM the TCP covers not only classical DSM topics such as load management but also energy efficiency topics in a wider range. These are essential topics within the Swiss energy strategy 2050. After the severe nuclear accident in Fukushima, Japan in 2011, the Swiss government decided not to replace the existing nuclear power plants when they reach the end of their operational lifespan. Therefore, the government established a new energy strategy 2050 with energy efficiency and renewable energies as the main pillars.

The current types of Demand-side Management – such as load management to decrease electricity consumption at peak hours by shifting consumption to off-peak hours or even better: reducing the consumption overall – has been a core business for utilities and grid operators for a long time and will even increase in the near future. E.g. distribution grid operators shift larger loads on the consumer level into night hours, relieving the grid from load peaks during the day. This, in effect, reduces the need for load driven grid expansion and allows more efficient planning and operation of distribution grids.⁸ There are no exact figures publicly available to display the size of these interventions but it is clear that grid operators will face more challenges while phasing out nuclear power and load management will significantly gain importance. The growing share of decentralized renewable energy sources demands more flexible systems and possibilities to manage the demand-side in order to match the increasing stochastic supply-side. Smart grid and smart meter are buzzwords in this respect. The roll-out of smart meters is in progress in different parts of Switzerland and studies showed that smart meters could shift around 10% of peak load for one hour in Switzerland. However, as long as the Swiss electricity market is not fully liberalized and time-related price differentiations are not implemented, smart meters have only little influence in terms of load shifting.

Beside the shift of the power supply from large, centralized plants with base-load production to smaller, decentralized renewable energy power plants with stochastic production, the phase out of nuclear power will increase imports from neighboring countries to fill the gap. Further, the Swiss pump storage hydro plants will play an important role in Europe to store some of the electricity produced by renewable sources. All these changes and e.g. also the growing share of electrical vehicles will increase the grid load and lead to DSM challenges that need to be solved. Switzerland developed a smart grid road map and an electric grid strategy to be prepared for the upcoming tasks to guarantee a secure, efficient and reliable system and grid operation. In addition, Switzerland will profit from the exchange with highly qualified international experts in the different IEA DSM TCP tasks to solve the upcoming challenges.

⁸ Task 17 investigates more on this topic.

The DSM TCP is also essential for Switzerland to exchange knowledge in terms of improving energy efficiency. For example, the participation in Task 16 helps to initiate an energy performance contracting market in Switzerland. The potential of energy efficiency (and DSM) is globally very high and it is not only environmental friendlier but in most cases also cheaper than the expansion of the production and grids. Energy efficiency is therefore the core pillar of the Swiss energy strategy 2050. IEA DSM TCP gives the opportunity to learn from other countries' successes and failures in order to implement effective and environmentally reasonable measures. This improves energy efficiency and leads to a secure energy supply.

UNITED KINGDOM

What DSM means in the UK

1. Current Policy Landscape

In June 2016, the UK voted to leave the European Union (EU) and this led to a new Prime Minister and Cabinet. In July 2016, the Department of Energy and Climate Change (DECC) and the Department of Business, Innovation and Skills (BIS) merged to form a new department, the Department for Business, Energy and Industrial Strategy (BEIS). BEIS leads on the UK's energy and climate policies and has the following objectives:

- Deliver an ambitious Industrial Strategy
- Maximise investment opportunities and bolster UK interests
- Promote competitive markets and responsible business practices
- Ensure the UK has a reliable, low cost and clean energy system

The UK remains committed to meeting its target of an 80% reduction in CO₂ emissions on 1990 levels by 2050, and five-year carbon budgets have been set to meet this target.

2. Definitions

BEIS uses the following definition of DSM (from Warren, 2015), which includes all demand-side activities and excludes activities undertaken at the distribution, transmission or generation level:

“Demand-side management (DSM) refers to technologies, actions and programmes on the demand-side of energy meters, as implemented by governments, utilities, third parties or consumers, to manage or decrease energy consumption through energy efficiency, energy conservation, demand response or on-site generation and storage, in order to reduce total energy system expenditures or to contribute to the achievement of policy objectives, such as emissions reduction, balancing supply and demand or reducing consumer energy bills.”

3. Current DSM Policies

The UK currently has the following DSM policies in place:

- Energy efficiency supplier obligations (have occurred since 1994)
- Energy innovation programmes (some focussed on smart energy, demand-side response, energy storage, vehicle-to-grid and flexibility markets)

- Energy performance standards in-line with EU Directives
- Labelling programmes in-line with EU Directives
- Renewable Heat Incentive (feed-in tariffs for low carbon heating systems in the domestic and small non-domestic sectors)
- Feed-in tariffs (feed-in tariffs for low carbon electricity generation technologies in the domestic sector)

4. Current DSM Interests

The UK is currently developing DSM policies in the following areas:

- Smart energy (covering demand-side response, smart appliances, energy storage and markets)
- Boiler regulations (covering boiler efficiency standards and heating controls)
- Fuel poverty-focussed energy efficiency supplier obligation
- Decarbonising heat
- Improving the evidence base for DSM (covering smart energy, buildings, heat, business models, big data and behavioural programmes)

UNITED STATES

What does DSM mean for the United States

Demand side management (DSM) in the U.S. refers to activities, traditionally by electric utilities, designed to encourage consumers to modify their level and pattern of electricity usage. The term DSM is still used somewhat in the U.S., but much less than its more popular use in the last two decades of the last century. Instead, DSM activities are now broken down into the two categories of energy efficiency and demand response, though as described later, these two separate categories are merging together with a range of other customer-facing services.

Both of the energy efficiency and demand response categories continue to see substantial and sustained growth in the U.S. for a number of reasons.

For energy efficiency, policies—such as state energy efficiency resource standards as well as building energy codes, appliance and equipment standards and labeling, and targeted incentives—have played a significant role in slowing the growth of electricity consumption. Advances in technology and the continued growth of the broader energy efficiency and energy management industry have also played important roles in achieving significant levels of savings.

A measure of available demand response is the deployed potential peak reduction capability, both deployed at the retail level, and as well available in regions with organized (RTO/ISO) wholesale markets. Both show continued growth. National retail demand response capability increased 15 percent in the last reported year of 2014 to a total of 31 GW⁹ (total U.S. 2014 electric power sector installed generating capacity was 1,037

⁹ Federal Energy Regulatory Commission, "Assessment of Demand Response and Advanced Metering", Annual Report, p. 14, <https://www.ferc.gov/legal/staff-reports/2016/DR-AM-Report2016.pdf> Note that installed retail (and wholesale) demand response potential varies significantly by region, as shown on p. 14 and p. 17.

GW). Wholesale demand response available in RTO/ISO wholesale markets grew in 2015 to 31 GW, which is 6.6 percent of total peak demand for those six regions.¹⁰ A favorable 2016 ruling by the U.S. Supreme Court upholding a Federal Energy Regulatory Commission rule on wholesale demand response is expected to spur further increases in wholesale demand response.

Much of the increasing electricity savings and demand response opportunities being unlocked by new technologies are from the digitization of end-use devices and the build-out of layers of communications infrastructure to allow them to both communicate their state and be controlled. Some of this information and communications infrastructure is being installed as part of the electric industry trend of grid modernization, which includes the now-less-used term of the “smart grid”. Smart meters are now installed in 65 percent of U.S. households¹¹, though much of their potential uses for DSM are still to be developed and deployed, providing many future opportunities.

The information and communications revolution now fully occurring in the U.S. electricity system is causing new terms and concepts for DSM to be used. These terms and concepts include “grid modernization”, “engaging with the customer”, “end-use solutions”, “data analytics,” “customer-focused energy solutions”, “grid of the future”, “utilities as orchestra conductors”, “customer engagement” and more.¹²

These terms and concepts indicate that DSM is blending with many other aspects of electricity. Traditionally, electric utilities had separate departments dedicated to energy efficiency and demand response. Now, many have organized their staffs to work out of “customer solutions” or similar named departments. More broadly, states (for the utilities they regulate) and utilities themselves are exploring new distribution utility business models, while the non-utility private sector continues to develop new products and services for electricity consumers. In the past decade, the electricity industry has seen a large increase in the number of businesses focused on providing electricity-related products and services outside of traditional utility business models, many in DSM. These businesses have found opportunities to provide value to customers through innovative technologies, novel business models, and state and federal policy decisions. These new businesses are changing the role of some electricity ratepayers from passive consumers of electricity to informed shoppers and producers of electricity and related end-use services.¹³ Many of these services are enabled by the recent widespread adoption of advanced electricity metering and communication systems that provide ratepayers with unprecedented levels of information regarding their own energy consumption patterns.

¹⁰ Ibid, p. 17.

¹¹ Edison Foundation Institute for Electric Innovation, “Electric Company Smart Meter Deployments: Foundation for a Smart Grid”, p. 1, <http://www.edisonfoundation.net/iei/publications/Documents/Final%20Electric%20Company%20Smart%20Meter%20Deployments-%20Foundation%20for%20A%20Smart%20Energy%20Grid.pdf>

¹² Much insight on these evolving DSM-related concepts and terms, and more importantly their implementation by utilities and other businesses offering services, can be obtained by reading the three volume set of “Key Trends Driving Change in the Electric Power Industry”, available at <http://www.edisonfoundation.net/iei/publications/Pages/publications.aspx?category=Book>

¹³ It is important to note that many, perhaps most, electricity customers are not interested in new services, including those that are DSM-related, but instead continue to desire simple delivery of reliable and affordable electricity. Ensuring equity between these and other more involved electricity customers can be a challenge for electricity regulators and policymakers.

Many non-utility businesses are now offering distributed generation, end-use energy services, and aggregated demand. Aggregators are playing a growing role in this customer-centric view of load. Aggregation involves grouping distinct end-users in an electricity system (including traditional consumers, consumers that produce power for grid use, third party onsite producers, energy service companies, competitive retailers) to act as a single entity providing a service to utilities under a contract, or to organized wholesale electricity markets operated by ISOs/RTOs through participation in resource auctions. In short, aggregators are enterprises that orchestrate and manage the offerings of aggregations functioning as a single entity. Value realized through aggregation transactions is typically shared between aggregators and their clients.

The revolution that is ongoing is fast paced, noted by Lisa Wood, executive director of the U.S. investor-owned industry's Institute for Electric Innovation: "Much of what was wishful thinking just a few years ago is being realized today."¹⁴

Further describing the many changes underway, a national examination of the U.S. electricity system released in January 2017 gives these DSM-related findings¹⁵:

- Advanced meter infrastructure has had a profound impact on the nature of interactions between the electricity consumer and the electric system, allowing two-way flow of both electricity and information and enabling the integration of assets behind the meter into the larger electric grid.
- Evolving consumer preferences for electricity services are creating new opportunities.
- The convergence of the electric grid with information and communications technology creates a platform for value creation and the provision of new services beyond energy.
- Mobile, internet-connected devices foster new ways of consumer engagement, as well as enable consumers to have more efficient and real-time management of their behind-the-meter assets.
- Development of standards for interconnection and device interoperability are critical requirements for seamless integration of grid-connected devices, appliances, and building energy management systems, without which grid modernization and further energy efficiency gains may be hindered.
- Currently, about 90 percent of residential, 60 percent of commercial and 20 percent of industrial electricity consumption is used in appliances and equipment that are subject to national minimum efficiency standards implemented, and periodically updated. National energy efficiency standards completed since 1987 are expected to save 70 quads of energy by 2020, more than all the energy used by all U.S. buildings in one year.
- Miscellaneous electric loads, devices that are often not well addressed by minimum efficiency standards, labeling and other initiatives, are expected to represent an increasing share of total electricity demand, particularly for the residential and commercial sectors.

¹⁴ p. 4, http://www.edisonfoundation.net/iei/publications/Documents/Key_Trends_Driving_Change_Volume_III_FINAL.pdf

¹⁵ Quadrennial Energy Review Task Force, "Quadrennial Energy Review, Second Installment: An Integrated Study of the Electricity System", Chapter 2, <https://www.energy.gov/epsa/quadrennial-energy-review-second-installment>

- There is enormous potential for more electric end-use efficiency improvement based on (1) technical analyses, and (2) the differences in energy efficiency performance between states and utilities with and without ambitious electric end-use efficiency policies and programs.
- Connected devices and Energy Management Control Systems (EMCS) are decreasing in cost and improving in functionality, although their market penetration is still low, particularly in residences and small to medium-sized commercial buildings. These new technologies and systems, and the broader 'Internet of Things,' provide a wide range of options for consumers to manage their energy use, either passively using automated controls, or through active monitoring and adjustment of key systems.
- EMCS with communication capabilities are increasing opportunities for demand response services in support of grid operations. Third-party aggregators and other business models are facilitating the expanded use of demand response.

In conclusion, what DSM means in the U.S. continues to evolve, with that evolution now occurring at a fast pace.

CHAPTER III

DSM University 2014–2016

Since 2014, IEADSM has partnership with European Copper Institute to develop the IEA DSM University (or DSMU – <http://www.ieadsm.org/dsm-university/>). According to plan, we have organized monthly webinars with speakers both from within our DSM TCP and from companies and organisations with interest in energy efficiency. In total there has been 28 webinars till the end of 2016. Over the past 3 years, DSMU has evolved into a community of practice through which DSM practitioners meet on a monthly basis. So far, DSMU has engaged over 2,300 professionals.

Webinar #	Lecturer	Task
5	Vreuls	1. Evaluation
10	Nilsson	3. Procurement
3	Crossley	15. Networks
1 + 18	Bleyl	16. ESCO
16	Kamphuis + Stifter	17. Integration
(15)	(Boerakker)	19. Micro DR
22	Vreuls	21. Calculations
4	Crossley	22. EE Obligations
15	Boerakker	23. Customers and smart grids
9 + 13	Mourik	24. Behaviour
17	Mourik	25. Business Modells
11 + 23	Campbell Cooremans	(26). Multiple Benefits
27	Nilsson	Compilation and outlook
<i>Total: 15 webinars</i>	<i>Total: 11 persons</i>	<i>Total: 12 Tasks</i>

Table 1: IEA DSM Internal material and presentations (yellow are completed tasks and orange prepare task)

There has also been 13 webinars with lecturers from outside the IEA DSM TCP and representing both the organisations, companies and other TCPs. The mixing of lectures allow to build interest and alliances with other interested parties but also bring in different views on the subject of DSM.

Webinar #	Lecturer and organisation	Subject
2	Maretta ISGAN	DSM and ISGAN
6	Jones, Alstom	Renewables and integration
7	Cooremans Geneva	Efficiency in Industry
8	Mallaburn UCL (eceee)	Energy Audits
12	Wene (IEA)	Learning Curves
14	Thollander Linköping	Efficiency in SMEs
19	Lebot IPEEC	Labelling
20	Karg S3C	Smart Energy and customers
21	Kusheler ACEEE	Utility Sector EE in US
24	Lebot and Lagarde IPEEC	EE in G20
25	Bayer and Lees RAP	EEO a Toolkit
26	Stenqvist EvalPart	Energy Intensive industries
28	Bryant IEA	Market report 2016

Table 2: External lectures in IEA DSMU webinars

The DSM University is a joint activity run between the IEA DSM-Programme (TCP) and Leonardo ENERGY where Leonardo ENERGY is also responsible for the administration and technological support for the webinars and also markets these together with eceee, who gives access to their database of recipients of information.

The webinars have an audience and it is an impressive one! On the average there is above 200 registered to participate for each webinar. People from several time zones on the earth are registering – from China to California – that is 17 zones. Normally we have more than 50 countries registered.

All webinars are recorded and it seems as both people who have registered, but not had the opportunity to listen, and people who are interested later are using the recordings that can be found on YouTube (<https://www.youtube.com/playlist?list=PLUFRNkTrB5O823sA-GZfO3x3BcaQd3jis>). The downloading is almost equal to the registered participants.

Secondly we have the substance in the Leonardo-pages (<http://www.leonardo-energy.org/resources/29/example-topic-4-577b76c83e0b8>) where all webinars are described in short, all presentation slides can be downloaded and in most cases there is additional reading material available to download for further studies.

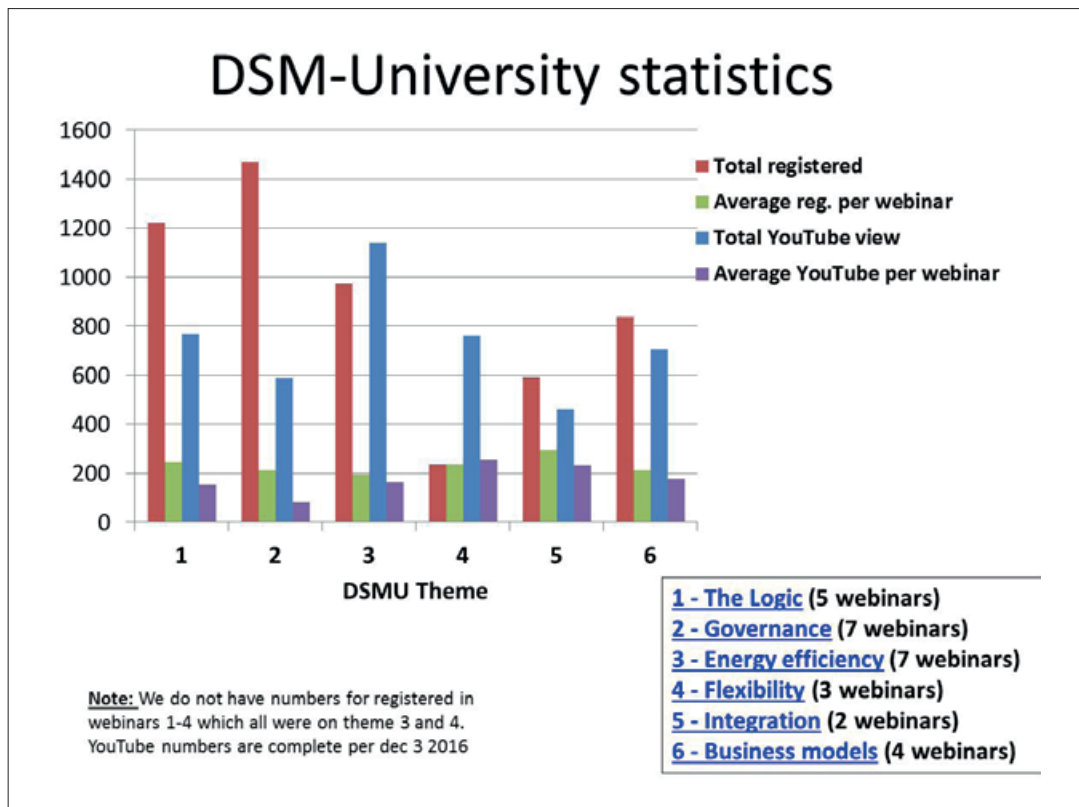


Figure 1: Registered to participate and You Tube views

This year we extensively discussed collaboration with other TCP's and the IEA secretariat. As they too are thinking about extending their outreach, and in some cases even have webinars on a smaller scale, we will act to combine the efforts.

Task 16

'Innovative Energy Services'

Phase IV. Life-Cycle Costing; 'Deep Retrofit'; Simplified M&V; Crowd-Financing & Energy Services Taxonomy.

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

Summary

In Task 16 "Innovative Energy Services", energy service experts from countries around the world join forces to advance know how, experience exchange and market development of (mainly performance-based) energy services. We view energy services as a 'delivery mechanism' in order to implement energy efficiency and renewable energy projects in the context of energy policy and climate change goals.

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 key publications like 'Simplified Measurement & Verification' of energy savings, Demand Response Services: Economic Pre-Feasibility Model and Case Studies for Austria, the 'Facilitator' concept, Comprehensive Refurbishment ('Deep Retrofit') business models or the 'Integrated Energy-Contracting' business model.

Task 16 is active since July 2006. Phase IV "Life-Cycle Cost; 'Deep Retrofit'; Simplified M&V; (Crowd)-Financing & ES Taxonomy" started in July 2015 and will end in June 2018.

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 to the ExCo.

Participating countries in Task 16, Phase IV are: Belgium (since July 2016), Nova Scotia, Canada (in kind); Germany (in kind cooperation with Annex 61 (Deep Retrofit); GIZ (until April 2016); The Netherlands; Norway; Switzerland (in alphabetical order, as of December 2016).

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 mechanism' for energy policy goals

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 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.

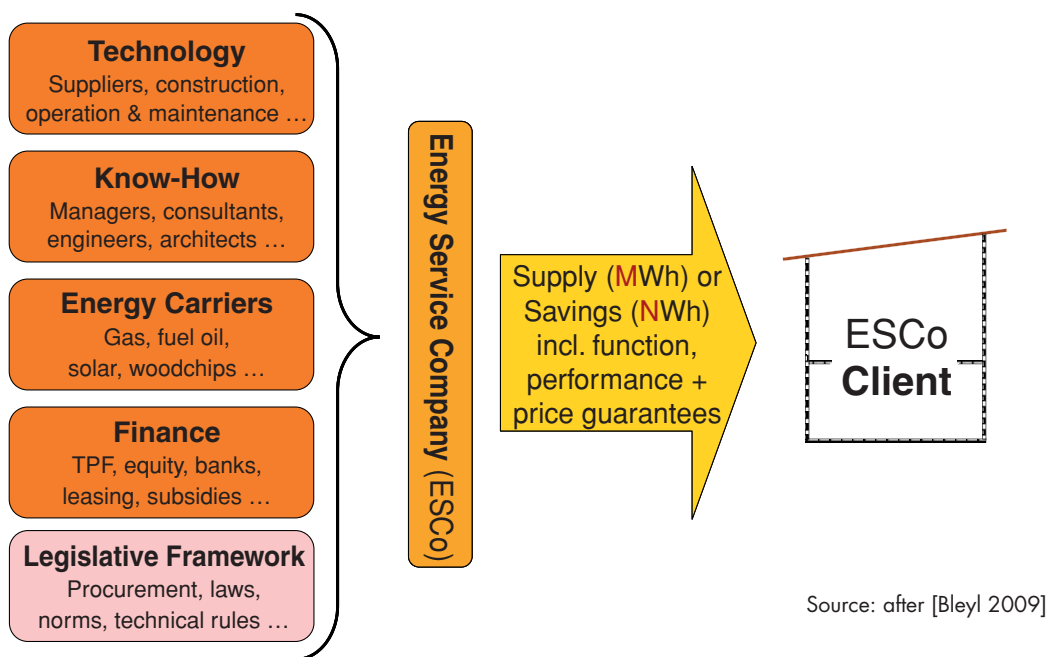


Figure 1: What is Energy-Contracting/ESCO?
An integrated service package with output and performance guarantees for the client

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 contribute to know how, experience exchange as well as 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 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 consultancy services (e.g. workshops, coaching, trainings ...) and to contribute to the "DSM University"

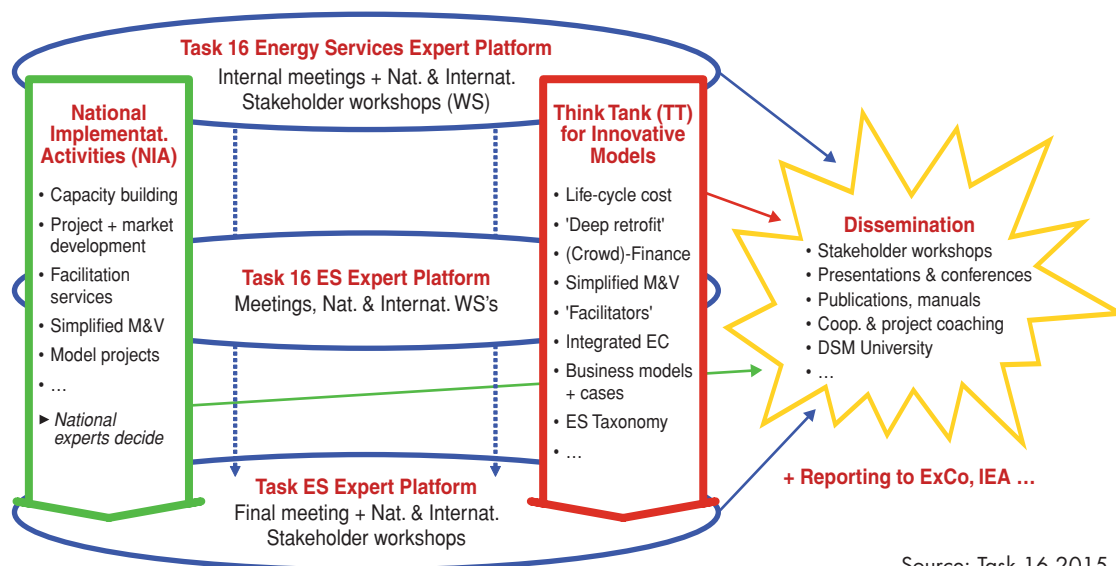
The underlying goal is to increase understanding of performance-based ES as a 'delivery mechanism' to implement energy efficiency policy goals and projects: Pros and cons, potentials, limitations and added values of ESCo products in comparison to in-house implementation.

Structure of the work and subtasks

Task 16 Phase IV continues to work with its well-established structure. The four operational subtasks are:

1. IEA DSM Energy Services Expert Platform (ES-Platform, subtask 19)
2. Innovative Energy Services Think Tank (TT, subtask 20)
3. Support and coaching of individual National Implementing Activities (NIAs, subtask 21)
4. Dissemination and cooperation (subtask 22)

The following scheme illustrates the general structure of the task extension:



Source: Task 16 2015

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

In the left pillar, the 'National Implementing Activities' (NIAs) such as capacity building or project and market development activities take place according to the individual needs and resources of the participating country.

The Think Tank is the common research platform with key publications like 'Simplified Measurement & Verification' of energy savings, the 'Facilitator' concept, Comprehensive Refurbishment ('Deep Retrofit') business models, Demand Response Services: Economic Pre-Feasibility Model and Case Studies for Austria or the 'Integrated Energy-Contracting' business model. Current topics are Life-cycle cost appraisals, (Crowd)-Finance, Simplified M&V (continued) and ES Taxonomy.

The IEA DSM Energy Services Expert Platform (ES platform) serves as the link between the two pillars and is our internal as well as external communication hub. The results of Task 16 are disseminated in a series of stakeholder workshops, presentations at conferences or workshops and through publications. Furthermore, we co-operate with other national and international projects and organizations.

Think Tank key results in 2016

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 still work in progress. The following subchapters provide abstracts and outlines of current Think Tank topics. If you have questions or remarks to any of these topics of Task 16 work, your feedback is welcome. You can reach the authors at EnergeticSolutions@email.de, attention to Jan W. Bleyl.

Deep Energy Retrofits: Using Dynamic Cash Flow Analysis and Multiple Benefits to convince investors

Task 16 Phase IV has a focus on Life Cycle Cost Benefit Analyses (LCCBA) and Deep Energy Retrofit of buildings. Task 16 has submitted an abstract to ECEEE Summer Study 2017 titled Deep Energy Retrofits: Using Dynamic Cash Flow Analysis and Multiple Benefits to Convince Investors, which was accepted for submission of a full paper. Task 16 is expecting contributions to this paper from all participating countries. This is the abstract:

Deep energy retrofit (DER) of the existing building stock is a necessary, but largely undeveloped strategy to significantly reduce fossil fuel consumption. In Europe, the annual investment in DER required to increase renovation rates to 3%/a is estimated at hundreds of billions EUR/a. This amount cannot be financed from public sectors alone, but will require substantial private sector engagement. For this paper we examined the economic and financial implications of a DER project from the perspectives of investors and financing institutes. We also analyzed how Multiple Benefits (MB) could make the business case more attractive and considered implications for policy makers.

A dynamic Life Cycle Cost & Benefit Analysis (LCCBA) and an appraisal of debt and equity-financing implications was applied to model cash flows of a building renovated to the Passive House standard. MB analyses included the spheres of micro- and macro-economics, social welfare and environment. A multi-parameter sensitivity analysis was performed to analyze impacts of input parameter deviations and to determine threshold values for MB contributions.

The project cash flow had a 20-year dynamic payback and an IRR of 3-4% over a 30-year period. The Loan Life Cover Ratio was 1,3; Levelized Cost of Heat Savings were 96-102 EUR/MWh. Tangible MBs identified were increased comfort, productivity, air quality, building value, fewer sick leaves and corporate governance image. Furthermore asbestos removal, job creation, reduced fossil fuel import and CO₂-emissions were factored into the business case.

Our results show that dynamic LCCBA modeling combined with MB analysis display the advantages of investments into DER and provide solid grounds for further analyses and to convince potential investors to finance such projects as well as to identify strategic allies. Furthermore, the method supports policy makers in their decision-making process to develop new policy measures in order to achieve their 2050 goals.

The full paper is currently in the writing and foreseen to be published at ECEEE Summer Studies in June 2017.

Simplified Measurement and Verification Using Quality Assurance Instruments: A Proposed Concept for Energy, Water and CO₂-Saving Projects

Following up on our previous work on “simplified M&V and quality assurance instruments”¹, Task 16 has refined the concept and prepared a submission for an academic journal paper. Co-authors are Mark Robertson and Sarah Mitchel from EfficiencyOne, Nova Scotia. Subsequently the abstract:

Measurement and Verification (M&V) is a prerequisite to assess the performance of energy, water or CO₂-saving measures, and to translate these into cash flows for reporting, financing or other purposes. This conceptual paper outlines the fundamentals of M&V, as well as project-based M&V approaches and formulae.

In practice, M&V is often complicated or hindered by limited data availability or accuracy, and limited comparability between ‘Baseline’ and ‘Reporting’ periods. Often, there is no clear M&V plan in place, or resources are limited to enact it. If conducted, understanding M&V reports requires expertise, which is not necessarily available to stakeholders.

This paper proposes simplified M&V approaches for individual saving measures in combination with Quality Assurance Instruments (QAI). QAIs shall verify the functionality and quality of energy conservation measures, but not necessarily their exact quantitative outcome over an entire project cycle. Simplified M&V can be a solution and feasible compromise between no M&V at all and the effort and perceived accuracy of a full scale M&V approach, in particular for in-house implementation, projects supported through energy efficiency or Demand Side Management programs, or smaller performance contracting projects.

Our first attempt submitted to the Renewable & Sustainable Energy Reviews journal was not successful, mainly due to our inapt journal selection (“more original research and assessment and not a review” as we have learned from the peer review). The author team is currently reviewing energy journals to identify a better suitable journal for publication.

¹ Bleyl et al. *Simplified measurement & verification + quality assurance instruments for energy, water and CO₂ savings. Methodologies and examples in ECEEE Summer Studies*, paper ID # 1-088-14, Arnheim, The Netherlands, June 2014.

Crowdfunding for Energy Efficiency. Can Debt or Equity Crowdfunding contribute to scaling up Energy Efficiency in Developing Countries

Crowdfunding (CF) for Energy Efficiency (CF4EE) is a new concept. Generally, CF as a new financing resource has grown exponentially over the last 5 years, offering advantages over existing financial instruments in several areas, including: (i) Tapping into new funding sources, such as small investors with risk appetite for venture capital and small impact investors, (ii) Empowering responsible investors seeking greater control over their investments, (iii) Encouraging investors to increase their risk tolerance by offering greater diversification and smaller amounts per investor, and (iv) Increase speed of decision and transaction processing, through standardized online processes.

This pre-feasibility study is a first effort to explore the potential of CF for financing cost-effective energy efficiency measures in developing countries, in particular in situations where lack of affordable financing is a main barrier to scaling up energy efficiency measures. The following research questions were addressed: Can Crowd-Financing contribute to solve financing bottlenecks for EE and RE projects? E.g. through access to equity or (cheaper) debt financing? In particular for smaller projects in SME and communities in developing countries? Can it reduce risks and transaction cost? The analyses is based on detailed LCCBA modeling of 2 cases studies.

The analyses was conducted on behalf of German Development Cooperation GIZ and in cooperation with KRITTER Advisory Services. The full report (published by GIZ) can be downloaded from www.ieadsm.org => Task 16.

Think Tank activities planned for 2017

For 2017, the following Think Tank activities are planned:

- Our first activity of the next year is a draft of our joint paper Deep Energy Retrofits: Using Dynamic Cash Flow Analysis and Multiple Benefits to Convince Investors. It will be peer-reviewed and is planned for publication at ECEEE Summer Study 2017. For this publication, Task 16 is expecting contributions from all participating countries.
- Preparation of a book contribution on Life Cycle Cost Benefit Analyses (LCCBA) of a 'Deep Retrofit' case study in cooperation with IEA ECB Annex 61.
- During first half of 2017, we will also resume our work on Simplified Measurement and Verification Using Quality Assurance Instruments: A Proposed Concept for Energy, Water and CO₂-Saving Projects. Selection of an academic journal, re-submission and (hopefully) publication in 2017. In close cooperation with EfficiencyOne, Nova Scotia, Canada.

Meetings held in 2016

Experts meetings in 2016

Date	Place	# of Experts	Type of meeting	Government	Industry	Academic
22-24/02/16	Brussels, Belgium	7	Experts meeting	3	4	2
April-July 2016	3 Telecoms on Life Cycle Cost	5-7 (each)	Experts meeting	2-3 (each)	3-4 (each)	2
Sept-Dec 2016	3 Telecoms on DER & Multiple Benefits	5-7 (each)	Experts meeting	2-3 (each)	3-4 (each)	2

Seminars/Conferences/Workshops in 2016

Date	Place	Participants	Type of meeting	Government	Industry	Academic
Jan. + Feb.	Pinkafeld, Austria	38	Lecture	0	0	38
18-21 Jan.	Bangkok, Thail.	45	Workshop	15	25	5
02 Mar.	Vienna, Austria	19	Lecture	0	0	19
16. Mar.	Stockholm, Swe.	50	Seminar	20	25	5
20 Apr.	Vienna, Austria	14	Seminar	2	12	0
21 Apr.	Vienna, Austria	8	Seminar	3	5	0
30 June	Gmunden, Austr.	6	Seminar	0	6	0
12-16 Sept.	St. Kitts, Caribb.	50	Workshop	15	30	5
04 Oct.	Nyenrode, Netherlands	120	Key note	100	15	5
12 Oct.	Vienna, Austria	17	Lecture	0	0	17
21 Oct.	Vienna, Austria	9	Seminar	3	5	1
25-28. Oct.	Vietnam	10 x 7	Meet./WS.	10	55	5
17 Nov.	Conf.call	15	Conf.call	0	15	0
20-23. Dec.	Vietnam	5 x 6	Meet./WS.	5	25	0
Dec. + Jan.	Pinkafeld, Austria	34	Lecture	0	0	34

Meetings planned for 2017

Planned Experts meetings

Date	Place
Jan-Apr.	gotomeeting
27-29/05	ECEEE Summer Study, France

Planned Seminars/Conferences/Workshops

Date	Place
Jan.	Fh Pinkafeld
22+23/03	Vienna, Austria (Seminars)
Jan., Feb. ... (exact dates tbd)	Pakistan, Marocco, Caribbean ... (Trainings, workshops, conferences)
27/05–02/06	ECEEE Summer Study, France
17/09	DER Symposium, London
06+07/11	Vienna, Austria (Seminars)

Recent publications of Task 16 (selection)

Recent Task 16 publications:

- von Ritter, Konrad; Bleyl, Jan W. CF4EE - Crowdfunding for Energy Efficiency. Can Debt or Equity Crowdfunding contribute to scaling up Energy Efficiency in Developing Countries? published by Deutsche Gesellschaft für Internationale Zusammenarbeit, Eschborn 2016, available for download from www.ieadsm.org/
- Amman et al. 2015 Demand Response Services: Economic Feasibility Model and Case Study for Austria. IEA DSM Task 16 discussion paper 2015, available for download from www.ieadsm.org/
- Bleyl et al. 2015 Simplified measurement & verification + quality assurance instruments for energy, water and CO2 savings. Methodologies and examples. Including examples and national perspectives of Task 16 experts IEA DSM Task 16 discussion paper 2015, available for download available for download from www.ieadsm.org/
- Bleyl et al. 2015 ESCo project and market development: A role for 'Facilitators' to play. Including national perspectives of Task 16 experts. IEA DSM Task 16 discussion paper (amended 2015), available for download available for download from www.ieadsm.org/

Task 16 also contributed to the DSM University with a Leonardo ENERGY Webinar on Simplified M&V, which is available for streaming through www.leonardo.org.

Publications planned for 2017

For 2016 the following publications are planned:

- Deep Energy Retrofits: Using Dynamic Cash Flow Analysis and Multiple Benefits to Convince Investors planned for publication at ECEEE Summer Study 2017
- Book contribution on Life Cycle Cost Benefit Analyses (LCCBA) of a 'Deep Retrofit' case study in cooperation with IEA ECB Annex 61.
- Simplified Measurement and Verification Using Quality Assurance Instruments: A Proposed Concept for Energy, Water and CO2-Saving Projects in an academic journal

Dissemination of results

Results were disseminated through publications, meetings, presentations at seminars and workshops, the IEA DSM homepage as well as webinars (c.f. 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 experts closely collaborate with the energy efficiency and ESCo industry (and vice versa), e.g. through concrete market and project facilitation activities or involvement in research projects. As a matter of fact, most Task 16 experts work in these industries in their day-to-day jobs.

Our experts are also engaged with their national and international ESCo associations or initiatives. Experts actively participate in national and international ESCo, Energy Efficiency and Renewable industry conferences to share our findings. E.g. Task 16 has established close cooperations with ESCo Europe, the ESCo Industry conference with an outreach even beyond Europe (www.european-utility-week.com) 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.

Other collaborations are related to teaching and research in academia, e.g. for regular lectures in Austria TU Vienna and FH-Pinkafeld or research collaboration with the Linköping university.

Another area of collaboration is development aid work, e.g. with GIZ and KfW, Germany.

Also through its stakeholder workshops, Task 16 is reaching out to industries and other stakeholders. Collaborations with other organizations and projects are welcome.

Positioning of the Task – v.s. other bodies

Task 16 is not developing any particular energy technologies, however it is advancing and disseminating innovative and performance-based energy service business models for technology implementation. As a prerequisite, the technology must have reached a commercial development status in order to be able to guarantee its outputs.

Furthermore Task 16 members are facilitating concrete project and market development activities to implement and deploy various kinds of end-use efficiency or renewable technologies with market-based instruments.

Generally, performance-based energy 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 indoor and street lighting, heating, electric motors, ventilation and air conditioning (HVAC-technologies), combined heat and power systems (micro-CHP) or comprehensive refurbishment of buildings (Deep Energy Retrofits) 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

In October 2016, about 120 employees from communities and municipalities around the Netherlands attended a keynote on “ESCo Market Development in Europe: Lessons Learned for Local Governments” at the Nyenrode Business Universiteit te Breukelen, which was organized by Gemeentelijk Vastgoed Dag 2016 with support from the Netherlands Enterprise Agency (RVO.nl) and the European guarantEE project.

As an example from the industrial sector, a large scale energy savings project for a steel mill based on a performance-based ESCo business model is currently being facilitated in Northern Africa. In Vietnam, strategic advice is being provided on the transformation process of the state utility EVN towards expanding its scope of service “behind the meter” to become an Integrated Utility Service Provider.

As another example of practical outreach, hands-on trainings for ‘bankable project calculation and financing’ were continued in a number of countries (Thailand, Pakistan, Caribbean), which were particularly appreciated by the audiences. They were also appreciated by national and international finance corporations (CDB, IFC, IDC, State Bank of Pakistan) participating in these trainings.

Also the co-operations with universities such as TU Vienna, Fh Pinkafeld or Linköping University continue to be mutually beneficial and good opportunity to share Task 16 results with students and the academic world.

Activity time schedule

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

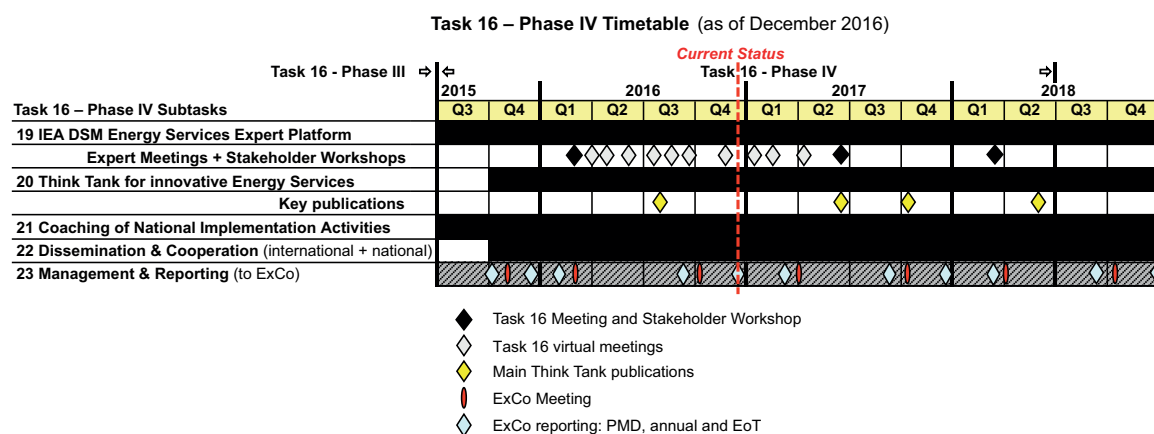


Figure 3: Task 16 – Project timetable overview

IEA DSM Task 16

Participating countries, Experts and Financiers

Currently, Task 16 actively participating countries are: Belgium; Nova Scotia, Canada (in kind); Germany (in kind cooperation with Annex 61 (Deep Retrofit)); The Netherlands; Norway; Switzerland (in alphabetical order, as of December 2016).

16.1 Participating Institutions Phases I-IV

Austria

Energetic Solutions (since 07/2012)

e7 www.e-sieben.at/

(since 01/2014 until 06/15)

Grazer Energieagentur

www.grazer-ea.at

(until 06/2012 and again 01/2014 until 06/15)

**ENERGETIC
SOLUTIONS**
JAN W. BLEYL



Belgium

Fedesco: www.fedesco.be

(until 06/2012)

EnergInvest (since 07/2010):

www.energinvest.fr

Factor4 (since 07/2010):

www.factor4.be



Canada (since 07/2015)

EfficiencyOne

<http://efficiencyone.ca/>



Finland (until 06/2009)

Motiva Oy:

www.motiva.fi



GIZ Germany (since 07/2013 until 04/2016)

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 until 06/2015)

Korea Energy Management Cooperation:

www.kemco.or.kr

Korea Association of ESCO

www.esco.or.kr



Netherlands

Netherlands Enterprise Agency:

www.rvo.nl

Essent Retail Services BV (until 06/2012):

www.essent.nl

ESCOPLAN (until 05/2015):

www.escoplan.nl

AHB Consultancy (since 06/2015)

www.ahb-consultancy.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:

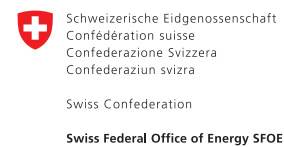
www.swedishenergyagency.se



Switzerland (since 07/2012)

Swiss Federal Office of Energy SFOE:

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Finland (until 06/2009)

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GIZ Germany

(since 07/2013 until 04/2016)

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Japan (Sponsor until 06/2009)

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1-18 Ageba-cho Shinjuku-ku
Tokyo 162-0824, Japan
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Industry Energy Management
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Essent Retail Services BV (until 06/2012)
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Norwegian Defence Estates Agency
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www.forsvarsbygg.no

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Switzerland (since 07/2012)

Swiss Federal Office of Energy SFOE
Department of the Environment, Trans-
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Mühlestrasse 4, 3063 Ittigen,
Postadresse: 3003 Bern
www.bfe.admin.ch

Financing Partners Phases I – IV

Austria (until 06/2012 and again 01/2014–06/2015)

Federal Ministry of Transport,
Innovation and Technology

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/>



Canada (in kind contribution since 07/2015)

EfficiencyOne

<http://efficiencyone.ca/>



Finland (until 06/2009)

Tekes – the Finnish Funding Agency for
Technology and Innovation

www.tekes.fi



GIZ Germany (since 07/2013 until 04/2016)

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 until 06/2015)

Korea Energy Management Corporation

www.kemco.or.kr



Netherlands

Rijksdienst voor Ondernemend Nederland (RVO.NL)
(Netherlands Enterprise Agency)

<http://www.rvo.nl/>



Norway (since 01/2016)

Enova SF

www.enova.no



Spain (since 07/2009 until 06/2012)

Red Eléctrica de España

www.ree.es



Sweden (since 07/2012 until 06/2015)

Swedish Energy Agency:

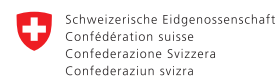
www.swedishenergyagency.se



Switzerland (since 07/2012)

Swiss Federal Office of Energy SFOE

www.bfe.admin.ch/



Swiss Confederation

Swiss Federal Office of Energy SFOE

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, the Netherlands

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 efficiency requirements, is been looked upon. The scalability and applicability of conducted and ongoing projects, with respect to specific regional differences and requirements, are explored.

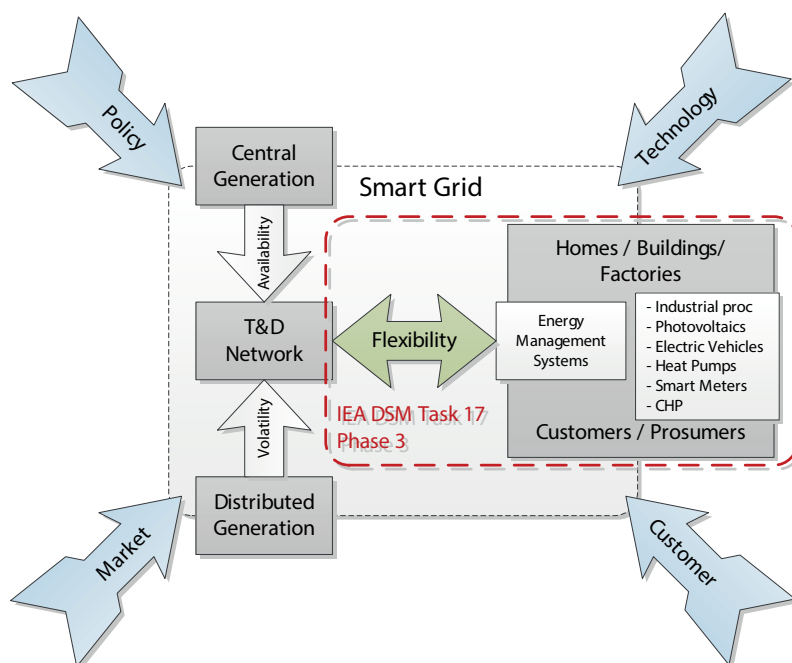


Figure 1: Focus of the IEA DSM Task 17 Phase 3 on enabling the consumption and production flexibility of electricity delivery

The project consists of four subtasks. The Subtask 10 deliverable describes the context and covers the current role and the interactions of flexible consumers and producers in the energy system. Subtask 11 covers the changes and impacts on grid and market operation once optimally using demand flexibility and includes cost/benefit analyses. This Subtask 12 deliverable collects experiences and describes best practices in several countries. Subtask 13 ends with the conclusions. The figure below illustrates the approach and the project structure.

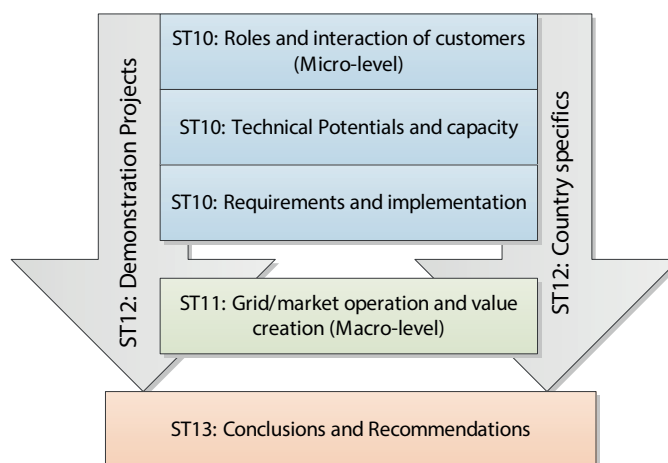


Figure 2: General approach of IEA DSM Task 17

The work of IEA-DSM Task 17 – Phase III has been finished in 2016. Presentations from various workshops and reports can be found on the website: <http://www.ieadsm.org/ViewTask.aspx?ID=16&Task=17&Sort=0>

Task aims & objectives

Table 1 show the 4 subtasks of Phase III.

Phase	Subtask	Titel
III	10	Role and potentials of flexible households and buildings
III	11	Changes and impact on the grid and market operation
III	12	Sharing experiences and finding best practices
III	13	Conclusions and recommendations

Table 1: Overview of subtasks in phase III

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 enforced. 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”

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”

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, ...). During the mid-term symposium the project base was extended.
- 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”

Subtask 13 – Conclusion and recommendations

Subtask objectives

Recommendations will be 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”

Activities completed in 2016

A joint IEA TCP symposium has been organized and held with focus on the various technologies related to demand flexibility and renewable integration.

Reports for each subtask has been edited and published in 2016.

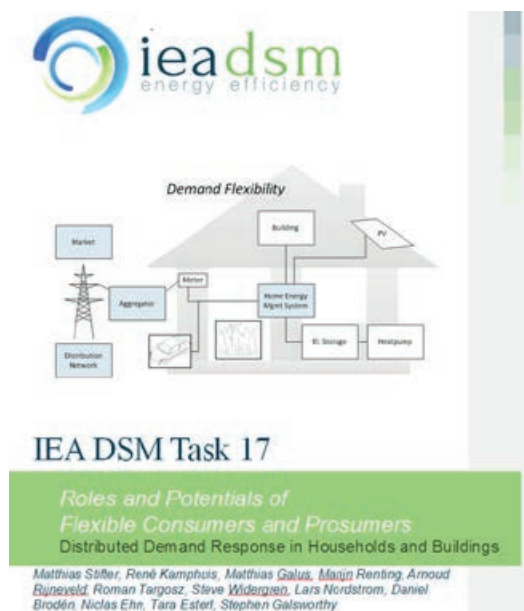


Figure 3: Subtask reports

The work of Phase 3 has been completed in October 2016 and new topics have been discussed.

Activities planned for 2017

New proposals on a new Task Data Analytics and a proposal on Phase 4 (Working title: "Active Prosumer Networks") are currently underway.

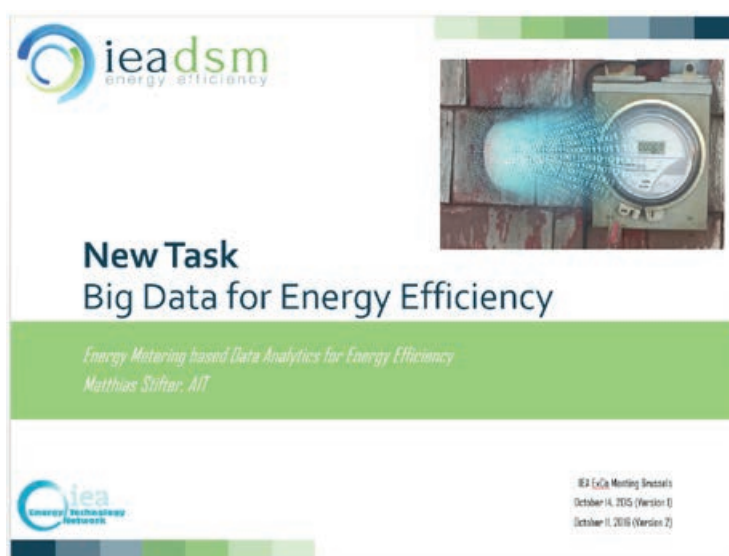


Figure 4: New Task Initiative on "Big Data for Energy Efficiency"

Meetings held in 2016

Experts meetings

Date	Place	# of Experts	Type of meeting	Government	Industry	Academic
2016-02-08	Webmeeting	8	Web	1	2	5
2016-03-14/15	XM, Stockholm	8	Physical	2	2	4
2016-05-10	XM, Linz/Austria	6	Real	0	1	5
2016-07-28	Webmeeting	6	Web	1	0	5
2016-08-26	Webmeeting	8	Web	1	2	5

Seminars/Conferences

Date	Place	Participants	Type of meeting	Government	Industry	Academic
2016-03-16	Stockholm	80	Workshop	20	30	30
2016-05-09	Linz/Austria	~40	IEA Joint Symposium	10	15	15
2016-09-28	Australia	30	Lecture on DR	5	5	20
2016-09-15	Netherlands	~50	Dissemination	10	20	20
2016-10-13	Brussels	60	International workshop	20	20	20
2016-10-20	Vienna	50	Dissemination	10	35	5

Publications

Presentations and workshops contributions (excerpt)

- DSM Workshop Brussels (10.6.2014)
- Workshop on DSM Potentials, Implementations and Experiences
- (Review on ‘Workshop on DSM: Potentials, Implementations and Experiences’)
- <http://www.ieadsm.org/task/task-17-integration-of-demand-side-management/#section-10>
- IEA EGRD Workshop „The Role of Storage in Energy System Flexibility – The role of DSM“ (siehe AP 5.2).
http://www.ieadsm.org/wp/files/2015/04/5.EGRDEnergyStorage_2014.pdf
- International Workshop ETH Lausanne
- <https://www.irgc.org/event/demand-response/>
- IEA DSM Day – Halifax (Canada), Sweden (Stockholm) and Brussels (Belgium)
- Workshop – IEEE PowerTech Eindhoven 2015: Demand Flexibility – Dream or Reality
- <http://www.ieadsm.org/task/task-17-integration-of-demand-side-management/#section-10>

- Joint IEA Workshop on Demand Flexibility.
<http://www.ieadsm.org/task/task-17-integration-of-demand-side-management/#section-11>
- Workshop „DSM-Day – The Role of DSM to Provide Flexibility in Electricity Systems“ in Brüssel am 13.10.2016 Leonardo-Energy.
<http://www.ecee.org/events/calendar/2016/DSM-Day-13-October-2016>

Master and Diplomathesis

- „Development of operational concepts for storage systems in distribution grids“ (Matthias Mitterhauser, FH-Technikum Wien, AIT, 2014)
- “Lessons learned from European pilot projects: Recommendations on market access requirements for electricity consumers” (Julia Schmidmayer, TU-Wien, AIT, 2015)
- (Jointly with IEA HPP): „Auswirkungen des vermehrten Einsatzes von Wärmepumpen auf das Niederspannungsnetz“ (Martin Häusler, FH-Technikum Wien, AIT, 2016)

Talks and presentations

- <http://www.ieadsm.org/task/task-17-integration-of-demand-side-management/#section-10>
- Leonardo Energy DSM-University Webinar: Integrating renewables and enabling flexibility of households and buildings
<http://www.ieadsm.org/dsm-university/>
<http://www.leonardo-academy.org/>
- Lectures IEA-DSM Task 17 for Master of Energy Studies program: Energy Efficiency Opportunities of the International Energy Centre’s (IEC): International Energy Centre’s (IEC) - University of QLD, university of Newcastle and university of Western Australia.
- Advisory Panel „Power System Flexibility“ - Roadmap (Copper Alliance, EcoFys).

Final reports

- IEA DSM Task 17.3 ST 10: Roles and Potentials of Flexible Consumers and Prosumers
- IEA DSM Task 17.3 ST 11: Valuation Analysis of Residential Demand Side Flexibility
- IEA DSM Task 17.3 ST 12: Best Practices and Lessons Learned
- IEA DSM Task 17.3 ST 13: Conclusion and Recommendations

Publications planned for 2017

Date	Place
2017-06-12	René Kamphuis, Matthias Stifter, et al, IEA DSM Task 17: Integrating Demand Flexibility with DG-RES at Residential Households in Electricity Grids, CIRED, 2017, Glasgow

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

Public workshops has been organized to involve government in networking events.



Figure 5: Photos from the public workshops in Graz (AT) and Eindhoven (NL)

Experts involved in expert meetings are from network operators like Enexis and Stedin (NL).

National stakeholder groups (industry, utility) are informed by newsletters and in meetings, e.g. like for the energy efficiency agency 'Efficiency One' in Nova Scotia (Canada).

Positioning of the Task – v.s. other bodies

Below the interrelations of our Task with other IEA-work have been tabulated and depicted.

On May 9th the IEA energy experts exchange meeting "Demand Flexibility and RES integration" took place in Linz, Austria. It was part of the Austrian Smart Grids Week 2016. Contributions came from a wide variety of IEA-programs (see below). The session started with a welcome by DSM-program chairman Rob Kool and a keynote by Luis Munera; then technology and equipment flexibility were discussed with contributions from the heat pump, electricity storage, solar heating and cooling technology annexes.

The morning closed with a session on electric vehicles (EV) as an option for domestic electricity storage. The afternoon focused on buildings as energy storages and the active role of buildings in uncovering the DG-RES embedding potential, improved load forecasting and buildings software and hardware component interoperability were the main themes discussed. Then, new customer energy services, business models and Task 17 Phase 3 were presented, also including the insights from ISGAN. The day concluded with a panel session on the tight interaction between the customer and the energy systems needed to come from already demonstrated increased energy efficiency to active contributions of end-users to the commercial market and the technical operation of electricity grids. The presentations can be found at:

<http://www.ieadsm.org/task/task-17-integration-of-demand-side-management/#section-11>

Smart ICT facilitated interaction of flexible loads is required for commercial and operational grid management and services. Also a better mapping of customer behavior has to be achieved, that provides well-aligned incentives for commercially optimal and grid friendly operation. This way of interaction combines best with energy transaction based models instead of fixed billing schemes.

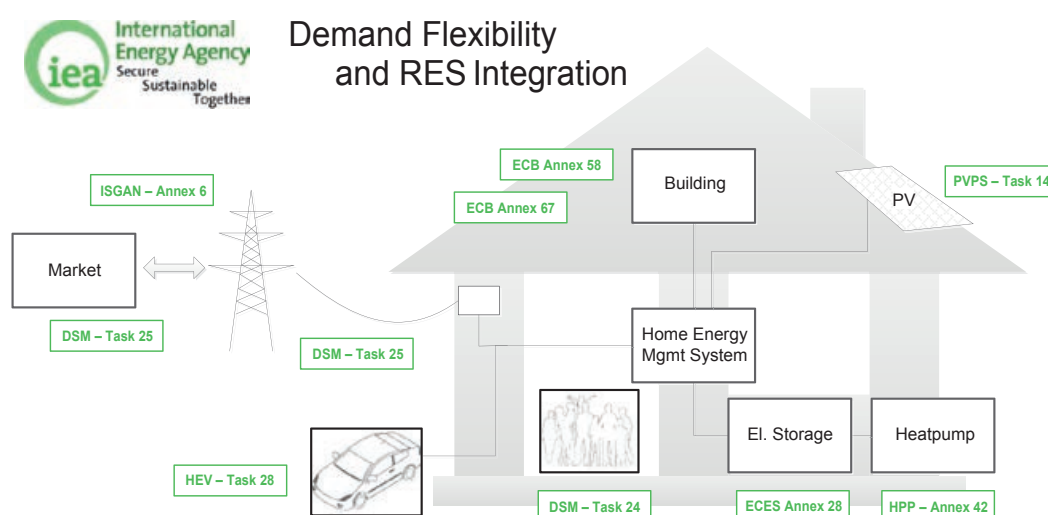


Figure 0-6: Interrelation between IEA programs and participating tasks

IEA DSM – Task 24 Closing the Loop: Behaviour Change in DSM – From Theory to Practice
IEA DSM – Task 25 Business Models for a more effective market uptake of DSM energy services
IEA HPP Heat Pump Program – Annex 42: Heat Pumps in Smart Grids
IEA ECES Energy Conservation through Energy Storage – Annex 28: Distributed Energy Storage for the Integration of Renewable Energies” (DESIRE)
IEA ECB Energy in Buildings and Communities – Annex 58: Reliability and Energy Performance
IEA ECB Energy in Buildings and Communities – Annex 67: Energy Flexible Buildings
ISGAN – Annex 6: Power T&D Systems
IEA PVPS – Task 14 High Penetration of PV Systems in Electricity Grids
IEA Hybrid & Electric Vehicle – Task 28: Home grids and V2X technologies

Table 0-2: Participant tasks in

Outreach of the Task – success stories

The Phase 3 reports have been published on the IEA-Task 17 website and newsletters.

- Public workshops with academics, universities, industry and network operators have been organized and published.
- A joint CIRED publication will be published in 2017.
- Leonardo-energy webinar of Task 17 has been held and is available.
- National reports have been published and the task has been presented at several national events, like IEA networking meetings and stakeholder conferences.
- University lectures have been held in Europe and Australia.

Activity time schedule

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

Figure 7: Time plan of Task 17 Phase III

Participating countries

List of participating countries and organisations

Austria
Netherlands
Sweden
Switzerland
United States
European Copper Institute (sponsor)

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Task 24

Behaviour Change in DSM – Phase II: Helping the Behaviour Changers

Operating Agent: Dr. Sea Rotmann, New Zealand

Description

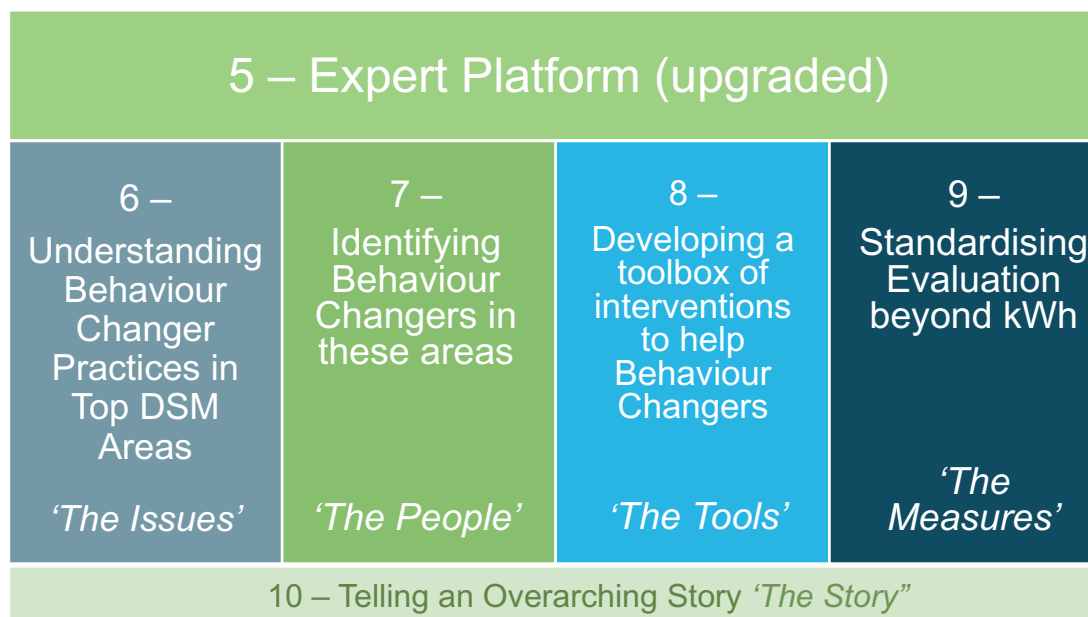
There is no behaviour change ‘silver bullet’, like there is no technological silver bullet that will ensure energy efficient practices. Designing the right programmes and policies that can be measured and evaluated to have achieved lasting behavioural and social norm change is difficult. We believe that this Task, and its extension, helped address these difficulties by developing guidelines, recommendations and examples of best (and good) practice and learnings from various cultures and contexts. We rely on a large, global network of 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. This Task (Phase I) had several Deliverables, including the expert network and platform for continued exchange of knowledge and successes, the large-scale analysis of the helicopter overview and case studies, several reports, factsheets and guidelines on how to evaluate behavioural interventions and the country reports with specific to do’s and not to do’s, future research questions and re-iterated case studies following our best practice recommendations. Phase I of this Task is now finalised and Phase II (How to help the Behaviour Changers) has commenced.

Phase II of Task 24 takes the theory into practice. Building on the solid theoretical foundations of *Phase I*, we now look at the:

- What?
- Who?
- How?
- Why? and
- So What?

We use a Collective Impact Approach in a Participatory Action (field) Research (PAR) setting and storytelling as the overarching language and bring together Behaviour Changers from all sectors (industry, government, research, middle actors and the third sector) with the end users whose behaviour they are ultimately trying to change.

The Subtasks of Phase II



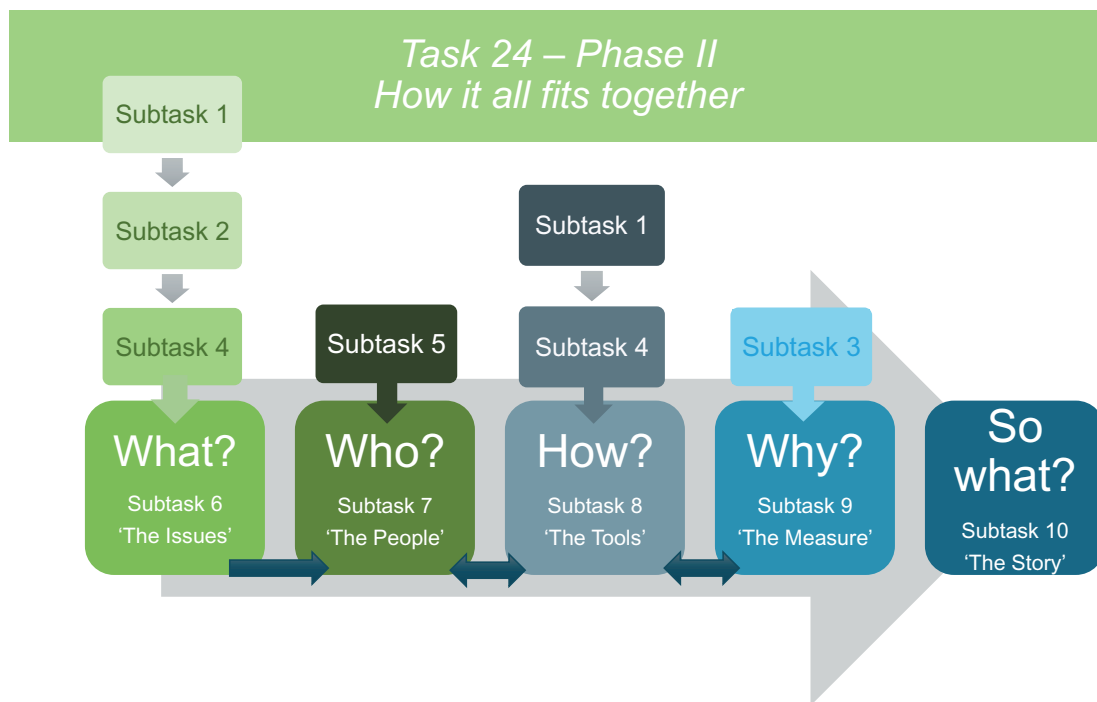
For more information, visit www.ieadsm.org



Task aim and objectives

The main objective of this Task is take good theory (from Phase I) into practice to allow ‘Behaviour Changers’ (from government, industry, intermediaries, research and the third sector) to:

- Engage in an international expert network (‘THE EXPERTS’)
- Develop the top 3 DSM priorities to identify the most (politically, technological-ly, economically and societally) appropriate DSM themes to focus on (‘THE ISSUES’)
- Identify and engage countries’ networks in the 5 Behaviour Changers sectors for at least one of the top 3 DSM themes to develop a collective approach (‘THE PEOPLE’)
- Use and test a Collective Impact Approach to develop shared methodologies, guidelines and a common ‘language’ based on narratives to aid Behaviour Changers’ decisionmaking of how to choose the best models of understanding behaviour and theories of change (a ‘toolbox of interventions’) (‘THE TOOLS’)
- Standardise how to evaluate behaviour change programmes ‘Beyond kWh’ and ‘Beyond Energy’ including multiple benefits analysis (‘THE MEASURE’)
- Collate national learnings into an overarching (international) story to understand, compare and contrast the different behaviour change approaches, risks and opportunities and which recommendations can be universally applied (‘THE STORY’).



Subtask 5

Objectives

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

Deliverables

D6: Social network expert platform and meeting place for (invited) DSM and Behaviour Changers and implementers. This platform may in future be hosted on the DSM-IA Task 24 website.

D7: At least one international conference for all Behaviour Changers involved in Task 24.

Work carried out

Progress in the last year was satisfactory, we now have >240 experts on the expert platform which has links to any films or presentations from workshops. All reports are on the IEA DSM website, which has been divided into Phase I and Phase II. We continue having great successes in matchmaking experts, with several spending time at each others' Universities, for example, or developing new research collaborations. Katy Janda, from Oxford University, an expert on green leasing, has partaken in two Swedish Task 24 workshops and Aimee Ambrose, our UK expert from Sheffield Hallam University has partaken in the Irish workshop. We secured the support of the 2016 Energy Cultures and BEHAVE conferences to hold our international Task 24 workshops as part of these highly successful, international expert conferences. We have thus exceeded our target of one international conference, with the possibility of holding another joint conference with Annex 66 in Beijing next year.

Subtask 6

Objectives

- Building on work from Subtasks 2 and 4, develop lists of common top 3 DSM implementable issues and their potentials in each country
- Use the Collective Impact Approach and the Task 24 Expert Platform to research and review current approaches and practices, nationally and internationally, on these top issues and provide feedback from the different disciplinary perspectives and their collaborative discussions and negotiations from available case studies and narratives that could illuminate some of the approaches (based on work in Subtask 1, 2 and 7)
- Feed these cases, and the ones analysed in Subtask 1 and 2 into a Toolbox of Interventions (ST 8)

Deliverables

D 8: List of top 3 DSM issues, including analysis of case studies elsewhere and their approximate contribution to each participating country's load management (economic, technological, political and societal potentials)

D 9: Continued collection and analyses of case studies and stories to add to the 'Monster' Wiki (ST 1 & 8)

Work carried out

Subtask 6 has now been discussed in more than 15 workshops in Ireland, the US, Sweden (3 workshops), New Zealand (3 workshops), the Netherlands (2 workshops), Canada (2 workshops) and Task 24 workshops at BECC, ECEEE Summer Study, Energy Cultures and BEHAVE conferences. We have been collecting lists of DSM interventions and energy efficiency and behaviour priorities in each of the participating countries, except Austria. We have discussed the top 3 issues in each of these countries during workshops. In addition, we have done the issues definition in our first ST11 participant, the Carolinas Health Network System (CHS) in the US. All workshops have extensive reports and three draft Subtask 6 and 7 reports have been prepared for Sweden, the Netherlands and New Zealand.

Subtask 7

Objectives

- Identify, with the help of the ExCo, National Experts and existing Expert Platform the most appropriate Behaviour Changers focusing on at least one of the top 3 DSM issues chosen by each participating country in Subtask 6 (can include the residential, business and transport sectors)
- Collect detailed information on their specific interests, organisations and past and current work, get each to tell their 'Sector Story'
- Use the Collective Impact Approach to initiate discussions between different disciplinary perspectives and sectoral contexts. An explicit focus will be on deepening the understanding of the political-institutional context Behaviour Changers are operating in and what it means for their capacity to take a more systemic approach to behavioural change

- Develop national Behaviour Changer dialogues in each participating country by holding (bi) annual workshops (1-2 days per country per year, all up maximum of 6 days per country - note some of this time includes work from ST 6 and 8)
- Foster mutual engagement, collaboration and shared learning amongst Behaviour Changers, enable them to build relationships on neutral, trusted ground
- Backbone support to set a common agenda, measurement systems, mutually reinforcing activities and ongoing communication between the Behaviour Changers
- Evaluate Behaviour Changers' impressions on the effectiveness of the Collective Impact Approach and use of narratives as a common language to overcome barriers
- Collect examples of successful matchmaking stories.

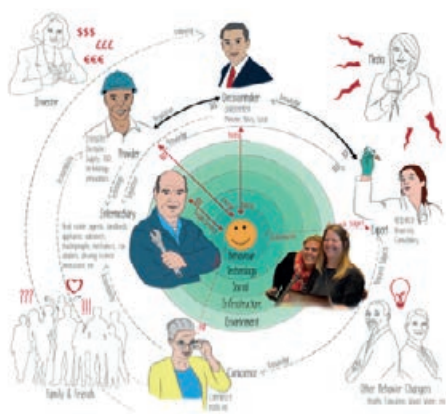
Deliverables

D 10: National networks of Behaviour Changers from all 5 sectors (government, industry, research, intermediaries, the third sector) in at least one of the top 3 DSM focus areas (chosen in ST 6); including workshop reports, videos, presentations, pecha kuchas, stories, blogs, Wiki etc

D 11: Evaluation Report based on in-depth stakeholder analyses on the effectiveness of the Collective Impact Approach and use of narratives as a common language to overcome barriers

Work carried out

Behaviour Changers have been identified for the top issues decided on in Subtask 6 for Canada, Sweden, the Netherlands and New Zealand. Ireland has chosen its top issue and is currently selecting the Behaviour Changers. Their sector stories have been told during Task 24 workshops and we have initiated deep discussions around relationships, mandates, stakeholders, restrictions and value propositions for each of the Behaviour Changers using the 'Behaviour Changer Framework'.



The Behaviour Changer Framework



Participants from the first workshop in Toronto in May

Subtask 8

Objectives

- Use the Collective Impact Approach to unite Behaviour Changers from all 5 sectors on a specific DSM issue (both chosen in ST 6 & 7) and develop, in collaboration, a common agenda, shared measurement indices, mutually reinforcing activities (a 'roadmap'), continuous communication and the backbone support function necessary to make it happen. Evaluate this approach continually via stakeholder analyses
- Collect information for a Decisionmaking Tree to pick the most appropriate case studies and models of understanding analysed by Task 24 (ST 1, 2 and 6) and test its usability with the Behaviour Changers
- Develop the common language of storytelling further and provide different examples of using storytelling and narratives in practice and how to best do it in the specific areas of focus and each of the Behaviour Changers' sectors
- Identify all the tools in each Behaviour Changer's Toolbox of Interventions, analyse their pros and cons, risks and opportunities, where they fall short and how another tool from another Behaviour Changer could overcome this deficit
- Continued testing and development of the Evaluation Tools (ST 3) that can prove if a (toolbox of) intervention/s leads to actual, ongoing behaviour changes in practice. The Behaviour Changers will feed back on its potential applicability, risks and additional needs by working through (hypothetical or real life) examples chosen in ST 6 and using double-loop learning approaches to assess multiple benefits of interventions
- Collaborative development of a testable Toolbox of Interventions for each top DSM focus area, where each Behaviour Changer sector has clearly identified and measurable roles and responsibilities. This intervention may then be taken into a real-life setting and trialled in practice (either as ST 11 or outside of Task 24)
- The toolbox is built on national and sectoral context specificities but will be synthesised and tested (eg in the international conference (ST5)) for the general aspects that are of international validity (ST10 - the overarching story).

Deliverables

D 12: Testable toolbox of interventions of each country and their top areas of DSM focus This includes:

- A description and evaluation of the validity and effectiveness of the Collective Impact Approach in the energy arena, possibly as a peer-reviewed paper (could be part of a special issue on Task 24, as envisaged in the continuation of ST5)
- A Decisionmaking Tool that enables Behaviour Changers to better utilise the findings of ST 1 and 2 without necessarily having to read all large Task 24 reports
- A peer-reviewed paper on the impact of storytelling in DSM
- A collection of sector stories from each Behaviour Changer in each country and DSM topic chosen in ST6, including analysis on how these stories can be used to aid collaborative DSM intervention design

- This includes a list of behavioural intervention tools each Behaviour Changer has at their disposal in each of their national and sectoral contexts
- Continued testing and development of evaluation tools created in ST 3
- Testable toolbox for national Behaviour Changers (when choosing to take part in ST11) and/or synthesis of internationally-validated tools to feed into the Overarching Story (ST10)

Work carried out

Storytelling as a tool in Task 24 has been published and presented at the eceee Summer Study. A paper analysing 145 stories we have collected from over 20 countries is currently under review as an extensive social science publication in the Journal of Energy and Social Science Research (ERSS). Dr Sea Rotmann is co-editing the ERSS Special Issue on 'Narratives and Storytelling in Climate Change and Energy' which has attracted over 50 abstracts. This work more than fulfils our deliverables around 'international publications and a Special Edition'. In addition, Dr Rotmann has created the 'A to Z of why using a story spine in energy behaviour research works' and has published two conference proceedings (ACEEE Summer Study and BEHAVE) on the 'magic carpet' Behaviour Changer Framework. She is currently finalising another peer-reviewed single author paper on the various tools developed in Task 24 for the Special Edition on global behaviour research of Energy Efficiency. The Task 24 monitoring and evaluation work was also presented at the 2015 eceee Summer Study by Dr Mourik and further evaluation work has been published by her in Energy Efficiency. A factsheet on multiple benefits in the building retrofit sector has been created by Dr Mourik (in Dutch).

Subtask 9

Objectives

- The goal of this research is to develop and validate a set of tools and metrics that can be used consistently for the evaluation of behaviour-based energy programmes including but not limited to eco-feedback, home audits, information and rebate programmes, and social games
- An in-depth assessment of current (best) practice, cultural and disciplinary idiosyncracies, country drivers and needs and the best possible international standard (along the lines of psychometric tools like the IQ test - arguably not a perfect indicator of intelligence, but valuable in terms of enabling measurement and comparison).

Deliverables

D 13: An internationally validated set of tools and metrics for evaluating behaviour-based energy programmes 'beyond kWh'

Work carried out

Karlin (the Principal Investigator of this Subtask) et al have published a paper at the IEPPEC conference in August that outlines the basics of the Beyond kWh toolkit they are developing for ST 9. There are now three peer-reviewed papers and a report on the toolbox on the IEA DSM website. The Subtask is co-funded to the tune of US\$100,000

by PG&E and Southern California Edison. Rebecca Ford from Oxford University presented the toolbox at the Task 24 BEHAVE workshop and garnered feedback from the 70 participants. Unfortunately, the fact that both Austria and the Netherlands chose to not join Subtask 9 means it will not be validated as a standardised tool in 2017 (as we only have 3 countries). We are working with Karlin et al to still test the toolbox outside Californian utility customers, for example, in Ireland where we focus our case study on the residential sector.

Subtask 10

Objectives

- Collate, analyse and distil all information collected in Subtasks 6-9. Develop an international, interactive handbook with guidelines and recommendations including:
- Evidence of the usefulness of following a Collective Impact Approach to solve complex whole-system, societal energy problems in practice.
- A decisionmaking tool from 75+ cases collected in Subtasks 1, 2 and 7.
- A practical guide on storytelling with the many examples and stories collected here.
- Overview of countries' and sectors' toolboxes of interventions, common findings and learnings.
- Overview of usefulness of the evaluation tools for each country and sector (as developed in ST 3 and ST 9).

Deliverables

D 14: Internationally validated, interactive handbook for taking behaviour change theory into practice with in-depth examples of each participating countries' main areas of focus and via collaboration of 5 Behaviour Changer sectors.

Work carried out

This Subtask will not start until end of 2017.

(Voluntary) Subtask 11

Objectives

- Provide continual assistance during implementation and evaluation of collaboratively designed policies, programmes or pilots in order to iterate them, if necessary.
- Report-back outcomes from each country's intervention and main learnings and stories.

Deliverables

D 15: Support on design, implementation, evaluation and iteration of national policies, programmes or pilots.

Work carried out

We have contracted our first voluntary participant to this Subtask, the second-largest hospital network in North America (CHS). We have started the work with a workshop

in October 2016 where we finalised the issues definition. In February 2017, we will participate in an international evaluation panel convened by the hospital network and hold another workshop. A third workshop will take place in May 2017, with final report-back expected end of 2017. The draft workshop report will be available early 2017 to participants.

Activities completed in 2016

We advanced significant work efforts in Subtasks 6, 7, 8, 9 and 11. A large number of workshops, conference presentations, seminars and lectures were given and stakeholder and expert networking and collaboration was undertaken with 100s of experts. We started collaborative efforts with IEA EBC Annex 66 and continue to support the Secretariat, where requested. We now have over 65 publications in this Task, including (soon) three primary literature publications in two highly impactful journals. We got two major international behaviour change conferences to support Task 24 by joining with us to hold our workshops. In addition, we are co-editing what is a highly anticipated Special Issue on storytelling. Our work in this field is regarded as world-leading by social science experts.

Activities planned for 2017

Subtask 5

Continue attracting experts to Task 24. Finalise and publish special edition on storytelling and two peer-reviewed primary literature papers. Continue to present DSMU webinars on Phase I and Phase II. Continue giving lectures, as requested (several already lined up in New Zealand and Australia). Continue attracting potential financial participants to Subtask 11, including from the UK, US, Canada and Australia where we already have national experts with in-kind contributions on stand-by. Possible joint international conference with Annex 66. Continued support to IEA DSM ExCo on our strategy and possible use of new business models (first discussed at the 2016 ExCo meeting in Brussels) to be trialed in Task 24.

Subtask 6

Continue with issues definition including in countries we haven't started in yet (Austria). Continue writing Subtask 6&7 reports in all participating countries.

Subtask 7

Will hold another at least another 8 workshops in New Zealand, Ireland (x2), Netherlands, Sweden, Austria, USA (x2). Will pull together most relevant Behaviour Changers in each participating country. Workshop notes all written up, and Behaviour Changer Frameworks (BCFs) animated in prezis.

Subtask 8

Continue working on storytelling and evaluation guidelines. Start working on decision-making tree for Subtask 1 and 2 case studies and models of understanding behaviour. Publish 2 papers on tools used in Task 24.

Subtask 9

Continue working on 'Beyond kWh' toolkit, start testing it with Ireland.

Subtask 10

Not until 2017.

Subtask 11

Two workshops, support evaluation panel and design and implementation on hospital pilot on building operators' behaviour. Draft report.

Meetings, conference, lectures etc. held in 2016

Experts and stakeholder meetings

Date	Place	# of Experts	Meeting type	Govt	Industry	Academic
Nov 2015	Paris, France	40	Experts	15	15	10
Nov 2015	Dublin, Ireland	>60	SHM	20	20	20
Dec 2015	Brisbane, AUS	10	SHM	7	3	
Feb 2016	Eindhoven, NL	25	SHM			25
Feb 2016	Wellington, NZ	12	SHM	3	6	3
Mar 2016	Stockholm, SE	10	SHM	4	3	3
Apr 2016	Dublin, IE	12	SHM	6	3	3
Jun 2016	Wellington, NZ	8	IEA	4	2	2
Jul 2016	Wellington, NZ	35	SHM, EX	10	10	15
Sep 2016	Coimbra, PO	70+	EX			
Oct 2016	Stockholm, SE	10	SHM	4	4	2
Oct 2016	Charlotte, USA	15	SHM	0	12	3

Seminars/conferences/lectures

Date	Place	Participants	Meeting type	Govt	Industry	Academic
Nov 2015	Dublin	>60	Mini conference	20	20	20
Dec 2015	Australia	20+	Lecture			20+
Dec 2015	Eindhoven, NL	30	Lecture	10	20	90
Feb 2016	Wellington, NZ	50+	Workshop		50+	
Apr 2016	Vienna, AT	>150	Workshop			
Jul 2016	Wellington, NZ	>250	Conference			
Aug 2016	Monterey, US	>1500	Conference			
Sep 2016	Australia	20+	Lecture			20+
Sep 2016	Coimbra, PO	300	Lecture			

Meetings planned for 2017

Seminars/conferences

Date	Place
Jan 2017	CHS, Charlotte, US
May 2017	DSMU
June 2017	eceee Summer Study
September 2017	Annex 66 and Task 24 conference (?)
October 2017	BECC conference
November 2016	DSMU

Publications produced in 2016

- 2 IEA DSM Spotlight Issues
- 7 workshop reports
- 3 draft ST6&7 reports
- 1 ST8 report on storytelling using the story spine
- 3 peer-reviewed conference papers (ACEEE, IEPPEC and BEHAVE)
- Peer-reviewed article and SCE report on Subtask 9
- 2 Energy Efficiency Publications
- 1 Energy Research and Social Science Publication
- 1 Special Issue on Storytelling in ERSS

Publications planned for 2017

Storytelling special issue and paper, two eceee Summer Study papers, Energy Efficiency paper, ST 6&7 reports on all participating country issues, additional workshop reports, Spotlight articles, ST11 report.

Dissemination of results

Everything will be available on the 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 60 subscribers and been viewed over 6 000 times.
- Expert platform www.ieadsmtask24.ning.com – 240 members from 22 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 10 000 times.

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 expert network and coming to Task 24 workshops. PowerCo, NZ second largest lines 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 was 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 have bid for Horizon 2020 proposals with Task 24 participating in dissemination work packages. PG&E and Southern California Edison, some of the largest utilities in the US co-fund Subtask 9. Energy Efficiency Nova Scotia has participated in the Canadian work to date, as are University Health Network, Toronto; in Sweden we have several commercial landlords and tenants as well as consultants involved; in New Zealand we also have Flick and Zen Energy; Solar City Nelson and NERI as well as the Smart Grid Forum involved and in Charlotte, we have the 2nd largest hospital network in North America involved, with another bid in with Cedar Sinai hospital in LA. More Behaviour Changers from Industry and the Third Sector will be involved in future research.

Positioning of the Task v.s. other bodies

Task 24 continues to support the Secretariat where needed. We are in talks with the Secretariat to co-write a report on behaviour at some stage in the future or to feed into eg Energy Technology Pathways and other publications. We are in contact with the Australian Annex of 4E and EBC Annex 66. Several 'Nudge Units', including the American, Canadian and British one are interested, and actively participating in workshops of our Task.

Outreach of the Task – success stories

The Behaviour Changer Framework (our 'magic carpet of behaviour change' as PG&E coined it at the BECC conference) of understanding the energy system, has received highly positive feedback by academics, policymakers and industry representatives around the world. It has even been called 'revolutionary'. It fits perfectly into the discipline of Participatory Action Research (PAR). We receive very positive feedback from all of our workshops by participants. 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. 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

Based on 4 participating countries

Subtasks	2015	2016	2017	2018
Subtask 0 Admin				
Subtask 5 Platform				
Subtask 6 Issues				
Subtask 7 People				
Subtask 8 Toolbox				
Subtask 9 Measure				
Subtask 10 Story				
Subtask 11 Pilots				

Participating countries

Austria – yet has not provided a National Expert nor done any work to date

Ireland, New Zealand, Sweden, The Netherlands

Participants

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No National Expert appointed

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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: Ms. Renske Bouwknecht, Ideate, the Netherlands

Description

This Task focusses 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.

Task aims & objectives

Subtask 0: Prescoping

Subtask objectives

The focus of this task was on making a first inventory of issues of common interest regarding business models and Service Value propositions on Energy efficiency. The main objective of this subtask was to map valuable knowledge, identify country specifics and general objectives.

- O1: Writing work plan, in close cooperation with team (DuneWorks, Ideate, TU/e) and interested countries
- O2: Performing a quick scan of country specifics (relevant policy and regulation, research, business models. energy targets etc).
- O3: Attendance (virtual) of ExCo meeting in 2014

Subtask deliverables

- D0: draft work plan

Work carried out

All activities have been completed.

Subtask 1: Management

Subtask objectives

- Overall project coordination and management, including contact relationship management:

- Attendance of ExCo meetings, conferences and reporting to IEA DSM ExCo
- Set-up Task Advisory Board (AB) of stakeholders (ExCo, IEA, intermediaries from research, industry, government, community sectors)

Subtask deliverables

D1: Advisory committee of stakeholders from ExCo, IEA, research, commercial, community, policy and end user sectors providing strategic guidance.

Other deliverables:

- Four half-yearly task status reports
- Three annual reports
- One End of term report (if applicable)
- One Final report (compilation of subtask deliverables)
- Task management report
- IEA DSM Spotlight articles
- Two Task flyers

Work carried out

- Overall project coordination and management, including contact relationship management: *ongoing*
- Attendance of ExCo meetings, conferences and reporting to IEA DSM ExCo
 - Participation and presentation of work progress at the two exco meetings this year: Stockholm and Brussels
- Set-up Task Advisory Board (AB) of stakeholders (ExCo, IEA, intermediaries from research, industry, government, community sectors)
 - Stakeholder lists set up for each country, and in each country, if deemed relevant a group of experts is set up to reflect on the work.
 - In addition the Exco members and national experts are considered to be the most important expert group.
 - We have decided to do a more informal and wide approach at the advisory board issue, and send out newsletters and ask for feedback from the market.

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

Subtask objectives

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.

- Identifying country specific suppliers, clients, and their stakeholder networks and trying to establish national advisory expert networks to continue working with throughout the task: stakeholder lists are being set up and will have been completed before the EXCO meeting in Canada.

- Narrowing down the focus of both services, target groups and typology of business models in close cooperation with national experts and other relevant stakeholders: initiated and translated into what information to collect in longlist, narrowing down took place during first expert workshop March 9–10th 2015.
- 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. Discussed during workshop March 10th, and through literature review being conducted.
- 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).

Subtask deliverables

- 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.

Work carried out

- We identified country specific suppliers, clients, and their stakeholder networks for the Netherlands, Sweden, Switzerland, Austria, Norway and established were relevant, national advisory expert networks.
- The focus of both services, target groups and typology of business models was narrowed down, and how the different parameters of success of business models and services will relate to each other in the analysis was clarified. A selection criteria toolkit was developed concordantly.
- A longlist overview of existing services and business models completed for all countries except South_Korea (joined later)
- A shortlist overview of services completed for all countries except South-Korea.
- A global analysis was performed by CREARA, hired by the ECI partner.

An individual analysis of all shortlisted cases is being performed, as well as the global analysis.

- D2 ready for Sweden, Netherlands. Being drafted for Norway, Switzerland and Austria before end of 2016, using a format or template developed in close cooperation with all national experts,
- D3 is finished and published.

- D4 is to be finalised in the first six months of 2017 (work in progress because of newly ascending countries and some delays in Swiss and Austrian delivery of D2).

Subtask 3

Subtask objectives

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 contribute to the setting up of piloting activities in each participating country and define guidelines for policymakers to allow a more effective upscaling of proven business models and services.

Activities

1. 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.
2. 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
3. Contributing to the setting up of piloting activities in each participating country. This activity will be initiated on the basis of the lessons learnt that we would like to turn into practice. The aim is to support one or two relevant stakeholder in the participating country to set-up a business model and service for EE based on the key success factors identified in this task, and support the set-up of a pilot or deployment strategy for this service and business model.

Subtask deliverables

- D5: report with repository of potentially effective business models and services in each country: This reports was merged with D2 in each country.
- D6: Country specific reports identifying potential barriers and opportunities for upscaling or mainstream selected potentially effective business models with guidelines/roadmaps for different stakeholders, i.e. policy makers, EE service suppliers and business model developers.

Work carried out

- D5: This reports was merged with D2 in each country.
- D6: during national expert workshop in Brussels, october 14th, the national experts and task management decided to slightly change the scope of D6.

D6 will consist of two outcomes:

1. A workshop format and accompanying assessment tool for the participating countries to use in workshops with entrepreneurs and on-line. This format will be created in close collaboration with Sweden who proposed to be the trial country and has another project we can work closely with to develop this workshop format and assessment tool

2. A critical paper to be written about context issues, such as policies and innovation systems and what they are contributing to more radical business models and services (the one leading to carbon zero systems) and what they could or should contribute. Svetlana Gross and Even Bjornstad both volunteered to help write this paper, but everyone is welcome to contribute! The abstract for this paper has been accepted for oral presentation at ecee Summer Study June 2017.

Subtask 4: Dissemination and expert engagement

Subtask objectives

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:

1. Set up a stakeholder communication and engagement plan
2. Traditional dissemination to external stakeholders and academia
3. 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.

Subtask deliverables

- D7: progress report on dissemination activities and outreach activities. Ongoing as part of the annual reports and input for the PMDs of excos.
- D8: outreach and dissemination material, including at least 2 academic publications, professional journal publications, animations and other outreach material highlighting the Task's work.

Work carried out

See the dissemination and stakeholder engagement activities

Activities completed in 2016

See the work carried out in section 2.

Activities planned for 2017

Subtask 1: Management

- Overall project coordination and management, including contact relationship management
- Attendance of ExCo meetings, conferences and reporting to IEA DSM ExCo

Subtask 2: Identify proven and potential models for energy services

1. In-depth comparative analysis of around 4 similar business models in different countries and around 12 per country. Determining patterns, drivers and pitfalls. ongoing.
2. Organising first country workshops with service providers and clients. Only two workshops left to do: in South-Korea and Norway.
3. Creating a draft report with all the national examples, the best practices and the analysis including useful tips and tricks etcetera. *ongoing*.

Subtask 4: Expert platform

Link to DSM website and experts and maintain a section for Task 25. Ongoing

Meetings held in 2016

Experts meetings/seminars/conferences

Experts meetings

Date	Place	Type of meeting	Total	Government	Industry	Academic
January 8th 2015	online	XM Webinar for national experts	8			
March 10–11th 2015	Eindhoven-The Netherlands	Xm= SHM National expert meeting	11		3	
ongoing	Many telco and skype meetings with individual experts	XM Process monitoring and training				
December 2015	Sweden	Expert Meeting	10+			
January 2016	Switzerland	Expert Meeting	15+			
January 2016	Austria	Expert Meeting	10+			
March 2016	Sweden	Expert Meeting	15+			
October 2016	Belgium	National experts internal meeting	10+			

XM = Experts meeting

SHM = Stake holder meeting

Seminars/conferences

Date	Place	Participants	Type of meeting	Government	Industry	Academic
30-03-2015	Cape Town	mixed	Conference	>20	>40	>40
October 2015	Halifax Nova Scotia	mixed	workshop	>10	>10	
12-13 November 2015	Paris, France	mixed	IEA workshop on influencing business behaviour	>15	>15	>15
November 2015	Dublin-Ireland	mixed	Short meeting To entice Ireland to participate in Task 25	2		
19-11-2015	Webinar Task 25 DSM University	mixed	webinar	>50	>50	>50
December 2015	Stockholm Sweden	mixed	workshop	4	8	4
January 2016	Bern Switzerland	mixed	workshop	5	10	5
January 2016	Graz Austria	mixed	workshop	2	12	1
March 2016	Stockholm Sweden	mixed	DSM day	33%	33%	33%
March 2016	Stockholm Sweden	entrepreneurs	Expert workshop	2	10	2
May 2016	Linz-Austria, coinciding with Smart Grid Week	mixed	IEA meeting where our Austrian national expert presented the Task 25 work	?	?	?
September	Portugal, Behave conference	mixed	conference			
October 2016	Brussel-Belgium	mixed	DSM Day	30+	30+	30+
October	Stockholm World green Building Conference	mixed	conference	30+	30+	30+

Meetings planned for 2017

Experts meetings/seminars/conferences

Experts meetings

Date	Place
TBD	South-Korea
TBD	Norway
TBD	Sweden
TBD	Exco 1
TBD	Exco 2

Seminars/conferences

Date	Place
DSM day before Exco meeting	Brussels, Belgium
eeeee Summer Study June	France

Publications produced in 2014–2016

- Task 25 website on the IEA DSM website <http://www.ieadsm.org/task/task-25-business-models-for-a-more-effective-uptake/>
- Literature review user centric design in business models <http://www.duneworks.nl/project-en/iea-dsm-task-25/>
- First Task 25 newsletter <https://ieatask25.wordpress.com/>
- Global analysis of business models, longlist and shortlist
- Toolkits for analysis of case studies (confidential for the moment)
- Factsheet Task 25
- Spotlight Issue 52
- Spotlight Issue 56
- Presentation at the IEA workshop on SMEs and behavioural change, November 2015
- Webinar for DSM university, November 2015
- Presentation at the Domestic Use of Energy Cape Town, South Africa, March 2015
- Presentation of Task 25 as a webinar (online publication)
- Presentation of Task 25 at IEA workshop on influencing business behaviour and decision making towards increased energy efficiency
- Presentation at IEA DSM ExCo Canada DSM day
- Thesis with analysis of Dutch shortlisted cases and impact of user centered design and service orientation on business models
- Global analysis of business models, longlist and shortlist (confidential for now, distributed amongst partners only)
- Spotlight issue on results of analysis
- Article in the Swedish Magazine Energy Efficiency on the Task 25 work in Sweden.
- D2: report with typology and description of existing services and business models in each participating country and their framework/ecosystem; Completed for Sweden and Netherlands
- D3: report with review of global business models and services in non-participating countries and their framework/ecosystem;
- D4: work in progress report with comparative analysis and key factors for success, including overview of success parameters to assess effectiveness of business models and services.

- Conference paper Behave conference on business models, capabilities, context
- Paper for special issue Journal for Cleaner Production on user centered business modelling for energy efficiency services
- Paper for special issue Energy Efficiency Journal on business models, capabilities and context
- Spotlight article on findings so far in task 25, October 2016
- Contribution to the Energy Efficiency Market Report of IEA 2016

Publications planned for 2017

- D4 finalised
- D2 for South-Korea
- Spotlight issue on results of analysis
- Paper as part of D6 for eceee Summer Study

Dissemination of results

Dissemination took place through a variety of activities and measures. Webinars for both national experts and other stakeholders, a newsletter/blog, dissemination on the website of the IEA DSM, The Duneworks Website and the Ideate website, papers to peer-reviewed journals etc.

Involvement of industry and other organisations

The Industry partners are explicitly represented in our Task, we involve them in the analysis (they are our unit of analysis), in the dissemination (they represent the majority of stakeholders for our newsletters), and in our workshops they are a key stakeholder.

Positioning of the Task – v.s. other bodies

ClimateKIC

We collaborated with ClimateKIC through the placement of Fiona Tutty, an ESCO entrepreneur in 2015 and Jaime Palomino in 2016.

Fiona spent several weeks with us working on the analysis of the BAS Path to Zero business case and a user analysis for this business model. This cooperation was very fruitful and has led to consolidated cooperation plans with Ireland.

Jaime worked towards a first draft of the D6 toolkit for entrepreneurs.

Other DSM IA Tasks

This Task aims to seek collaboration with Task 16, 24 and 26 to make sure the results build upon the work done

As the OA for Task 25 is also partner of Task 24 behavioural issues around business models and energy services on both the level of households and SMEs are organically fed into the Task work.

Collaboration with other Implementing Agreements (TCPS)

This type of collaboration is key for the success of the IEA DSM and for this Task.

Task 25 explicitly includes an expert from one of the ISGAN tasks, Prof. Dr. Geert Verbong, from the Eindhoven University of Technology (TU/e) as one of the team members. The IEA PV Power Systems programme is also attended by Prof. Geert Verbong and Dr. Boukje Huijben and as such good transfer of results is accomplished by them.

In addition, in May 2016 a cooperation day was organised in Linz, Austria, where operating agents will meet and discuss cooperation together with national experts.

Furthermore Task 25 and 4E EDNA exchanged work and aim to connect their experts.

And first contact was made with IEA EBC Annex 67.

Outreach of the Task – success stories

This year was again very much focused on developing a good analysis framework and developing a conceptual framework that allows for a perspective on the energy transition and the servitisation transition as well. We received very good feedback from the interviewed entrepreneurs, stating that our interview in itself already generated relevant learnings for them.

The entering of Norway and South-Korea was a clear example of the increasingly clear benefit of participating in our project.

The placement of Fiona Tutty and Jaime Palomino from ClimateKic was a very useful transfer of knowledge project, which has led to consolidated cooperation with relevant players in Ireland.

Finally we received several hundred hits on the first blog for our Task and many email queries following that blogpost. The project website is visited frequently by numerous visitors.

Finally, we are increasingly invited to contribute to programmes focused on business models. For example we supported the development of business models of Team FAST of the TU/e.

Activity time schedule

The planning for Task 25 has experienced some delays in terms of delivering D2 for some countries because of personnel change and internal reorganisations at the national expert institutes (austria and Switzerland). However, the later participation of Norway and South_Korea demanded an extension to allow a good catching-up and dissemination. At the exco meeting in Canada this extension was granted until November 2017.

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CHAPTER V

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Task 17

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Phase 2 – Behaviour Change in DSM: Helping the Behaviour Changers

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Business Models for the Effective Market Uptake of DSM Energy Services

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