



Norwegian Centres of Expertise

NCE Energy and Emissions Trading Halden

**Summary of the research
and innovation project**

Manage Smart in SmartGrid

December 2009



Manage Smart in SmartGrid

The project "Manage Smart in SmartGrid" explores the potential of Advanced Metering Infrastructure (AMI) / Advanced Metering System (AMS) for improving energy management both in private homes and public buildings. The proposed research will provide detailed understanding of how this is possible and what opportunities can be extracted for the benefit of the consumer, the suppliers, the environment and for society in general. Both new technologies, new models of energy management, services and prototype products will be developed.

SmartGrid is the term used for a group of concepts related to a more modern power network. SmartGrid is not a specific technology, but rather an infrastructure that enables active control and a two-way flow of electricity and information. The use of digital measurements and control systems such as AMI and AMS are important prerequisites for the consumer side of the SmartGrid. In Norway new legislation will be introduced by the end of this year, leading to an expected introduction of AMS in 2015. A functional specification for the basic metering part of the AMI concept for use in Norway has recently been presented. Still work remains to be done to define additional services that can take advantage of the benefits that the two-way digital connection between the grid and the electrical infrastructure of a building offers. Many opportunities can be found related to the measurement and control part of this as well as in combination with extended services.

One of the project's primary tasks will be to measure energy consumption in relation to individual and collective behaviour. Here, the collection of huge amounts of consumption and management data as well as study of consumer behaviour will be absolutely essential. The main objective will be to show, based upon user defined criteria, how the SmartGrid concept can be applied in practice to create more effective energy management in private homes and commercial buildings. This should ensure consistently lower energy consumption per capita in Norway. Moreover, the project intends to shed light on specific conditions around the robustness and flexibility of the supply situation as well as identifying economic incentives both for suppliers and for end-users. The project will, in these ways, contribute to establish a new regime for energy management and a new type of energy system that will meet the requirements imposed by the next generation climate and energy agreements. The developed models will lead to innovative services and products that exploit the SmartGrid concepts and that can be integrated with the future AMI. The solutions created should demonstrate user-friendliness, a high degree of utility and user benefit and meet the society's requirements for sustainable energy rewards. The project must also demonstrate a commercial potential.

The project is motivated by the need for a substantial reduction in world energy consumption as specified by the IEA. This is important for achieving the goals of avoiding a temperature increase of more than 2°C by the end of this century. Studies of energy usage in Norwegian buildings carried out by Enova¹, shows that the current reductions will not be sufficient to meet this goal. It can be noted as a paradox that a significant percentage of new buildings constitute the most demanding energy consuming units. Bellona² and Siemens have calculated that it is possible to reduce energy consumption in buildings, households and the service sector with a total of 8.4 TWh per year. This corresponds to a reduction in energy costs of approximately NOK 7 billion per year. Like the IEA³ and Enova, also the regional research institute, Østfold Research, concludes that knowledge about energy consumption in Norway, like many other places

¹ Enova SF is owned by the Norwegian Ministry of Petroleum and Energy and was established to take a leading role in promoting environmentally friendly restructuring of energy consumption and energy generation in Norway.

² The Bellona Foundation is an international environmental NGO based in Norway. Founded in 1986 as a direct action protest group, Bellona has become a recognized technology and solution-oriented organization with offices in Oslo, Brussels, Washington D.C., St. Petersburg and Murmansk. Altogether, some 75 engineers, ecologists, nuclear physicists, economists, lawyers, political scientists and journalists work at Bellona.

³ International Energy Agency



in Europe, is low. As an example, they relate this to house and office lighting, pointing out that control systems in use often are operated manually. Turning off lights then is the sole responsibility of the end-user. Poor attitudes and inadequate delegation of responsibility for extinguishing lights constitute a major challenge. The research institute also points out that houses equipped with control systems did not function well as the automatic control function was often poorly adapted to the task.

Expected project results

The project will contribute to:

- significant reduction in energy consumption in Norway resulting in a decrease of emissions from sectors that use electric power,
- more profitable investments in SmartGrid technologies and services,
- create a good instrument for more efficient energy use as well as a sustainable development,
- increased competitiveness and added value for Norwegian energy companies related to sale of sustainable energy resources offered through SmartGrid technology and services,
- increased added value in the Norwegian supplier industry related to products and services in energy trading and SmartGrid services, and
- creation of new knowledge in this field pertaining to industry, R&D as well as in higher education. This will create the foundation for research-based innovation in NCE¹ Energy and Emissions Trading Halden (NCE Halden).

The project will create new expertise and tangible results such as:

- new insight, as well as methods and models designed to influence the emerging market and regulatory mechanisms in the end-user market,
- new parametric and measurement methods to monitor energy efficiency and effectiveness related to individual behaviour and consumption,
- contribute a simulator to the NCE Halden's Simulation and Scenario Centre to study both micro and macro effects,
- develop new models for energy trade between market and end-user,
- develop at least two new service concepts and two new product prototypes aimed at the end-user market,
- conduct four pilot studies with the use of SmartGrid intended for specific users,
- educate one new PhD candidate, and
- publish six articles in scientific journals or presentations at conferences.

The project will primarily focus at the interaction between end-users and the professional players associated with SmartGrid. In addition to the development of models, services and technology, the project has an element of social studies through focusing upon consumer behaviour.



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Project organization

- Project owner: Tieto
- Academic: Institute for Energy Technology (IFE), Østfold Research, Digital Xalienc, NCE Energy and Emissions Trading Halden, Østfold University College, Norwegian University of Life Sciences
- Industrial: Tieto (IT product provider), moreCom (IT service provider), Statkraft (energy production), Fortum (energy distribution), Norske Skog (industrial consumer), Halden Municipality (public consumer)
- Reference Group representing additional industry and academic partners

¹ The Norwegian Centres of Expertise Programme (NCE) is established to enhance sustainable innovation and internationalization processes in the most dynamic and growth-oriented Norwegian clusters. The programme supports long-term development processes in the clusters based on collaboration between industry, R&D and the public sector. Twelve clusters have so far been selected and given status as a NCE project. More information at: www.nce.no