



# 1 Electric Lab

Development and testing of electric power components, software and systems

Comprehensive configurable low-voltage (400 V) grid with 22 lab cells, different energy resources and large experimental halls for flexible electric experiments. The dedicated grid connects a number of resources with the lab cells suited for testing individual components or concerted testing of several components/units against each other.

Powerful programmable three-phase 150 kVA 4-quadrant power amplifier with unique characteristics for test, lab supply and combined grid studies.

The Electric Lab facility is strongly linked to central SCADA system and other PowerLabDK facilities as Student Lab, Intelligent Control Lab, SYSLAB and Bornholm Power System.



## Applications

- ▶ Flexible electrical power experiments
- ▶ High power electronic units
- ▶ Power line carriers
- ▶ Solar power inverters
- ▶ EMC component tests (IEC/EN 61000-4-11)
- ▶ Concerted testing of components against each other
- ▶ Testing of components against simulated network
- ▶ Grid control architecture
- ▶ Grid control strategies
- ▶ Electrical vehicle charging and V2G components
- ▶ EV infrastructure and grid integration
- ▶ Energy forecasting systems

TEST AGAINST STANDARDS:  
PowerLabDK facilities are suitable for technology development related testing of electric power components and systems against a wide range of standards; including IEC and CENELEC standards.



## 2 Electric Lab



### Flexible and configurable test bed

- ▶ **Comprehensive configurable low-voltage grid with 22 LabCells** and different energy resources: The purpose of Electric Lab is to offer a flexible and reconfigurable test bed for fundamental study, development and testing of component and systems relevant to the future electric power system anticipating a market based power system relying increasingly on distributed and intermittent resources.
- ▶ **Flexible grid structure:** Electric Lab constitutes a flexible and reconfigurable triple bus dedicated grid structure rated at up to 400 V/200 A per bus. The dedicated grid connects a number of resources with 22 lab cells suited for testing individual components or concerted testing of several components/units against each other. Each lab cell is fitted with a standard panel offering the following: access to three buses including monitoring of 3-phase voltage, current and power; access to other basic resources such as water, natural gas, hydrogen, liquid nitrogen, forced cooling and pressurized air; access to high speed (Gbit/s) wired communication lines as well as wireless coverage.
- ▶ **Powerful three-phase 150 kVA 4-quadrant power amplifier** with unique characteristics for test, lab supply and combined grid studies: Ideal and disturbed voltages up to 150 kW continuous as source and 42 kW continuous as sink. High peak load-ability (1.2 MW). Very fast slew rate (>52 V/ms). Large signal bandwidth (DC - 5 kHz). Very low internal resistance.
- ▶ **Large experimental halls for flexible electric experiments:** Resources that may be connected to each lab cell are: a unique 600 kVA 50/60 Hz rotating generator; a 100 kVA rotating generator; a variable frequency, programmable three phase 150 kVA 4-quadrant electronic power amplifier; a real time digital system (RTDS) with the option of connecting this with hardware in the loop and a powerful blade server configured with a platform for testing control architecture as well as control strategies.
- ▶ **Supervision of experiment:** The configuration of a particular experiment in Electric Lab can be overviewed from a single local computer and from a central SCADA system wherein personal safety as well as data security is an integrated part. From a dedicated SCADA system in the Control Lab Electric Lab may be accessed and reconfigured alongside Student Lab. Experiments in Electric Lab may through Intelligent Control Lab be strongly linked to experiments at SYSLAB and Bornholm Power System.