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Global AC Optimal Power Flow (SuperOPF)

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Solving the Alternating Current Optimal Power Flow (ACOPF) problem is key to economically efficient and reliable power networks while providing significant environmental benefits. A good solution technique could potentially save utilities tens of billions of dollars annually (according to FERC) and benefit the environment by cutting millions of tons of CO₂ emissions (according to EIA).

However, ACOPF is difficult to solve due to its numerical and modeling complexity. Many utilities are still using linearized DCOPF for their power market. Even after the first formulation of ACOPF almost 55 years ago, there is not yet a commercially-viable full ACOPF package empowered by a fast and robust solution technique.

Bigwood Systems, Inc. (BSI), a world leader in advanced on-line solutions for the electrical grid, has developed a global constrained AC optimal power flow tool appropriately named SuperOPF. This innovation is the result of a 7-year project with the U.S. Department of Energy and the Advanced Research Projects Agency - Energy. It goes beyond traditional power flow analysis to provide the ability to fully optimize and refine your transmission system.

SuperOPF is a commercial-ready package that integrates a portfolio of analytical optimization technologies to compute the non-linear ACOPF for a transmission system. Through testing, it has already emerged as one of the most successful optimization tools, winning against incumbent commercial products in testing and evaluations. Whereas conventional power flow relies on the engineer to systematically investigate a variety of solutions before arriving at a good solution, BSI's SuperOPF automatically adjusts controls to determine the best solution. From virtually any reasonable starting point, one or multiple optimal solutions are attained, solutions that simultaneously satisfy system constraints, given a pre-determined objective.

Key features of the tool include (1) modeling that reflects actual system behavior and (2) a robust and efficient computation process. SuperOPF can be adjusted and tailored to handle voltage/transient stability constraints with large contingency lists. SuperOPF can also serve as an advisory tool to compute the minimum number of control adjustments needed to relieve overloads in the system.

The BSI SuperOPF Suite comprises a set of OPF tools covering the full range of application scenarios encountered in power industry operation, planning, and marketing, ranging from dealing with renewable energy integration to smart scheduling reactive power devices to predict and remove violations in the system.

Overall, BSI's unique AC OPF solution framework, SuperOPF, offers many desirable benefits, including:

1. Field-proven technology for reliably optimizing large-scale power networks (>250,000 variables).
2. Comprehensive and flexible full (nonlinear) AC OPF modeling capability to meet industrial modeling requirements.
3. Optimal OPF solutions and accurate LMP results for improved competitiveness in the power market.
4. Superior flexibility with customized optimization objectives and constraint co-optimization.
5. Contingency-oriented optimization for system security maintenance.
6. Constraint feasibility analysis and diagnosis and restoration of infeasible scenarios.
7. Enablement of more renewable energy penetration.
8. Comprehensive analysis result reporting and database bridging.
9. Support of major power system data formats.

Bigwood Systems is seeking more electric power utilities to work with on SuperOPF.
