

NATIONAL SMART GRIDS LABORATORY

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ERIGrid-CINELDI Workshop
28.10.2019

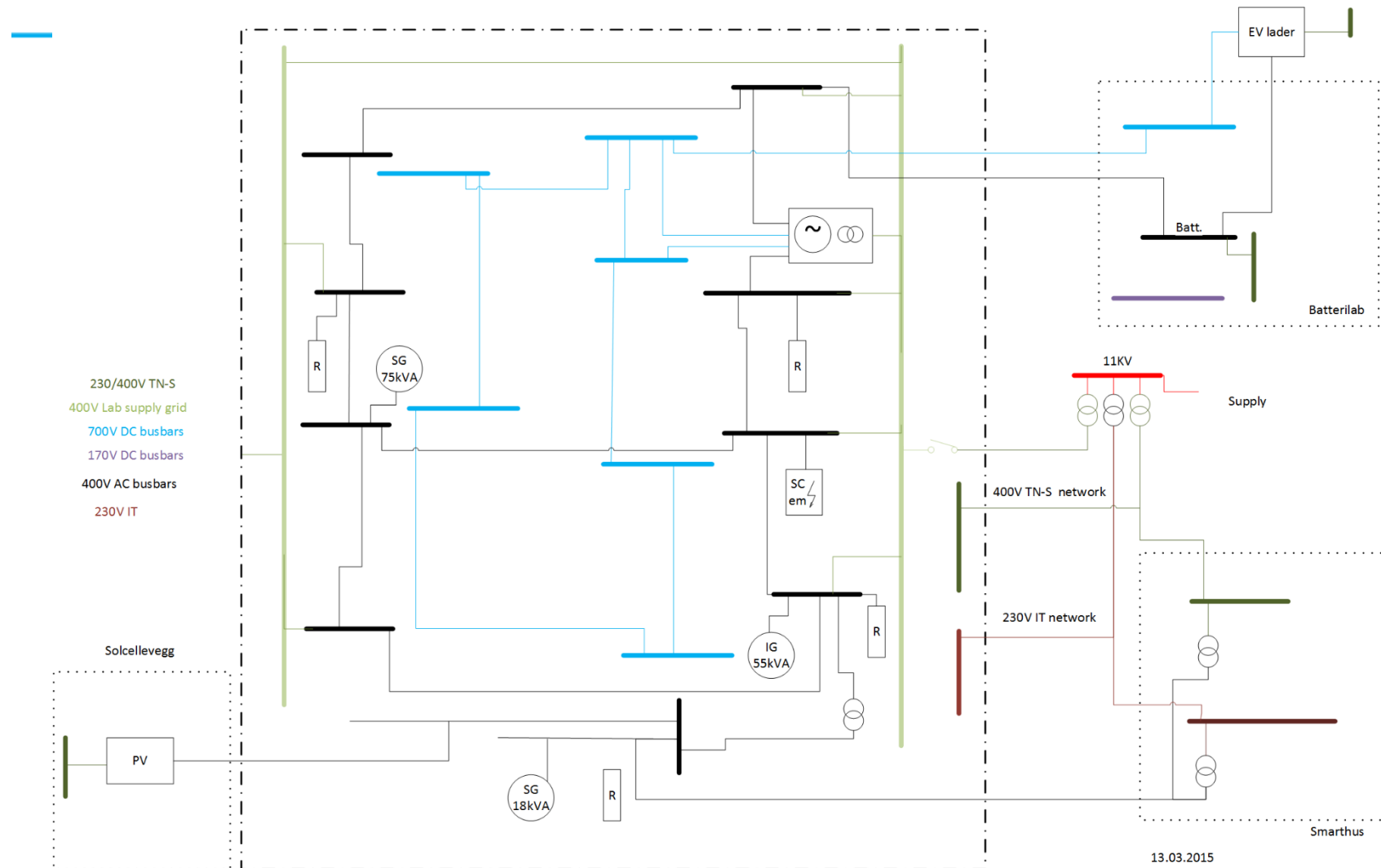
The story

- It is research infrastructure project funded by NFR since 2014
- Formally opened in September 2016
- Multiple projects use it daily
- In ERIGrid, 5 user groups from multiple countries and institutions

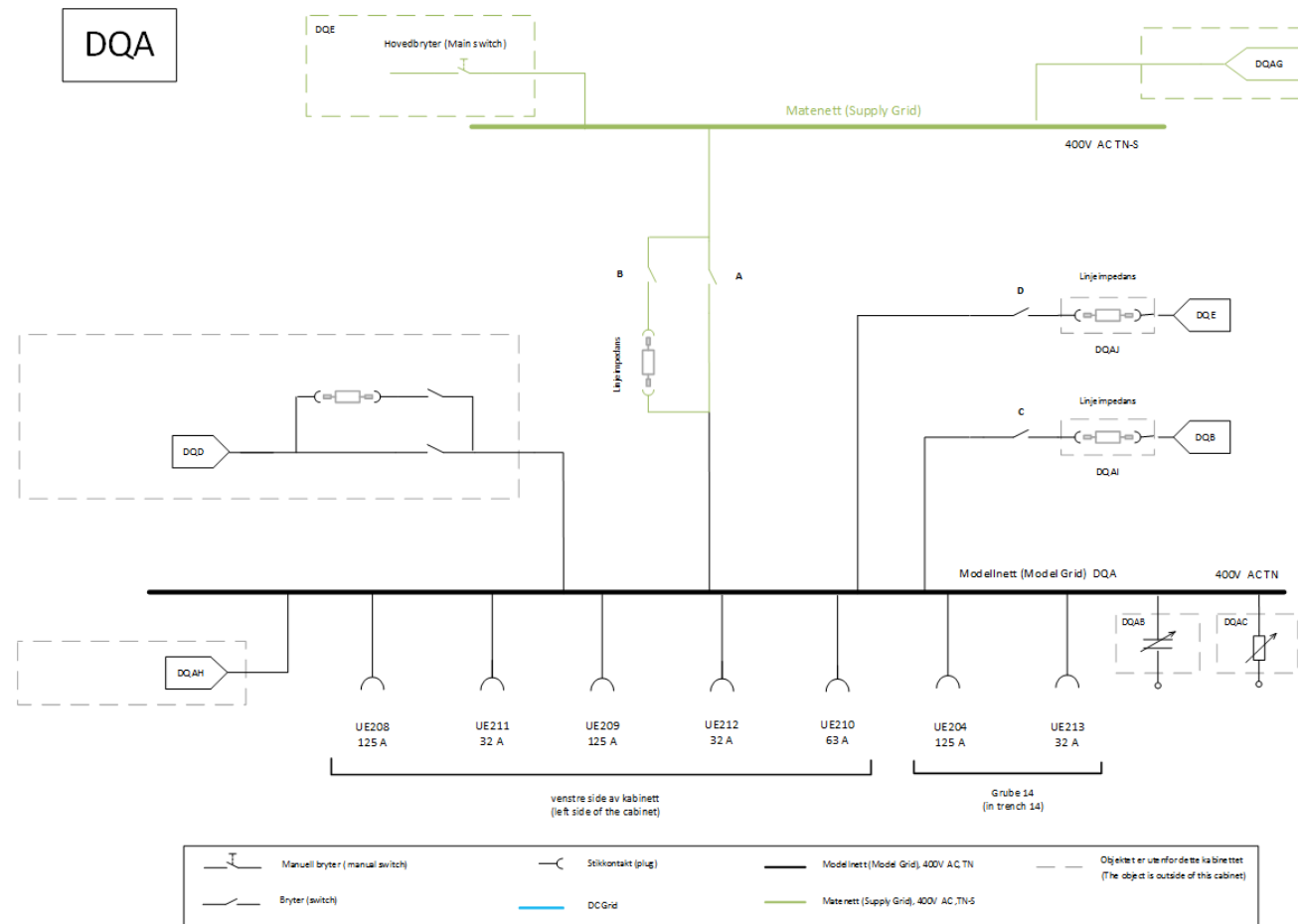
Main features

- Reconfigurable layout with ac and dc bus
- Power electronics converters
 - 2 level VSC 60 kVA, MMC 60 kVA, Grid emulator 200 kVA
- Electrical machines
 - Synchronous generators, Induction machines
- Real time simulator platform (OPAL-RT eMEGASIM 7 parallel cores, 2 FPGAs, Fiber optic communication)

Network Overview

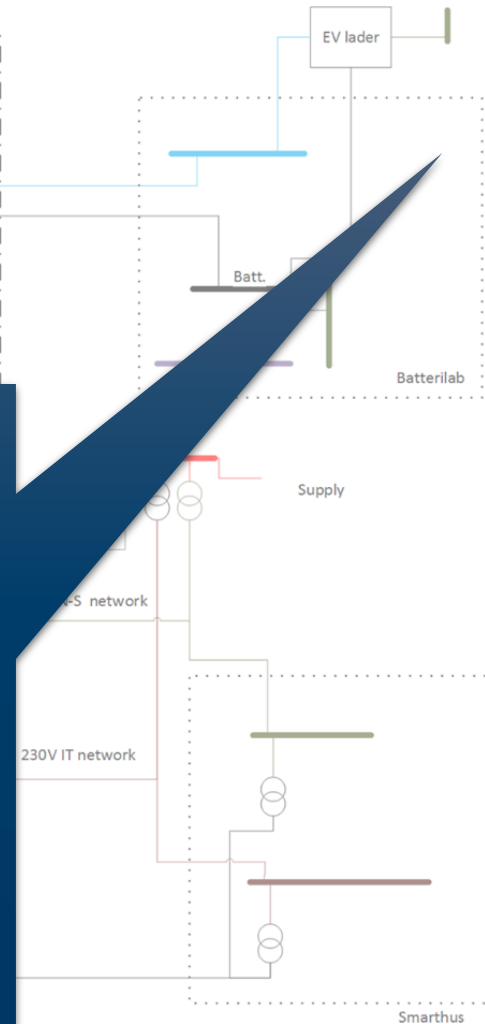


Busbars and topology overview



Network Overview

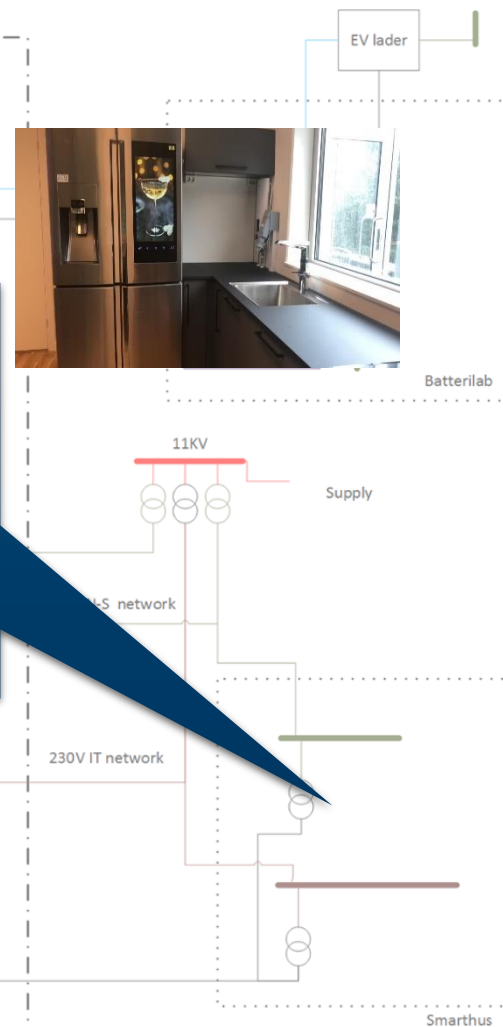
- ✓ Regenerative battery tester
- ✓ Climate chamber
- ✓ PV simulators
- ✓ PV Inverter



13.03.2015

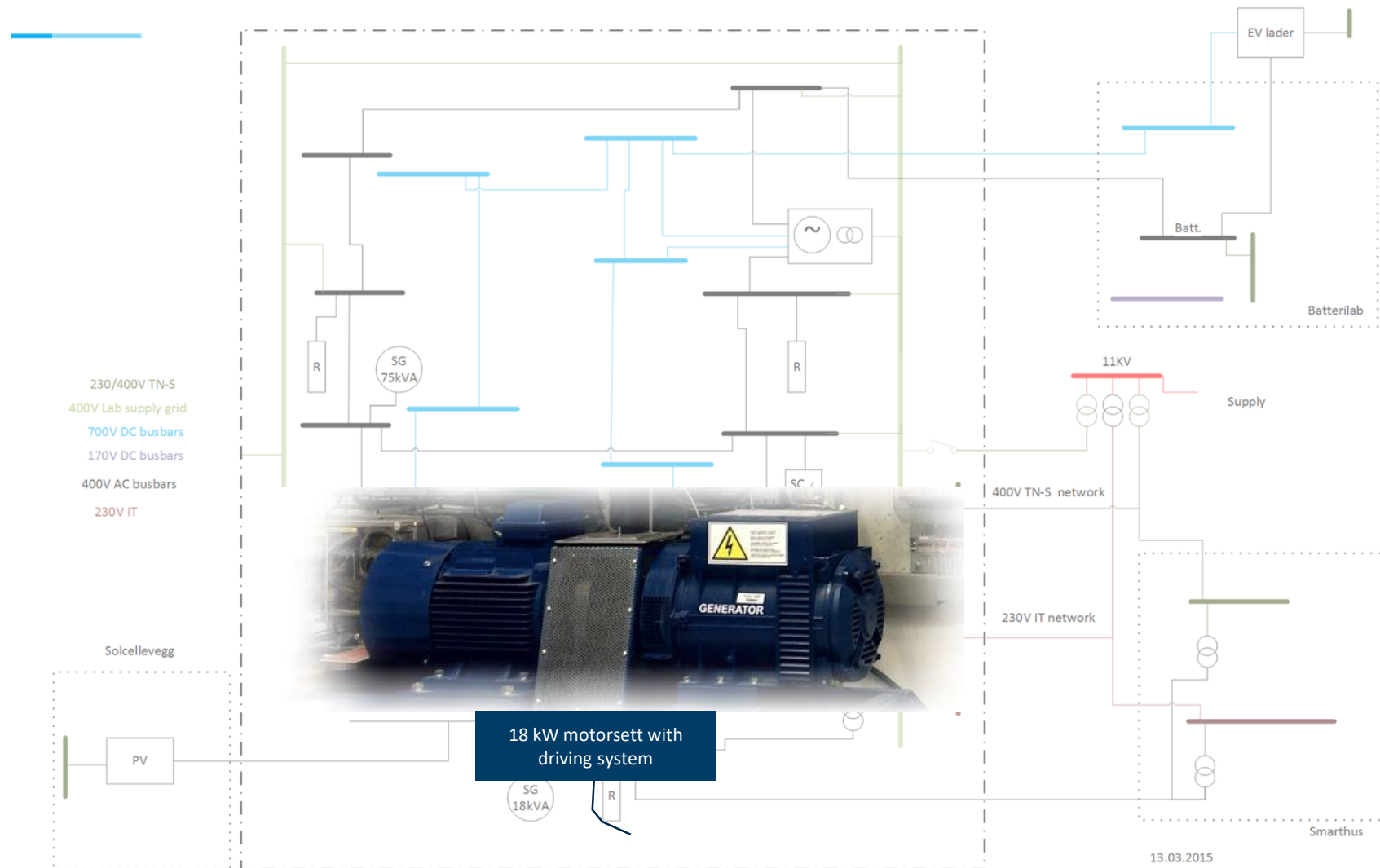
Network Overview

- ✓ Testing of smart control etc.
- ✓ Network for IT and TN systems.
- ✓ Can be fed in from Smart Grid Lab. and Energy Storage Lab.

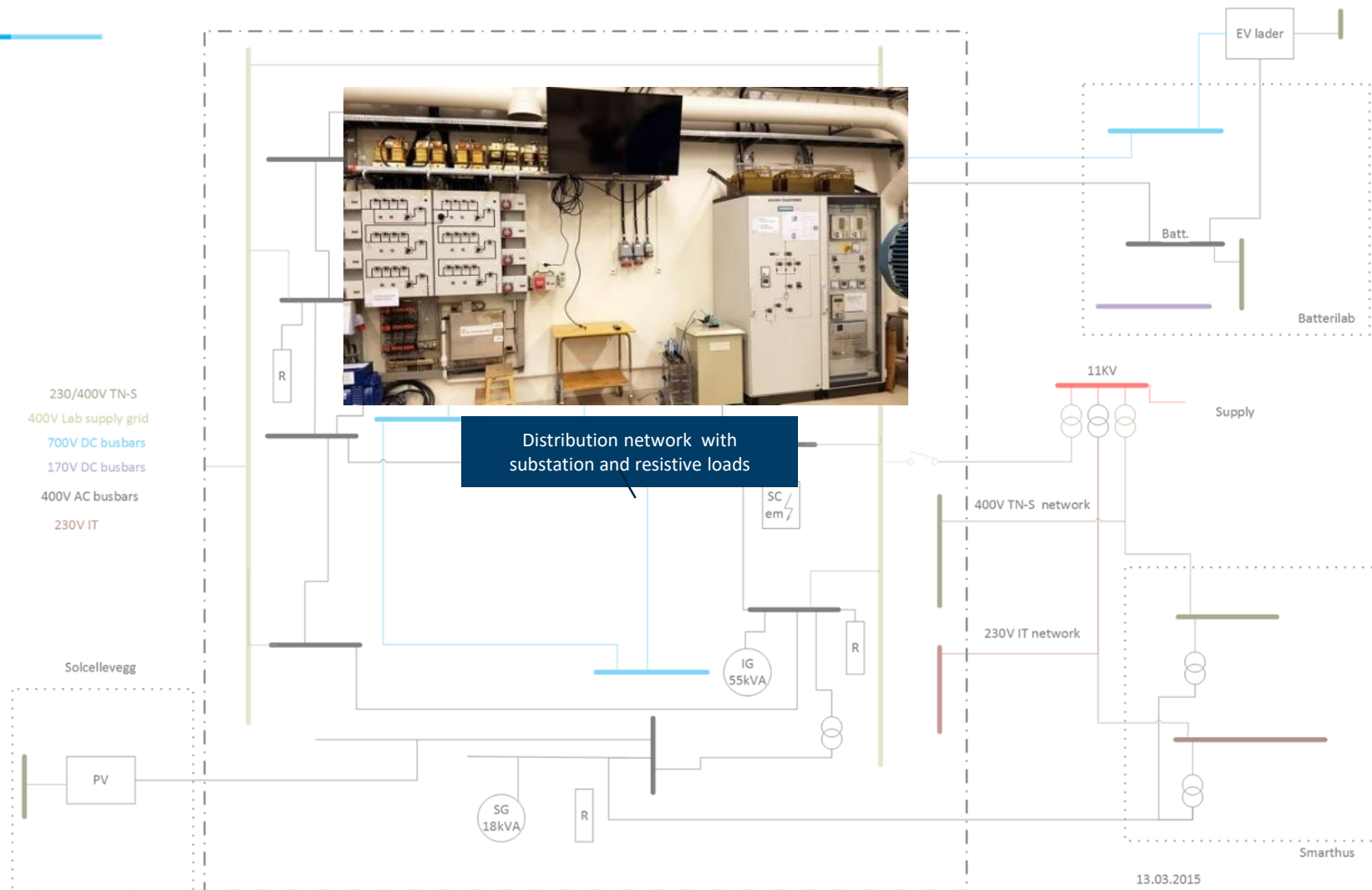




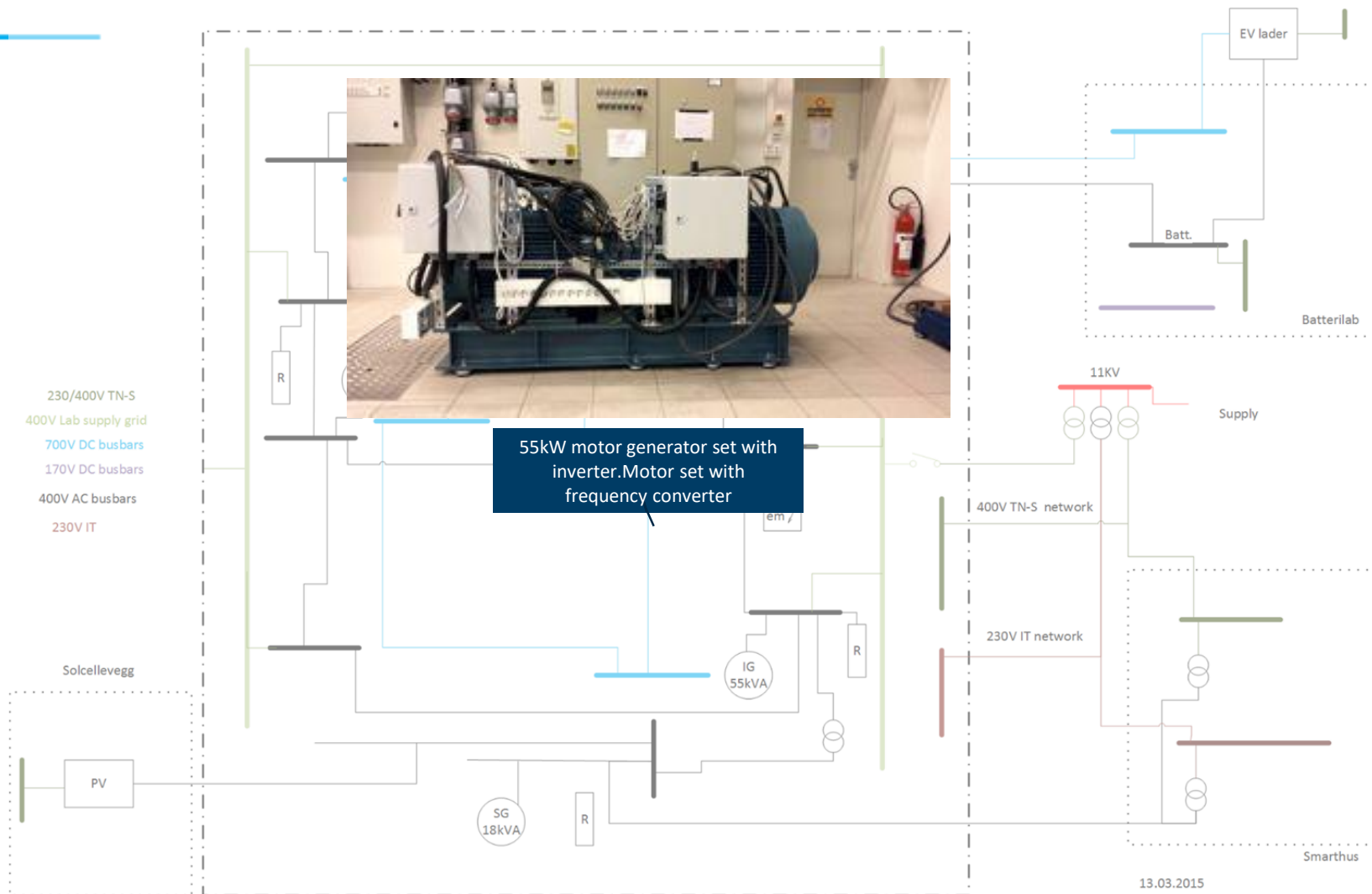
Network Overview



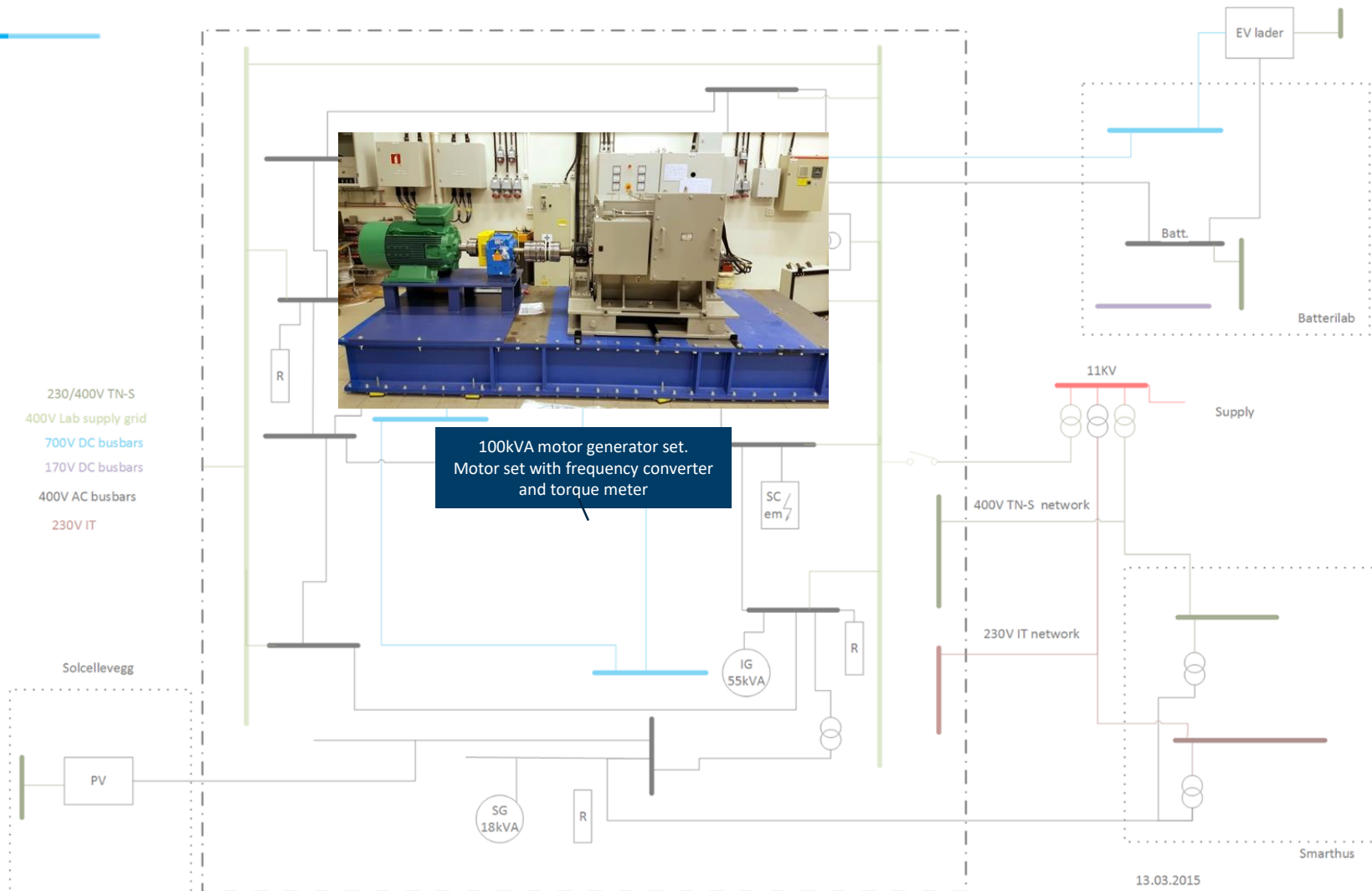
Network Overview



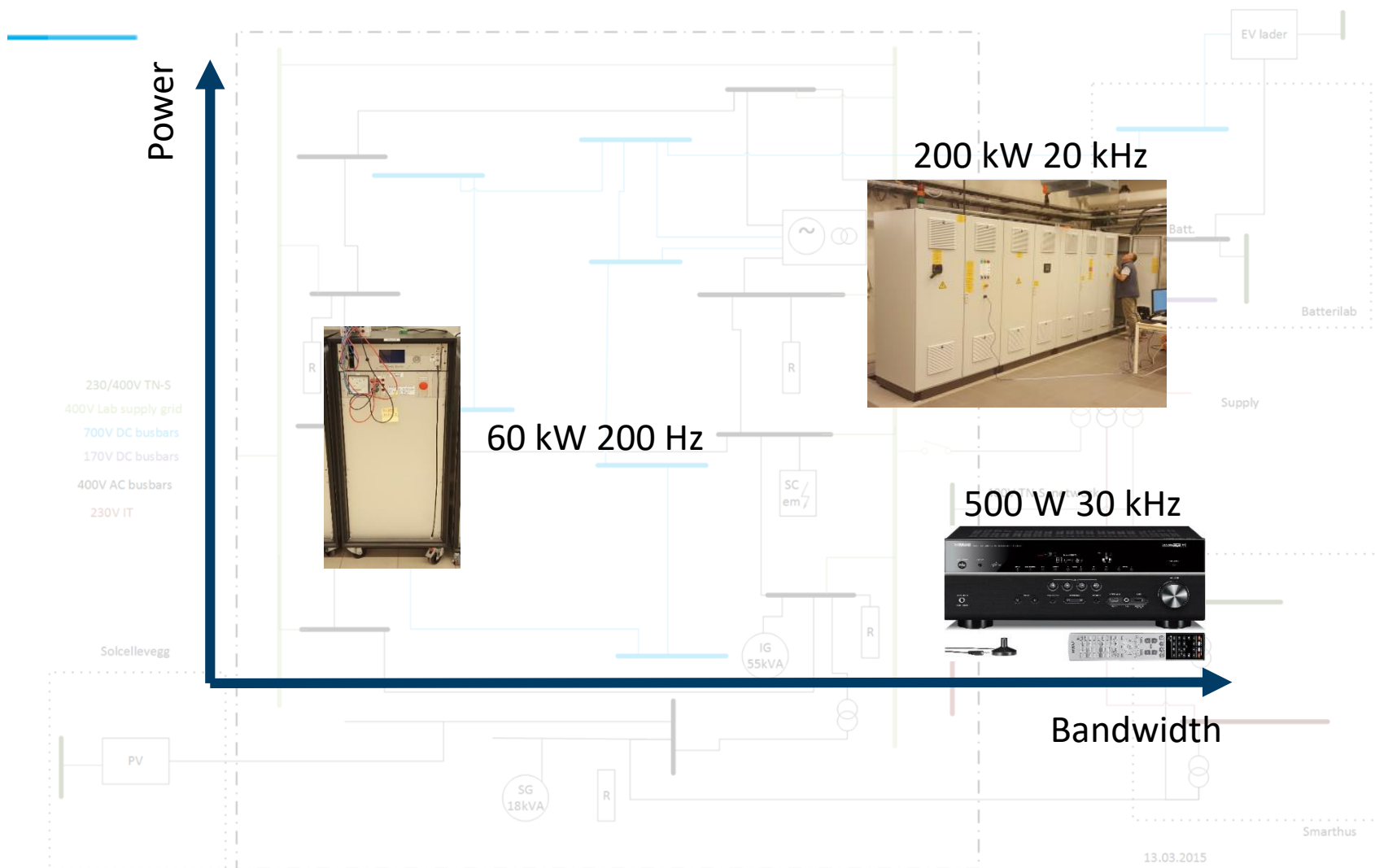
Network Overview



Network Overview



Network Overview



Capabilities and application areas

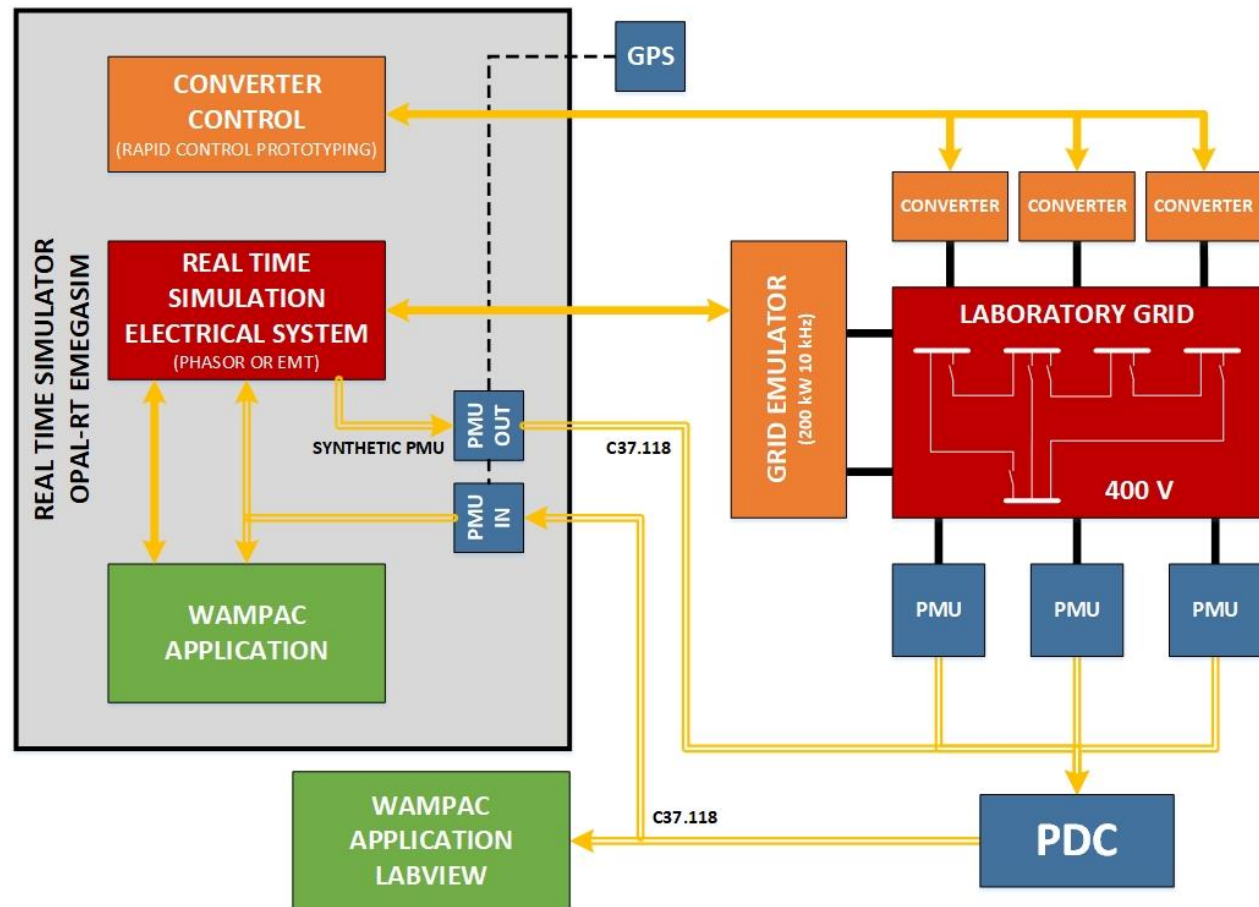
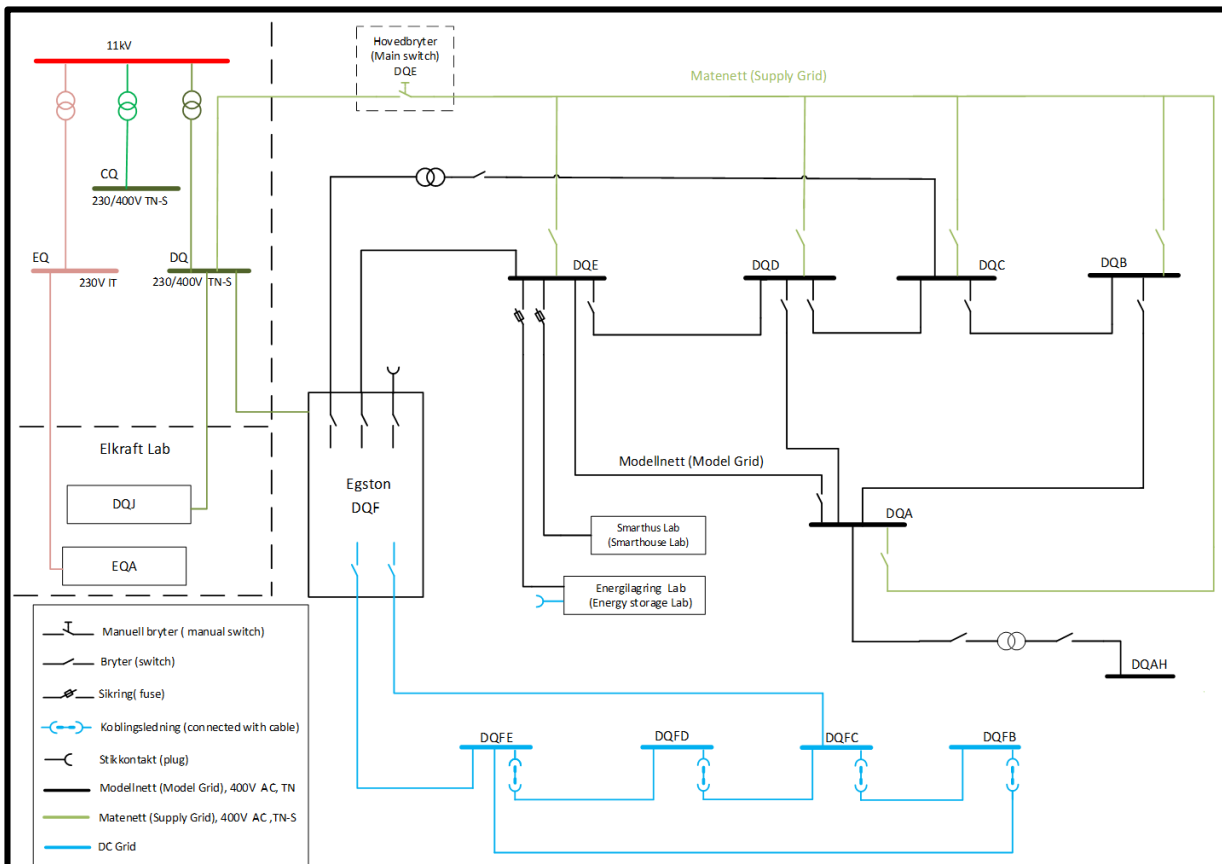
Laboratory inventory / capabilities

- Transmission systems (AC/DC)
- Distribution systems
- Generation (Large scale, DG, wind farms, PV, hydro..)
- Network customers / loads
- AC/DC converters: Voltage Source Converters (VSC) and Multi-Level Converters (MMC)
- Rotating machinery: Induction generators/motors (IG), Synchronous generators/motors (SG), Permanent magnet generators/motors (PM)
- Grid emulator (200 kVA amplifier , DC to 5 kHz)
- Real-Time Digital Simulators, Hardware-In-the-Loop (HIL) testing equipment and Rapid Control Prototyping (RCP) systems (OPAL-RT)
- Smart meters
- Smart homes Smart buildings
- Smart appliances
- Energy storage
- EV charging infrastructure
- Protection equipment
- Monitoring and measurement equipment
- Wide area monitoring – Phasor Measurement Units (PMUs)
- Communications

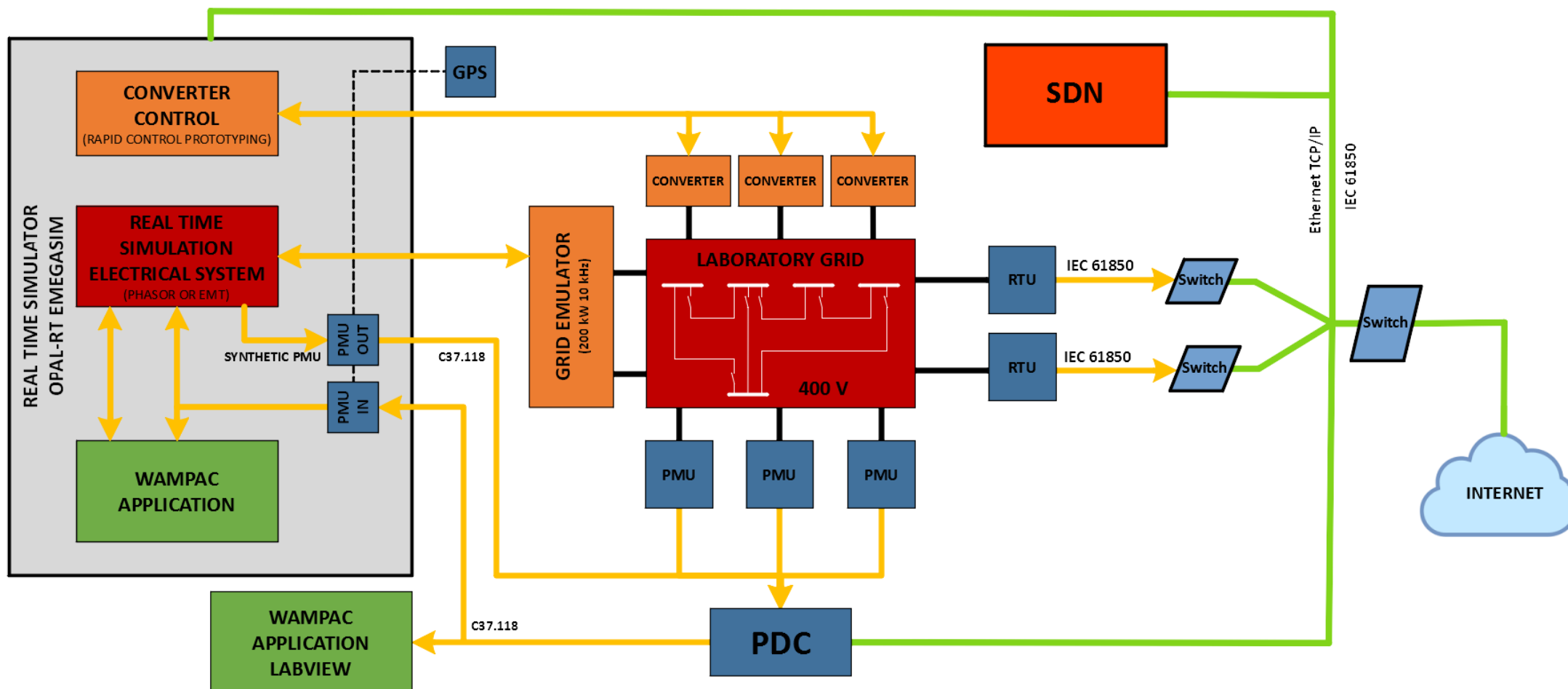
Application areas / Domains supported

- Smart transmission grids
- HVDC grids
- Smart active distribution grids
- Micro grids
- Integration of Smart Grids, Smart houses and smart industries
- Integration of renewables (large scale, DG)
- Smart Grid and home automation
- Smart electricity use
- Electrification of transport
- Energy storage in Smart Grids
- Energy conversion in Smart Grids
- Power system stability in Smart Grids
- Monitoring, control and automation in Smart Grids
- Communication technologies for Smart Grids
- Information security and privacy in Smart Grids
- Reliability challenges in Smart Grids -dependencies of Power Grid and ICT
- Smart grid software
- Big data management and analytics in SmartGrids

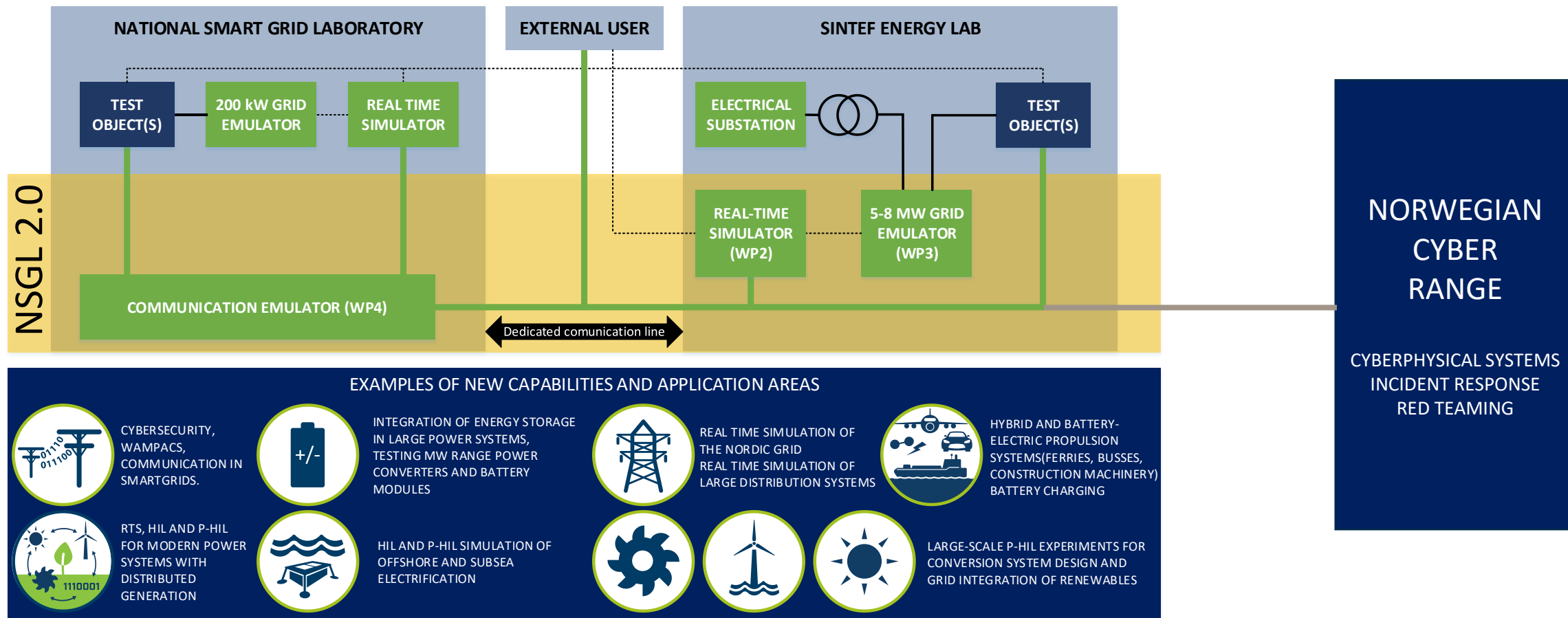
NSGL today



NSGL comming soon ...



NSGL 2.0





Teknologi for et bedre samfunn