

Briefing document CIRED 2013 Smart Grid Gotland project

(Project internal; Vattenfall, ABB, Schneider Electric)

Background (why are we doing this?):

- Sweden's target for the share of renewable energy in the year 2020 is 49 per cent according to the 20-20-20 targets. To achieve this target we need to increase the production of renewable energy.
- A large amount of this renewable production will be windpower (and solar energy) which varies over time and often is produced far out in the distribution grid. A large amount of electricity production in the distribution grid brings new challenges when it comes to power quality and surveillance and control of the grid. The existing grid has been designed for a central, non-variable electricity production, now we need to modernize the grid in order to handle more wind and solar power.
- In the future, electricity will be an environmental and economic alternative in energy systems (such as the transport sector) which today rely on other energy carriers. Electricity will most likely have a more prominent position in the energy system. But then electricity needs to be more reliable and available. We need to be confident that we get electricity. More and more functions in the society are becoming dependent on electricity – we need to have a reliable system that provides us with electricity on time and with a high quality.
- Focus on power quality and availability increases within the European Union.
- Smart grids are a necessity for the transition to a sustainable society. Smart grid is needed for example within the transport sector if we should use more electrical vehicles. The smart grid is the platform where we handle the challenges of tomorrow.
- Freedom of choice. More electricity customers want the opportunity to choose energy source themselves.
- Distributed micro generation.
- More electricity customers want the possibility to control their consumption and thereby have the possibility to affect the cost. Load shift. Use electricity when the price is low.

Why are we doing this in Gotland?

- The island of Gotland has due to favorable weather conditions, a large and growing wind power production
- The energy system in Gotland is similar to a future energy system with a large amount of renewable energy. This makes it possible to upscale the system and the results that are tested in Gotland.
- An update of the grid has been planned to enable more windpower on the island and a new DC-link is planned from the main land.
- Vattenfall/Gotlands Energi responsible for frequency control
- Gotlands Energi have very good customer relations, which facilitates the performance of test activities

Who are doing something?

The project is a cooperation between Vattenfall, ABB, Gotlands Energi, Schneider Electric, Svenska Kraftnät (The Swedish Transmission System Operator), KTH (Royal Institute of Technology), partly financed by Energimyndigheten (The Swedish Energy Agency).

Why is the Smart Grid Gotland project unique?

Smart Grid Gotland is a full scale demonstration project that will show how an existing distribution grid can be upgraded to handle large amounts of electricity produced by wind power. Real customers, electricity producers, grid owners and other actors interact according to market based conditions.

What are we doing?

Three main objectives:

1. Cost efficiently increase of the hosting capacity for wind power in an existing distribution system
2. Show that new technology can improve the power quality in a rural grid with large quantities of installed wind power
3. Create possibilities for demand side participation in the electricity market, in order to shift load from peak load hours to peak production hours

Five measurable objectives:

- Increase the hosting capacity of wind power from 195MW with 5 MW by use of load shift
- 20% reduction of SAIDI (System Average Interruption Duration Index), in the grid between substations in Källunge and Bäcks
- Active participation of 30 industrial companies
- Attract 2000 households to participate in a market test under market driven conditions.
- Active customer will contribute to a load shift of +/- 10%.

What are we doing in Gotland?

2 main activities in Gotland – The existing distribution grid between the substations Källunge and Bäcks will be updated to a smart grid and the project will carry out a market test in the whole of Gotland. The project will use a new smart SCADA system (supervisory control and data acquisition) to operate the updated smart grid between the substations Källunge and Bäcks and use one research off-line SCADA system to manage the market test. The research SCADA system is a copy of the operative SCADA but is equipped with some extra (high end) functions (DRMS, Focal point, Nostradamus).

- The smart grid between the substations Källunge and Bäcks
 - Installation of 2900 smart meters
 - New updated substations (part 2 of the project)
 - New sectioners and sensors achieving the self-healing grid (part 2 of the project)

- Installation of a photo voltaic system
- Installation of an energy storage (part 2 of the project)

- Market test
 - 2 000 households (Smart Kund Gotland) and 30 businesses
 - The market test will be used to test a number of different technical applications.
 - Aims to achieve a load shift by of +/- 10%.
 - Test is open for all households and businesses in the whole of Gotland, not just those located on the upgraded electricity grid between the Källunge and Bäcks substations.

How are we doing this?

The project consists of nine different sub projects. Three of the sub projects are associated with the specific objectives (windpower integration, power quality and market test) and the other six sub projects consist of technical installations (smart meters, smart substations and rural grid, energy storage, smart SCADA, ICT and market installation).

When?

The project started in September 2012 and is planned to continue until December 2015.

What is happening in a near future?

Installation of 2900 smart meters will start after the summer

SCADA Implementation (DRMS = demand response management system) finished during the summer, release 5th of July

Market test for households will start in October.