

GSGF Member of the Month: The Norwegian Smartgrid Centre

The Norwegian Smartgrid Centre (NSGC) was established in 2010 on the basis of a recommendation of the Norwegian Ministry of Petroleum and Energy in its national strategy process for defining future Energy R&D in Norway. NSGC is a strategic partnership, organized as a membership organization, where the purpose is to coordinate and promote smart grid R&I initiatives, education, and exchange of information between the members of the NSGC. NSGC has currently 46 members; universities, research institutions, manufacturers, power companies ICT companies and consulting companies. The NSGC also promotes international initiatives on Smart Grid by being a member of GSGF, by acting at the Executive Committee of ISGAN, and holding a position as Co-Chair at the EU National Stakeholders Coordination Group under the Energy Platform on Smart Energy Networks for the Energy Transition (ETIP-SNET). NSGC joined GSGF in 2012.

Demo Norway for Smart Grids

One of the main achievements of the NSGC so far is the establishment of **Demo Norway for Smart Grids**, a national Smart Grid demonstration and laboratory platform. The main purpose of Demo Norway is to support development, testing and verification Smart Grid technologies, services and use cases both in real life and laboratory environment. Demo Norway comprises presently eight real power system demo sites with more than 10.000 network customers with Smart meters connected as well as the brand new National Smart Grid Laboratory – see the figure below:

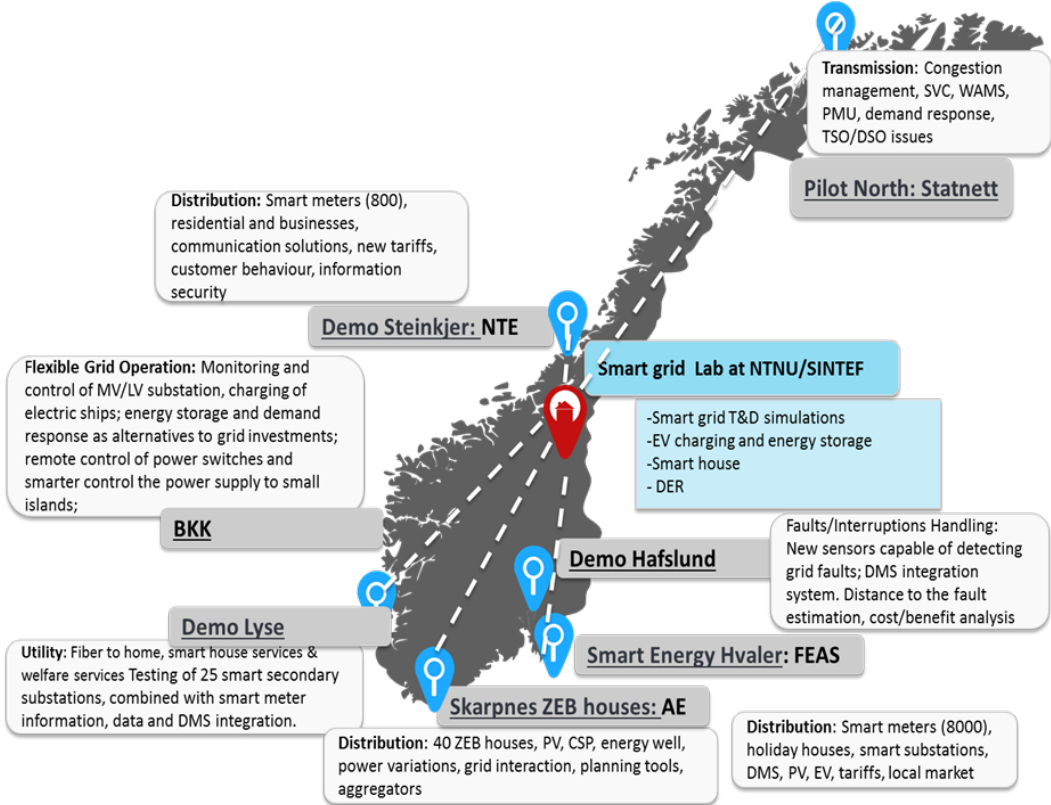


Figure 1 Demo Norway for Smart Grids

The demos are generally operated by regional DSOs except for *Pilot North*, which is operated by the Norwegian TSO: Statnett. The focus areas for the different pilots are indicated in the map (figure 1). Furthermore, together with 18 other national or regional innovation - and technology platforms in Europe the NSGC has mapped its smart grid activities in order to make it easier identify areas of common strengths and cooperation:

Centres of Excellence

	Austria	Belgium: Flanders	Cyprus	Czech Republic	Denmark PowerLabDK	Denmark SEN	France	Germany: BW	Greece	Ireland	Italy	Latvia	Netherlands	Norway	Poland	Slovenia	Spain	Switzerland	UK	
Smart Metering																				
Demand Response																				
Market Integration																				
Storage																				
Privacy/Data Security																				
Regulation																				
Integration of Renewables																				
Reference Architecture																				
Island Power Systems/Cells																				
Smart Cities																				
Home Intelligence																				
E-Mobility																				
Distribution Network Solutions																				
Education/Training/Seminars																				
Grid (infrastr.) Intelligence																				
Holistic Energy Concept																				
Industrial Prosumers																				

All National Technology Platforms in Europe have individual strengths. Platforms and initiatives, leading in a certain topic, can act as a reference for others and share its best practices. In the following matrix, the top competencies of all platforms are listed, making it easy to find common strengths.

Figure 2 Mapping of Demo Norway for Smart Grids in comparison to other technology platforms in Europe.

See the document **National and Regional Smart Grids initiatives in Europe" - Cooperation opportunities among Europe's active platforms** (May 2016, 2nd Ed.) on the website http://www.smartgrids.eu/ETP_Documents

Experience from the "living labs" in Demo Norway

The experience from the living labs under the Demo Norway for Smartgrids umbrella, has proven to be very useful for ongoing full-scale rollout of Smart Meters in Norway, which should be completed by January 1st 2019. The learnings range from practical issues

concerning smart meter installation and communication to investigations on how to utilize customer flexibility for smart operations of transmission and distribution systems.

The National Smart Grid Laboratory

Immature and high-risk use cases and technologies are best first studied and tested in laboratories while the more mature use cases and use cases which include the behaviour or human response of customers need to be tested in real power systems with real customers. In 2016 the Norwegian National Smart Grid Laboratory was formally opened. A specific feature of the laboratory is the opportunity to integrate real-time simulations and physical power system assets (power hardware-in-the-loop) with ratings up to 200 kVA, 400 V AC or 700 V DC. The set-up is very flexible allowing a range of use cases to be tested ranging from smart homes/micro grids to AC or multi-terminal DC transmission systems. The figure below shows the laboratory concept.

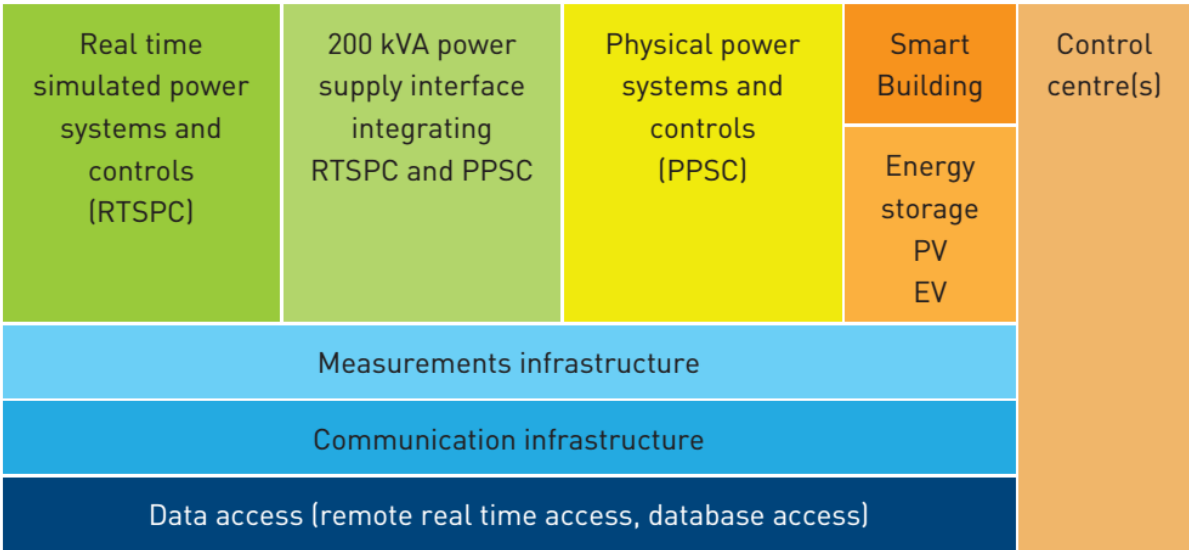


Figure 2 The National Smart Grid laboratory concept.

Smart grid outlook Norway 2017

As mentioned, the roll-out of smart meters keeps the DSOs quite busy these days and the smart metering infrastructure will be an important element in the next generation power system. But, there is not a clear view or road map describing the Norwegian Smart Grid version 2030-2040. There are so many options and the rapid technology development e.g. the IoT development, will bring almost infinite ways of combining stakeholders (old, new), technologies and systems in the construction of next generation power systems/energy systems - and their integration with smart city concepts (which at this stage are even more fuzzy than the smart grids). The Norwegian Smartgrid Centre has for worked for new instruments to support the strategy work needed to create a more clear vision and transition strategy for the future development. During 2016 two new initiatives were launched which will become fully operational in 2017:

1. Forum for future power networks in Norway
2. Centre for Intelligent Electricity Distribution (CINELDI)

The forum for future power networks is operated by the Norwegian energy regulator NVE on a mandate from the Ministry of Petroleum and Energy. The scope is to develop a vision for

the development of future power grids with respect to more efficient operation, utilization and development. Especially to evaluate the implications of the future smart grid for various stakeholders and the needs for the development of the regulatory framework.

CINELDI is one of Norway's Centres for Environment-friendly Energy Research (FME) co-funded by the Research Council of Norway and the industry (utilities, technology providers) The centre is headed by SINTEF Energy Research in cooperation with the Norwegian University of Science and Technology (NTNU) and will operate for eight years with a budget of about NOK 360 million (40 mill. €). The main objective of CINELDI, is to enable a cost-efficient realisation of the future flexible and robust electricity distribution systems including TSO/DSO interactions. This will pave the ground for increased distributed generation from renewable sources, electrification of transport, and more efficient energy use. To develop a credible set of Smart Grid visions and scenarios is a key element, which will provide a basis for fostering new ideas and innovations. To develop guidelines and recommendations for the transition to the flexible, robust, and cost-efficient electricity distribution system of 2030 – 2040 is an important goal for CINELDI. <http://www.sintef.no/projectweb/cineldi/>

Selected ongoing demonstration projects:

Demo Smart Energy Hvaler: Consists of 6800 customers in an island community. The demo focuses on developing and testing enhanced network utilisation, end user flexibility, residential PV and storage solutions, prosumers, local energy market solutions.

Demo Steinkjer: Energy companies, vendors, researchers, customers and governmental bodies can test smart meters, communication, system services, and other products on 800 end users consisting of ordinary households, commercial companies and industry. Flexibility of end users, value added services for DSOs, dynamic tariffs schemes, and feedback solutions to customers of Smart Meter Data are particularly in focus.

Demo Lyse Customer Services & Demo Smart City Grid: Testing of new energy services for residential customers. Gateway rollout to >150,000 customers as a new service platform. Testing of 25 smart secondary substations, combined with smart meter information, data processing and integration into a new DMS.

Demo Hafslund Grid Faults and Interruptions Handling: Installation of sensors capable of detecting grid faults; information about grid faults from sensors connected to the control system. Combination with various measurements in the grid for calculation of the distance to the fault location. A new methodology for calculation of costs and benefits.

Demo BKK Flexible Grid Operation: Monitoring equipment and control of MV/LV substation where special loads are connected, e.g. charging stations for EV, prosumers, tram, charging of electric ferry/ships; evaluation of energy storage as an alternative to grid investments; remote control of power switches and smarter control the power supply to small islands; DR as an alternative to grid investments (industry customers).

TSO Pilot North Norway: Load management and smart system operation on the basis of the monitoring and control of 200 load objects. Executed in cooperation with local DSOs.

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