



Understanding Transmission Seams Issues

Christina E. Simeone, PhD
Senior Transmission Planner
Grid Planning and Analysis, NREL

Photo by Dennis Schroeder, NREL 46840

Key Terms & Context

- **Transmission Seam:** interconnection(s) between neighboring transmission systems.
 - e.g., RTO-to-RTO, RTO-to-non-market, Non-market-to-non-market.
- **Seams Issues:** barriers to sharing or trading between systems (e.g., wholesale markets), for example, due to different market rules and procedures.
- Today's presentation provides a general overview of some of these issues.
- National Transmission Planning (NTP) study initiative will be publishing a report, ***“Barriers and Opportunities to Increase the System Value of Interregional Transmission”*** ~ June 2024. Deeper dive into these and other issues.

Why care about efficient use of existing (or new) interregional transmission?

- Interregional transmission has several potential benefits:
 - **Avoid Capital Costs** – e.g., avoided generation capacity investments, access to lower cost generation, access to policy incentives (e.g., ITC).
 - **Avoid Operating Costs** – e.g., avoided variable costs for fuel/cycling, reduced transmission losses, access to policy incentives (e.g., PTC).
 - **Contribute to Reliability** – e.g., reduce loss-of-load probability, reduced cost of meeting resource adequacy or ancillary service requirements.
 - **Contribute to Resiliency** – e.g., reduced severity/duration of outages, mitigation of weather/load uncertainty, reduced outages during extreme weather events.

Sharing & Trading

- **Emergency sharing (operational):** Often, neighboring systems have agreements in place that dictate terms and conditions for emergency sharing of energy resources.
- **Economic trading (operational):** Ideally, surplus lower-priced power could flow between systems to higher-priced areas, reducing costs for consumers.
- **Resource adequacy (planning):** Reliance on external resources for meeting reserve margin planning requirements for reliability.

Example Barriers Explored Today

- Market-to-Market Program Inefficiencies
- Extreme Weather Scenarios
- External Resource Adequacy Resources
- Reliance on Bilateral Trading

Market-to-Market Program Inefficiencies

- Typically occur between RTO/ISOs markets, aided by programs established in joint operating agreements (JOAs).
- Examples of these programs:
 - **Coordinated Transaction Scheduling** – meant to facilitate economic trading between markets.
 - **Market-to-Market Congestion Management** – meant to manage congestion on key interconnections (called flowgates) that have the potential to impact each other's systems.

Coordinated Transaction Scheduling (CTS)

- In simplistic terms, CTS is a market-based platform where market participants can submit bids/offers to import or export power based on price difference between areas.
 - Allows market participants the opportunity to profit from arbitrage.
- CTS is generally seen as an improvement compared to having no interchange scheduling method. (MISO/PJM, PJM/NYISO, NYISO/ISO-NE, SPP/MISO)
- In practice, there may be challenges with these programs, for example:
 - High transaction fees
 - Poor price forecasting
 - Proxy pricing points

Coordinated Transaction Scheduling

- **High transaction fees:** Wide range of potential charges can be imposed on transactions, depending on the area. These charges can reduce the arbitrage opportunity and reduce trading interest.
- **Poor price forecasting:** Price differences between areas may be based on *forecasted* price differences. Real-time prices are extremely volatile and difficult to predict.
- **Proxy pricing points:** Interchange transactions may be priced on proxy interfaces that may be different from where the power is physically injected. This creates the potential for loop flows (power flowing in-and-out of systems), which is difficult to control and can damage equipment.

Large Power Transfers in Extreme Weather Scenarios

- Extreme weather can cause situations (e.g., unplanned generator outages, above normal peak loads) where **large, unplanned power transfers** are needed to maintain reliability.
- These large transfers can result in **atypical transmission constraints** from **abnormal power flows**.
- **Lack of operational awareness** about new constraints, **internal congestion** can reduce opportunities to transfer power when needed.

External Resource Adequacy Through Interregional Transmission

- Different stakeholders have comparably **greater or less tolerance** for long-distance deliverability of **external resource adequacy resources**.
- For example, accessing capacity in wind-rich areas could lower costs, but also could create deliverability uncertainty.
- FERC has approved stringent (e.g., PJM pseudo-tie) and flexible (e.g., western resource adequacy program) approaches to external resources contributing to resource adequacy.

Areas Reliant on Bilateral Trading

- Non-market areas
- Bilateral trading has benefits, but also drawbacks. Historic issues with:
 - Rate pancaking
 - Trade friction
 - Limited real-time options
 - Potential more expensive resources
- Lack of transparency to detect issues

Solution Options Overview



General Observations

- Technically **complicated** issues.
- Potentially **difficult stakeholder dynamics**. Solutions have the potential to create **winners and losers**.
- Changing system needs and characteristics (e.g., generation mix, load patterns, extreme weather) may impact these barriers/solution options. This **report examines the past**.
- Some **evolving innovations** too.

Forthcoming NTP Study

“Barriers and Opportunities to Increase the System Value of Interregional Transmission”

- Identifies potential symptoms of barriers.
- Describes common barriers and barriers in market, non-market, and hybrid (market to non-market).
- Provides information on potential solution options that have been proposed.
- Highlights transformative solution concepts.



Thank you. Questions?

Christina.Simeone@nrel.gov