The Brattle Group

Seams Inefficiencies

Problems and Solutions at Energy Market Borders

Prepared for:

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Introduction

Evaluating Four Flavors of Seams Issues

- Substantial inefficiencies tend to materialize between markets related to disconnects in planning, market rules, and regulatory structures
- This presentation focuses on select problems and solutions in four categories of seams issues:
  1. Transmission Rights Between Markets
  2. Energy Dispatch at Market Borders
  3. Investment Tensions between Market and Non-Market Regions
  4. Constructing Inter-Regional Interties

1. Transmission Rights Between Markets

Value of Transmission Rights

- The owner of a transmission right has the option to schedule energy flows from the source to sink
- Enables the owner to capture the value of cross-market price differentials (if energy is scheduled optimally)

Transmission Rights Models

- *No Physical Rights* (Ontario, Alberta) – Opportunity service only
- *Point-to-Point* (U.S., BC, SK) – First-come, first serve allocation over a specific receipt and delivery path within a market region (can ship power across the continent via a string of PtP reservations)
- *Physical Transmission Rights* (Europe) – Auction-allocated right to transfer power over a market seam
- *Financial Transmission Rights* (Ontario, U.S. RTOs, Nord Pool) – Financial hedge simulating the value of a physical right (generally restricted only into intra-market, not cross-border)

North American Point-to-Point Model

Initiated by U.S. FERC

- FERC 888 and 889 required open access to transmission infrastructure
- "Reciprocity requirements" compelled non-jurisdictional U.S. and Canadian entities to comply as well

Problems with Point-to-Point (PtP)

- First-come, first-serve allocation is inherently inefficient
- Lack of coordination to award cross-border rights (separate processes for rights to the border and from the border for a complete path)
- Illiquid and non-transparent secondary market
- Transmission rights tied up under long-term reservations may go unused for valuable transactions (e.g. MISO-PJM capacity seam)

Potential Solutions

- Within RTOs, efficiencies have been greatly enhanced by eliminating PtP reservations in favor of "network service" and financial rights
- WECC awards cross-border rights with one-stop "wesTTrans" system for securing transmission rights through multiple balancing areas

European Physical Transmission Rights (PTRs)

Introduction of PTRs

- Recognizing seams inefficiencies among the many national markets, the European Commission mandated reforms including PTRs
- Cross-border rights recognized in both markets
- Allocated via competitive auctions over a range of time periods
- Online platforms and secondary auctions enable secondary trade
- Simplified treatment of transmission topology reduces complexity of transmission rights compared to North American PtP model

"Use-it-or-Sell-it" Feature

- Owner of a PTR has the right to physically schedule power (or not), and thereby capture the associated congestion rents
- If the owner fails to schedule power that should economically flow, the market operators will schedule that power flow and return the economic value of the rights to the owner (same as if the power were scheduled)
- Prevents valuable transmission capacity from going unused and net power flows from going in the wrong direction

2. Energy Market Dispatch Across Seams

Seam Problems

- Cross-border energy price differentials even when not all transmission capability is scheduled
- Power flowing in the wrong direction from high-price to low-price regions
- Inefficient flows likely when “correct” direction may change frequently (e.g. due to similar economics on both sides, or wind variability)

Causes of Inefficiency

- Most import and export schedules based on fixed pre-scheduled quantities (not determined endogenously with prices)
- Price latency (i.e. import-export schedules must be fixed far before prices are determined, potentially causing regret)
- Loop flows cause real-time power flows and prices to deviate from day-ahead schedules
- Complex timing and scheduling rules (separate processes for physical scheduling with e-Tags, market clearing on each side of the border)

2. Energy Market Dispatch Across Seams

European Market Coupling

Market Coupling

- Coordinated pricing and import/export scheduling between markets
- Introduced to address the problem of inefficiently utilized transmission

Two Types of Coupling

- *Price Coupling* – Prices and in both (or multiple) markets, as well as the efficient quantity of export are set simultaneously in an integrated process
- *Volume Coupling* – Import and export bids submitted by both markets are selected in a coordinated process based on a preliminary prices (but actual market prices independently set in each market after the fact)

- Easier to implement such options in Europe's day-ahead zonal national markets (while most U.S. markets have thousands of nodes priced every 5 or 15 minutes in real time)
- Only works between two market-based regions

2. Energy Market Dispatch Across Seams

North American Efforts to Address Seams

Offer-Based Import/Export Scheduling

- Many organized markets have moved from fixed schedules to priced import export bids (only on one side of the border at a time)
- Day-ahead schedules selected endogenously to price-setting; real-time schedules selected based on an indicative price prior to the real price-setting run (realized prices may still be quite different)
- Pricing and bid selection still a separate process from physical scheduling with e-Tags

Cross-Border Efforts

- ISO-NE–NYISO – coordinated transaction scheduling will clear priced bids (improving current approach where export from one RTO must be scheduling separately from import to the other RTO)
- PJM–MISO – use shadow prices on "reciprocal coordinated flowgates" to resolve congestion in each others' markets
- WECC – introducing a number of improvements for shorter scheduling windows, Dynamic Scheduling System to accommodate wind balancing across systems, possibly introducing Energy Imbalance Market (EIM)

3. Investment Tensions between Market and Non-Market Regions

Nature of Tension

- Restructured markets have been set up with the intention of being able to attract new generation through market revenues
- Importing excess resources from neighboring regulated markets reduce prices and hurt the profitability of merchant generation
- Examples: BC capacity imported to Alberta, Canadian hydro imported to eastern U.S. markets, MISO restructured vs. non-restructured states

Consequences

- Suppliers in the market regions are concerned about "unfair" competition from regulated assets
  - Regulated return provides financing advantage
  - Reduces opportunities for merchant developments
  - Creates regulatory uncertainty if new regulated projects persistently threaten prices
- Reliability concerns to energy-only market if regulated assets maintain a first priority to serve host market in the event of emergency
- Eastern U.S. RTOs actively working to prevent artificial capacity price suppression with minimum offer price rules (MOPR)

4. Constructing Inter-Regional Interties

Single-Market System Planning

- Traditional planning activities have been largely focused in one market
- Inter-regional transmission has been under-developed except in special circumstances with an overwhelming cost or reliability driver
- Cost allocation and permitting are perpetual hang-ups

Merchant Opportunities

- A number of markets award transmission rights to merchant lines
  - Allows them to capture the value of energy and capacity price differentials
  - In select locations with severe under-investment in transmission, these price differentials are sufficient to support the cost of building a merchant upgrade
  - Examples: Neptune, Cross-Sound Cable
- Focus on HVDC because these fully controllable lines are usually better-rewarded through the transmission rights mechanism
- Other value of merchant transmission is not rewarded (e.g. system reliability benefits, renewable integration improvements), meaning that a merchant-only model is likely to result in under-development

New Inter-Regional Planning Activities

Coordinated Planning Efforts

- Recent efforts to develop inter-regional transmission plans have recently been initiated
  - Eastern Interconnection Planning Collaborative (EIPC)
  - WECC's Regional Transmission Expansion Planning (RTEP)
  - European Ten-Year Network Development Plans (TYNDP)

Limitations

- Finalized plans are still voluntary options for development that the individual RTOs or balancing authorities involved are then encouraged but not required to pursue
- To move forward with any cross-border projects, the same difficult issues of cost allocation and permitting have to be addressed

Take Aways

- All market borders tend to generate tricky seams issues that are inherently difficult to solve
  - Conflicts in stakeholders' interests on each side
  - Lack of a single market administrator or regulatory authority, so changes require long multi-year efforts to build consensus
  - Difficult to revise and coordinate complex scheduling rules, particularly when integrated to large market software infrastructures
- Many advancements at market seams have only materialized in response to a binding policy mandate (e.g. from the European Commission or U.S. Federal Energy Regulatory Commission)

About *The Brattle Group*

The Brattle Group provides consulting and expert testimony in economics, finance, and regulation to corporations, law firms, and governmental agencies around the world.

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