

Seams Issues on BPA's Southern Intertie

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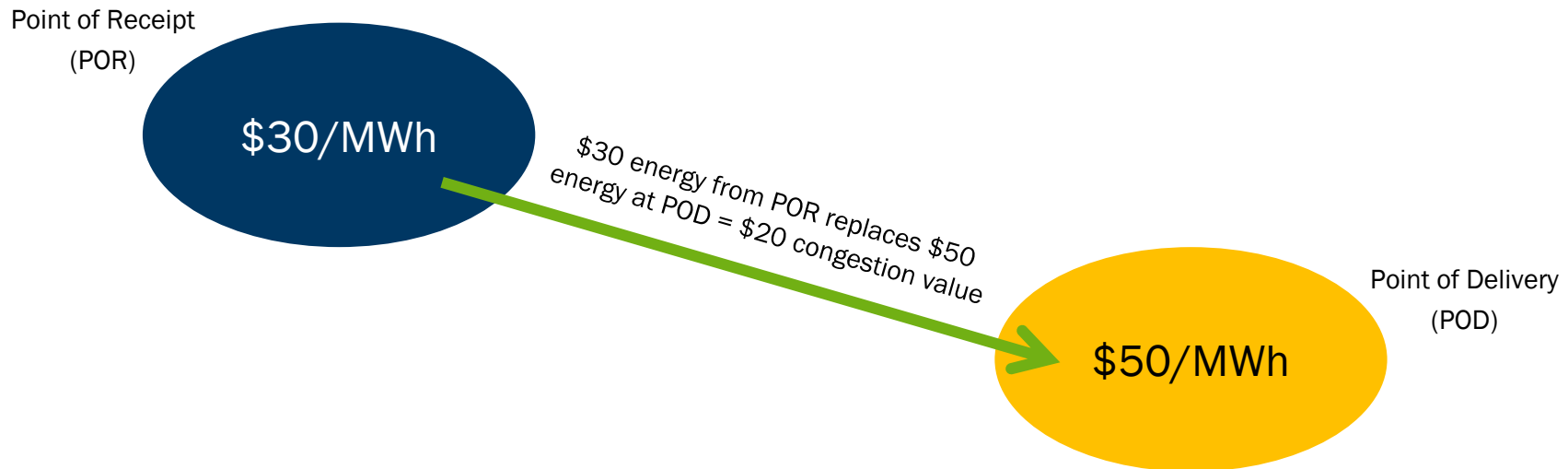


Overview

- “Congestion value” of a transmission path
 - What is it?
 - Who receives it, and why?
 - How do the OATT and LMP frameworks return this value to entities that fund the transmission facilities?
- Seams issues on coordinated interties can disrupt the intended outcome
 - Seams with other OATT providers
 - Seams with organized LMP markets
 - Evidence that seams issues are distorting congestion value to BPA customers
 - How this harms BPA and *all* of its customers
- Addressing Southern Intertie seams issues

Understanding “Congestion Value”

Value of Congested Transmission



- When prices differ between two locations, energy from the lower-price location can be used to displace energy at the higher-price location
 - Greater efficiency, as total cost of energy is reduced
 - Possible only if transmission is available to deliver energy between the two locations
- Value of congested transmission is the difference in price between the POR and POD
 - 1 MW of additional transmission capacity allows 1 MW of \$50 energy at the POD to be replaced by 1 MW of \$30 energy from the POR, saving \$20 in total costs
 - Value of congested transmission is equal to the incremental savings of moving energy between the POR and POD

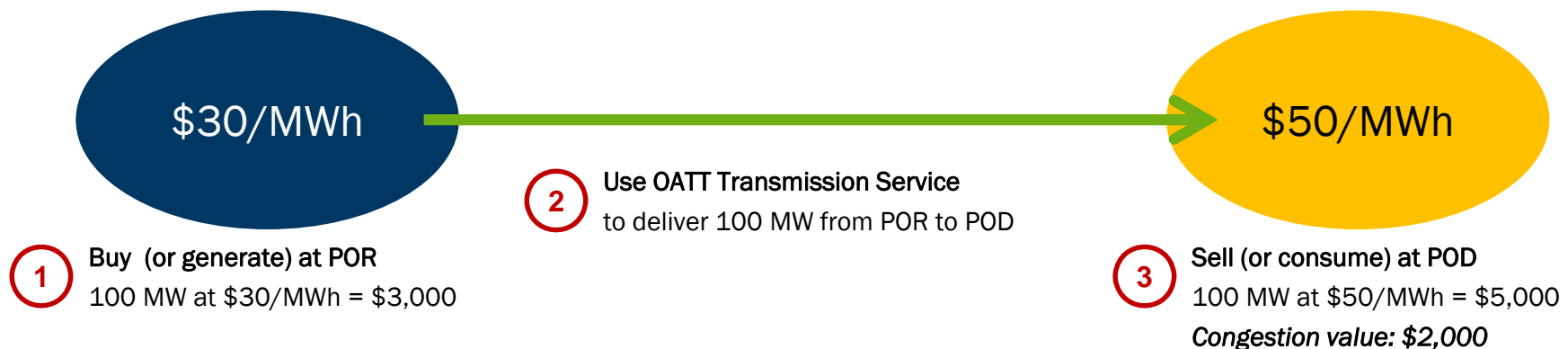


Who Receives the Value of Congested Transmission?

- Congestion value generally goes to parties that fund the transmission facilities
- Why?
 - Consistent with **cost causation**: Entities that pay the embedded cost of transmission facilities are entitled to the benefit of those facilities
 - Provides necessary **incentive to invest** in upgrades or system expansion
- Both of these principles would be violated if **one group of customers bore the costs** of transmission assets, but **a different group of customers received the value**
- **Both OATT and LMP** transmission frameworks allocate congestion value to entities that fund the embedded costs of the transmission facilities

Allocation of Congestion Value: OATT Framework

- In bilateral markets under the OATT framework, individual market participants undertake transactions to deliver energy from lower-price locations to higher-price locations
 - The price at the POD exceeds the price at the POR
- Congestion value can be earned by:
 - **Load** in higher-price locations, to buy energy from lower-price locations
 - **Generators** in lower-price locations, to sell energy into higher-price locations
 - **Intermediaries**, to buy from lower-price locations and sell at higher-price locations



- Liquid wholesale markets provide opportunity for transmission customers to use their reservations to deliver energy, even if they have no surplus resources of their own
- Regardless of who schedules the deliveries, there is a strong financial incentive to seek out the lowest-price available resources at the POR, promoting efficient dispatch



In OATT Framework Congestion Value is Received by Customers Using **Firm** Service

- Under OATT framework, congestion value is obtained by entities that physically schedule energy between two locations
 - If the schedule is curtailed, there is no transaction and no congestion value is earned
- OATT providers sell transmission service “more than once,” as Firm and as Non-Firm
 - When price differences exist, expect *all* participants to seek to engage in transactions
 - Who flows (and earns congestion value) and who doesn’t is based on scheduling priority
- On frequently congested paths, use of Non-Firm service will generally not be possible
 - TSP may have no “unused” Firm capacity to offer as Non-Firm
 - Even if Non-Firm is available, it will be curtailed first if total schedules exceed scheduling limit
- In a market with multiple buyers and seller, a buyer that chooses to purchase from a seller using Non-Firm (rather than Firm) is exposed to delivery risk
 - Firm deliveries can still be arranged with other buyers, displacing Non-Firm deliveries
- Under OATT framework, customers using Firm transmission service are able to transact at the prevailing price at the POD, and earn congestion value, ahead of customers using Non-Firm service



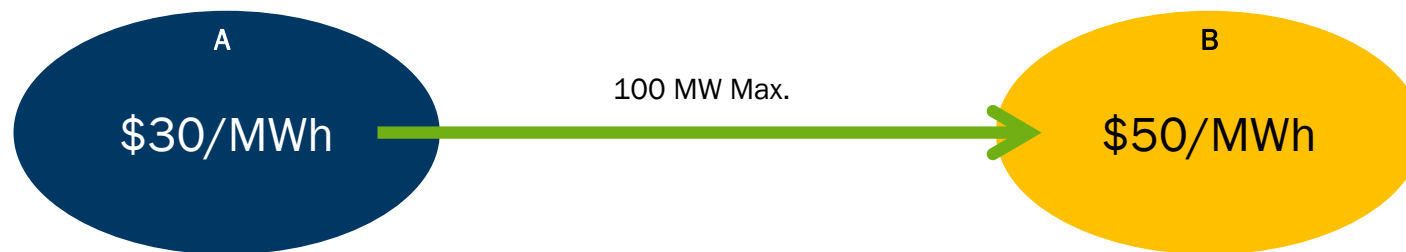
OATT Competition to Acquire Firm Service Benefits Native Load Transmission Customers

- Transmission paths between locations experiencing frequent or large price differences attract competition to obtain Firm transmission reservations
 - Under OATT framework, this competition is based on duration of commitment to pay embedded cost of underlying facilities
- Sale of Firm service by TSP results in a **long-term, low-risk revenue stream**
 - Reduces the residual revenue requirement that must be recovered from native load customers
 - Both the burden of funding embedded costs and the risk of uncertain and volatile market revenues are shifted to the transmission customers using the facilities
- On BPA Southern Intertie, nearly all of the \$100 million annual revenue requirement is recovered under Long Term Firm service commitments, often with terms of multiple years or even decades
 - Permits funding of investments of facilities that are primarily used for export, and not to serve firm load in the Northwest
 - Long-Term Firm service on Southern Intertie has been reserved almost entirely by generators or marketers in the Northwest; it is not used to serve firm load obligations.
 - Attractiveness of Long-Term Firm service on Southern Intertie depends entirely on ability to use it to collect congestion value on the facilities

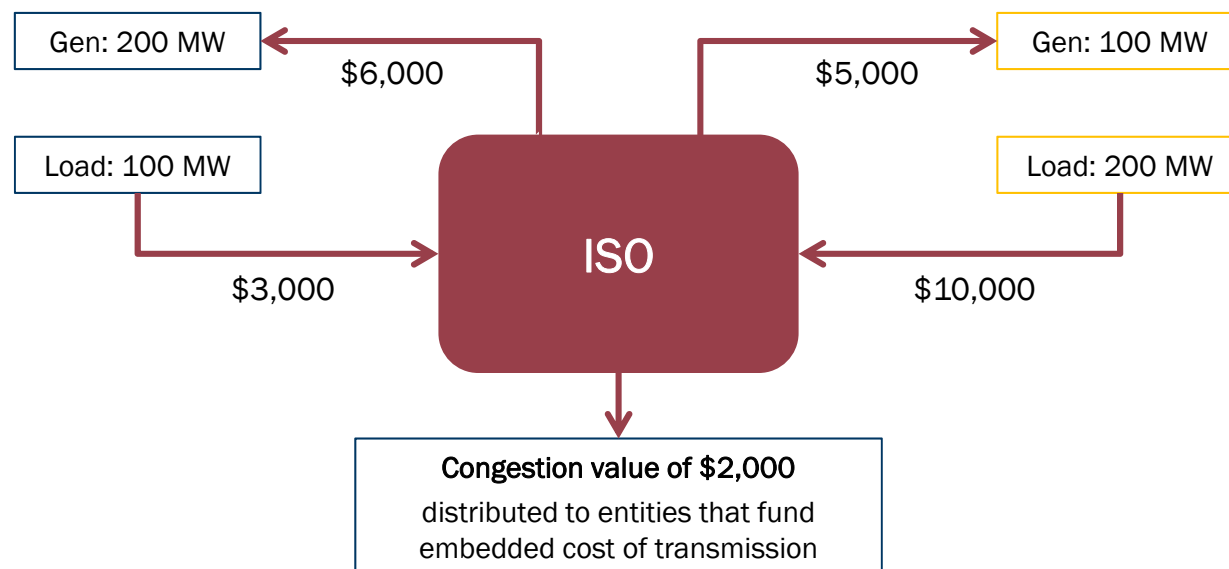
Allocation of Congestion Value: LMP Framework

- In a centralized LMP market, transmission service is not “scheduled” from POR to POD
 - Market operator uses the transmission grid to meet demand from the lowest priced available resources, subject to security constraints
- When transmission constraints are binding (*i.e.*, when there is congestion), prices differ between locations. The revenues collected from loads will be greater than the payments to generators, resulting in surplus revenue for the Market Operator:

All generation at “A” is paid \$30, even though 100 MW serves load at \$50 location “B”



All load at “B” pays \$50, even though 100 MW is served by \$30 generation at “A”



Allocation of Congestion Value: LMP Framework

- In LMP markets, transmission revenue requirement is collected from load through an access charge.
- For this reason, load is entitled to receive all congestion value in LMP framework.
- Load receives congestion value in two ways:
 - By receiving an allocation of financial congestion rights (“CRRs” in CAISO), resulting in a direct distribution of congestion revenue collected by the ISO; or
 - By receiving proceeds from the auction of any unallocated CRRs to third parties

“a fundamental principle underlying eligibility for CRR allocation is that parties who support the embedded costs of the CAISO grid are entitled to an allocation of CRRs.”^[1]

- *In LMP markets, the market operator explicitly collects congestion value between all locations on the grid, and distributes that value to the entities that fund the embedded costs of the transmission system*

1. CAISO tariff amendments to implement CRRs under MRTU, FERC Docket Nos. ER07-869 and ER06-615, May 7, 2007 Exh. No. ISO-1 at 42:8-10.

How Seams Issues can Distort the Allocation of Congestion Value



Overview of “Seams”

- Both OATT and LMP frameworks are generally effective in allocating congestion value to entities that fund embedded costs, *when the transmission service is entirely within a single TSP’s service territory*
- Seams issues can arise when a transmission path is “split” between two adjacent TSPs
 - Despite being a single path with a coordinate rating, each TSP provides service on their “side” under their own rules
- The Southern Intertie involves seams with both OATT and LMP adjacent TSPs
 - Transmission service on southern segment of COI:
 - ~66% allocated by CAISO (LMP)
 - ~33% allocated by TANC (OATT)
 - Transmission service on southern segment of PDCI:
 - 50% allocated by CAISO (LMP)
 - 50% allocated by LADWP (OATT)
- Seams issues can change “who flows first” on BPA’s facilities
 - Can result in BPA Firm service not flowing ahead of Non-Firm
 - Can render BPA Firm priority unnecessary, or even irrelevant, for flowing across the COI or PDCI

Example 1:

BPA/LADWP on PDCI (OATT-to-OATT Seam)

- BPA and LADWP both make Firm and Non-Firm service available. If schedules exceed limit, “who gets to flow” depends on which schedules get curtailed
- Example: Scheduling limit is 1,500 MW

Customer	Submitted Schedule (MW)	Big Eddy > NOB (BPA)	NOB > Sylmar (LADWP)	Final Schedule (MW)	
				If BPA Curtails First	If LADWP Curtails First
1	500	FIRM	FIRM	500	500
2	500	FIRM	Non-Firm	500	0
3	500	FIRM	Non-Firm	500	0
4	500	Non-Firm	FIRM	0	500
5	500	Non-Firm	FIRM	0	500
6	500	Non-Firm	Non-Firm	0	0
	3000			1500	1500

- 3,000 MW of schedules at T-20, requiring curtailments to stay within 1,500 MW limit
 - Which schedules are curtailed depends on who does the curtailments (BPA vs. LADWP)
- If LADWP regularly curtails before BPA:
 - Congestion value shifts to LADWP Firm transmission customers
 - BPA Firm service no longer has lower curtailment risk than BPA Non-Firm service, undermining value of investing in BPA Firm service

Example 2: BPA/CAISO on COI (OATT-to-LMP Market Seam)

- BPA sells Firm and Non-Firm service, but CAISO awards imports “only once”
 - e.g., CAISO only accepts 3,000 MW of net imports at COB
- Example: Scheduling limit is 3,000 MW, price inside CAISO is \$50/MWh

Customer	MW	John Day > COB (BPA)	Offer Price to CAISO (\$/MWh)	CAISO Award (MW)
1	500	FIRM	\$35.0	500
2	500	FIRM	\$35.0	500
3	500	n/a	\$35.0	500
4	500	FIRM	\$36.0	500
5	500	n/a	\$36.0	500
6	500	n/a	\$36.0	500
7	500	n/a	\$37.0	0
8	500	n/a	\$39.0	0
9	500	FIRM	\$40.0	0
10	500	FIRM	\$43.0	0
11	500	n/a	\$43.0	0
12	500	FIRM	\$44.0	0
	6000			3000

BPA offers “unused” Firm capacity as Hourly Non-Firm service; can be purchased by sellers with CAISO awards

CAISO rejects offers from customers with Firm BPA reservations; no other buyers exist, ensuring Firm BPA reservations go “unused”



Example 2: BPA/CAISO on COI (OATT-to-LMP Market Seam)

- As the sole buyer on its share of the intertie, CAISO rejection of an offer ensures that Firm reservations will go “unused”
- CAISO can rely on BPA making that “unused” Firm capacity available as Non-Firm service, which is then purchased by customers whose offers CAISO did accept
- A seller that receives a market award from CAISO can be highly confident of being able to procure Non-Firm transmission service from BPA
 - In order to flow on Southern Intertie, a CAISO award is critical, but BPA Firm transmission is not
 - Congestion value shifts to the critical activity: securing a CAISO award
- BPA Firm customers harmed in two ways:
 - Not able to flow ahead of Non-Firm, despite being priced below \$50 price within CAISO; and
 - Those who do flow pay increased CAISO congestion charges

Example 3:

BPA/CAISO seam during de-rate

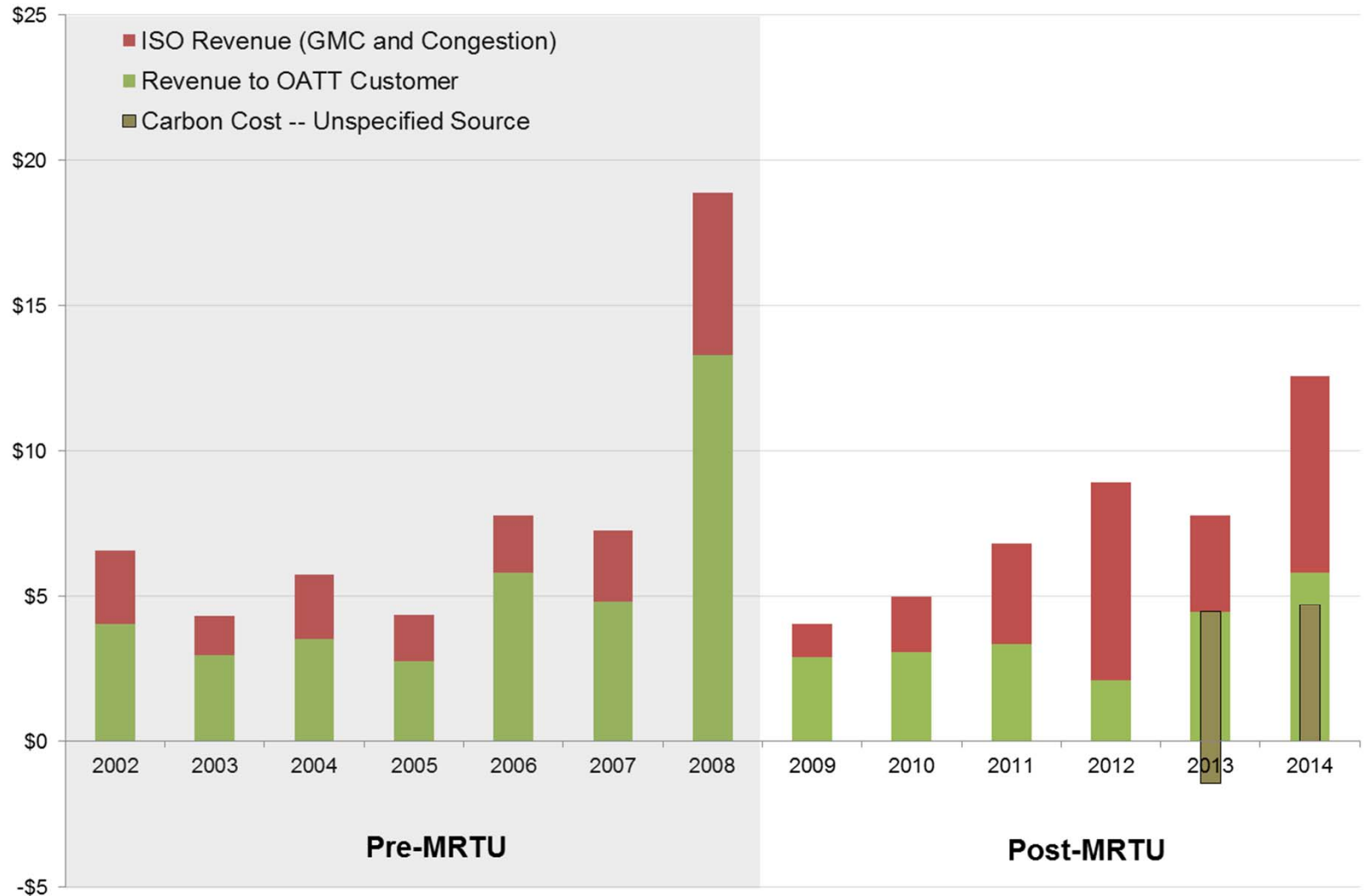
- Congestion value shifts to CAISO even if there is no BPA Non-Firm, but path is de-rated
 - BPA does not prospectively reduce ability to schedule on Firm service to reflect actual conditions
 - Same effect as if BPA had oversold Firm service
- Example: 3,000 MW coordinated intertie between BPA and CAISO
- **Scenario 1:** BPA sells 3,000 MW Firm and CAISO applies 3,000 MW constraint in its market
 - Result: no congestion
- **Scenario 2:** BPA sells 10,000 MW of Firm service, CAISO applies 3,000 MW constraint
 - Result: high CAISO congestion, no value to BPA Firm service
 - Effectively BPA has overstated northern side of intertie, giving appearance of constraint at the seam
- **Scenario 3:** BPA sells 3,000 MW of Firm service; intertie is de-rated to 2,000 MW
 - CAISO applies actual 2,000 MW rating in its markets
 - Same result as Scenario 2: high CAISO congestion and no value to BPA Firm service
 - BPA failure to prospectively limit schedules during de-rate effectively overstates capacity on its side of the intertie



Congestion Value to BPA OATT Customers has Declined Sharply in Recent Years

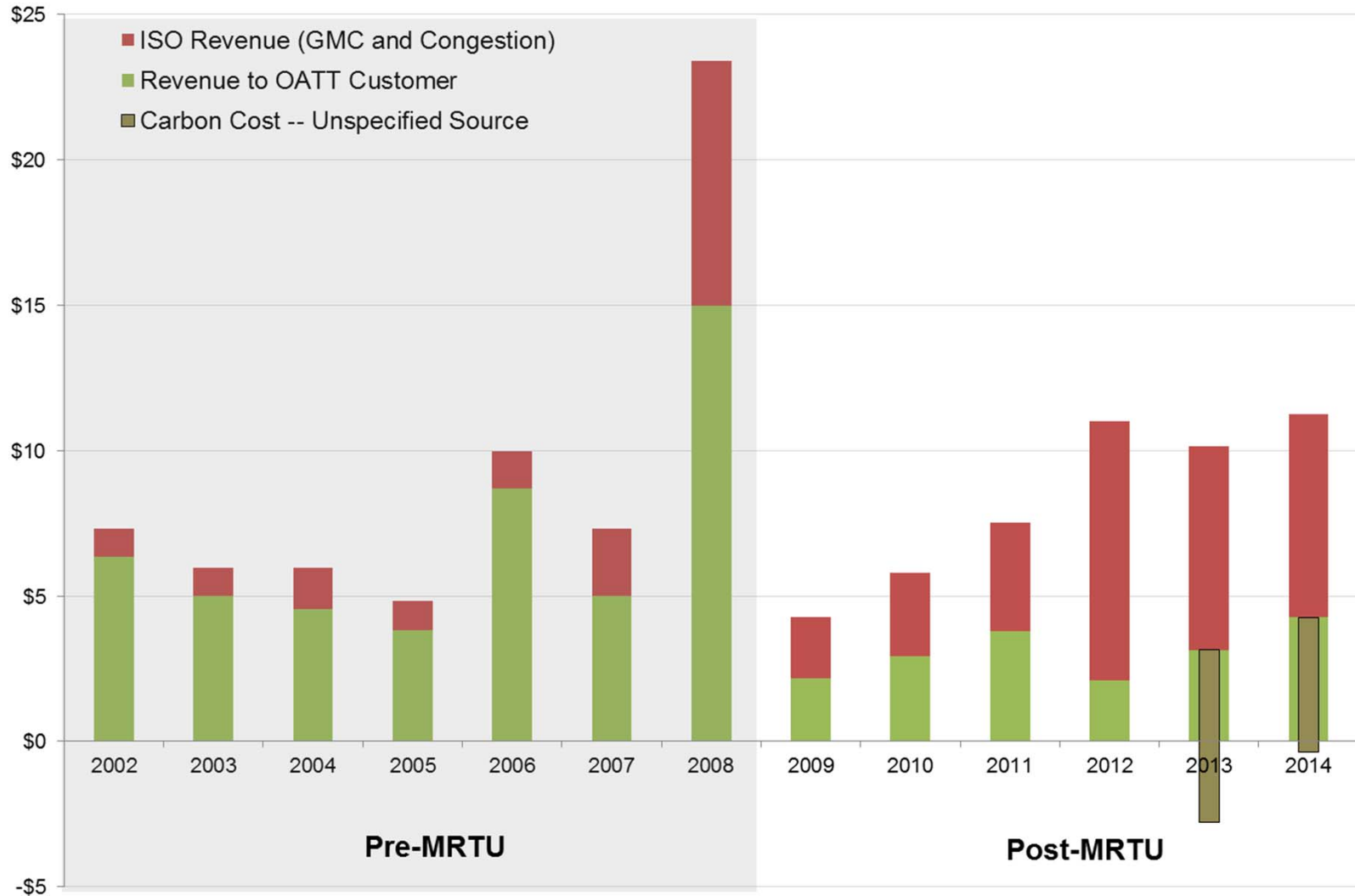
- Public data shows how the allocation of congestion value has changed over time
- **Total** congestion value between Northwest and California has arguably never been higher:
 - Increase number of hours of positive value
 - Increased price spreads during those hours
- But a disproportionately large share of this total value has been captured by CAISO congestion charges, which increased significantly since the market redesign in 2009
- Results have been corroborated by other information and analysis

Allocation of Mid-C/NP15 Price Spreads: 2002 - 2014 (updated)



	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
% Hours Economic	76%	71%	67%	56%	59%	58%	53%	47%	51%	72%	84%	84%	91%

Allocation of Mid-C/SP15 Price Spreads: 2002 - 2014 (updated)



	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
% Hours Economic	64%	58%	55%	45%	52%	45%	37%	34%	34%	68%	79%	80%	86%



Seams Re-Cap

- Transmission capacity between Northwest and California is limited and highly valuable
 - If end-to-end service were offered by a single TSP, would be straightforward to ensure congestion value is received by entities that fund the cost of the facilities.
 - Both OATT and LMP frameworks can and do achieve such outcomes
- “Splitting” service on the Southern Interties between multiple TSPs makes achieving this objective significantly more complicated
 - Transmission customers do not receive a fixed share of the congestion value of the entire path, but only the portion of congestion value of the specific segment where they have service
 - The value of each segment is the result of intricate interplay between the rules of each TSP
 - Differences in market design, business practices and operating policies can make service on one segment more scarce, and hence more valuable, than service on another segment
 - Some TSPs clearly understand the impact of market design on congestion value, others do not
- In the past several years, a disproportionate share of the congestion value of the Southern Intertie facilities has gone to TSPs on the southern portions
 - Harms entities investing in BPA Long-Term Firm rights, including BPA and Preference Customers
 - Reduces demand for BPA Long-Term Firm service, undermining stability of segment revenue
 - Increased reliance on Hourly Non-Firm raises incremental “hurdle rate” to flow; impedes utilization
 - Exposes BPA network customers to funding SI embedded costs and upgrades, if these cannot be recovered from SI customers.

Next Steps



Key Questions to Explore

- BPA Firm service would have zero value if BPA offered Non-Firm service that was (1) unlimited; (2) never curtailed by BPA; and (3) free.
- Extreme example, but highlights key questions to be asked regarding BPA's current Southern Intertie transmission service
 1. Does BPA offer excessive amounts of service?
 - Availability of Hourly Non-Firm service
 - Scheduling limits on Firm service during de-rates
 2. Does BPA issue curtailments an appropriate amount of the time?
 3. Does BPA offer Hourly Non-Firm service at an excessively low rate?
- Above factors affect the value of BPA transmission service relative to adjacent TSPs, but collaborative solutions can take an entirely different approach
 - If there is an explicit framework that recognizes transmission value on both segments of the interties, it does not matter which TSP performs the allocation
 - LADWP could perform all curtailments on PDCI, but under a joint framework that considers priority on LADWP and BPA systems
 - CAISO could calculate and collect congestion on entire path, but distribute proceeds equally



Evaluating Solutions

- Will it achieve the overarching goal of providing BPA's transmission assets with an equitable share of congestion value?
 - Not just about “enforcing the letter of the OATT”
 - Not necessarily about BPA “deciding who flows” as long as BPA and its customers receive equitable share of the congestion value
- Will it last?
 - Consider possibility of changes by adjacent TSP to counter BPA changes
 - Collaborative solutions more likely to be stable over time
- How soon can it be implemented?
 - Timetable depends on formal requirements for approval
 - e.g., business practice change vs. rate change vs. tariff amendment
 - Collaborative solutions may take longer to negotiate initially, but may face less opposition or subsequent challenge than unilateral solutions

Conclusion and Discussion



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About

Mr. Wellenius provides expert witness testimony and litigation support in various power-sector proceedings before FERC, state regulatory entities, courts and arbitration panels in the United States and abroad. He advises on a range of policy and market design initiatives regarding competitive wholesale electricity markets, with a particular focus on Western U.S. markets, including CAISO. Mr. Wellenius has also provided market assessments supporting a variety of generation projects, transactions, and financings in the United States and throughout Latin America.

Mr. Wellenius received his S.M. in Technology Policy from the Massachusetts Institute of Technology and his B. Eng. from Imperial College, London.