Smart Energy Demand Coalition Position Paper

The intelligent cooperation between consumption and generation at the heart of the Smart Grid.

The SEDC Vision: *To promote the active participation by the demand side in European electricity markets, in order to ensure consumer benefits, increase security of supply and reduce carbon emissions*

Smart Energy Demand Coalition

The **SEDC** is an industry group, which represents the requirements of programs involving smart energy demand in order to further the development of the Smart Grid and ensure improved end-consumer benefits.

The SEDC **Vision** is to promote the active participation by the demand side in European electricity markets – ensure consumer benefits, increase security of supply and reduce carbon emissions**.**

The SEDC **Focus** is to promote Demand Side programs, including the full range of **"D3"** capabilities: demand management, demand response and the demand side support of distributed generation/storage. They involve such measures as: energy usage feedback and information, dynamic pricing, capacity and availability pricing, smart home, in-home and in-building automation, electric vehicle charging management, and other programs related to making demand a **smart**, interactive part of the energy value chain.

Demand Side participation is essential to:

- achieving renewable energy integration,
- meeting CO_2 targets,
- increasing energy efficiency,
- supporting electric vehicles,
- realizing the benefits of the Smart Grid,
- optimizing the use of distribution and transmission grid capacity,
- contributing to the innovation economy,
  creating cleantech jobs

and doing so cost-effectively

SEDC Policy Goals

SEDC Position Summary

Intelligent cooperation between consumption, transmission & distribution and generation, acting as equal partners in a holistic energy eco-system, forms the heart of the Smart Grid. Without this, the grid continues to function in a traditional manner - Generation supplies the needs of Demand, and the Demand Side blindly continues to consume. The price of this blind consumption will rise, especially as high levels of intermittent generation are introduced into the system, and as consumption patterns change. Immediate drivers for this change include electric vehicles, heating and cooling equipment. The success of the "smart" grid is therefore very much dependent on making energy demand "smart", using tools such as feedback, dynamic pricing, automation, capacity and availability pricing, and aggregated demand response.

Billions of Euros are currently being spent on the development and rollout of a variety of Smart Grid related technologies throughout Europe. These include smart metering, wind generation, grid automation, solar generation, electric vehicles etc. Yet in comparison to the funding, standardization initiatives, regulation, publicity and special interest activity surrounding and supporting these **technologies** – comparatively little attention is paid to the development of the demand side **programs** which are the heart of the Grid's "intelligence". This is especially unfortunate as these programs also form the heart of improved customer service within the Smart Grid. The lack of their development will both increase the cost of the grid and reduce return to European citizens.

Successful support of Demand Side Programs should therefore constitute a **top priority issue** within European regulation, in order to ensure that the intelligent interactive use of demand resources can effectively reduce CO_2 emissions by decreasing fossil fuel generation (especially generation induced by peak demand), support energy efficiency measures, support the cost effective integration of intermittent renewables and new technologies, such as electric vehicles, and bring more flexibility to the entire electricity system. These evolutions can only be achieved with maximum efficiency at minimum cost, through efficient demand side implementation.

Smart Energy Demand is defined here in the widest possible definition of the term and includes the full range of "D3" capabilities: demand management (energy efficiency), demand response (flexibility) and the demand side support of distributed generation/storage. This involves such capabilities as: dynamic pricing, capacity and availability pricing, energy usage feedback and information, smart home, in-home and in-building automation, electric vehicle charging management, intermittent generation integration and other programs related to making demand a smart, interactive part of the energy value-chain. Though each is designed to solve a different challenge within the energy system, each places the end-consumers (residential, industrial, commercial, institutional) at the heart of Smart Grid, and ensures they are equal partners within that system.

The Demand Side involves the active participation of customers. This participation will reinforce a closer relationship between customers and suppliers: new tariff structures, better value from and development of appliance control and smart electric consumption technology. With new information and technologies, suppliers and other market participants can offer end-users services that are often data-fed, in order to achieve a virtuous model of consumption pattern. As a direct result, the energy market functions efficiently, environmental goals are met, jobs and businesses are built, and security of supply is ensured at a ”net positive” economic cost.

Cost and Benefit of the Demand Side Programs

An increase in peak load, with the power plant and grid structures required to supply a few hours of electricity a year, exponentially increases the overall structural cost of the sector. This burden of payment is directly shouldered by end users and consumers, (residential, commercial and industrial), through increased network and electricity tariffs, unnecessarily raising their costs and lowering buying power. Besides this, generation of peak load is usually supplied through CO_2 emission intensive thermal plants. Peak supply, therefore, costs a disproportionate amount in CO_2 emissions as well as Euros.

Demand side programs and job creation

Demand response, available at peak consumption times, can lower the need to invest in grid and generation capacity, in a manner that saves the sector money and also directly benefits consumers and industry, allowing them to lower and control their own consumption and costs.

The demand side industry is of a higher job intensity than pure generation and creates employment within local economies. Unlike generation, which is low employment intensity and relies on the purchase of fossil fuels often sourced outside the country - the financial savings from demand side programs are reinvested directly in the local economy and the jobs that they create are also local. These factors are important consideration and should be included above and beyond the increased efficiency and other benefits.

Economic activities related to smart energy demand are expected to create significant job opportunities over the next two decades, with likely continued expansion thereafter. These positions would result from a number of key factors that driven by the adoption of smart grid technology, energy efficiency and demand response programs, integration of renewable energy resources, electricity storage including benefiting from existing building and other thermal storage, and electric vehicle charging support and optimization.

The jobs analysis results in estimates of job creation from two sources:

1. The first source is acceleration of the adoption of EU-wide renewable energy resources. In a detailed economic analysis prepared for the European Commission, a group of industry experts assessed the effect of such acceleration. The analysis compared a "business as usual" scenario with an "accelerated deployment policy" scenario. The conclusion was that accelerated adoption would increase total job creation by a net of 500,000 jobs across the EU.[1] Such an acceleration would require the support of widespread smart energy demand programs and services in order to (among other beneficial outcomes):

    - enable efficient and seamless integration of renewable technologies with the power grid and
    - avoid problems caused by intermittence (and other integration issues) of renewable resources such as solar and wind.

2. The second source is job creation associated directly with smart energy demand programs and services as outlined above. KEMA Consulting, based in Arnhem, the Netherlands, conducted a detailed analysis of smart grid jobs for the U.S. market.[2] Providing the full range of smart energy demand products and services to 70 million U.S. customers would create an estimated 278,600 jobs. When KEMA's methodology for the USA is adjusted for the European technology context and a larger population, the results were a calculation of approximately 927,800 estimated jobs by 2022 for smart energy demand in the EU, assuming 100% of customers have access to smart energy technologies and programs by that time.

Though these two studies are significant, it should be noted that they were not performed by members of the SEDC and may not account for all jobs lost through Smart Grid development. What do they point to is; firstly, that a significant number jobs would be created throughout Europe, and secondly, that more research should be carried out in this area to learn how this potential can be maximised.

Regulation as an enabler of investment

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[1] - European Commission, *The impact of renewable energy policy on economic growth and employment in the European Union*, April 2009.

[2] - KEMA Consulting, *The U.S. Smart Grid Revolution: KEMA's Perspectives for Job Creation*, December 23, 2008.

SEDC sees tremendous benefits implementing Demand Response Programs be it in the residential, commercial industrial, or institutional sector. Given the "low hanging fruit" of Commercial, Industrial (C&I) and institutional buildings, mainstream programs could focus on those buildings first, followed by residential pilot programmes. Utilities, grid operators and independent Demand Response Aggregators should design their programs based on where they see the greatest potential in the most cost efficient way for peak demand reduction and for demand management programs.

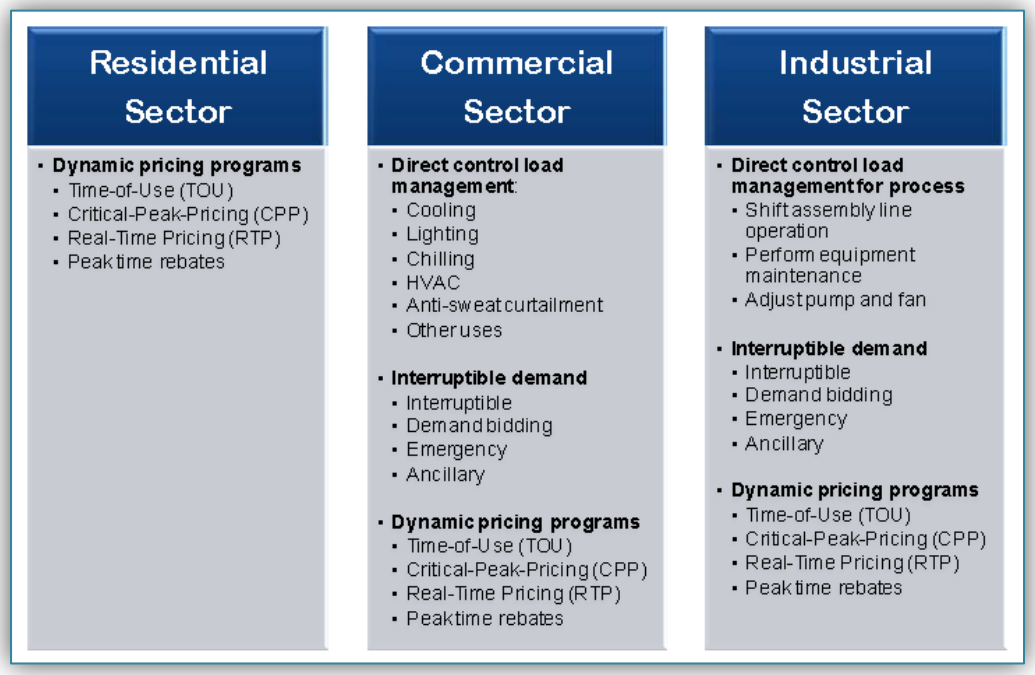
Demand side programs and generation should form a **partnership** to supply electricity securely, with the optimum efficiency and at the lowest possible cost. Including the demand side definitively lowers the cost and improves the efficiency of supplying electricity, but in order to do so, demand side programs **must be able to participate in the energy market to the full** - with the same access and providing the same services as a power plant. Examples of this participation include:

- 4-second management of consumption and power quality at all times,
- one- to ten-minute notice consumption management at all times
- peak load management of consumption and
- economically-managed consumption, in all hours

The value of each of these capabilities is enhanced by the fact that

- the resource is geographically targeted, local and specific
- the capital cost of "constructing and maintaining" a demand response "virtual power plant" is quite low and earnings go directly into the local economy
- demand response resources can be deployed in all manners, to reduce the maintenance cost and extend the life of any fleet of traditional power plants therefore lowering the cost of the total system for consumers
- demand response resources create supply diversity that will ensure that the "supply curve" is more vertical, creating lower clearing prices for all, in all electricity markets.

Scaling up mass market residential as well as commercial and industrial focused Demand Response programs will eventually equally deliver substantial benefits to the greater good – to consumers, the energy industry, the society and the environment.



Types of Demand Side Programs per market segment Source: Entelios

The timing of DR implementation is key

Demand Side Programs form part of a private public partnership. Wind generation is increasing, new back-up generation and grid investments are being planned and implemented. New demand sources are also appearing: server farms, heat-pumps, cooling units, and Electric Vehicles. To fully realize the potential of demand response and other demand side programs, the programs must be implemented **during** this phase of the European electricity market development, so that it can be built as an integral part of the new system. As unnecessary investments are made and as essential required investments are ignored, part of the value of demand side programs, both to European consumers and to the electricity industry, will be lost.

The Smart Grid is being supported in Europe as a key means, together with Energy Efficiency measures, to reach the Commission's 2020 objectives: 20% lowered energy consumption, 20% lowered CO_2 emissions and 20% use of renewable energy resources. Yet in order to achieve these ambitious goals, the Smart Grid technology now rolled out will need to enable intelligent cooperation along the entire value chain – from demand to generation.

SEDC Main Conclusions

Nr.	MAIN SEDC CONCLUSIONS
1	**The intelligent cooperation of Demand and Generation forms the heart of the Smart Grid.** Intelligent cooperation between consumption, transmission & distribution and generation, acting as equal partners in a holistic energy eco-system, forms the heart of the Smart Grid. Without this, the grid continues to function in a traditional manner, where Generation supplies the needs of Demand and the Demand Side blindly continues to consume – this system cannot be called intelligent or "smart".
2	**Aggregated Electricity Savings must have access to the wholesale markets and sold at the going market price.** Demand response can clip peak consumption, lowering the need for costly and polluting peaking plants. In order to carry this out effectively, the energy savings (the MW of reduced load) are often sold in the same way that electricity is currently sold. This is not the case in European Member States. The result: generated electricity can be sold at the going market price, aggregated energy savings cannot. Energy savings need to be treated with the same priority and protection as energy production within the wholesale markets.
3	**Demand Response programs are the natural partners of Wind and Solar generation.** Demand Response, especially commercial and industrial, can act as a reliable, highly cost effective, balancing mechanism for wind and solar generation in certain market situations. Intermittent renewables, other low carbon generation and Demand response programs are therefore natural partners, in a clean intelligent energy system. Demand response programs should therefore be provided regulatory support through the creation of country appropriate market structures, to enable them to fulfil their potential.
4	**Demand side programs ensure consumers an active place in the smart grids future.** Though each demand side program is designed to solve a different challenge within the energy system, each places the end-consumer (residential, industrial, commercial) at the heart of Smart Grid, and ensures they are equal partners within that system. Demand side programs will allow end-consumers to be involved in the Smart Grid's future, improving customer choice as well as lowering costs.

Nr.	MAIN SEDC CONCLUSIONS
5	**When and if Smart Meters are rolled out, they should support end consumer programs.**
6	**Communication capabilities and new standardised interfaces become as central as hardware**. Growing data and information dependency requires drastically rethinking of Smart Grid fundamentals. Communication capabilities become as central as hardware. An information model to help identify information requirements and granularity is needed. Industry systems will have to be overhauled and new interfaces standardised.
7	**Timing is central to long term savings. To fully realise the potential of demand side programs they should be implemented now as increased wind and solar enter the markets.** Timing is central. Wind generation is now increasing, while new generation and grid investments are being made. Once unnecessary back-up and network capabilities are built for Wind a large part of the value of Demand Response will decrease. Once electric heating without storage is rolled out, the storage cannot readily be added later. Once consumers learn patterns of charging electric vehicles immediately when arriving home, those patterns won't readily be altered. To fully realize the potential of demand response and other demand side programs, they should be implemented during this phase of the European electricity market development, so that it can be built in as an integral part of the new system.
8	**Commercial and Industrial Demand Response represent the "low hanging fruit" in European energy markets.** Currently many European demand side programs centre on residential applications only. While the residential sector is highly important, other consumer segments such as Commercial and Industrial are both cost-effective to work with and have a good potential of involvement in Demand Side programs. Currently they form the low hanging fruits within these markets Active demand participation by all demand side market segments, is a valuable way of mitigating market power and improving the operation of the competitive electricity markets and public research and investments should reflect this.
9	**Not to act is an action. If action does not take place, in effect - policy makers have decided against demand side development in their markets.** Successful demand side program implementation is a public/private partnership, requiring extensive regulatory support and planning alongside private financial investment. Without policy support, these programs will be neither effective nor financially viable. It is therefore policy makers who must act first. If action does not take place, in effect -

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	policy makers have decided against demand side development in their markets.
10	**Privacy protection and infrastructure security are also crucial for the smart grid reliability and consumer confidence and should be addressed quickly.**
11	**National market appropriate compensation structures are needed to counter "split incentives".** One major barrier to demand side management (demand response as energy efficiency), is "split incentives": each of the different stakeholders are reluctant to pay for improving the whole performance of the electric system, because the benefits are shared between them and neither, individually has a big enough incentive to shoulder the cost. Fair payment compensations have to be found, possibly through market mechanisms and price incentives.
13	**The measure and calculation of the megawatts savings or shifting by demand side actions is an important issue for the development of demand side programs and needs to be clearly defined by regulators.**
14	**Rising levels of intermittent generation and peak consumption, create the need of truly flexible consumption.** Due to the changing profile of generation in Europe, particularly the increased penetration of intermittent of renewables, consumption needs to become truly flexible - both upward and downward. Research, market development and regulatory initiatives should reflect this new reality.