

# Voltage and Reactive Management

**Wes Yeomans**

*Director of Operations*

*New York Independent System Operator*

**Federal Energy Regulatory Commission**

**Staff Technical Conference on Enhanced Power Flow Models**

*Washington, DC*

*June 23, 2010*

# Improving Market and Planning Efficiency through Improved Software

- ◆ FERC Technical Conference on Enhanced Optimal Power Flow Models and Software:
  - *“...The Commission is identifying opportunities to enhance operational efficiency in jurisdictional markets by encouraging public utilities, particularly RTO’s and ISO’s, to consider the deployment of new modeling software for their market operations...”*

# Current NYISO Operations

- ◆ The NYISO's **Security Constrained Unit Commitment (SCUC)** and **Security Constrained Economic Dispatch (SCD)** processes consider the impact of transmission losses when determining optimal generating unit power output schedules.
  - *SCUC for the Day-Ahead Market and SCD for the Real-Time Energy Markets determine the optimal generating unit megawatt schedules accounting for the impact of system losses on 69kV and higher New York transmission system facilities. (SCD runs every five minutes).*
  - *The resulting Day-Ahead and Real-Time Energy Market Locational Marginal Based Prices (LBMP) includes a marginal loss pricing component consistent with the SCUC and SCD generation schedules.*

# Optimal Power Flow Background

- ◆ In addition to accounting for losses through the SCUC and SCD processes, transmission losses could be further reduced by the implementation of software technology such as an **Optimal Power Flow (OPF)**.
- ◆ OPF technology could be used to aid in transmission loss reductions by adding the capability to **identify** periodic adjustments to voltage and reactive control devices.
- ◆ Voltage and reactive control devices include the tap position settings of transformers, capacitor switching, and the voltage set points and reactive outputs of generating units.

# Optimal Power Flow Issues

- ◆ OPF technology could be used to aid in loss reductions on the transmission system but would come with significant infrastructure and recurring costs.
- ◆ The NYISO estimates the cost of implementing real-time OPF for reactive power control scheduling, including both one-time and annually recurring components, as follows:
  - **One-time costs are estimated to be about \$1.2 M**
  - **Annual recurring costs are estimated to be \$1.0 M due to additional staffing requirements necessary to operate the OPF system**
  - *NOTE: These cost estimates do not include any recurring or one-time costs that would be incurred by the transmission owners for additional manpower and software implementation costs associated with the necessary communications infrastructure.*

# Optimal Power Flow Alternatives

- ◆ The expected outcome of OPF technology is that the transmission system should normally be operated at the highest operating levels allowable by equipment ratings.
- ◆ This expected outcome is based on the engineering principle that transmission facility current (ampere) flows are inversely related to operating voltages and transmission losses are a function of the square of the facility current flows.
- ◆ Given this understanding, the NYISO worked with Transmission Owners to determine whether existing technology exists or ISO processes could be modified to achieve loss reductions similar to an OPF implementation.

# NYISO and Transmission Owner Efforts

- ◆ Historically, the NYISO's authority has been limited to maintenance of operating voltages to *only within reliability-based limits*; the objective of reducing transmission losses was not considered.
- ◆ A review of existing operating practices found that NYISO and Transmission Owner procedures for operating voltage control devices could be modified to aid in transmission loss reductions.

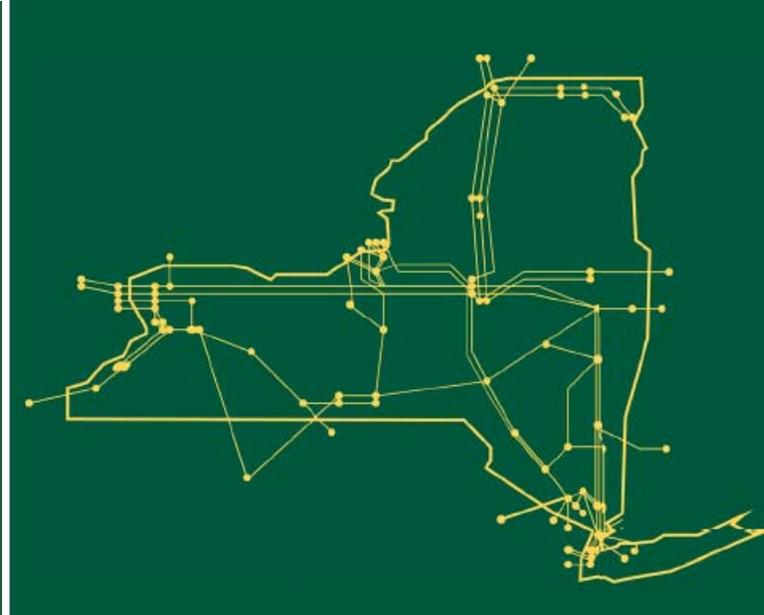
# NYISO and Transmission Owner Efforts

- ◆ These modifications were carried out by agreeing on target voltage levels and incorporating them into NYISO and Transmission Owner procedures.
- ◆ Operating the system to target voltage levels results in higher transmission voltages across the transmission system and reduced losses.
- ◆ Pursuing losses reductions through target voltage levels complements existing NYISO and transmission owner reliability practices.

# NYISO and Transmission Owner Efforts

- ◆ In addition to the development of a set of target voltage levels, the NYISO and Transmission Owners are developing procedures to define daily operational responsibilities for transmission voltage control devices.
- ◆ To aid in the effectiveness of the operating procedures, the NYISO has implemented monitoring and alarm capability when transmission voltages deviate from target voltage levels.

The New York Independent System Operator (NYISO) is a not-for-profit corporation responsible for operating the state's bulk electricity grid, administering New York's competitive wholesale electricity markets, conducting comprehensive long-term planning for the state's electric power system, and advancing the technological infrastructure of the electric system serving the Empire State.



[www.nyiso.com](http://www.nyiso.com)