RTDS Technologies

RTDS NEWS

WHAT'S NEW: JULY 2019

Validating subsynchronous resonance (SSR) damping schemes at Cardiff University

Multi-core network solution allows larger closely-coupled systems, plus many more new RSCAD features

Upcoming Training Courses

We are currently accepting registrations for the following courses at **rtds.com > News & Events > Training Courses**.

INTRODUCTORY RTDS® SIMULATOR TRAINING
September 23-27, 2019
Winnipeg, Canada

ADVANCED APPLICATIONS TRAINING: IEC 61850
Sept 30 - Oct 4, 2019
Winnipeg, Canada

Upcoming Events

IEEE PES General Meeting
Come in and cool off at our Northern Hospitality Suite!
Atlanta, USA
August 5, 2019: 8 PM - 10 PM
August 6, 2019: 7 PM - 10 PM

Symposium on Microgrids
Silver Sponsor
Fort Collins, USA
August 9-12, 2019

IEEE Electric Ship Technologies Symposium
Platinum Sponsor
Arlington, USA
August 14-16, 2019

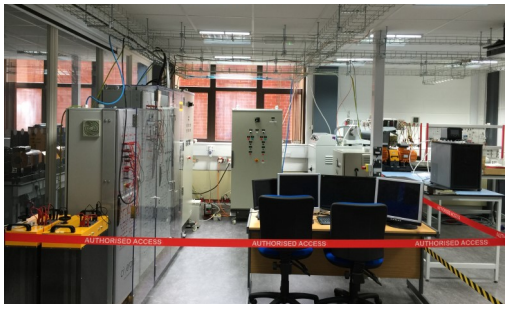
USER STORY

Mitigating SSR in an HVDC– and renewable-rich grid at Cardiff University

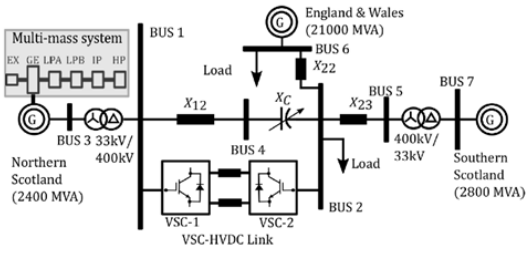
Tibin Joseph, Carlos E. Ugalde-Loo, Jun Liang, et. al – Cardiff University

Cardiff University's Centre for Integrated Renewable Energy Generation and Supply (CIREGS) is a world-leading research group with over 20 research projects on power system stability and control, DC grids, the integration of renewables, VSC-HVDC, and MTDC. Funded by the UK's Engineering and Physical Sciences Research Council and the Higher Education Funding Council for Wales, their lab features a multi-terminal HVDC test-rig, RTDS Simulator, power amplifiers, DC grid emulator, wind turbine test-rig, and more.

In recent published work at CIREGS, a hardware-in-the-loop setup has been leveraged to investigate a wideband filter approach to damp the effects of subsynchronous resonance on a renewable- and HVDC-rich AC grid. The threat of SSR in Great Britain's transmission system has increased due to the recent installation of series compensation near the Anglo-Scottish intertie. While traditional SSR mitigation schemes use filters placed at the generator terminals or integrated with network components, damping at transmission level is also common (via, for example, schemes embedded in HVDC and FACTS converter stations). However, most proposed controllers are designed for specific operating points and are sensitive to system configuration and loading conditions. The wideband filter based damper proposed by CIREGS, embedded in the VSC control system, damps multiple torsional modes and can be used regardless of system configuration and series compensation level. Instead of designing filters for each torsional mode, the wideband filter does not require re-tuning. Given the uncertainty around Great Britain (GB) system data, this flexible approach is highly relevant. Notably, damping via the embedded filter is provided without the need for overrating the converter—the dc voltage and power are within the converter's existing capabilities.



The CIREGS lab at Cardiff University



Three-machine model of the GB transmission network with reinforcements

Performance was tested on a scaled down version of the GB transmission network. In the hardware-in-the-loop setup, the RTDS Simulator provided real-time representation of the three-machine model GB network (developed in consultation with National Grid and upgraded to include new infrastructure reinforcements).

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RTDS Technologies

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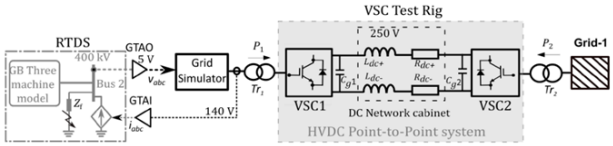
Friedrich-Alexander University equipped to innovate with Europe's most powerful academic RTDS Simulator

Located in Erlangen and Nuremberg, Germany, FAU is a leader in the research and development of innovative electrical power systems. The focus is on the design and operation of sustainable energy systems, quite often with an interdisciplinary approach and international collaboration.

The RTDS Simulator installed at FAU on March 29, 2019 is not only the most powerful real-time power system simulator at any university in Europe, but also among the top five most-powerful university simulators in the world. The system consists of six NovaCor chassis and an extensive suite of I/O capabilities.

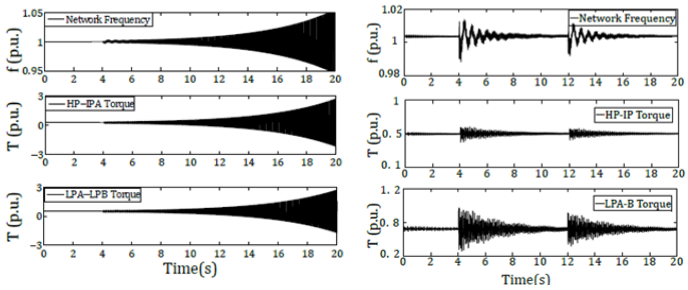
The institute will take advantage of these hardware-in-the-loop capabilities to investigate protection solutions for grids with distributed in-feed or HVDC systems, to prototype controls for modular multilevel converters (MMC), to conduct performance testing and grid interaction studies for conventional and MMC -based HVDC systems, and to de-risk the grid connection of distributed energy and storage systems.

With one of the world's most powerful real-time power system simulators at a university, the IEES at Germany's Friedrich Alexander University will be an institute to watch. Stay tuned to our website and RTDS Newsletter for project updates.



The RTDS Simulator connected to the HVDC test rig in a hardware-in-the-loop setup

Via hardware-in-the-loop testing, it was found that SSRs were effectively damped by the operation of the wideband damper irrespective of the series compensation level. The damping scheme was tested for both strong and weak AC systems (varying effective short circuit ratio), and it was found that damping capability is preserved for weak systems. However, preservation of damping came at the expense of affected generators oscillating for a longer period.



Experimental results from the RTDS Simulator—network frequency and mechanical torque for two low-pressure turbines without (left) and with (right) the damping scheme in place

The main limitation of this damping scheme is the location of the damper; the damping scheme relies on the use of local measurements and reacts slowly if the affected generator is far away. This issue could be alleviated by placing the damper nearby the generator most susceptible to SSR.

The SSR phenomenon will only become more common with increased integration of renewable sources and series compensation into existing AC grids. Complex solutions and extensive testing will be required in order to properly mitigate the issues that will arise from the incorporation of these new technologies into traditional systems. The CIREGS team was able to validate a scheme which effectively mitigated SSRs — via wideband filter-embedded HVDC links — using a real-time HIL setup which incorporated the RTDS Simulator.

First-ever Korean User's Group Meeting a huge success

RTDS Simulator users in Korea gathered on June 27, 2019 for the first-ever Korean UGM! This special event took place at KEPRI-KEPCO, where a large-scale RTDS Simulator helps KEPRI-KEPCO reliably supply power to nearly all of South Korea. Thank you to all the presenters who shared their simulation work, accomplishments, and challenges, and who participated in our expert-run tutorials.

RTDS Technologies is hosting User's Group Meetings in Australia and China in October 2019!

Don't miss this!

New Features in RSCAD

- Multi-core network solution: Up to two cores can now be dedicated to the network solution for one closely-coupled subsystem, eliminating the need for subsystem splitting T-lines within one NovaCor unit.
- Enhanced phase domain synchronous machine: In the presence of parallel windings, users may apply turn-turn fault in the same phase and in the field winding, faults between phases and the field winding, and series faults.
- Support has been added for publishing and subscribing routable (R-) GOOSE and SV messages.
- Cross-chassis Substep and Superstep subnetwork connections are now supported.

You can access the full RSCAD release notes in the Client Area at **support.rtds.com/clientarea/**.

If you have an idea for a new feature, please send it to **feedback@rtds.com**. We want to hear from you!