Technology Innovation Project

Project Brief

TIP 274: Development & Demonstration of Applications for BPA & FCRPS Compliance with Modeling Standards & Performance Monitoring

Context

BPA has been a recognized leader in power plant model validation in numerous publications and presentations. BPA developed and successfully deployed the Power Plant Model Validation (PPMV) application that uses disturbance data for power plant model validation. The PPMV application was very useful in helping with compliance with WECC Model Validation Policy, finding modeling errors and triggering generator retest, and finally with detecting power plant controller failures. Now, NERC-generated modifications and the need for wind power plant models require BPA to join with other federal agencies in upgrading model validation and performance tools for the Federal Columbia River Power System (FCRPS).

Description

This project develops and integrates a comprehensive set of model validation and performance monitoring applications for BPA and FCRPS participants. The project approach includes (a) developing a consistent set of dynamic performance requirements, (b) establishing a good baseline for power plant model / performance, (c) continual monitoring of power plant dynamic performance using synchronized wide-area measurements. The project is expected to reduce the compliance costs with the NERC MOD-06 and -027 Standards and WECC business practices.

Specifically, the project will accomplish the following:

- Greatly help facilitate FCRPS compliance with upcoming NERC MOD Standards
- Apply model validation techniques for wind power plant model validation
- Develop power plant performance metrics and online monitoring applications

Four major needs have been identified in this process, to be satisfied by program studies :

- Developing standardized tools for baseline model validation and compliance filing will be essential for reducing BPA expenses and mitigating noncompliance risks.
- Improve data and model management for the BPA Power Plant Model Validation (PPMV) application that uses PMU data for model validation. Explore capabilities to do model verification using ambient data. Add model identification capabilities to PPMV.
- No valid model for more than 4,400 MW of wind power plants interconnected to BPA's transmission network.
- It does not help to have a perfect model of an unstable plant. There is a need to develop power plant performance requirements and online applications to monitor their performance.

These stated needs call for solutions that satisfy the static requirements of NERC standards while also accommodating actual performance data. Thus, as part of this overall task, "benchmark" performance models that represent the best control practices for each class of equipment will be developed. Then, actual equipment behavior will be compared against the benchmark, plant performance will be reviewed and control changes will be recommended as needed.

Why It Matters

The project is expected to provide the following benefits to BPA and FCRPS participants:

- Financial
  - Reduce FCRPS expenses associated with compliance with WECC model validation policies and upcoming NERC Standards by $150,000 annually
  - Enable model calibration for Columbia Generating Station, replacing the need for baseline retest, estimated at $50,000
  - Mitigate need for additional BPA FTE for compliance monitoring
  - Reduce noncompliance risks because of bad model data
- Reliability
  - Improve quality of power system models, particularly wind power plant models
  - Better awareness of generating fleet performance
- Workforce
  - Build technical expertise at US COE to conduct model validation testing
  - Build technical expertise at FCRPS in the area of generator controls

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Goals and Objectives

1. Software for baseline model validation, including documentation and training (SG-1A)
2. Model library and project set-up for baseline model validation (SG-1B)
3. Data and model management for Power Plant Model Validation (SG-2A)
4. Data calibration module (SG-2B)
5. Software and data set-up for validation of power flow wind power plant models in BPA system (SG-3A)
6. Software and data set-up for validation and calibration of dynamic wind power plant models in BPA system (SG-3B and SG-3C)
7. Software for power plant performance monitoring

Project Start Date: October 1, 2012

Project End Date: September 30, 2016

Reports & References (Optional)

Links (Optional)

Participating Organizations

Funding

Total Project Cost:	$418,747
BPA Share:	$418,747
External Share:	$0
BPA FY2014 Budget:	$160,000

For More Information Contact:

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