Supplemental Project Notice

VOLT/VAR CONTROL AND OPTIMIZATION IN TRANSMISSION SYSTEMS

Use of Advanced Software Tool and Approaches

PROJECT HIGHLIGHTS

- Optimize use of reactive power resources
- Effective approach for voltage control and reactive power management assessment
- Offer one "Go-To" tool for voltage and reactive power optimization
- Significantty reduce engineering time to perform Vol/var control and management studies.

Background, Objectives, and New Learnings

Transmission planners and operations engineers perform a variety of studies to procure adequate reactive resources to control voltage and maintain voltage stability across their network. Volt/VAr planning and management studies and procedures are performed in different time frames, ranging from long-term planning to real-time operations. Transmission planners identify network expansions that ensure the system meets the reliability criteria for medium (three to four years) to long-term (six years and beyond) future time frames. Performed from two years out to the previous day, operations studies' main objective is to identify system operating conditions that may imperil voltage control performance and stability, as well as determine what operating procedures are required to mitigate possible adverse effects. In real-time operations, studies are conducted to prepare for contingencies and changes in system operating conditions. Specialized studies are also conducted for specific objectives, such as determining optimal voltage control settings or developing procedures for system operators. Studies for all time frames are often lengthy, require coordination amongst many parties, are in frequent need of update as system conditions evolve, and rarely provide a comprehensive voltage strategy across all equipment and operating conditions.

EPRI has developed a software tool – VCA Studio - to assist transmission planners and operations personnel in performing voltage control and reactive power optimization studies. The VCA Studio software comprises various interrelated modules and functionalities for different Volt/VAr optimization applications that are often separate tools (or non-existent) in industry applications. The tool has been validated in numerous case studies using real transmission system data. New functions are also continuously being developed and implemented to address specific needs. VCA Studio is intended to be the "Go-To" tool for voltage and reactive power optimization.

The objective of this project is to apply the advanced optimization tool – VCA Studio – to help identify and design effective solutions to Volt/VAr control and management issues and improvement, throughout all time frames, in participants' transmission systems.

Benefits

Implementation of the VCA Studio software is expected to support transmission planners and operations engineers in multiple ways, including:

- Optimizing use of reactive power resources.
- Improving system operation security with effective and coordinated control actions.
- Producing cost-effective, practical solutions to var resource deficiencies and reinforcement needs.
- Providing significant reduction in engineering time.
- Reducing risk of equipment damage and loss of life from exposure to abnormal voltage conditions.

Project Approach and Summary

This project will include the following main tasks:

1. **Definition of Volt/VAr optimization use cases:** EPRI will work with project participants to identify their voltage control and reactive power management needs and then to define the scope and approach of the cases to be studied for their system. Topics could include:
    - Optimize generators and dynamic var resource voltage setpoints.
    - Assess reactive power adequacy to ensure secure operation under normal and contingency conditions.
    - Find effective and practical control actions to mitigate voltage violations during normal and contingency conditions.
    - Optimize voltage settings and bandwidth for static and automatic switching shunt devices or transformer tap settings.
    - Identify optimal sites, type, and capacity of new voltage resources to ensure adequate performance under varied operating scenarios.
2. **Identification and implementation of pre- and post-processing functionalities**: Based on the selected use cases, this task will evaluate the need to develop and implement specific software scripts for pre-processing of input data or post-processing results for better visualization and analysis. The possibility to implement and test the new functions will be determined based on budget availability and schedule constraints.
3. **Perform case studies:** EPRI will work with each participant to conduct a study based on the defined use case.
4. **Report:** EPRI will prepare a report for each participant detailing the results of each case study, including a synopsis of study objective and problem statement, detailed results, and recommendations for voltage control process enhancements.

Deliverables

Each participant will receive a detailed report and any scripts developed as part of Project Approach.

The non-proprietary results of this work will be incorporated into EPRI's Transmission Operations and Planning R&D programs.

Price of Project

The cost of participation is expected to be between $65,000 - $80,000 depending on the system size and scope of study. Contact EPRI for tailored scope and pricing. The project can be funded over two calendar years. The project is eligible for Self-Directed Funds (SDF).

Project Status and Schedule

The project duration is expected to be 24 months from the start date.

Who Should Join

Electric utilities, transmission companies, and system operators looking for better alternatives and tools to solve pressing Volt/VAr optimization issues.

Contact Information

For more information, contact the EPRI Customer Assistance Center at 800.313.3774 (askepri@epri.com).

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Product ID: 3002028631 **Project ID:** 1-118884 **October 2024**

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