RTDS Technologies NEWS

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WHAT'S NEW: AUGUST 2020

- User Spotlight Series announced
- HIL testing with SEL
- New features in RSCAD

UPCOMING VIRTUAL EVENTS

USER SPOTLIGHT SERIES

September to November 2020

This webinar-based event will showcase the work of RTDS Simulator Users worldwide each week starting September 2020. Webinars will include two 20-minute presentations from users, followed by 10-minute Q&As, plus commentary from RTDS Technologies.

Adapted from our popular in-person User's Group Meetings, the virtual User Spotlight Series is your opportunity to hear user success stories, learn about their challenges, and explore new applications.

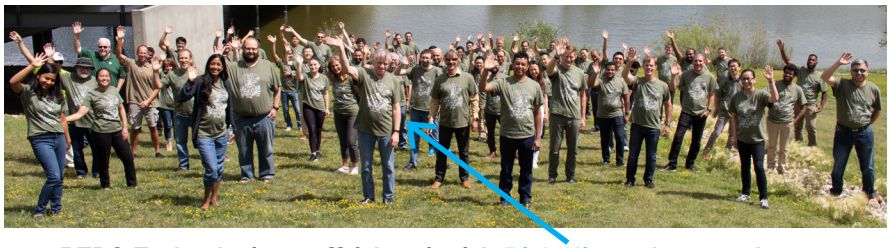
REGISTER NOW!

ALSO FIND US ONLINE DURING...

- **UPEC 2020 (Gold Sponsors)**
  September 1 - 4, 2020
- **IEC 61850 Global (Event Sponsors)**
  October 28 – 29, 2020

  Presentation: *Day 2 at 11:00 AM*
  Topic: *"Testing Tools Panel Debate – Meeting the challenges of delivering interoperable configuration and testing tools for commissioning and testing live substations"*

STAY IN-THE-LOOP WITH RTDS:



RTDS Technologies staff (above) wish Rick King, who served as our Production Manager for 19 years, a very happy retirement! Thanks, Rick!

GUEST ARTICLE // SCHWEITZER ENGINEERING LABORATORIES, USA

HIL TESTING A SPECIAL PROTECTION SYSTEM ENSURING STABILITY OF THE BELGIAN GRID (INCLUDING HVDC AND OFFSHORE WINDFARMS)

One of eleven Special Protection System cubicles assembled by SEL

An HVDC interconnection built and managed by a joint venture between National Grid in Great Britain (GB) and Elia in Belgium has been operational since early 2019. The HVDC project provides GB and Belgium with power exchange capability: the 400 kV bidirectional DC link is capable of transmitting 1,000 MW of power.

Moreover, 2GW of offshore windfarms were built in the North Sea close to the HVDC link. In the project development process, studies done by Elia proved that there was a notable risk of power system instability brought by windfarms and HVDC converters for extreme contingency events. Consequently, Elia decided to mitigate this risk by installing a special protection system to avoid potential blackouts – which could be damaging to other regions as well considering the meshed nature of the European grid – Elia worked in collaboration with Schweitzer Engineering Laboratories (SEL) to install a Special Protection System (SPS). The SPS had to be implemented prior to energization of the link, which gave SEL a tight deadline for development and testing of the system.

SEL designed a high-speed contingency detection system with the goal of detecting issues on the Belgian 380 kV system and taking corrective action within a time limit defined by Elia: 40 milliseconds. The SPS consisted of eleven panels with a variety of automation devices, including the SEL-451 Protection, Automation, and Bay Control System; SEL-3555 Real-Time Automation Controller; SEL-2240 Axion logic control; and more. Software-Defined Networking (SDN) was used for cyber-secure substation-to-substation communication using IEC 61850.

Elia, together with SEL, determined that hardware-in-the-loop testing of the full real panels with the RTDS Simulator was the best way to validate and fine tune the system. It allowed Elia to build confidence in the reliability and speed of the technology. After manufacturing, the eleven protection and control panels were sent from the manufacturing facility in Mexico to SEL's real-time simulation laboratory in Pullman, WA, USA for testing.

An electromagnetic transient model of Elia's power system, including the DC link, transmission lines connecting five substations and an aggregated wind farm model to represent the 2,000 MW offshore system, was developed in the RSCAD

software. The model was validated against available power flow, fault level studies for the network, and a detailed PSCAD model. With the utility wanting every aspect of the SPS system tested in detail, a large number of input/output channels were required to connect each hardware device to the RTDS Simulator. Over 100 analogue output channels were used to pass signals from simulated instrument transformers to the physical protection and control devices, as well as dozens of dry contact digital input/output channels for breaker status and trip signals.

HIL testing allowed SEL to prove to Elia that the high-speed criterion was met and also the security and dependability of the system. In fact, the speed requirement was exceeded, with the system operating in the 12 to 20 ms range for various contingencies during the testing process. Laboratory HIL testing allowed such contingences, which would be difficult or impossible to impose on the real Belgian system, to be simulated efficiently and in a closed-loop environment with the actual SPS panels that would then be installed on-site at the utility.

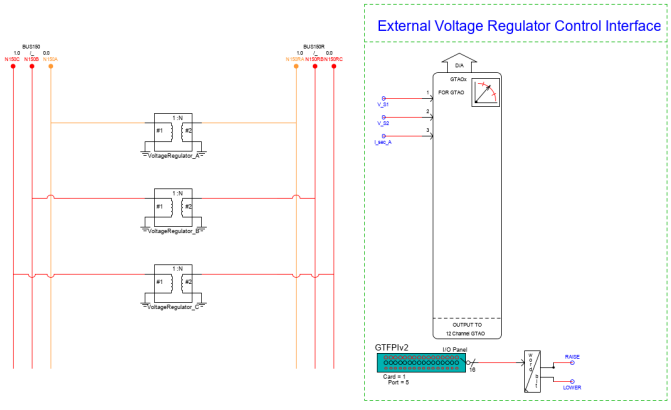
Moreover, all the cubicles were located in the same testing environment, allowing SEL and Elia to view their behaviour all together. Once on site the eleven cubicles would be spread between 7 substations. Worst-case scenarios allowed for the fully redundant design, allowing uninterrupted operation in case of failure, to be fully validated prior to deployment. After testing, the satisfied utility installed the HIL-hardened SPS prior to the deadline, and the HVDC Link to the UK became operational in January 2019. Since 2001, SEL has used the RTDS Simulator to support their work, and currently operates one of the largest commercially-available real-time simulators in the world with dozens of experiences engineers. HIL testing with the RTDS Simulator allows for not only high-fidelity Factory Acceptance Testing of SEL's turnkey protection, automation, and control solutions, but also customer-specific applications testing.

RSCAD V5.011: DON'T MISS OUR NEW FEATURES

SAMPLE CASE AND DOCUMENTATION FOR HIL TESTING OF A VOLTAGE REGULATOR

The IEEE 123 Bus Feeder sample case available in RSCAD, which is simulated using Distribution Mode, now includes a version that has been configured for interfacing a physical voltage regulator in a closed loop with the simulated network. The new version replaces the simulated controls for one of case's four voltage regulators with an external control system. The SEL-2431 was chosen for the sample case and documentation, but theoretically any external controller could be used as long as I/O is properly configured.

The updated case includes auxiliary tap changer controls and GTAO and GTFPI components for exchanging analogue and digital signals between the RTDS Simulator and the controller. The documentation includes a discussion on power amplifier settings and how to appropriately scale signals in the simulation environment when using an external amplifier to provide secondary-level signals to equipment under test. Basic configuration of the third-party controller is also discussed.



USAGE LOGGING FEATURE

RSCAD's new usage logging feature allows simulator owner/operators to conveniently keep track of how their institution's simulation hardware is being used. Once the feature has been enabled via the Tools menu and a suitable database has been specified, the logging tool will automatically record the simulation Start and Stop times, duration, and the user's IP address for any simulations run on the system. The case filename is also recorded.

This feature may be helpful for administrators who would benefit from the ability to precisely track simulator resource usage by particular projects or users. It may also be helpful for users with limited simulation hardware who wish to track and schedule usage to make the most of their available resources.

Note that the IT administrator at your institution may need to be involved in enabling this feature.

OTHER FEATURES INCLUDE:

- Aurora Protocol Enhancements
- Electric Vehicle Modelling Enhancements
- New CIGRE Distribution Network Sample Cases

VISIT OUR CLIENT AREA TO DOWNLOAD THE RELEASE NOTES FOR A FULL LIST OF UPDATES TO RSCAD V5.011 AT SUPPORT.RTDS.COM