CINeLDI

Centre for intelligent electricity distribution
- to empower the future Smart Grid

Norwegian Centre for
Environment-friendly
Energy Research

Innovation type:
Algorithm

Innovation:

TRL: # 8

Year: 2024

Contacts:

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Potential users:

User	X
DSO, TSO	X
Technology provider	
Member organisation	
Market operator	
Research/consultancy	
Teaching	

Sensor installation at Arva

Pilot project: Flexible power grid by dynamic operation - I

The starting point for the pilot has been to use the technology called Dynamic Line Rating (DLR) with the use of line sensors and software provided by the Norwegian technology supplier Heimdall Power. The ambition has been to monitor enough adjacent lines and voltage levels to research capacity utilization, bottleneck monitoring, and management in a dynamic operated grid.

Challenge
Today, most power grids are operated based on static operating limits and experience-based models and forecasts, with relatively few sources of real-time data. The capacity of the grid is under pressure, and with increased electrification in the future, there will be a need to increase capacity to allow connections of new consumption and production. Can better utilisation of the existing power grid can be achieved through large-scale digitalization and what values does such monitoring bring to DSOs and TSOs?

Solution
Installing sensors from Heimdall Power, called Neurons, on a total of 19 lines and 325 km of the grid, at voltage levels from 22 kV to 132 kV. The work done in this pilot led to a lot of creativity and new work processes, models and so on, please see reference below. The Heimdall client was developed by Linja (DSO) in connection with the pilot and is a service that acts as an intermediary between the Heimdall Power API and SCADA systems. It runs on a Windows Server and retrieves real-time data on current and voltage from the Heimdall Power Cloud API. The data is transferred to the SCADA system using the IEC 60870-5-104 protocol. The Heimdall client is integrated with HeimdallPower.CloudApi.Client and uses lib60870.NET library to communicate in real-time with the SCADA system. Code written for Linja's Heimdall client and the integration methodology has been shared with BKK and adapted for integration with their SCADA system.

Potential
The use of DLR has a large potential to increase the use of existing power grid in Norway and internationally. This can postpone investments in grid and enable connection of end-users more rapidly. One example from Arva show that DLR capacity from the sensors on power lines have more capacity than the current limits suggest in 70-80% of the time over the course of a year.

Reference in CINELDI
• [Pilot "Flexible power grid by dynamic operation" report](#) (in Norwegian)

Innovation type:
Product

Innovation:

TRL: # 9

Year: 2024

Contacts:

Therese Åsheim, Iver Endresen, Erling Solberg, Vemund Losnedal og Magnus Helgeby, Heimdall Power, Bjørn Pedersen, Arva, Augusta Pithalice, BKK, : Arne Våge, Fagne, Kristen Skrivarvik, Linja, Karl-Fredrik Skalleberg, Lede, Erling Tønne, Tensio TN, Maren Istad, SINTEF Energi

Potential users:

User	X
DSO, TSO	X
Technology provider	X
Member organisation	
Market operator	
Research/consultancy	
Teaching	

Credit: Heimdall Power

Pilot project: Flexible power grid by dynamic operation - II

The starting point for the pilot has been to use the technology called Dynamic Line Rating (DLR) with the use of line sensors and software provided by the Norwegian technology supplier Heimdall Power. The ambition has been to monitor enough adjacent lines and voltage levels to research capacity utilization, bottleneck monitoring, and management in dynamic operated grid.

Challenge
Today, most power grids are operated based on static operating limits and experience-based models and forecasts, with relatively few sources of real-time data. The capacity of the grid is under pressure, and with increased electrification in the future, there will be a need to increase capacity to allow connections of new consumption and production. Can better utilisation of the existing power grid can be achieved through large-scale digitalization and what values does such monitoring bring to DSOs and TSOs?

Solution
Installing sensors from Heimdall Power, called Neurons, on a total of 19 lines and 325 km of the grid, at voltage levels from 22 kV to 132 kV. The work done in this pilot led to a lot of creativity and new work processes, models and so on, please see reference below. Drone installation of sensors is a new standard service from Heimdall Power addition, this pilot. In ground, new functionality for N-1 monitoring has been developed in a cooperation between Arva (DSO) and Heimdall and is now available for all of Heimdall's costumers. In cooperation with Lede (DSO) functionality that enables the setting of temperature limits for individual spans has been added to Heimdall's product. This is an important functionality, as some spans has low clearing to the ground, and this is crucial information to operate the grid safely.

Potential
The use of DLR has a large potential to increase the use of existing power grid in Norway and internationally. This can postpone investments in grid and enable connection of end-users more rapidly. One example from Arva show that DLR capacity from the sensors on power lines have more capacity than the current limits suggest in 70-80% of the time over the course of a year.

Reference in CINELDI
- Pilot "Flexible power grid by dynamic operation" report (in Norwegian)