TIP 360: EPRI Program 162: HVDC Transmission

Context

The electric power industry is faced with difficulties in acquiring right-of-ways. It is also faced with the challenge of integrating renewable power sources into an ac power system. As well, it is under pressure to improve the reliability of the power grid. High-voltage direct current (HVDC) offers many features to increase right-of-way utilization and connecting renewable resources to load center. For example, by converting an AC line to DC, it may be possible to raise the power transfer capability of an existing transmission corridor. HVDC may be the most cost effective solution for long distance bulk power transfer.

As well, HVDC could be installed to operate a power system asynchronously, but still being able to transfer power through back to back converters. For these reasons, HVDC technology has been identified as a key component for the future grid.

Description

HVDC technology applications have been extended beyond its traditional role of bulk power transfer. The electric power industry has to understand the evolved applications in order to take full advantage of this technology. This program provides the following:

- Technology awareness through technology watch newsletters, conferences, and workshops
- Experience of recent HVDC technologies, integration of HVDC into an AC system, HVDC electrical effects, and system and component performance to members who are considering adopting HVDC for either bulk power transfer, power system performance improvement, and integration of renewable power sources or transmission system flow management
- Options to increase the capability of existing transmission corridors by providing methods to convert high-voltage alternating current (HVAC) lines to HVDC lines and to construct hybrid ac and dc lines.
- HVDC planning guide on applications and effects of HVDC in an AC grid.

The program offers comprehensive information for both owners and non-owners of HVDC systems.

Why It Matters

Electric Power Research Institute (EPRI) research in HVDC yields results beneficial to program members. This information will come in a number of forms and is expected to include the following:

- Publish HVDC reference guides for the design and operation of HVDC systems
- Provide HVDC technology awareness by publishing reports and organizing industry-wide conferences and workshops
- Provide guidelines for planning of HVDC
- Evaluate and mitigate impacts of integrating an HVDC system into an AC grid
- Evaluate voltage-source converter (VSC) based DC transmission and advanced power electronic devices for adoption and identify research and development (R&D) needs to further enhance the use of these technologies at higher voltages
- Evaluate component and system performance, and conduct component testing
- Study HVDC electrical effects such as corona, audible noise, electromagnetic interference, and electric fields and ions, so that companies can better understand how dc lines may affect their environment
- Develop strategies and guidelines for converting AC lines to DC lines to increase and manage transfer capability on existing transmission corridors
- Provide leadership in theoretical and experimental fronts in HVDC, AC-to-DC line conversion, hybrid AC and DC, and the operation of HVDC systems
- Demonstrate HVDC technology options at utility sites

Goals and Objectives

Current year activities:

- Provide a technology watch newsletter with the latest developments in HVDC technologies
- Update the leading reference guide for the design and operation of HVDC systems
- Evaluate the impact of integrating HVDC into an ac system
- Resolve operational concerns of owners and operators of existing HVDC systems and those considering the addition of HVDC to their systems
- Evaluate HVDC system performance and conduct component testing
- Collect data from test line and improve algorithms for predictions of HVDC electrical effects such as electromagnetic interference, corona and, electric fields and ions
- Arrange a demonstration of ac-to-dc line conversion at a utility site
- Prepare a guide for HVDC planning

TIP 360: EPRI Program 162: HVDC Transmission

Project Start Date: January 1, 2015

Project End Date: December 31, 2016

Reports & References

Links

Participating Organizations

Electric Power Research Institute (EPRI)

Funding

BPA FY2016 Budget: $131,000

For More Information Contact:

BPA Project Manager:
Eric Heredia, Transmission Planning
emheredia@bpa.gov

EPRI Program Manager
John Chan