

**OFFER-BASED MECHANISM FOR PARTICIPATION
OF DYNAMIC REACTIVE POWER SUPPLIERS IN
A REAL-TIME DEREGULATED ELECTRIC MARKET**

By

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An Abstract of a Thesis Submitted to the Graduate

Faculty of Rensselaer Polytechnic Institute

in Partial Fulfillment of the

Requirements for the Degree of

MASTER OF SCIENCE

Major Subject: ELECTRICAL ENGINEERING

The original of the complete thesis is on file
in the Rensselaer Polytechnic Institute Library

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August 2010
(For Graduation December 2010)

ABSTRACT

Dynamic Reactive Power devices such as static synchronous compensators (STATCOM), static VAR compensators (SVC), and synchronous condensers can be used to regulate power system bus voltages so as to increase the reliability and efficiency of energy transfer. In spite of this benefit, no mechanism currently exists whereby such devices can independently compete in deregulated electric market environments. Here a new market based mechanism is proposed to allow FACTS controllers to provide competitive offers to supply (or absorb) reactive power in the bulk transmission system. A two-tier dispatch is proposed, first without the FACTS device(s), then subsequently with the device(s) included. If inclusion of the device(s) reduces voltage constraints or reactive power constraints, reflected through a lower system generator production cost, then the offers are accepted and the devices are scheduled in the dispatch. To demonstrate the concept, we discuss four common situations using a simple power system, where bus voltage and/or reactive power constraints give rise to higher system dispatch cost. We then proceed to demonstrate how suitably positioned, marginally bidding SVC(s), STATCOM or synchronous condenser, could act to alleviate these constraints and lower the overall production cost. Throughout this work it is generally assumed that generators incur no additional cost to supply reactive power and thus, their offer price for reactive power is zero. An offer-based mechanism solved as part of an AC OPF that minimizes generator and reactive provider cost, can make known the marginal cost of reactive power at buses in the bulk power system. This reactive LMP gives appropriate price signals to the market place, making more visible the locational marginal price of reactive power as well as indicating suitable buses for future reactive power investments. Appropriately computed prices could spur future investment in dynamic reactive power devices, ultimately strengthening the bulk transmission system, increasing reliability and reducing the cost of serving load.