Coordinador Eléctrico Nacional, Chile

WHAT'S NEW: DECEMBER 2018

Grid modernization at SDG&E: multi-device distribution automation, standardizing DER integration

Chile's first RTDS Simulator laboratory

GUEST ARTICLE

San Diego Gas & Electric Company® uses RTDS Simulator to test distribution system control and monitoring, develop integration standards for energy storage

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Two recent projects from San Diego Gas & Electric Company® (SDG&E®), a Sempra Energy utility serving 3.6 million people throughout southern California, have leveraged real time simulation as part of a suite of impressive tools for the development, demonstration, and evaluation of distribution automation systems. SDG&E®'s research focuses on the need for advanced monitoring, communication, and control infrastructure to reliably and efficiently operate an increasingly complex network.

Open Field Message Bus for Distributed Intelligence

Through the Electric Program Investment Charge (EPIC) program, SDG&E® completed a project aimed at demonstrating the Open Field Message Bus (OpenFMB) framework as a potential communications architecture within the distribution network. OpenFMB creates a publish/subscribe smart grid message bus enabling distributed intelligence via peer-to-peer communication and the interoperability of multi-vendor devices. The use of OpenFMB adapters for legacy protocols is also a major potential benefit, extending the life of aging field assets as part of an intelligent system.

SDG&E® built a pre-commercial evaluation system consisting of several controllable devices networked together to mimic two feeders on the utility's distribution network using the RTDS Simulator. The testbed was subjected to a number of test cases, initiated by changing parameters in the power system simulation. The system's control response, via multiple communication protocols on the OpenFMB network, was then analyzed and various use cases were validated.
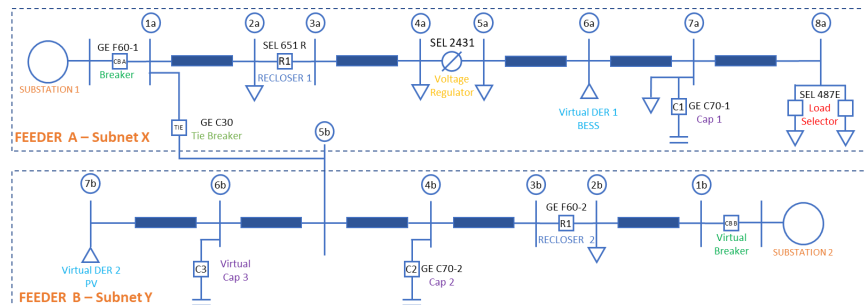
The devices on the test network, shown here, included a combination of simulated and physical reclosers, voltage regulators, battery and solar PV systems, capacitor banks, and load selectors.

The devices were networked in a way to mimic their physical location on the real feeders, using a realistic network design. Each device is connected to the network using a wireless field agent which can run different field message bus protocols (MQTT, DDS, R-GOOSE, etc.) and can translate protocols such

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We are thrilled to welcome our first RTDS Simulator user in the country of Chile — Coordinador Eléctrico Nacional (CEN). In 2017, the country's two major electrical systems (the Northern and Central systems), which were previously electrically separate, were joined. CEN is charged with the coordination of the resulting National Electric System, which is unique in that it covers over 3,100 km.

Such a system has unique challenges. CEN plans to utilize the RTDS Simulator to study the impacts of expanding its lines at the 500 kV level, testing new schemes for protection and compensation, and for operational studies.

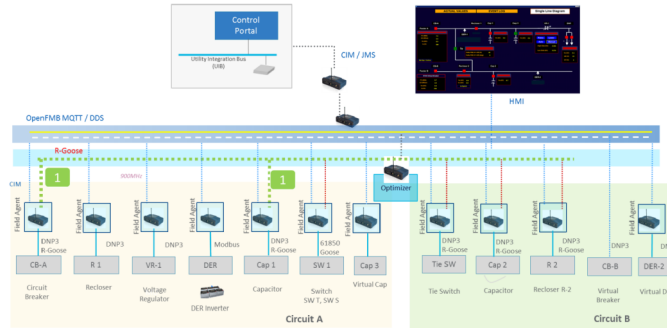## Submit an abstract for our conference!
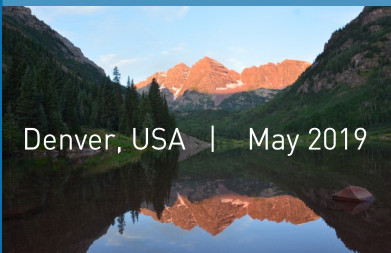
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*Communications architecture for use case described in this article*

as DNP3 and MODBUS.

During the course of this project, more than twenty different tests were run to verify a variety of use cases. For instance, a test case was developed to evaluate R-GOOSE in a Volt-VAr application, where reactive power (VAr) at the breaker end of "Feeder A" was monitored . When VArs were increased beyond a set-point using the real time simulator, an R-GOOSE message was sent from CB-A to Cap 1 to cut in the capacitors. The results saw 6 cycles between the increase in VARs and the capacitor cut-in.

The project saw that IEC 61850 R-GOOSE messaging can benefit from OpenFMB's use of adapters and focus on distributed intelligence, and that OpenFMB shows much promise as a framework for peer-to-peer communication. Using this over traditional hierarchal communication in the distribution system context unlocks potential for new use cases and the potential involvement of devices with traditionally limited communication capabilities (such as DERs who communicate locally via MODBUS).

Learn more about this and other EPIC projects at **www.sdge.com/epic**.

DERMS Integration Testbed for Battery Energy Storage Systems
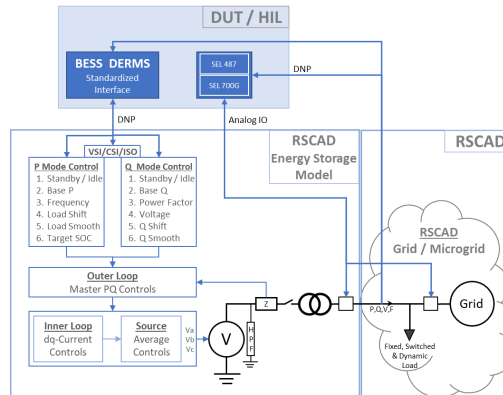
SDG&E® has developed a testbed designed to standardize the integration process for new battery energy storage systems (BESS) on their network. The testbed, which features an RTDS Simulator, allows suppliers of BESS and their control systems to perform standardized tests on equipment prior to commissioning it on the SDG&E® network.

The utility has defined a wide array of tests that the BESS control systems will be subjected to, including:

▪ The ability to charge or discharge at a fixed kW power level.

▪ The ability to charge or discharge in response to analog or digital control signals in order to support system frequency during deviations.

▪ Active and reactive power load shifting and smoothing to counteract changes in load on the system.

▪ The provision of capacitive or inductive VARs at varying levels according to analog or digital control signals to perform voltage regulation.

▪ Requirements for blackstart, islanding, and resynchronization.

A real time simulator lends the testbed a high degree of flexibility and efficiency, allowing a huge variety of grid conditions and contingencies to be imposed on the physical equipment.

BESS is becoming a prominent component of renewable energy strategy for utilities as evidenced by increasing number of BESS installation around the globe. While groups such as MESA Standards Alliance is creating an open source standards for BESS controls and communication interface, SDG&E® has recognized the need early on and has been working on creating their standards and a flexible testing platform.

New Features

Don't forget to check out RSCAD V5.006.1. It's packed with new features (see our September newsletter for details).

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!