RISØ DTU - Technical University of Denmark

Risø DTU is The National Laboratory for Sustainable Energy under The Technical University of Denmark (DTU), an independent, national university that covers all engineering disciplines, and teaches engineers at Bachelor, Master and PhD levels. The university has around 2300 researchers, 6000 students and 700 PhD students, and has a yearly turnover of € 500 million. Risø DTU has a staff of 700, of which half are scientists. The objective of the research is to provide industry and society with new opportunities, taking into consideration the demands for reduced consumption of resources and lower environmental loads. Risø DTU participates in Danish and international research programmes and conducts research and consulting activities for industry and governmental authorities.

Web:  www.risoe.dtu.dk

Contact:
Per Norgaard  
Intelligent Energy Systems
Email: pern@risoe.dtu.dk
Tel: +45 4677 5068

Research infrastructure(s):

**DTU SYSlab**  
(Roskilde)

The DTU SYSlab.dk experimental research facility is a full scale distributed laboratory for experimental testing of distributed, intelligent power systems with real power system components in a safe and flexible environment. The backbone of the facility is a flexible 3 phase 0.4 kV isolated power grid with several switchboard nodes distributed kilometres apart, and an Ethernet based communication network with several communication nodes and distributed intelligent control. The power grid may be coupled in either tree, ring or mesh topologies.

The SYSlab communication node consists of a computer with local data storage and with I/O interfaces for local control of the power units, for local monitoring and for external communication. All SYSlab communication nodes are interconnected via the redundant SYSlab high-speed Ethernet communication network, in a flexible setup providing on-line change of topology and testing of faults in the communication system.

The facility is constantly being developed and extended along with new research activities. At present (2008) the facility includes:
- 3 substation switchboards + 1 crossbar switchboard;
- 1 tap-changing transformer;
- 50 kW diesel generator set;
- 10 kW wind turbine;
- 50 kW wind turbine;
- 10 kW PV solar panels;
- 15 kW / 120 kWh Vanadium flow battery;
- 30 kW back-to-back converters to the public grid;
- 20 kW office building load with flexible load control (FlexHouse);
- 35 kW mobile load simulators;
- 75 kW controllable dump load;
- 46 kVAR controllable capacitor bank;
- 30 kW motor-generator set for power plant simulation;
- 1 kW / 10 kWh plug-in hybrid vehicle with intelligent load flow control;
- 20 communication nodes.

Among other thing, the SYSlab facility may be used to test virtual power plant concepts – e.g. by controlling the 10 kW wind turbine, the 10 kW solar panel and the 15 kW Vanadium flow battery as a virtual power plant in a power system with the diesel generator set and the combination of real load by the office building and simulated distributed loads. The build-in data acquisition facilities in the communication nodes may be used for distributed measurement of the system performance.

The DTU SYSlab forms part of the wider DTU PowerLab, including various laboratory kW-scale facilities for detailed analyses as well as a semi isolated part of the Danish power system – the comprehensive monitored MW-scale Bornholm Island power system – for testing in a real and complex environment.

Web:  syslab.dk

Contact:
Henrik Bindner  
Intelligent Energy Systems
Email: hwbi@risoe.dtu.dk
Tel: +45 4677 5050