OpenDSS With Geomagnetically Induced Current (GIC) Simulation Capability - Media Brief

March 2012

Overview

The Electric Power Research Institute, Inc. (EPRI) made its Distribution System Simulator (DSS) program available as an open source project (OpenDSS) on the SOURCEFORGE.NET® website in 2009. The OpenDSS software is a comprehensive electrical power system simulation tool for the electric utility industry, and supports nearly all frequency domain (sinusoidal steady-state) analyses commonly performed on electric utility power distribution systems. In a joint effort with the North American Electric Reliability Corporation (NERC) and other utility participants, EPRI has improved the capability of OpenDSS to include the simulation of geomagnetically induced currents (GIC) in network transmission systems. The GIC simulation capability is now available in the current version of OpenDSS located on the SOURCEFORGE.NET® website.

Why it Matters

During geomagnetic disturbances (GMDs), magnetic field variations drive low frequency (quasi-dc) electric currents through transmission lines and transformer windings to ground. These geomagnetically induced currents (GIC) produce half-cycle saturation in transformers, leading to harmonic generation and increased reactive power demand. As part of assessing the impact of a GMD on the grid and potential mitigation strategies, it is necessary to determine the GIC produced by different levels of geomagnetic activity.

GIC Simulation Capability of OpenDSS

OpenDSS is capable of performing geomagnetically induced current (GIC) analysis of power systems. The N-phase modeling capability of OpenDSS is taken full advantage of meaning that GIC analysis is not limited to three-phase systems. Additionally, the COM interface capability allows users to define circuit models, execute the functions of the program and implement algorithms that interact with the simulator under programmatic control. This allows users to dynamically change circuit parameters, modify input, and control OpenDSS through an external program such as MATLAB® ; thus, enabling long-term (hours or days) analysis of GMDs. The experienced software developer has two additional options for customizing the OpenDSS tool. They can download the source code and modify it as needed, or they can develop Dynamically Linked Libraries (DLLs) that plug into the OpenDSS program.

History

EPRI's OpenDSS tool has been used for more than a decade in support of various research and consulting projects requiring distribution system analysis.   Improvements, such as GIC simulation capability, have advanced the use of the program to include the analysis of network transmission systems. The OpenDSS software tool has been designed to be scalable so it can be modified to meet future needs.

Together . . . Shaping the Future of Electricity

PALO ALTO OFFICE
3420 Hillview Avenue, Palo Alto, CA 94304-1395 USA • 650.855.2000 • Customer Service 800.313.3774 • www.epri.com

Key Stakeholders

The new capability of the OpenDSS program should be of interest to a wide range of potential users involved in assessing the impact of GMDs on the grid and potential mitigation strategies.

To download the program, visit: http://electricdss.sourceforge.net/

There is a Wiki containing supplementary documentation, the latest information, hints and tricks, etc. available at http://electricdss.wiki.sourceforge.net/

The OpenDSS software is provided with a BSD license. This makes the software readily available to the widest possible audience with few restrictions. Derivative works may not claim EPRI endorsement.

The technical contact at EPRI for the OpenDSS software program is Roger C. Dugan, rdugan@epri.com, or via phone at 865.218.8074.

About EPRI

The Electric Power Research Institute, Inc. (EPRI, www.epri.com) conducts research and development relating to the generation, delivery and use of electricity for the benefit of the public. An independent, nonprofit organization, EPRI brings together its scientists and engineers as well as experts from academia and industry to help address challenges in electricity, including reliability, efficiency, health, safety and the environment. EPRI's members represent more than 90 percent of the electricity generated and delivered in the United States, and international participation extends to 40 countries. EPRI's principal offices and laboratories are located in Palo Alto, Calif.;

# # #

Contact:

Don Kintner
EPRI
Manager, Communications
dkintner@epri.com
704-595-2506