RT-LAB BERTA

OPAL·RT TECHNOLOGIES

What is BERTA

- A safe, reliable and portable test bench for speed governors, turbines, voltage regulators (AVR) and power system stabilizers (PSS);

- A high-performance real-time simulator and generator of speed/frequency signals to be injected in the speed governor for on-site tests in the power plant.

Who needs BERTA

Electricity producers:

- Automatic control engineers involved in speed governor, AVR and PSS tuning;

- Automatic control engineers involved in validation and certification of generating unit control system technical specifications.

Engineering staff involved in generating units commissioning and/or specific on-site tests to comply with NERC's (or any other regulatory agency) requirements on verification of models and data for:

- Turbine/governor and load control or active power/ frequency control functions; (Standard MOD-027)

- Generator excitation control system or plant volt/var control functions. (Standard MOD-026)

Developed in collaboration with Hydro-Québec Production and tested on actual sites

Applications

On-site tests of speed governor and excitation system in power plant:

- Open loop tests on speed governor and AVR;
- Closed loop tests on speed governor, simulating the unit behavior in islanded operation;
- Monitoring of voltages and currents, frequency, speed, power and up to 20 low voltage or low current (4-20 mA) signals;
- Computation of frequency, speed, electric power and mechanical power.

Training and on-site test preparation:

- Virtual grid and virtual tested unit for simulating a test in the power plant;
- Numerous models of speed governors, prime movers, AVR and PSS.

On-site triggered monitoring:

- Monitoring of voltages and currents, frequency, speed, power and up to 20 low voltage or low current (4-20 mA) signals;
- Computation of frequency, speed, electric power and mechanical power;
- Recording triggered on voltage and frequency thresholds;
- Up to 20000 samples/s.

Laboratory tests for speed governor certification:

- Real-time simulation of wicket gate servomotors;
- Real-time simulation of turbine and generating unit.

Features

- Using the world renowned OPAL-RT's RT-LAB real-time simulation software;
- Real-time computation and generation of a speed-frequency signal to be injected directly in the feedback loop, e.g. in the speed/frequency transducer instead of the set point input port;
- High-performance acquisition system;
- Friendly user interface for easier conduction of on-site and/or laboratory tests;
- 50 µs time step ensuring great computation accuracy;
- Real-time emulation of the tested unit behavior in islanded operation mode though synchronized and transmitting power to the main grid (Using the actual equipment, no other model than the rotating inertia of the tested unit);
- Real-time simulation of wicket gate servomotors and generating unit (behavior at speed no load, synchronized to the main grid and in islanded operation) for speed governor certification in laboratory.

Benefits

Meet system operator's requirements for connecting to the main grid

- The connected unit should not deteriorate the power system stability;
- The connected unit should contribute to the system stability, to the frequency control and to the voltage control;
- For providing adequate models of speed governors, prime movers (including the transient impact of the water hammer in the penstock, on the mechanical power) and excitation systems.

Increase system stability

- Decrease risks of:
  - Generalized black out;
  - Unit and/or load shedding
- Decrease required spinning reserve
- Increase the power transportation level with the same installed equipment

Prevent excessive oscillations of speed governor mechanical and hydraulic components

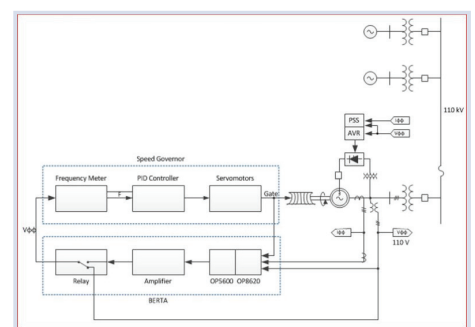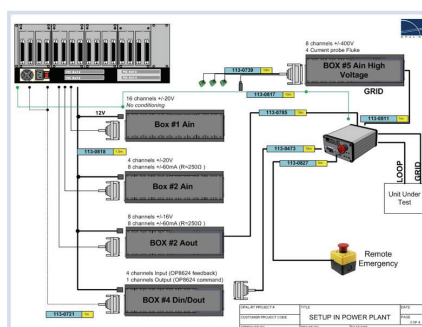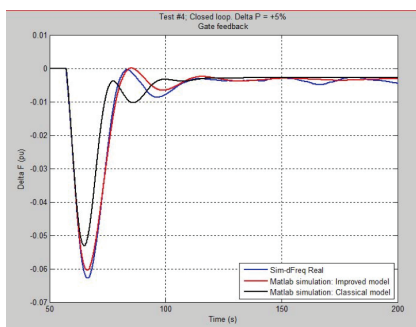### Minimize power plant downtimes and loss of revenues

Who will benefit from BERTA?

Electric power system operators:

- Transmission planning engineers involved in power system stability studies requiring adequate models of speed governors and excitation systems;
- Owners will benefit from the increase of the power system stability

Example of a real on-site test on a 270 MW Francis unit

- Power at 80% of rated MVA
- Gate feedback
- Simulation of a +5% load step in islanded mode of operation
- Starting from usual classical models of speed governor and Francis turbine, both models were improved after an on-site test using RT-LAB BERTA islanded operation feature.

NOTE: TECHNICAL DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE

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