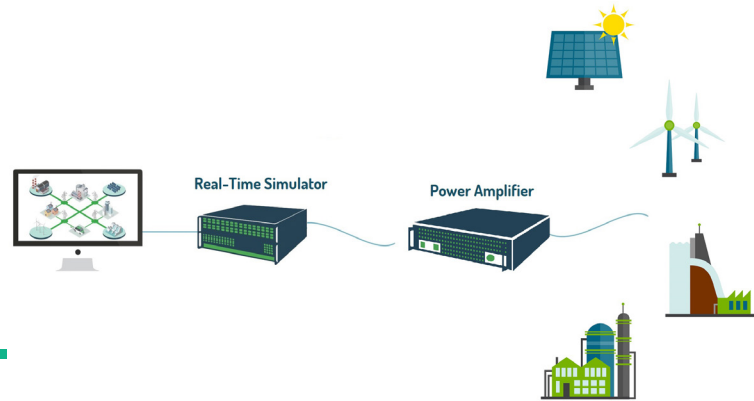




Real-time simulation platforms

Covering a full scope of Medium & High Voltage testing for your algorithms, controllers, mock-ups and converters in a realistic power system environment

Our real-time simulation platforms allow you to test your MV & HV equipment efficiently and cost effectively. Validate your designs quickly in a realistic environment. Eliminate the risk of damaging your network before the commissioning phase.



OVERVIEW

Hardware-in-the-Loop

Our Hardware-in-the-loop testing facilities offer you an excellent alternative to traditional testing methods.

With our state-of-the-art software models, we recreate the electrical grid and accurately reproduce the network's dynamics. This allows us to test your algorithms' and equipments' interaction with control systems and other equipment in real-time.

We provide comprehensive closed-loop testing, negating the need for costly, dangerous tests on real systems.



Power Hardware-in-the-Loop

Our Power-Hardware-in-the-Loop test platform allows you to test your devices under full power within the real-time simulation environment.

This in-depth testing allows you to validate your power equipment and understand its behaviour in real-life usage conditions, thanks to highly accurate and powerful simulations.

DESCRIPTION

Our real-time simulation platforms are capable of simulating both AC and DC networks. We perform simulation tests with industrial or prototype controllers and can integrate our Modular Multilevel Converter (MMC) or your custom mock-ups. A specific platform is dedicated to hydraulic system testing.

AVAILABLE SERVICES

- Developing models for the real-time simulation of a tested device's environment
- Validating device and innovative control & protection scheme performance
- Fine-tuning and optimising control and protection parameters before on-site installation
- Conformance and interoperability testing
- Testing your converter control systems or protection relay replicas
- Routine testing of new MMC converter control algorithms, in development or in deployment
- Prototyping Intelligent Electronic Devices, converters and master controllers
- Studying non-stationary behavior of Hydro Electric Conversion: improving system integration reliability & studying the interaction between different functions

This list is not exhaustive. Please contact us to express your needs so we can offer you a personalised service.



REAL-TIME SIMULATION

High performance real-time simulation capabilities for a realistic representation of the network and its components.

Hardware

2x OPAL-RT OP5700

- XEON E5 (16 cores), 3.2GHz
- FPGA Virtex7

1x OPAL-RT OP4510

- Intel CPU (4 cores), 2.3GHz
- FPGA Kintex 7

Analog & Digital I/O (32/64)

- 16 SFP interfaces (fiber optic, Aurora)

Software

HYPERSIM (20 cores)

- AC networks & DC Grids: 5000 buses at 20µs time step
- MMC converters: up to 512 levels at 500ns time step

Matlab-Simulink suite, Simscape Electrical, RT-LAB (CPU), RT-XSG (FPGA), eHS.

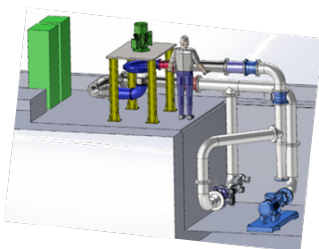
RAPID CONTROL PROTOTYPING

Facilities and expertise in Rapid Control Prototyping

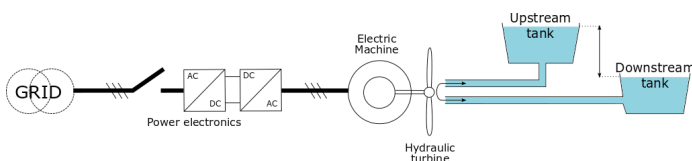
- Automatic code and FPGA generation
- Matlab-Simulink model-based design (SuperGrid Institute or customer's)
- Rapid Control Prototyping with Speedgoat: Simulink Real-Time + HDL Coder (CPU/FPGA)
- Rapid Control Prototyping with Opal-RT: RT-LAB + RT-XSG (CPU/FPGA)

HYDRO POWER-HARDWARE-IN-THE-LOOP

Hydraulic & electro-mechanical real-time conversion scaled model, with a three-phase power source emulating an electrical network and a hydraulic loop emulating the behavior of a given site's hydraulic circuit (water hammer, surge tanks, pipe sharing, etc.).



- 10kW bidirectional conversion mockup
- Turbine and pump modes
- Simulation of hydraulic & electrical events
- Investigating improvements for ancillary services



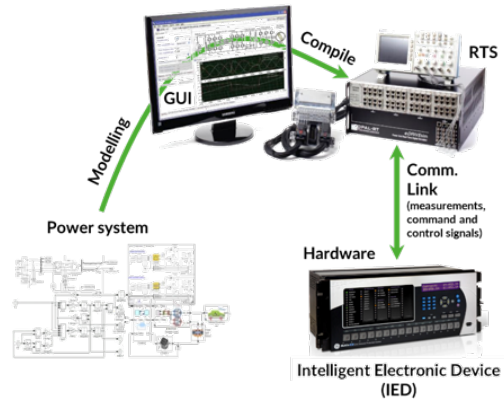
CONTACT

For additional information or to ask for a quote, please contact : sales@supergrid-institute.com

HARDWARE-IN-THE-LOOP

Closed-loop testing of control and protection systems

- Prototyped IED or customers' industrial controllers
- Libraries/protocol IEC 61850



POWER HARDWARE-IN-THE-LOOP

Closed loop testing of real devices (scaled converter, MMC, breaker, etc.).



MMC mock-up (6 kW)

| | |
|----------------------------------|--------------------------|
| Rated Power | 6 kW |
| Rated DC voltage | 400 V (pole to pole) |
| Rated AC voltage | 208 V (rms line to line) |
| Number of SMs per arm | 10 |
| SM capacitance | 4,92 mF |
| Arm inductance/resistance | 6 mH / 35 mOhm |
| AC filter inductance/ resistance | 5 mH / 26 mOhm |

Power amplifiers (21 kW)

| | | |
|---------------|-----------|---------------|
| Nominal Power | | 21 kVA 40 |
| Voltage | Dynamics | ~ 20 µs |
| | Bandwidth | 100 ~ 150 kHz |
| Current | Dynamics | 30-50 µs |
| | Bandwidth | 15 kHz |

Shaping power transmission

SuperGrid Institute SAS - 23 Rue Cyprien, CS 50289 - 69628 Villeurbanne CEDEX, France
+33 4 28 01 23 23 - accueil@supergrid-institute.com - www.supergrid-institute.com