

# DSM Spotlight

The Newsletter of the International Energy Agency Demand-Side Management Programme February 2014



# EOI

## Flexible Industrial Processes: A Valuable Tool To Accommodate Big Scale Variable Renewables

*The progressive penetration of variable renewables in the European electricity landscape requires, together with the upgrade of transmission networks, the development of flexibility means to match generation and demand. Given the limited capacity to store electricity on a large scale, a massive deployment of demand side response will be required in the years to come. Industry accounts for one third of the EU electricity consumption, and deploying its DSM potential would unlock significant amounts of valuable balancing resources.*

*Findings: Eleven flexible industrial processes could accommodate in Europe, under economic conditions, 68 GW of additional wind capacity, delivering 176 TWh/year of electricity, out of which two-thirds would be consumed on-site.*

### Introduction

The development of industrial DSM requires a proper economic valorisation of the flexibility. A number of avenues can be considered: integration of on-site wind power, integration of off-site wind power, adapting demand to electricity price signals, and offering balancing capacity to Transmission System Operators (TSOs). In this study, the first option is analysed (integration of on-site wind power).

Initiated and financed by the European Copper Institute (ECI), the German company

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## Note from the Chairman

### Inspiration from a Legend

In January renowned folk singer Pete Seeger died, aged 94.

This man inspired me through the years by being an independent and creative mind that always spoke out in a gentle way. So the decision to let him inspire me once more, this time to write the intro to this newsletter was easily made.

His remark "technology might save us, if it doesn't kill us first" seems an easy one, and variations on this theme can be heard and read on numerous occasions.

What makes his remarks different is that he made it in front of his pickup truck at the Clearwater and Alternative Energy Fair in front of interested visitors that passed by. (As can be seen on You-tube).

A guy in his early eighties who recently bought an experimental electrical truck made by an inventor who wanted to prove it was possible.

Pete made a number of topics clear to the audience: you can make a choice when it comes to how and when you use energy. His choice was a slow car to take him to

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## PARTICIPATING COUNTRIES

Austria  
Belgium  
Finland  
France  
India  
Italy  
South Korea  
Netherlands  
New Zealand  
Norway  
Spain  
Sweden  
Switzerland  
United Kingdom  
United States

## SPONSORS

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SYNLIFT Systems GmbH analysed the technical and economic potential for powering ten selected industrial processes using wind energy at the EU-27 scale at the 2020 time horizon. Phase 1 of this project finished in December 2012 and this paper presents the methodology used, the data available and the results of Phase 1.

Interested parties (industrial sites, energy management system providers, electricity market and regulation experts, etc.) are invited to join the consortium currently being established to implement a demonstration project.

### Project Aim

The aim is to assess the potential for on-site wind generation and self-consumption, under economic conditions, for a selection of electricity intensive industrial processes at the EU-27 scale and 2020 time horizon.

### General Methodology

The general approach consists in assessing the local wind condition and the electricity prices for each concrete location of the main industrial plants (of the selected process) in EU-27. The levelised cost of wind energy will then be compared to the average electricity price for the industrial sector in each country. In the cases where the price differential is positive, an opportunity for self-consumption exists. The price difference is first used for the payback on required investments (either product storage, manufacturing capacity or energy management systems) then to make an economic profit.

### Electricity Prices

Grid electricity prices for industry have been clustered into 4 categories. The price difference between the levelised cost of wind energy and the grid electricity prices has been clustered into 10 categories.

Grid electricity prices for industry (> 2 GWh/year)

Copper Alliance, one of the IEA DSM Programme's most recent members, is developing a concept to directly couple a wind turbine to an industrial process. This approach has the potential to provide GW-scale flexibility from the demand side.

are obtained from the Enerdata database during the period 2006 to 2010. Next, an annual increase of 2% is applied to the grid electricity prices, starting in 2010 and ending in 2020. Finally, the resulting prices at the 2020 horizon are clustered into four classes (G I to G IV). Most of the countries' grid tariffs belong to the lower classes G I (0.07 EUR/kWh  $\leq$  0.11 EUR/kWh) and II (0.11 EUR/kWh  $\leq$  0.15 EUR/kWh). Countries in the two higher classes are Germany and Malta in G III (0.15 EUR/kWh  $\leq$  0.19 EUR/kWh) and Denmark and Cyprus in G IV (0.19 EUR/kWh  $\leq$  0.23 EUR/kWh). See Figure 1.

### Wind Energy Generation Cost

The wind energy generation cost is calculated based on wind speeds at 80 m above the ground [2]. The four classes of levelised cost of wind energy are then defined and represented in a map (see Figure 2).

### Differential Costs

The levelised cost of wind energy is then compared to the grid electricity prices, country by country. Ten price differential categories are defined. The map in Figure 3 shows how Denmark, Germany, UK and Cyprus offer a significant price differential between the levelised cost of wind energy and the grid electricity prices. In these countries the opportunity to valorise the industrial flexibility is very high. Other countries also can have local interesting opportunities, but are not considered at this level of analysis.

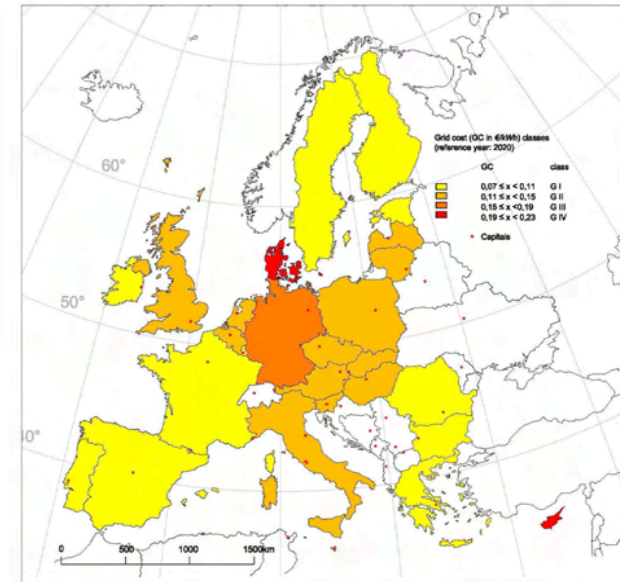


Figure 1. Countries categorised by the four grid cost classes.

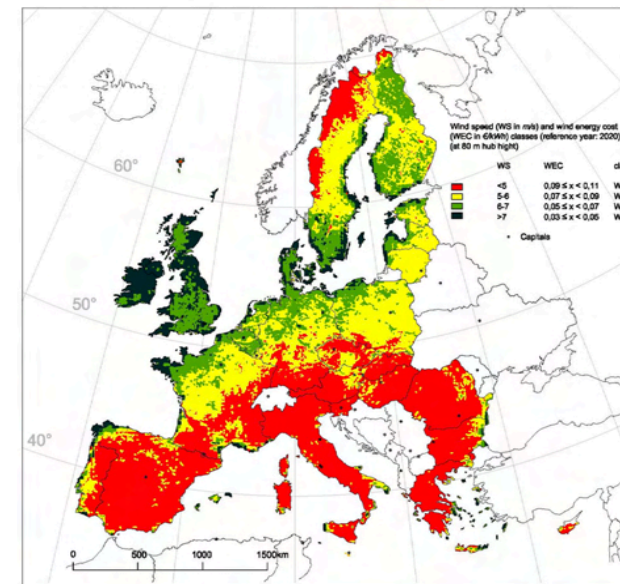


Figure 2. Wind speed and wind energy cost classes.

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### Relevant Industrial Processes

Eleven industrial applications were selected based on the following criteria:

- Electricity has a high share in the total cost of the manufactured product.
- The sector represents a relevant share of the electricity consumption in the EU.
- The process is suitable for load management [6].

The following processes were selected: chlorine-alkali- electrolyses by membrane technique (chlor), air separation, aluminum production (alu), copper production, mechanical pulp production, paper recycling, electro steel production (e-steel), cement industry, cold storage, seawater desalination and zinc die casting. These sectors consume 220 TWh per year, around 20% of the total electrical consumption of the EU's industry sector.

### Technical and Economic Potential

The technical suitability of a process for demand side management is assessed according to the following criteria: time behaviour, capacity range, synchronism, power gradient, activation effort and development state.

Following such an assessment, chlorine-alkali and desalination are clustered as having a high technical potential, aluminium and cold storage having medium potential, and e- steel having low potential.

As for the economic potential, the fact that some investments will be required in the process (additional process capacity, additional storage, energy management systems, etc) was taken into account. Only investments leading to a payback period shorter than 10 years are considered. Based on this, the minimum price difference between wind and grid costs to make the project profitable is as follows:

Process	Price difference (€/kWh)
Chlorine – Alkali	0.025 to 0.082
E – Steel	0.089 to 0.200
Desalination	0.040 to 0.122

The price difference is given in a range. The lower value is required to achieve a wind penetration of 70% (electricity with wind origin / total electricity consumed) while the higher value corresponds to a wind penetration of 90%.

### Wind Power Potential Assessment

The following table represents the potential for application, under economic conditions of on-site wind energy power for self-consumption purposes.

The 11 sectors selected represent an annual consumption of 220 TWh. Excluding the sites that have no economic potential for application of the concept, the target industrial locations represent a consumption of 180 TWh/year. Two thirds of this consumption could be provided by self-produced wind power (the remaining 60 TWh would need to be imported from the grid). About 58 GWh/year of excess wind power is required to be exported to the grid (and valorised at the levelised cost of wind energy in each case).

The total additional wind power that could be accommodated reaches 68 GW, which is as much as two thirds of the total wind power installed in Europe.

### Conclusions and Current Activities

Findings from Phase 1 of this show that eleven flexible industrial processes could accommodate in Europe, under economic conditions, 68 GW of additional wind capacity and deliver 176 TWh/year of electricity, out of which, two thirds would be consumed on-site.

Currently, the company Synlift Systems is carrying out an in-depth assessment of three industrial

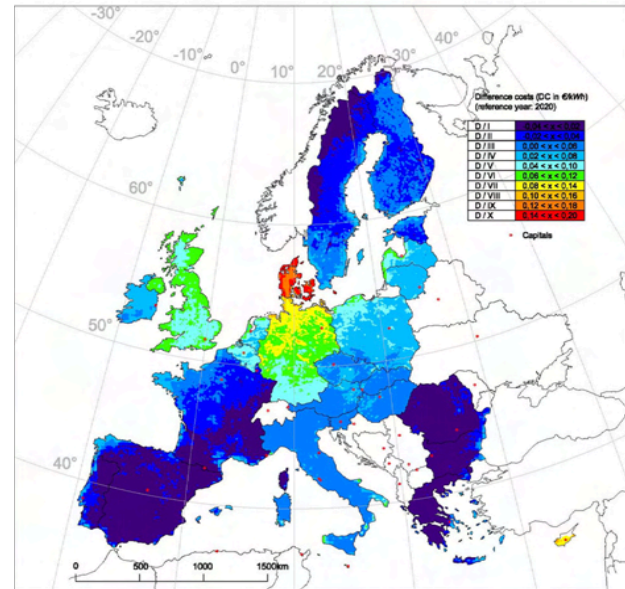


Figure 3. Map of price differential categories.

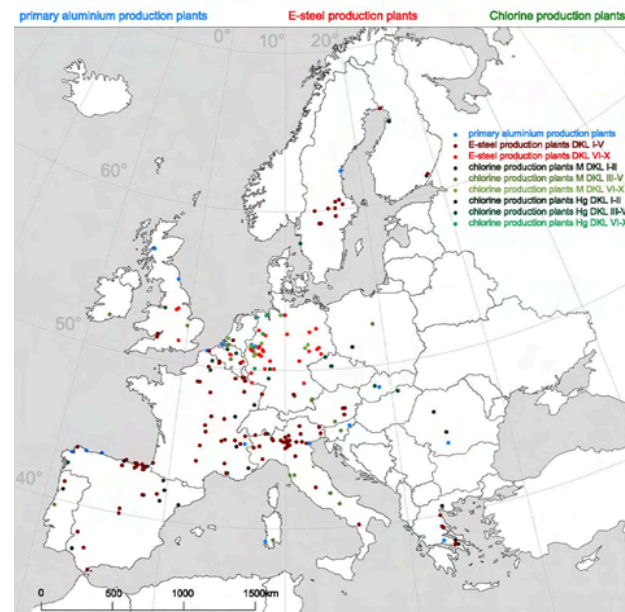


Figure 4. Map of select processes.

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companies in the chemical, air separation and metal sectors. The objective is to start demonstration projects in 2014 supported by as broad a consortium as possible. Interested parties (industrial sites, energy management system providers, electricity market and regulation experts, etc.) are invited to join the initiative.

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Process	Economic potential for on-site wind power	Sector consumption	Excluded from economic on-site wind	Net sector with on-site wind potential	Wind generation	Wind self-consumption		Wind generation exported to grid
	GW	GWh/year	GWh/year	GWh/year	GWh/year	GWh/year		GWh/year
Chlor	10	31447	5401	26046	26000	21798	84%	4202
E-Steel	10	32485	5564	26921	26000	16610	62%	9390
Alu	13	41739	8520	33219	33800	20783	63%	13017
Desalination	2	5399	985	4414	5200	3238	73%	1962
Cold Storage	9	29504	5381	24123	23400	16845	70%	6555
Air Separation	5	17471	3186	14285	13000	8941	63%	4059
Mechanical Pulping	6	18545	3382	15163	15600	9491	63%	6109
Paper Recycling	6	18545	3382	15163	15600	9492	63%	6108
Cement Production	6	19263	3513	15750	15600	9858	63%	5742
Cu and Zinc Production	1	4481	817	3664	2600	2293	63%	307
<b>TOTAL</b>	<b>68</b>	<b>218879</b>	<b>40131</b>	<b>178748</b>	<b>176800</b>	<b>119349</b>	<b>67%</b>	<b>57451</b>



# new work

## Business Models For A Better Uptake Of DSM Energy Services

*The DSM Executive Committee will consider the initiation of a new Task at their March 2014 meeting in New Zealand. The proposed Task aims to analyse and develop effective business models for a better uptake of DSM energy services. By focusing on the identification and creation of effective business models and the provision of viable value propositions ranging from audits to innovative financing to co-creation of micro generation in neighbourhoods, the Task participants will support the growth of the demand market for energy efficiency. Participants also will focus on identifying and supporting the creation of energy ecosystems in which these business models can succeed.*

### Why is there a need for this work?

To achieve growth in the demand market for energy efficiency, we need (1) energy services to mass market energy efficiency and deal with changing market structures and new regulations, (2) value propositions that meet the what's in it for me customer needs, and understand the needs and motives of end-users, (3) business models to bring the value propositions to market, and (4) a system in which viable business models can be created and flourish.

Over the years, we have learned that Energy Efficiency is a diverse, and therefore, complex proposition that is very difficult to grasp. Many end-users, (homeowners, business managers and the list goes on) intend to live a lifestyle that is more energy efficient, to make energy efficient purchases and to manage their home or business more energy efficiently. Despite these good intentions many of them find it difficult to identify the opportunities, decide if and which product/technology to choose, or

actually change their behaviour. A technical solution to this problem is not enough – services, enabled by technology are needed to provide a clear solution to the perceived need.

### How will end-users be part of the process?

There are many value propositions/energy services and accompanying business models out there, and saving money on energy costs seems an easy proposition, but most of these energy efficiency services have difficulty entering the mass market. There have been successful pilot projects, but becoming mainstreamed or replicated in other contexts (ecosystems) is proving to be difficult. The acceptance and acceptability of many innovative services and smart technologies is just not happening on a large scale. And despite various attempts to introduce “pull” elements, such as labels and certification of products and providers, the present approach still is very much of a “push” approach.

Most energy services are designed from a technical perspective, and as a result, the services proposed are insufficiently tailored to meet the users’ needs and are ultimately unsuccessful. When the users’ perspectives are centre stage right from the start when developing services then chances are the users will value the services.

Therefore, we need to understand what "Unique Buying Reasons" users have and what they perceive as valuable instead of the current focus on "Unique Selling Propositions" and technical possibilities. Value can be financial, but also wellbeing, status, comfort,

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### Why Participate?

Join this international team and...

- Create and/or support a market for energy services that effectively achieve energy conservation, generation or load shifting of households and SMEs.
- Achieve energy reduction or generation targets on national and international levels.
- Participate in the IEA DSM Task 25 Expert Platform and communicate with a large variety of international and national stakeholders. gaining eye-to eye contact and exchange of experiences between business developers, service providers and their results, successes as well as failures.
- Participate in the Task’s platform of shared learning, best practice examples and know-how in DSM energy services and business models. Contribute to a list of best practices on business models and the exchange of valuable knowledge.
- Contribute to the database of global knowledge and examples of successfully up-scaled energy service projects and business cases.

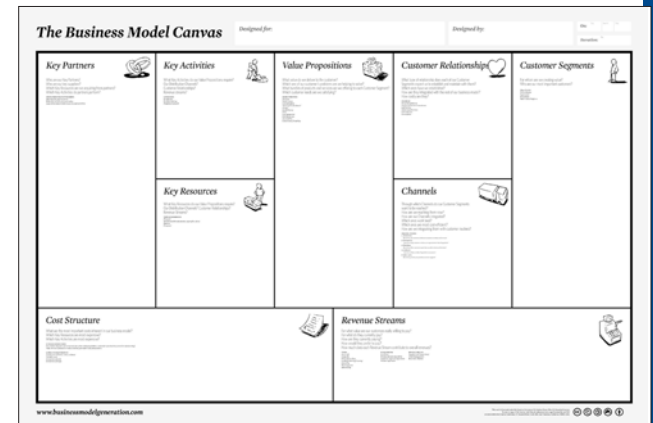
## Main Objectives

1. Analyse what works, how it works and what framework conditions are needed. This will be accomplished by identifying proven and potential business models for energy services on (first phase) issues of common interest in different countries, with a special focus on how to create conducive different market dynamics and policies in different countries.
2. Analyse acceptance and effectiveness of existing DSM 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 of business models + market dynamics and policies.
4. Develop a “canvas” for energy service business models and value networks able to mainstream and upscale business models and disseminate the information through national workshops.
5. Create a set of guidelines, instructions and plans to encourage market creation and the mainstreaming of business models in different countries.
6. Create and maintain a digital platform for shared learning, best practices and know-how that is focused on bringing this new knowledge to the national market, including banks and other funders!
7. Develop a database that includes useful tools, such as contractual formats, business plans, etc.

health, knowledge and skills. To design, develop and deliver services that get the end-users job done and that help service providers better understand end-user needs and motives. The Task will build upon the work of *DSM Task 24: Closing the Loop - Behaviour Change in DSM, From Theory to Policies and Practice*.

We also need to gain a better understanding of the multiple ways to create sustainable business models in order to create instruments and measures that will support the creation of energy efficiency markets and stimulate market innovation. Unfortunately, many suppliers of products and services that could provide energy efficiency are not trained to put together a viable business model. In addition, many of these businesses do not know how or with whom to cooperate with within the value chain, or they fail to use the right channels to bring the propositions to their customers. As a result, potentially great ideas and propositions never take off in the marketplace apart from some standardized cases and for some larger users who have the capacity to procure services (ESCO and EPC).

There also is a dire need for understanding how to support the creation of (inter)national systems that in turn can help create viable business models. Barriers on a national level may relate to policy and regulatory frameworks that are not functioning in favour of certain business models or to infrastructural issues that are hindering the use of certain technologies that are part of an energy service. The market structure also can be a barrier as it can inhibit competition and innovation. In addition, we need to gain an understanding of the roles of all the members in the many different national systems, including, the way they interact and the different types of value they exchange. New developments also need to be assessed for they may be drivers for energy efficiency business models and energy services. For example, energy companies and utilities are



**With business models we refer to the rationale of how an organisation creates, delivers and captures value. To describe a business model we start off with the business model canvas as developed by Alexander Osterwalder. This canvas comprises 9 building blocks: resources, value propositions, customer relationship, revenues, partners, channels, cost structure, customer segment and key activities. The canvas is widely used (not only for scientific purposes) as a strategic management and entrepreneurial tool.**

focusing more and more on energy services and the search for viable business models as they face the paradigm shift from selling energy to providing solutions (for many the result of the EU's EE Directive).

The proposed Task will be tailored to country specific needs and demands in terms of the Energy Service ecosystems and business models to be analysed. What is learned will be compared and shared and a best practices list will be created.

As a starting point, based on the preliminary analysis and feedback on the potential needs of interested countries, the Task will focus on business models for energy efficiency and energy saving services in the

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urban environment, with a primary focus on buildings and districts.

The targeted groups will be:

1. Companies (including small SMEs)
2. Communities/cities trying to set up (decentralised) energy smart districts
3. Households experiencing the principal-agent (owner-tenant) problem
4. Homeowners

The Task's initial focus will be on the professional energy service suppliers (electricity utilities, HEMS and BEMS vendors/developers, aggregators of Demand Side Management, providers of ICT services and (intermediaries representing) in social and local energy communities.

The Business model analysis will aim to:

- Make industries and businesses more energy efficient, including audits and advice services.
- Create smart districts, for example smart heat for district heating systems (CHP or other heating system change, integrated approach with decentralized energy sources) and measures on the demand side (renovation, EE measures, EPC, labelling).
- Create viable smart grid based services at the building level, for example small-scale distributed power, smart grid technologies (smart meters, HEMS, BEMS, control systems, forecasting, optimisation and interfaces) and smart appliances.

Issues of common interest for all business models, irrespective of country specific differences will include:

- Technology acceptability (related also to privacy, ownership of data and security), behaviour issues, shaping of incentives as well as governance and regulation.
- Outputs beyond energy and cost savings as identified by the IEA in Spreading the Net (2012): health and wellbeing improvements, job creation, poverty alleviation or increased disposable income, industrial competitiveness and productiveness, energy provider and infrastructure benefits, energy security, development goals.

*Interested countries and experts are invited to take part in the preparation of the Task's work plan. Please contact Ruth Mourik at [ruthmourik@duneworks.nl](mailto:ruthmourik@duneworks.nl) for more information.*

# finland

## Demand Response in Finland: A Retail Perspective

Demand Response is often seen as simply managing electricity demand in order to achieve lower peaks and shallower valleys in grid consumption profiles. In smart grid environments, the situation becomes more interesting however. Suddenly things like local production, alternate energy sources, fluctuating energy prices, personal preference and work schedules begin to mean new things.



### Smart Meters – Simple Or Connected All The Way?

Finland has rolled out smart meters in full scale. This means that practically every consumer has a smart meter, and more importantly, a smart meter with two-way control functionality. Many other countries have rolled out meters, but Finland did not stop there. Every meter registers use and optional production hourly (an hour being the unit of measure because it is the unit of trade all the way through the wholesale market structure). It is also a legal requirement to have

"Finland is the only country where the smart meter is connected all the way through all market levels"

Finland is a country where the electricity market was deregulated early on. For the past fifteen years, the electricity supply has been a completely deregulated business with customers exercising their right to choose levels of service, origin of supply and value added services. While there have been challenges in rousing consumer interest in the early years, people are becoming more aware of their possibilities to choose. Finland also has implemented smart metering in a scope that is unique in the world. This and innovative products will take the Finnish consumers into a new and interesting era of energy choice.

"600,000 metering points with controllable heating loads connected and running"

control relay functionality in the meter. Every meter is now read every day and every reading is transmitted daily both

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to the supplier responsible for the metering point's electricity supply and the end user. This means that every supplier gets a daily balance settlement figure based on real information and can plan accordingly. In other words, Finland has made the electricity market smart all through the market processes instead of just eliminating meter reading.

Early on in the development of the Finnish electricity system it was revealed that the heating load could be controlled to balance consumption with production. Time-of-use tariffs were introduced decades ago and implemented together with load control on a large scale. Now these controllable and already working dynamic loads have been connected to smart meters. In over 600,000 heating equipped metering points there are loads that can be dynamically controlled by the customer or the supplier in order to achieve optimum economy, comfort or allocation of local or environmentally sound production.

### Devices Galore, Is There Room For Them All?

While smart meters provide a control interface, they lack the ability to interact with the local environment in a dynamic way. Everywhere there are home and building automation systems and devices of different generations either installed, being deployed or

"The customer can now choose a temperature profile and choose to use energy when market prices are low, all without lifting a finger"

developed, which provide a rich environment for creating novel energy solutions for smart homes and offices. Now, as smart meter enabled information flows allow for accurate registering and billing of consumption and production on a metering point

level, the home and building automation systems also can provide services that are measurable and commercially viable. In Finland, there a number of companies promoting automation-driven energy products to provide dynamic load control, which eventually will affect the energy bill in a favorable way.

### Market and Customers, Or Was It The Other Way Round?

In the Smart Grids and Energy Markets project (SGEM) of the Finnish Cluster for Energy and Environment CLEEN, research is being carried out on how to create market infrastructure that will bring the existing controllable loads and potential new opportunities into the reach of every supplier and customer participating in the retail energy market. The 50 million euro project spans five years and will be completed this year. Among other things, this has resulted in developing information exchange structures and semantic information formats that can enable the aggregation of loads and local production into positions with business potential.

The SGEM project consortium also has worked on the challenge of engaging customers on a number of levels. A trial apartment environment was built to understand the interaction between the home and the customer and there have been multiple efforts to understand the factors that incentivize customers to take part in active energy market operations. The project also is working on engaging the government in order to ensure ongoing support for the development of demand response.

### Load Control For The Control Room Or Trading Floor?

One of the key results in the SGEM project has been to understand the complexity of working with flexible energy positions in an open market situation. The fundamental purpose of the market is to expose loads and production to market forces

"The SGEM project has helped understand the complexity of demand response in a market setting"

and to require control of these purely on commercial grounds. Obvious technical constraints exist, but as distribution and supply are unbundled and production is distributed onto different levels of the grid from transmission to distribution, managing demand ceases to be an engineering optimization problem. As markets evolve there probably won't be a single correct way to manage demand or to optimize production, but it has become clear more than ever that the role of technology is to facilitate market operation, not to control it. In Finland, the transmission grid operator already runs multiple markets for flexible loads and the Nordic wholesale market structure incorporates flexible bids across the board.

With the SGEM project ending in 2014, Finland is looking ahead to combine the knowledge and technologies developed in this most interesting setting with findings of other development projects around the world. Creating a scalable and nimble market that facilitates smart grid infrastructure is in the interest of everyone, as energy resources become scarce, changes in nature and the ever-increasing needs for environmental sustainability. Read more about the SGEM project and the project partners at [www.cleen.fi](http://www.cleen.fi).

*This article was contributed by Jan Segerstam, Chairman, SGEM Project Steering Group, [jan.segerstam@empower.fi](mailto:jan.segerstam@empower.fi)*



# new zealand

## The New Zealand Treasury looks to the Demand Side

### The New Zealand National Infrastructure Plan's Commitment To Demand Management

In 2009, the New Zealand Government established the National Infrastructure Unit (NIU) within the Treasury, to assist in its aim to permanently lift the sustainable growth rate of the economy. The NIU's role is to take a national overview of infrastructure priorities – providing cross-government co-ordination, planning and expertise.

The NIU wants to ensure that demand-side options are increasingly considered both as a substitute and a complementary tool to supply-side options in all areas of infrastructure. Demand-side options are already utilised across a wide range of infrastructure in New Zealand, however, too often they are discounted as there is limited understanding of the benefits and options available, with many people thinking only of pricing and regulation rather than other demand-side options such as marketing and technology.

The 2011 National Infrastructure Plan committed to "increase understanding of and encourage debate on the use of demand management and pricing in infrastructure sectors". This outcome is important to the success of infrastructure in New Zealand, as managing demand to the most effective and efficient level is crucial for ensuring New Zealand continues to grow and living standards continue to improve. This cannot be achieved by supply-side options alone.

Good infrastructure provision is crucial for economic growth and productivity, and this is optimised when we are investing in the right place and at the right time. A better understanding of demand maximises

our investment in new infrastructure and helps us to maximise our existing infrastructure by extending the life of existing assets.

In addition, a greater awareness of demand and how it can be managed makes long-term planning more predictable, and smoothes investment. A good use of demand management techniques also means that demand can be evened out to a constant level, reducing the need to build bigger just for peaks. Rapid advances in technology, for example battery storage, will only improve demand management capabilities into the future.

In September 2013, the NIU released a discussion document to help facilitate the debate on demand management. This was supported by a think piece from the National Infrastructure Advisory Board. The NIU is also publishing a range of case studies to show how demand management is already being successfully used in New Zealand. These can be found at [www.infrastructure.govt.nz](http://www.infrastructure.govt.nz). The NIU intends to continue the discussion of demand management practices in New Zealand with all infrastructure sectors in order to gain more understanding of good practice in New Zealand, and where it can be extended.

In early 2014, the National Infrastructure Unit is publishing an evidence base on the state of infrastructure assets in New Zealand. One of its key themes is the need for a better understanding and forecasting of demand, and it includes sections on scenario and trend analysis. Challenges we are facing include ageing assets and a changing and a moving population base. The National Infrastructure

"We strongly believe that demand response programmes can provide numerous benefits in managing the National Grid going forward. Ultimately, we can reduce the number of physical assets that need to be built in the future, meaning lower costs to the end consumer."

TRANSPOWER'S CHIEF EXECUTIVE PATRICK STRANGE

Advisory Board says in its foreword that 'With some large investment decisions on the horizon, especially in transport and productive water, we have a great opportunity for some bold discussions on meeting these future demands, improving our decision making and increasing our use of demand side options.' Both the electricity and urban water sectors also have opportunities to do some bold thinking regarding ageing distribution assets, coupled with advancing technology.

### Demand Management In The New Zealand Energy Sector

As the energy supply in New Zealand has been developing over time, consumer expectations of reliable, high-quality supply also have been increasing. Looking forward, projections for demand are lower in some energy types, adding to investment uncertainty. There are opportunities for energy efficiency and demand side management to improve utilisation of energy infrastructure.

The electricity market in New Zealand has been utilising demand-side management techniques for a long time, a particular example being reduced night-time rates. These have delivered successful results in

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terms of improved management of peaks and higher utilisation levels. The last few years have seen the widespread roll-out and use of smart metering, which is helping shift the focus towards increased customer control.

The energy markets are actively exploring new uses of demand-side management techniques in New Zealand, as demonstrated by the case study below, one of the first to be published by the NIU.

### Case Study: Transpower Demand Response

Transpower New Zealand Limited (Transpower) is the state-owned enterprise responsible for owning and operating the high voltage electricity transmission network throughout the country. The National Grid is made up of over 12,000 km of transmission lines and more than 170 substations. Electricity is transmitted over the grid at up to 220,000 volts from power stations to local distribution companies and major industries.

This case study demonstrates the active participation of electricity consumers reducing demand in order to postpone capital investment and achieve other benefits.

Demand Response (DR), or demand side participation, allows electricity consumers to respond to a signal from an organisation, like Transpower, to reduce their electricity demand for a period of time in exchange for a payment. It's a win-win situation where consumers are compensated for their involvement and see lower charges long term, while helping Transpower manage demand on the national electricity grid.

The benefits include:

- **Lower costs to all customers** – any reduction in peak demand can result in reduced grid and generation investment. Less transmission and generation infrastructure means lower electricity costs.

“Demand response will have a much wider role in making the electricity system more cost-effective for customers in the future and this Transpower programme will be a valuable prototype.”

- **Increased reliability of service** – if Transpower can actively manage non-essential load in response to transmission or generation failures, supply can be maintained to customers' essential services.
- **Reducing carbon footprint** – Continuing to 'expand' the current grid will increase the footprint of the grid, which Transpower would like to limit where possible.
- **Payment for participation** – Those consumers who enrol in Demand Response will receive payment for participation.

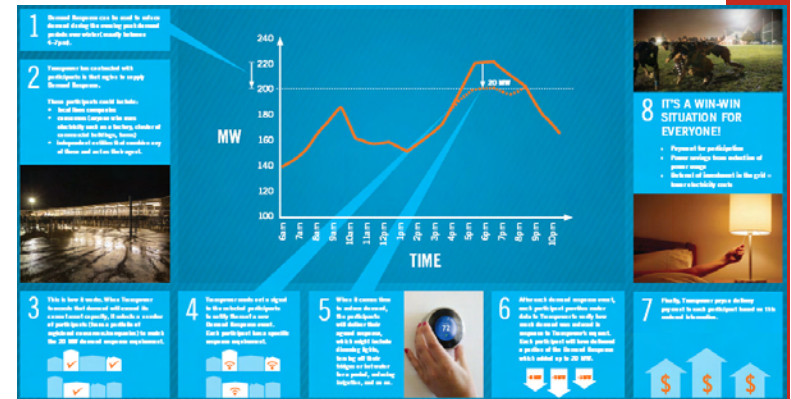
Transpower began using the new Demand Response platform in June 2013, targeting large electricity users as well as smaller business consumers, with the aim of having at least 100MW registered across the programme.

There are two options for participants:

- **Economic DR** – Providers bid to provide a demand response to offers by Transpower comprising a requested reduction and a strike price (in \$/MWh).
- **Security DR** – Providers make available a guaranteed level of demand reduction if Transpower calls a Security DR.

Since the programme started, Transpower has received a very positive response. Interest in the programme is high, with eleven parties signing up to provide demand response, varying from commercial businesses, to electricity industry participants, and larger industrials.

128 MW was offered in total, exceeding the target of 100 MW. It was also offered at a lower cost than anticipated, which makes demand response a real, and very exciting, opportunity for New Zealand. By December 2013, the Transpower DR team had successfully completed 24 DR events, with each designed to answer specific questions about how DR could be used during different scenarios on the grid. Performance had been positive enough for Transpower to use DR to support the power system in times of real need during those initial events. One encouraging aspect was that participation in the programme increased over time, with the peak response delivered at 214MW; more than double the target level.



This article is extracted from 'Demand Management: A Discussion Document by National Infrastructure Unit', first published in September 2013. For more information visit: [www.infrastructure.govt.nz](http://www.infrastructure.govt.nz) and [www.transpower.co.nz/projects/demand-response-project/demand-response-programme](http://www.transpower.co.nz/projects/demand-response-project/demand-response-programme).

# task 16

## ESCo Project and Market Development: A Role for 'Facilitators' to Play

*This third, and last article in the series on Facilitators' role in ESCO project and market development, looks at what has been learned so far and what the future holds for Facilitators. The work is part of IEA DSM Task 16: Competitive Energy Services (Energy Contracting, ESCo Services) and this article is based on the DSM Task 16 paper "ESCo Market Development: A Role for Facilitators".*

### What is a 'Facilitator'?

The previous two articles discussed the who, the what and the how much so now it's time to summarize what's been learned and what the future holds for this new field of work. First, a quick reminder:

- A Facilitator is an independent intermediary between ESCos and (potential) clients.
- The role of a facilitator is to enable a client to develop, structure and procure energy service projects.
- A Facilitator also serves as a mediator between clients and ESCos "(corporate) cultures", interests and expectations in different phases of the project cycle.

### What Has Been Learned?

Market development in a (largely) non-regulated environment is ultimately

determined by its (potential) clients' decisions to buy or not to buy. Therefore, this paper looked at the ESCo market development, predominantly from a client's perspective, both public and private sector, using the Energy-Contracting model.

By their very nature, Energy-Contracting models constitute a significant degree of complexity— they offer solutions for an entire project or life cycle (from design, building, operation & maintenance, optimization, measurement and verification to disposal). And, they integrate different technical trades as well as economical, financial, organizational and legal aspects of a project into one customized energy service package.

The integrated and multidimensional approach of performance based Energy-Contracting models offers solutions for a number of obstacles that face energy efficiency projects, which are not met through standard planning instruments and procurement practices. These solutions include minimization of project cycle costs, comprehensive planning and optimization across different technical disciplines and trades, and performance and operation guarantees for an entire project cycle.

In return, this comprehensive approach

has extensive implications and requirements for all parties involved, but particularly can be a challenge on the client side. From a client's perspective (but also for consultants and want-to-be ESCos), we found that these requirements often constitute substantial obstacles and challenges for comprehensive energy service projects and Energy-Contracting market development, and to overcome them requires special know-how and expertise not readily available in public institutions or within most private sectors undertakings.

### Facilitator Responsibilities

As a solution, we found that Facilitators, who mostly act on behalf of a client, can play an important and enabling role. The Facilitators role is to consult with the client (and sometimes also the ESCo) and to provide the specific know-how and experience needed to overcome specific energy service requirements. Additionally, Facilitator activities may include feasibility studies, selection of the best suited energy service business model (e.g., ESC, EPC or IEC), structuring of financing from different internal and external sources or subsidies, preparing tender documents, evaluating ESCo proposals, and providing quality assurance and

M&V on behalf of the client.

In addition to facilitating project development, another important advantage of the buyer-led approach is that it fosters competition amongst the supply side for particular projects. And, the role of the Facilitator is to provide a fair and level playing field for this competition between ESCos, other EE suppliers and financiers.

Another Facilitator role is to serve as an intermediary between clients and ESCos '(corporate) cultures', interests and expectations in different phases of the project cycle. This mediation may encompass guidance to ESCos on client needs and requirements either for specific projects or more generally, information and exchange about innovative energy services model developments or cooperation opportunities. Sometimes client's expectations towards ESCos and energy service models also need a 'reality check' so as not to overburden the model. Mediation may be needed to find consensus on how to adapt energy cost baselines to changes in the use of a building or plant. Facilitators can also provide independent advice on how to solve billing and M&V controversies.

But even the best Facilitator will not

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be successful if a client's organization and those involved are not able to meet the requirements and be supportive and knowledgeable counterparts for comprehensive Energy-Contracting projects. We want to acknowledge the fact and raise awareness among Facilitators and other stakeholders that the identified needs for change require approaches beyond economic rationale based on a 'homo economicus' concept or environmental awareness. Psychological and organizational change processes are needed, which may be new territory for many energy efficiency professionals. A key task for the client organization is to define their new role as client representatives and supervisors in 'energy saving partnerships'.

### Facilitator Costs

Facilitation costs are up-front investments for project development and for creating a level playing field for competition. In principle, the costs are comparable to other up-front planning costs, such as fees for architects, engineers and other consultants. Even though more cost data is needed for an in depth analyses, the typical facilitation cost in the more developed project facilitation markets of Austria, Germany and Sweden is 3% of the energy efficiency investment cost, with an average range between 1% - 14%. When comparing this cost to typical planning fees for engineers, which range between 10 -15% of the investment cost, the facilitation cost figures are notably lower—on average by about one half order of magnitude.

It should be noted that both clients and Facilitators remarked that the advantages achieved with regard to price and quality far outweighed the initial facilitation costs during intensive (but fair) competition between suppliers.

At least initially, facilitation costs must be borne by the clients. This up-front investment often constitutes an obstacle for market development and therefore policy makers need to be made aware of this so that they can take actions to support market development. Facilitation costs also appear to have only a little correlation with project sizes, which means their percentage value decreases for bigger projects. On the other side of the coin, this means that facilitation costs for smaller investment projects can be prohibitively high. In this context, facilitation costs also can be viewed as a transaction cost and thus can be used as an indication for minimum project sizes of Energy-Contracting projects.

The findings above are supported by empirical evidence from a number of ESCo market examples in Europe. Facilitators in these examples supported potential ESCo clients and thus successfully contributed to ESCo market development by creating a demand pull through energy service project development, which led to calls for proposals for ESCos to bid on.

### Outlook for the Facilitator Approach

For Facilitators, project facilitation will require interdisciplinary training

and experience in the various fields of EE and RE technologies, life cycle cost evaluation, procurement of comprehensive services, contract design and not the least communication skills to facilitate between the different parties involved. Ideally, Facilitators should have knowledge and understanding of both the demand and supply side of the market.

For Clients, decisions will need to be made on which parts of the facilitation know-how they want to build internally and which they prefer to hire external consultants. This is again a 'make or buy' decision, and will depend on the time frame, the resources available and the foreseeable number of projects in a client's portfolio to be outsourced. Whether this training can be left to commercial seminar providers or needs another institutional set-up is open for discussion. Proof of training or a comparable certification of professional competence could be made mandatory if public subsidies were used.

In terms of the Process, it will be necessary to encourage more interdisciplinary cooperation and research between the traditionally technical and policy led energy efficiency community and the behavioral economists and change management professionals. (For example, linking to the work of *IEA DSM Task 24: Closing the Loop - Behaviour Change in DSM, From Theory to Policies and Practice.*)

It would also be interesting for future work to compare the buyer-led facilitation approach to the ESCo-led

project development practice, which appears to be prevailing in developed markets in Europe and North America as well as in developing markets around the world that have received technical assistance from mostly US-led assistance programs.

Despite the opportunities that the Facilitator approach brings to the table, it is important not to lose sight of the fact that some Energy Efficiency obstacles can only be solved through legislative or regulatory changes, namely budgetary household regulations and respective accounting rules to permit signing and administrative implementation of long-term ESCo contracts in national, provincial and municipal public households as well as in private undertakings. Another example where legislative intervention is needed is for the split incentives between landlord and tenants in the residential and commercial building sector.

If the market is to move from individual projects led by highly motivated individuals to mass roll-outs of comprehensive building refurbishment portfolios as a means to provide more significant contributions of EE, and more specifically, energy services sectors that support energy policy goals, then the challenges noted above must be tackled and the Facilitator approach replicated.

For information on DSM Task 16: *Competitive Energy Services (Energy Contracting, ESCo Services)* visit the [DSM website](#) or contact the Operating

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This article is based on the paper, "ESCo market development: A role for Facilitators to Play" by Jan W. Bleyl, IEA DSM Task XVI c/o Energetic Solutions; Nathalie Adilipour, Swedish Energy Agency; Markus Bareit; Charles-Henri Bourgois and Johan Coolen, Factor4; Ger Kempen, Escoplan; Kim, Kil-Hwan and Jang, Hye-Bin, Korea Energy Management Corporation; Cho, Sung-Hwan, Jeonju University; and Lieven Vanstraelen, Fedesco Knowledgecenter.

This Task is also working with Leonardo ENERGY as part of the IEA DSM University. The first webinar on facilitators was held February 4, 2014 and can be replayed at <http://www.leonardo-energy.org/webinar/escos-market-development-role-facilitators-play>.

### Chairman's Note from page 1

town and to public transportation.

He also showed that being a singer-songwriter doesn't have to keep you from having the knowledge and attitude to create change.

And most of all that, by the end of the day it's a matter of taking action yourself.

The DSM Programme has embraced story telling as one of the instruments that has to be used to change the attitude towards the technology that does save us, and to reduce energy when possible.

In our research, we add a scientific basis to the storytelling and we work on options for how Pete's car can be beneficial to stabilize the grid when it's not driving.

The articles in our newsletter and our website can give you more information on this.

Back to Pete. In his Clearwater ship story (where the polluted Hudson River was cleaned

up as the result of his actions by the way) he states, "mankind has a 50/50 chance to survive climate change".

During one of his last interviews when talking about climate change, he was told about an initiative where you write a letter to the people alive 100 years from now. The answer of the man in his late 80s was heart warming: "Kids, how glad I am that you were on the good side of the 50/50 that managed to keep it."

He also quotes "I think there will be good stories told on how we saved the streams, the community and the planet, it's good to be an optimist."

We can't all be icons, like Pete, but if we share his passion we will bring forth better technological and non-technological solutions. And if we do it in the spirit of his optimism, we will have a fun time doing it.

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