RTDS Technologies

RTDS NEWS

Commissioning and training
Tallinn University of Technology, Estonia

WHAT'S NEW: DECEMBER 2015

Improving New Zealand's power system reliability with Transpower's Grid HVDC Offline Simulation Tool

Power hardware in the loop simulation with a PV inverter using the RTDS Simulator

Upcoming Training Courses

We are currently accepting registrations for the following courses. Please contact **christine@rtds.com** for more details.

INTRODUCTORY RTDS® SIMULATOR TRAINING

April 11-15, 2016
Winnipeg, Canada

ADVANCED APPLICATIONS TRAINING: RENEWABLE ENERGY MODELLING

April 19-22, 2015
Winnipeg, Canada

Upcoming Events

RTDS Southern Africa UGM

January 25, 2016
Johannesburg, South Africa

IET DPSP 2016

March 7-10, 2016
Edinburgh, UK

International Synchrophasor Symposium

March 22-24, 2016
Atlanta, GA, USA

IEEE PES T&D Conference

May 2-5, 2016
Dallas, TX, USA

GUEST ARTICLE

Simulating is believing: a GHOST story

Transpower improves New Zealand's power system reliability with hauntingly accurate simulation results

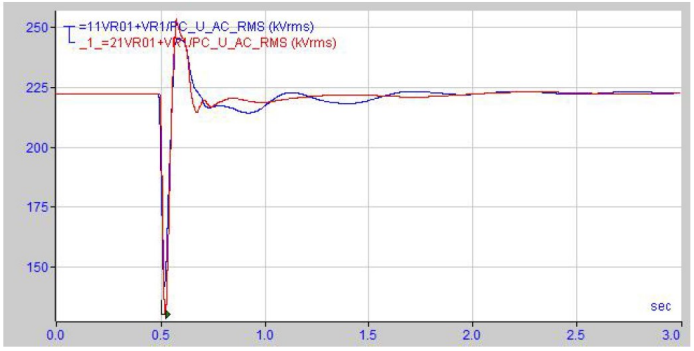
Willie Otto, Geethma Dissanayake, Milmark Gregorio—Transpower New Zealand Ltd.

The New Zealand HVDC Pole 3 upgrade project, commissioned in December 2013, made extensive use of the RTDS Simulator to verify the design and performance of HVDC control and protection systems. The project replaced the old Pole 1 mercury arc valve converters and associated control and protection systems with modern thyristor-based converters. The project also included the replacement of the control and protection system of the existing Pole 2. Close to 2000 unique functional and dynamic performance tests were carried out before commissioning and on-site testing took place.

The project included the delivery of a four-rack RTDS Simulator and a replica HVDC control and protection system to Transpower. This was installed in a dedicated test facility in Wellington in March 2013 and named the GHOST (Grid HVDC Offline Simulation Tool). Since then the GHOST has been extensively used to resolve issues related to the HVDC control and protection systems before implementing changes on site.

For each end of the HVDC link, the replica HVDC control and protection system consists of a measurement system interfaced with outputs from the RTDS Simulator, control and protection for Poles 2 and 3, bipole and station controllers, and a transient fault recorder. The software for all of these controllers was developed to run on both the actual on-site system and the replica system. A single Valve Base Electronics (VBE) system is also included in the GHOST. This can be configured to work with Pole 3 at either terminal, and is interfaced with Thyristor Valve Monitoring (TVM) electronics which emulates the actual on-valve electronics. The system is used for simulating valve misfiring. The GHOST also has LAN networks that emulate the on-site communications networks, making it possible to simulate communication faults between converter stations.

During the Pole 3 on-site testing, a number of staged AC faults were carried out to test the dynamic performance of the system. The RTDS Simulator was benchmarked against these actual test results.



220 kV voltage during a single phase fault
blue = actual system, red = simulated

As shown on the graph here, the two results are almost identical. The minor differences are due to the response of the AC system. The GHOST models are reduced network models with a restricted number of equivalent generators, so power frequency oscillations and other interactions cannot be modelled exactly. Therefore, minor variations are inevitable.

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RTDS Technologies

Visit us online!

2015 China User's Group Meeting a huge success!

RTDS Technologies would like to thank everyone who attended or contributed to our 2015 China User's Group Meeting, helping to make it a huge success. The meeting took place from November 9 to 11, in Beijing, China – a global hub for power systems research and development – and provided a forum for users of the RTDS Simulator to share their work, hear about many exciting new applications of the Simulator, participate in RTDS Technologies staff-led presentations and tutorials, and make connections with other users. Over 120 RTDS Simulator users attended our 2015 China UGM.

The meeting also featured over 20 different user presentations from a wide variety of Simulator users from Chinese utilities, power system equipment manufacturers, universities, and research institutions. User presentation topics included the simulation of MMC-based HVDC schemes, the application of an extreme fault in a multi-HVDC infeed power grid, factory testing of a scheme looping back-to-back LCC and MMC HVDC systems, the use of the Simulator for intelligent substation testing, railway system simulation, and power-hardware-in-the-loop simulation of a UPFC system, and much more. The presentations are available upon request and are listed on our website.

Click here to learn more and access presentations

Any issues found during testing and post-commissioning have been investigated and replicated on the Simulator. Solutions were engineered and tested thoroughly before implementation, resulting in robust and timely remedies.

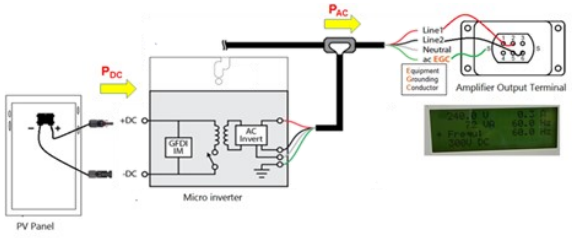
Studies were also done to investigate the effects of increasing the HVDC south transfer limit from the existing 850 MW design value. This could not be tested on-site due to market constraints, so GHOST studies were used to validate the performance of the system at high south transfer levels.

Future applications of the GHOST include a digital substation test facility, which is currently in development. The goal of this project is to provide a better understanding of the IEC 61850 standards in a practical perspective. The RTDS Simulator will play an important role in simulating a substation environment by using GOOSE and Sampled Values protocols. GHOST will also play an important role as part of Transpower's relay selection process—the extensive conformance and compliance testing which is currently applied to all new protection relays at Transpower will be carried out with the RTDS Simulator. The RTDS Simulator will provide a basis for the assessment of existing protection device performance and the formulation of recommendations for improvement.

Power hardware in the loop simulation with a photovoltaic (PV) inverter using the RTDS Simulator

Power hardware in the loop (PHIL) simulation involves the real-time simulation environment exchanging power with real, physical power hardware, such as renewable energy hardware, electric vehicles, batteries, motors and loads. The interface between the RTDS Simulator and the device under test should be carefully considered with respect to the computation time step of the RTDS Simulator, which determines the total delay in the PHIL interface. The method used to exchange the voltage and current signals in the PHIL interface and the power ratings of the test device and selected amplifier are also critical considerations.

An increasingly popular application of PHIL simulations is the testing of grid-connected PV inverters. At the RTDS Technologies headquarters, a PHIL interface with a 255W PV inverter and a 1kVA linear voltage amplifier was developed. The test setup is shown below.



The DC side of the inverter is connected to a solar panel with a metal halide light source. The AC side of the inverter is connected to the amplifier output terminal which provides the grid simulation at 240Vrms, 60Hz. The inverter current measured by the amplifier is sent back to the simulated grid in the RTDS Simulator. PHIL simulation enables the testing of devices with unknown circuit topologies under various contingency scenarios. To learn more about how we've used this test setup, visit our website.

Click here to learn more about PHIL

New Features in RSCAD

- A new transmission line parameters estimation model, rtds_Lpara, has been added to the RSCAD\MLIB\CTLS_V2\MISC library. The model estimates series resistance, series reactance, and shunt susceptance of the equivalent model of a transmission line using synchrophasor measurements.
- The GTFPI component now includes a parameter to set the initial state of the digital input channels.
- Added new VSC components: rtds_vsc_SEQ_TIMER is a resettable timer for sequences in the small timestep, and rtds_VSC_RANGE_CHECK determines whether a Real input is in a user-specified range.

Click here to log in to the RTDS client area, where you can access the full RSCAD release notes.

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