Transmission Reforms
1992 - Present

Key Developments

Generation Deregulation
1992 to 2000
- Generation market opened up
- FERC has new authority to order wheeling
- Orders 888 and 889 (1996)
- Transmission owners to provide transmission open access and establish Tariffs (OATT)

Continued Regional Transmission Policy Development
2000 to 2010
- Order 2000 (end of 1999): creation of Regional Transmission Organizations
- Order 679 (2006): FERC incentives to stimulate transmission investment
- Order 890 (2007): requirement for open, transparent regional transmission

Order 1000 and Region-by-Region implementation
2010 onwards
- Order 1000 (2011) requirements for:
  ✓ Regional Transmission Planning
  ✓ Selection of Projects
  ✓ Cost allocation
  ✓ Elimination of Right of First Refusal
- Individual Regional Transmission Planning entities make compliance filings
- FERC proceedings to approve filings
- Implementation
FERC Order 1000 (FERC Order 1000, 2011)

Issued July, 2011

Drivers
• Address inadequacies of Order 890
• Establish planning and cost allocation processes for future investment

Objectives
• Reform transmission planning processes to find most efficient and cost-effective transmission solutions
• Ensure that the costs of transmission solutions chosen to meet regional transmission needs are allocated fairly to those who receive benefits

Three Reforms
• Transmission Planning
• Cost Allocation
• Nonincumbent Developer
Requirements for transmission planning:

- Each public utility transmission provider must participate in a regional transmission planning process that satisfies the transmission planning principles of Order No. 890 and produces a regional transmission plan.

- Local and regional transmission planning processes must consider transmission needs driven by public policy requirements established by state or federal laws or regulations.

- Public utility transmission providers in each pair of neighboring transmission planning regions must coordinate to determine if there are more efficient or cost-effective solutions to their mutual transmission needs.
Requirements for transmission cost allocation:

• Each public utility transmission provider must participate in a regional transmission planning process that has a regional cost allocation method for new transmission facilities selected in the regional transmission plan for purposes of cost allocation. The method must satisfy six regional cost allocation principles.

• Public utility transmission providers in neighboring transmission planning regions must have a common interregional cost allocation method for new interregional transmission facilities that the regions determine to be efficient or cost-effective. The method must satisfy six similar interregional cost allocation principles.
Requirements for transmission cost allocation:

• Public utility transmission providers must remove from tariffs and agreements any federal right of first refusal for a transmission facility selected in a regional transmission plan for purposes of cost allocation, subject to limitations

• Public utility transmission provider required to amend its tariff to require reevaluation of the regional transmission plan to determine if delays in the development of a transmission facility require evaluation of alternative solutions, including those proposed by the incumbent, to ensure incumbent transmission providers can meet reliability needs or service obligations
Order 1000 Transmission Planning Regions

The colored areas are intended to approximate the scope and location of the transmission planning region, but are for illustrative purposes only.

Development of Transmission Facilities in Regional Planning Process

Competitive Bid Approach
• Transmission project identified through regional planning process
• Region selects transmission developer through competitive bidding process
• Used by CAISO, MISO, SPP

Sponsorship Approach
• Transmission need is identified through regional planning process.
• Transmission developers propose projects
• Region evaluates proposals and selects preferred solution
• Developer that proposed the preferred solution constructs, owns, and operates project
• Used by ISO-NE, NYISO, PJM
Competitive Bid Approach

- Regional transmission facilities identified through MTEP process
- RFP issued after Board approves projects
- In bid evaluation, 5 points (out of 100 possible) awarded for participating in the planning process and submitting a solution to address the same issue addressed by the Competitive Transmission Project

Source: "MTEP15," MISO, October 14, 2015 (Draft)
What projects qualify?

- **Multi-Value Projects (MVP)**
  - Provide regional public policy, economic and/or reliability benefits
  - Project includes facilities 100 kV and above
  - Capital cost ≥ $20M

- **Market Efficiency Projects (MEP)**
  - Reduces market congestion
  - Project includes facilities 345 kV and above
  - Capital cost ≥ $20M

Competitive Projects

- **MTEP14**
  - None
- **MTEP15** (pending board approval)
  - Duff-Rockport-Coleman 345 kV. 43-mile line in southern IN
Competitive Bid Approach

- Detailed Project Proposals (DPP) submitted during the ITP process
- Regional transmission facilities identified through ITP process
- RFP issued after Board approves projects
- In bid evaluation, 100 point bonus (out of 1000 possible) is applied if bidder proposed the project during the ITP process

Source: B. Bright, 2015
What projects qualify?

- Voltage > 100 kV
- Project is not a rebuild of an existing facility
- Project is not required to be in service within 3 years

Competitive Projects

- 2015 ITP10 (Bids due Nov 2)
  - Walkemeyer-North Liberal 115 kV. 27-mile line in southwest KS
Sponsorship Approach
- Need identified by NYISO or NYPSC
- NYISO solicits solutions
- NYISO evaluates solutions and selects project

What projects qualify?
- Reliability, economic, and public policy projects.

Competitive Projects
- Western NY Public Policy Transmission Need (Issues Nov 1)
NYPSC designated western New York congestion relief as a public policy requirement

Increase Western NY transmission capability sufficient to:
- Obtain the full output from Niagara (2,700 MW);
- Maintain certain levels of simultaneous imports from Ontario across the Niagara tie lines (i.e., maximize Ontario imports under normal operating conditions and at least 1,000 MW under emergency operating conditions);
- Maximize transfers out of Zone A to the rest of the state;
- Prevent transmission security violations (thermal, voltage or stability) that would result under normal and emergency operating conditions; and
- Maintain reliability of the transmission system with fossil-fueled generation in Western NY out-of-service, as well as in-service.

NYISO provides developers with power flow base cases and auxiliary files
Challenges for Planning Regions and Developers

• Identifying regional reliability, market efficiency, and public policy needs.

• Developing solutions that are optimized to meet regional needs.

• Evaluating reliability and economic benefits of competing proposals.

• Allocation of regional project costs.
Manitoba Hydro Transmission Expansion Studies

Manitoba Hydro Wind Synergy Study (J. Bakke, 2013)
• Performed by MISO in 2011-2013
• Evaluate if expanding transmission capacity between Manitoba and MISO would enable greater wind participation in the MISO market
• MISO requested stakeholder input for transmission projects to study

CapX2020 Transmission Expansion Studies (CapX2020)
• CapX2020 is a joint initiative of transmission-owning utilities in Minnesota and the surrounding region to expand the electric transmission grid to ensure continued reliable and affordable service
• Transmission Expansion Studies undertaken to provide thoroughly studied project(s) for inclusion in the Synergy Study
CapX2020 Transmission Expansion Studies

MANitoba Transmission EXpansion (MANTEX)
• Identify cost effective transmission project to deliver new Manitoba Hydro power into the MISO market
• CapX2020 identified target levels of incremental transfer up to 2,000 MW

Dakota Wind
• Analyze the level of additional North and South Dakota generation resources that could be delivered to the MISO market with the additional transmission projects identified in the MANTEX study

Upgrade Options
• CapX2020 developed 18 base projects
• Total of 32 network upgrade options created by combining base projects
• Upgrade options were evaluated for peak and off-peak system conditions in 2021 and 2026
Planning Process Analyses

- Simplified Power Flow (Screening) Studies
  - AC Power Flow Studies
    - Stability Studies
      - Special Transient Problems
        - Short Circuit Studies
          - Line Design Studies
          - Production Cost Studies
    - More Alternatives
- Less Detail

- More Detail

- Fewer Alternatives
Screening of Upgrade Options

- Linearized power flow frequently used to identify feasibility of expansion plans
  - Converts nonlinear ac problem into a simple, linear circuit analysis problem
  - Efficient, noniterative numerical techniques used to compute an approximate power flow solution
  - Ignores reactive power flow and changes in voltage magnitudes

- Linear FCITC analysis was used to identify system overloads associated with each target transfer level
  - Power flow model created with an upgrade option
  - Underlying system overloads were identified and unit costs were used to estimate associated mitigation

- Results were compared by graphing cost (project+mitigation) versus transfer level
Option Screening - Cost vs Incremental Transfer
Detailed Reliability Analyses of Preferred Options

Upgrade options selected for detailed analyses.

Steady state power flow and contingency analyses (nonlinear)
• Calculate incremental losses
• System intact and post-contingent thermal and voltage constraints

Transient stability analyses
• Determine if the system is in a stable state such that synchronism is maintained when the system is subjected to a disturbance

Study-specific requirements
• Voltage stability
• Electromagnetic transients
• etc
Economic Benefits

Project benefits can be used to compare transmission projects, determine if a transmission project will be eligible for competition, identify beneficiaries for cost allocation, etc.

Range of possible benefits ("Multi Value Project Portfolio", 2012)

• Economic
  • Production cost savings
  • Load cost savings
  • Operating reserves
  • System planning reserve margins
  • Transmission line losses
  • Reduction of generator curtailments
  • Qualitative and social benefits

Accounting of benefits used to calculate project benefit/cost ratio is unique to each planning region
Economic analysis is performed using an hourly production cost model to simulate a security constrained economic dispatch (SCED).

Production Cost Model includes
• Transmission
• Load hourly profiles
• Wind hourly profiles
• Complete generation characteristics
• Fuel and emission prices

Simulation results include hourly generating unit statistics including production cost, LMP forecasts, binding constraints, and branch flows.

Benefits are determined by comparing simulation results without and with the proposed transmission project.
Manitoba Hydro Wind Synergy Study

- Stakeholders submitted two 500 kV projects.
- Economic analyses performed by MISO concluded that the projects showed similar benefits across a wide range of plausible futures.
- The benefit-to-cost ratios for the East and West projects ranged from 1.70 to 3.84 across all futures using a modified production cost metric developed specifically for the synergy study.
- Neither project qualified for cost sharing under the MISO tariff.

Source: J. Bakke, 2013
Summary

Implementation of FERC 1000 is here.

Challenges for Planning Regions
• Performing planning studies at regional level.
• Identifying regional reliability and market efficiency needs.
• Evaluating reliability and economic benefits of competing projects.
• Allocation of regional project costs.

Opportunities and Challenges for Transmission Developers
• Understanding and analyzing, in a cost-efficient manner, regional systems in terms of transmission topology, constraints, and high benefit-to-cost projects.
• Developing solutions that are optimized to meet regional needs.
Thank you for your attention!

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