Western Area Power Administration

DSW Markets Update

January 31, 2024

Agenda

- California Independent System Operator (CAISO) Western Energy Imbalance Market (WEIM)
  - Estimated Benefits - Dave Young
  - Allocations and Invoicing - Trent Nunn
- Arizona Electric Power Cooperative Update
- WMEG Results
- Day-Ahead Market Strategy

Teams Meeting Housekeeping Items

- All participants are muted on entry to ensure a smooth remote meeting
- For questions during Q&A periods, please choose one of the following options:
  - Send questions to the host in the Teams chat
  - Use the “Raise Hand” icon next to your name in participant list. The host will unmute and call on you
- We will have time for additional questions at the end of the meeting
- Make sure you are not “double-muted” when attempting to talk (i.e., muted on your device in addition to the Teams application)

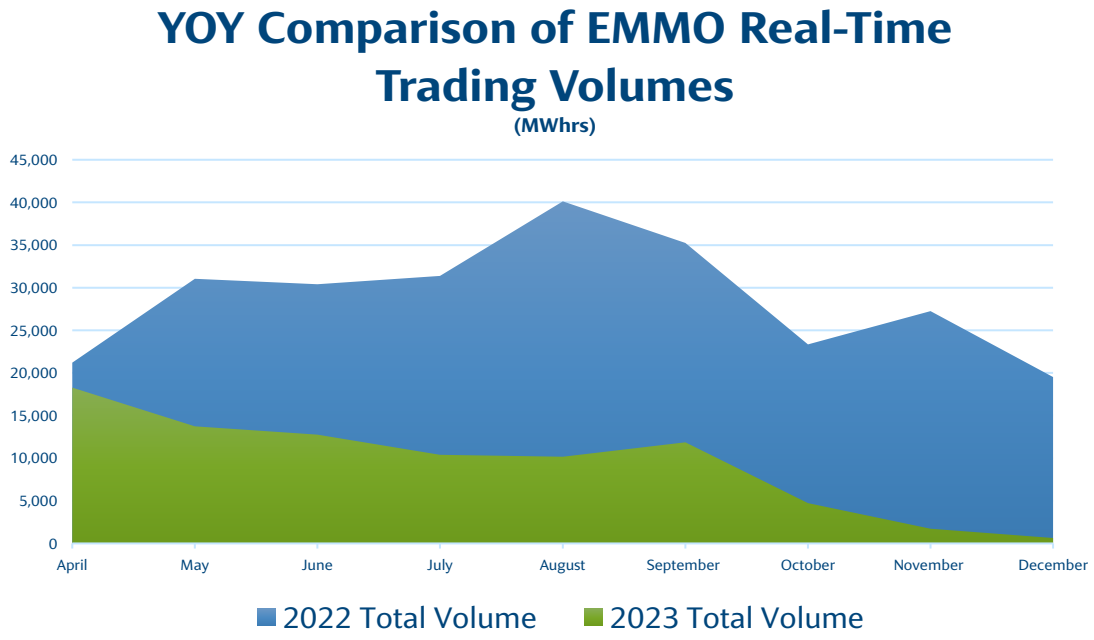
DSW joined WEIM on April 5, 2023

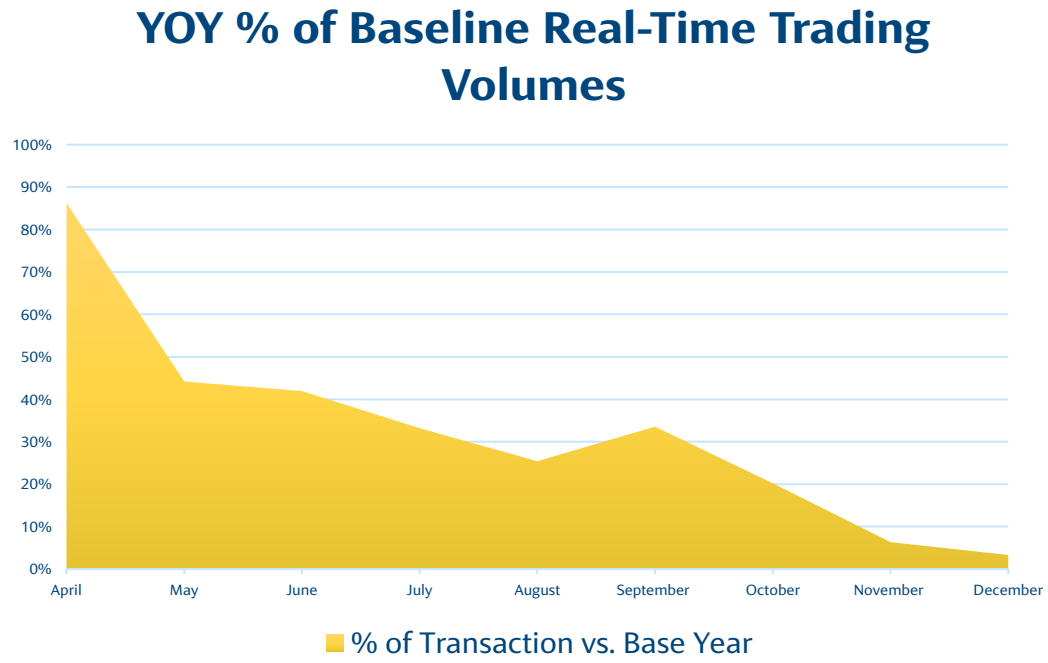
- Comparing 2022 pre-WEIM activity to 2023 WEIM activity shows the following:
  - Monthly Savings $1.2 million / month
  - April – October 2023 Total $8.6 million

- The CAISO's Counterfactual / WEIM Benefits Report shows the following:

	Q2 2023	Q3 2023
DSW/WALC Benefits (*Total BA / Includes AEPCO)	$17.17 million	$26.06 million

DSW's Merchant bilateral activity with WEIM market participation





Real time trading volumes have reduced substantially since joining WEIM taking advantage of lower WEIM prices in $/MWhr terms for our customers.

WEIM PRSC and EESC Statement Overview

- Participating Resource Scheduling Coordinator (PRSC)
- EIM Entity Scheduling Coordinator (EESC)
- DSW released statements this week with the schedule shown below

Estimated Statement Delivery Schedule

	Batch #1		Batch #2		Batch #3		Batch #4		Batch #5		Batch #6	
Customer Invoice Issued in this month	Late January						By Q2 2024		By Q2 2024		By Q2 2024	
INITIAL Daily (Trade Dates in Invoice)	6/16/2023	7/13/2023	7/14/2023	8/17/2023	8/18/2023	9/14/2023	11/15/2023	12/13/2023	12/14/2023	1/18/2024	1/19/2024	2/14/2024
RECALC Daily (Trade Dates in Invoice)	6/16/2023 4/5/2023	7/13/2023 4/13/2023	7/14/2023 4/14/2023	8/17/2023 5/17/2023	8/18/2023 5/18/2023	9/14/2023 6/15/2023	9/15/2023 6/16/2023	10/12/2023 7/13/2023	10/13/2023	11/14/2023		
INITIAL Monthly			July 2023		August 2023		*November 2023*		*December 2023*		*January 2024*	
RECALC Monthly	*June 2023*		*April & July 2023*		*May & Aug 2023*		*September 2023*		*October 2023*			
	Gap Dates: 4/14/2023 6/15/2023 62 Days *From trade date 4/14 to 6/15, the WAPA customers will not have any EIM Allocation results yet.*		**Gap Dates:** 5/18/2023 6/15/2023 28 Days *From trade date 5/18 to 6/15, the WAPA customers will not have any EIM Allocation results yet.*		**Gap Dates:** No Gap							

WEIM PRSC and EESC Statement Overview

- Illustrative invoice review:
  - 4-5 number codes are WEIM charge codes
    - Charges are positive
    - Credits are negative
  - Approach covered in DSW's WEIM Business Practice / reference materials linked below
- All settlement data backup for the billing period can be provided per your request
- DSW's Settlements Team is prepared to talk review the information and provide answers to any questions your team has with your specific invoice

DELIVERY 1111EI-D2 EI MRT T+70 RECALC

	ENERGY (KWH)	RATE	DEMAND (KW)	PULSE	
6478-Real Time System Imbalance Energy Offset					$-6.12
7070-Flexible Ramp Forecasted Movement Settlement					3,461.00
7076-Flexible Ramp Forecast Movement Allocation					826.72
7077-Daily Flexible Ramp Up Uncertainty Award Allocation					436.33
7087-Daily Flexible Ramp Down Uncertainty Award Allocation					-11.68
64600-Instructed Imbalance Energy - FFM Market					-18,689.47
64700-Instructed Imbalance Energy - RTD Market					-5,649.12
64770-Real Time Imbalance Energy Offset					54,302.11
66780-Real Time Bid Cost Recovery Allocation					47,862.26
67740-Real Time Congestion Offset					-16,296.41
69850-Real Time Marginal Losses Offset					3,817.65
TRANSACTION TOTAL					**$70,053.27**

DELIVERY 1111EI-D3 EI MARKET MONTH

	ENERGY (KWH)	RATE	DEMAND (KW)	PULSE	
4575-Scheduling Coordinator Charge					$1.20
7078-Monthly Flexible Ramp Up Uncertainty Award Allocation					0.50
7088-Monthly Flexible Ramp Down Uncertainty Award Allocation					3.00

Example Invoice – dollar amounts illustrative

Additional Settlements Resources

- WEIM Business Practice: http://www.oasis.oati.com/woa/docs/DSW/WALC/DSW/WALCdocs/WEIM_BP_clean_01.18.23.pdf

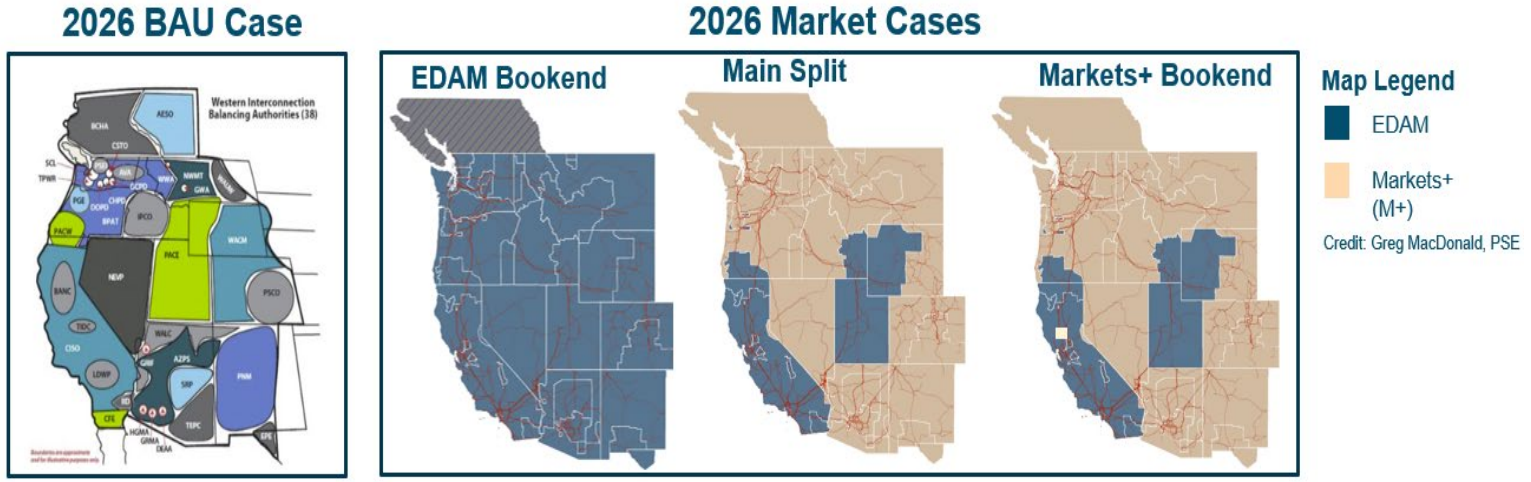
- WEIM Settlements Overview Meeting: http://www.oasis.oati.com/woa/docs/DSW/WALC/DSW/WALCdocs/BP_Customer_Meeting_9212022.pdf

AEPCO Update

Western Markets Exploratory Group

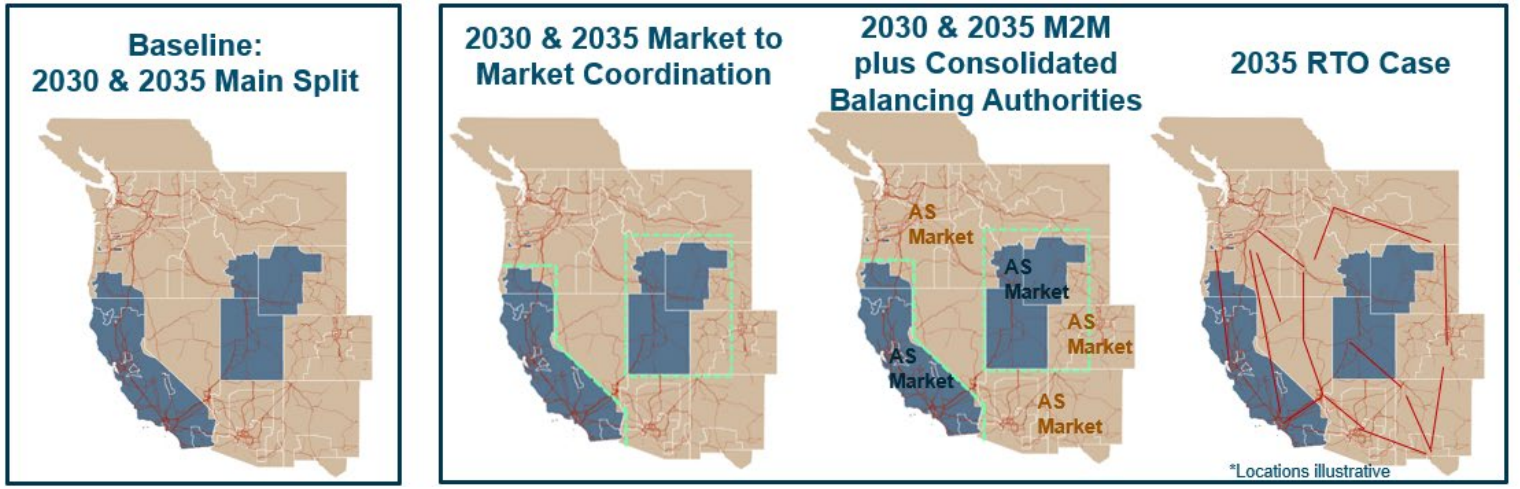
- The Western Markets Exploratory Group (WMEG) was a group of 25 utilities and public power entities
- WMEG examined ways to develop markets in the west, including day-ahead market opportunities
- WMEG day ahead market production cost study performed by E3
  - CAISO Extended Day-Ahead Market (EDAM)
  - Southwest Power Pool Markets Plus (Markets+)
- Western Area Lower Colorado (WALC) was modeled with a separate zone for AEPCO. “DSW/WALC” excludes AEPCO.

Study Cases 2026



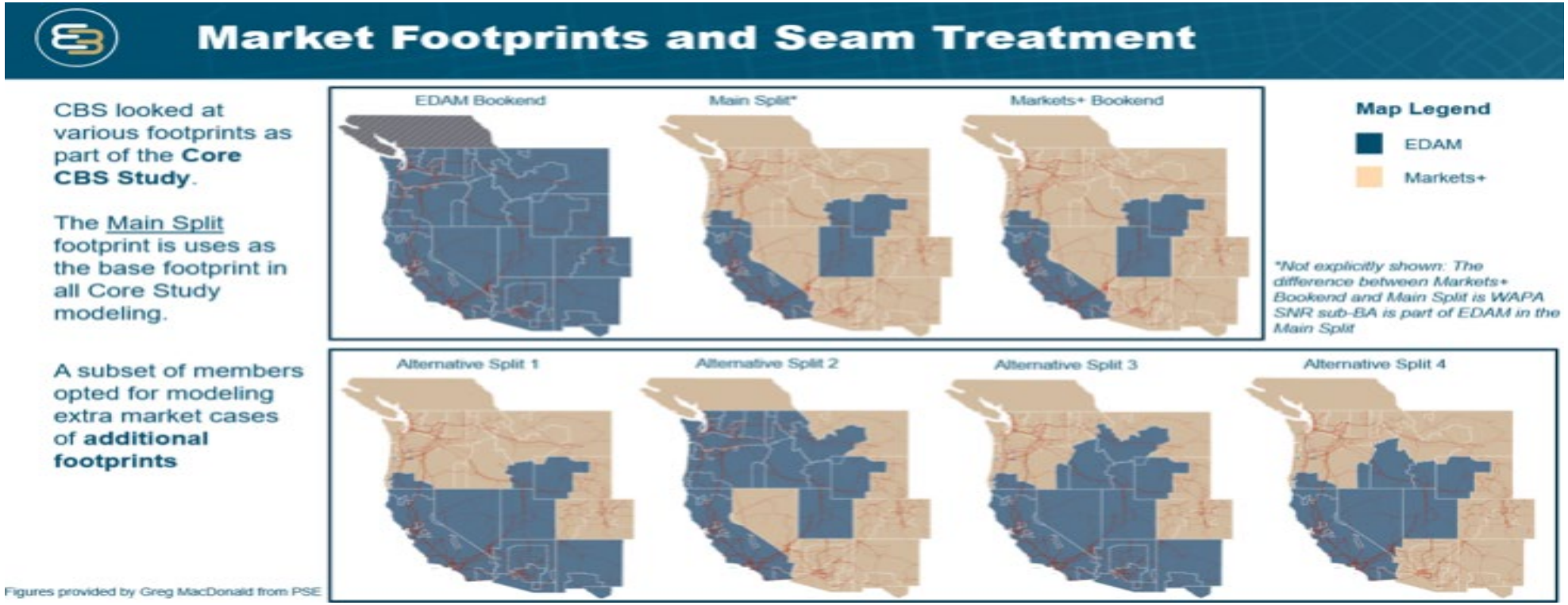
- 2026 BAU: Modeled day-ahead (DA) with bilateral trading but no organized market. In real-time (RT), wheeling and friction-free trading within the existing WEIM and WEIS footprints.
- EDAM Bookend: Modeled a single DA and RT market as EDAM
- Main Split: Modeled (a) an EDAM comprised of PacifiCorp, and the state of California and (b) a Markets+ region consisting of the rest of the footprint
- Markets+ Bookend: Modeled like the Main Split, except WAPA's Sierra Nevada Region in Markets+

Study Cases 2030 and 2035



- Main Split: Same as the 2026 Main Split, but with load growth, generation retirements and additions, and updated the fuel and GHG prices
- Market to Market Coordination (M2M): Main Split, but reduced the hurdle rates that are charged on trades over the seams
- M2M + Consolidated Balancing Authority (M2M + CBA): M2M, but added a market for co-optimized ancillary services
- RTO: M2M + CBA, but added significant transmission to evaluate each market's performance

Alternative Study Cases



- Alternative 1 – PAC+CA in EDAM; the rest in Markets+
- Alternative 2 – PAC+CA + NW in EDAM; the rest in Markets+
- Alternative 3 – PAC+CA, SW, ID, NW MT in EDAM; the rest of Markets+
- Alternative 4 – PAC+CA, ID, NV in EDAM; the rest in Markets+

Overall Results (all WMEG members)

2026:

- EDAM Bookend
  - WMEG members incurred $20m net cost increase overall
  - 16 realized cost savings, 9 including DSW/WALC incurred cost increases
  - Non-WMEG members (California) realized $80m in savings
- Main Split
  - WMEG members realized $26m net cost savings overall
  - 16 realized cost savings, 9 including DSW/WALC incurred cost increases
  - Non-WMEG Members (California) incurred $247m in increases

2030 and 2035

- M2M: 2030 adjusted production cost is reduced by $162m, 2035 is reduced by $206m
- M2M + CBA: 2030 and 2035 adjusted production cost is reduced by $10m annually
- RTO: 2035 adjusted production cost is reduced by $387m

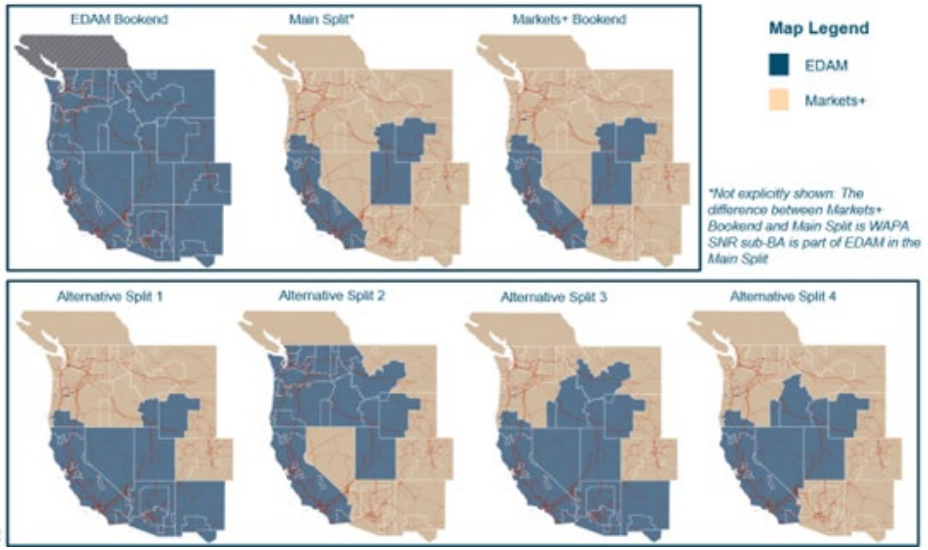
Key Takeaways

- The overall production cost differences between footprints is modest
- Results vary significantly by entity
- One market is more efficient than two markets. If two markets, additional transmission between the NW and SW will be important.
- Improving market to market coordination and reducing friction drives cost savings
- Did not consider benefits which can be significantly larger in impact than production cost savings:
  - Coordinated generation and transmission planning and investment
  - Resource procurement savings
  - Reliability improvements during extreme weather or challenging operational conditions

DSW/WALC Results

- 2026:
  - In general, DSW/WALC incurs a net cost increase for all footprints studied relative to the BAU for 2026, primarily from lost wheeling revenues
  - The exceptions are Alt Split 1 and 3 where net cost savings are realized due to surplus solar in CA and wheeling revenue
  - Wheeling revenues in the studies were very speculative due to modeling parameters
- 2030 and 2035:
  - Impacts modest and did not change the relative ranking of the various market footprints

DSW/WALC Results 2026



	Case							
Cost/Benefit ($ millions)	BAU (2026)	EDAM Bookend (2026)	Markets Bookend (2026)	Main Split (2026)	Alt Split 1 (2026)	Alt Split 2 (2026)	Alt Split 3 (2026)	Alt Split 4 (2026)
Load Cost	47.2	48.9	48.5	50.4	40.7	51.0	40.9	49.5
Generation Cost	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Reserve Cost	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Generation Revenue	-22.7	-23.6	-22.9	-23.6	-22.5	-23.7	-22.2	-23.1
Reserve Revenue	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wheeling Revenue	-9.2	-0.6	-3.7	-3.7	-7.7	-2.4	-11.0	-5.6
Congestion Revenue	-0.1	-0.6	-1.4	-1.4	-1.9	-2.7	-2.7	-1.8
GhG Revenue	0.0	0.0	0.0	0.0	-0.2	0.0	-0.2	0.0
Net Cost	15.2	24.1	20.5	21.7	8.3	22.2	4.8	18.9
DSW/WALC Market	NA	EDAM	M+	M+	EDAM	M+	EDAM	M+

Day-Ahead Market Strategy

- Study results are somewhat dated but they reflect the limitations of DSW hydropower and realities of the current transmission footprint
- Cost and difficulties of implementation/transition
- Uncertainly of which or whether either option becomes viable and or more advantageous for DSW
- Conclusion is for DSW to wait for the foreseeable future
- Please provide your thoughts on this strategy

Questions?

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