

### Western market regionalization: PSCo Day-Ahead market benefits analysis

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# PSCo sees total costs reduced by an average of \$13.2 million/year through 2060 when participating in EDAM as opposed to Markets+

This analysis aims to identify the potential benefits or costs for Public Service Company of Colorado (PSCo) under two Western US market regionalization scenarios: (1) PSCo participates in EDAM and (2) PSCo participates in Markets+, with all else remaining equal. Comparisons between scenarios include those of various cost categories, generation mix, and emissions outputs.

#### Average cost breakdown for PSCo under EDAM vs Markets+ DAM, 2028-2060

\$Million/year

| Metric                  | EDAM   | Markets+ | Delta (EDAM -<br>Markets+) <sup>1</sup> | • | Average delta,<br>2028-2040 | Average delta,<br>2041-2060 |
|-------------------------|--------|----------|---|---|-----------------------------|-----------------------------|
| Production cost         | 857.4  | 862.3    | (4.9)                                   |   | (1.2)                       | (7.4)                       |
| Bilateral trading costs | 231.9  | 227.0    | 4.9                                     |   | 0.2                         | 8.0                         |
| Congestion<br>revenue   | (85.8) | (72.9)   | (12.8)                                  |   | (9.2)                       | (15.2)                      |
| Wheeling<br>revenue     | (5.5)  | (5.1)    | (0.4)                                   |   | (1.0)                       | (0.0)                       |
|                         |        |          |   |   |                             |                             |
| Costs less<br>revenues  | 998.0  | 1,011.2  | (13.2)                                  |   | (11.2)                      | (14.6)                      |

1) A negative delta indicates lower costs when PSCo is modeled in EDAM compared to Markets+, demonstrating benefits to joining EDAM 2) Ownership assumed to be split 50-50 with connecting BA unless data on ownership is available Sources: Aurora Energy Research



- PSCo sees an average \$13.2mil/year benefit in total costs when participating in EDAM vs. Markets+
- Production costs When participating in EDAM, greater wind generation and lower gas production drive down energy production costs
- Bilateral trading costs PSCo is a net importer in all scenarios, primarily from WACM. This dynamic creates additional bilateral trading costs for PSCo in the EDAM scenario, where imports from WACM are subject to additional friction charges
- Congestion and wheeling revenue – Under the EDAM scenario PSCo sees higher utilization of its transmission interconnection to facilitate trades between PACE and PNM<sup>2</sup>

## The composition of each offering in the West is modeled based on confirmed and likely commitments as announced by each BA

Map of modeled balancing authority (BA) market decisions



1) BAs with announced leanings or commitments are modeled as participating in the respective offering. BAs that are undecided or have no public leaning are modeled as uncommitted and therefore do not participate in any offering 2) Some BAs are modeled to join a market after the initial markets go live. All DAM positions are finalized by 2030.

Sources: Aurora Energy Research, CAISO, SPP

Key<sup>1,2</sup>

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### Aurora modeled PSCo utility portfolio following the JTS through 2050; PSCo BA capacity includes resources from other utilities



Installed capacity, PSCo utility and PSCo Balancing Authority Area<sup>1</sup>

- Aurora modeled PSCo installed capacity based on existing installed capacity owned and contracted to utilities within PSCo territory, with capacity growth throughout the forecast for PSCo utility following the Just Transition Solicitation (JTS) released in 2024
- Retirements of 1.8GW of coal and gas by 2031 as outlined in the JTS are included in Aurora's forecast
- About 10GW of renewables, storage, and new CCGTs are planned to come online in the next 5-6 years to replace the retiring conventional resources
- The technologies procured in the JTS are designed to meet 2030 and 2050 emissions targets under SB 19-236, while procuring enough capacity to meet the 108% increase in expected load by 2050 driven by data center growth and electrification



1) Capacity serving the PSCo BA load includes capacity within Blackhills, Tristate CO, and other LSEs under PSCo BA territory. 2) Xcel (PSCo) provides their preferred portfolio in lump capacity additions for the periods from 2025 through 2031 and 2031 through 2050. The lump capacity amounts have been distributed across years following annual load growth, which varies year to year Sources: Aurora Energy Research, Xcel (PSCo)

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## Under both Day-Ahead markets, PSCo is compliant with SB 19-236 emissions targets in 2030 and 2050

Xcel (PSCo) CO<sub>2</sub> emissions forecast<sup>1</sup>

Million MTCO<sub>2</sub>e



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- The CPUC accepted Xcel (PSCo)'s 2021 Clean Energy Plan. The 2024 JTS sees accelerated procurement to meet the same emissions reduction requirements while serving new load demands
- Retirements of ~1.8GW conventional coal and gas resources, with renewables and storage replacements, enables PSCo to reach 2030 targets
- Emissions are similar between the two modeled scenarios for PSCo participation in EDAM and Markets+ given the capacity mix was held constant. Marginal differences in emissions are driven by variation in carbon intensity of imports and exports

1) Results shown here are the emissions for Xcel (PSCo) utility as the largest LSE within the BA territory. SB 19-236 targets only apply to electricity providers serving at least 500,000 customers in Colorado; Xcel (PSCo), Black Hills, and Tri-State are qualifying utilities 2) Using 2005 emissions level as a baseline, which was 23.8MMTCo2e Sources: Aurora Energy Research, Xcel (PSCo), Colorado Air Pollution Control Division

### Aurora considers transfer limits between regions when modeling the Western Interconnection

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1) Transfer limits are modeled at the BA level. BAs identified here show all modeled interchange possibilities for PSCo with neighboring BAs

Transmission projects modeled with impacts on Net Transfer Capability (NTC)

| Project name   | Modeled year in-<br>service                                   | Description  |
|--|---|--|
| Colorado Power<br>Pathway (CPP)<br>Segments 1-5                            | Segment 1: 2026<br>Segment 2 + 3: 2025<br>Segment 4 + 5: 2027 | Connects PSCo system<br>into eastern Colorado,<br>accommodating the<br>addition of up to 5GW<br>nameplate capacity     |
| CPP extension (May<br>Valley – Longhorn)                                   | 2032  | Connects PSCo system into eastern Colorado   |
| Colorado Electric<br>Transmission Authority<br>(CETA) Southeast<br>Concept | 2032  | 345kV line from the<br>Longhorn substation in<br>CO to the Gladstone<br>substation in NM                               |
| CETA Northwest<br>Concept  | 2032  | 345kV line from CO<br>Craig substation to UT<br>PacifiCorp Gateway<br>South transmission line<br>via Coyote substation |

### Even with lower interstate transmission build-out, PSCo sees a \$4.2million/year cost benefit to participation in EDAM



Interstate transmission projects studied to date by the Colorado Electric Transmission Authority (CETA) that have been identified as drivers of reduced congestion hours and congestion costs were modeled to quantify the cost impacts on PSCo under both Markets+ and EDAM. These projects include the Southeast Concept and the Northwest Concept, with the former increasing modeled transfer capability to PNM and the latter increasing modeled transfer capability to PACE.

#### Average cost breakdown for PSCo under EDAM vs Markets+ DAM, 2028-2060

#### \$Million/year

| No additional interstate Tx projects |        |          |                    |
|--------------------------------------|--------|----------|--------------------|
| Metric                               | EDAM   | Markets+ | Delta <sup>1</sup> |
| Production<br>cost                   | 950.3  | 945.4    | 4.9                |
| Bilateral<br>trading costs           | 197.3  | 200.8    | (3.6)              |
| Congestion revenue <sup>2</sup>      | (42.5) | (43.4)   | 0.9                |
| Wheeling<br>Revenue <sup>2</sup>     | (22.4) | (16.0)   | (6.4)              |

| Costs less | 1092.6 | 1096.9 | $(\Lambda 2)$ |
|------------|--------|--------|---------------|
| revenues   | 1002.0 | 1000.0 | (4.2)         |

- Lower hurdle rates for trades with WACM when modeling PSCo in Markets+ provide access to imports at a lower cost, particularly of thermal generation
- The lower production costs for PSCo in Markets+ compared EDAM is partially mitigated by higher bilateral trading costs, reducing the benefits to Markets+ in these categories

| Addition of CETA Southeast Concept |        |          |                    |
|------------------------------------|--------|----------|--------------------|
| Metric                             | EDAM   | Markets+ | Delta <sup>1</sup> |
| Production cost                    | 903.1  | 908.5    | (5.4)              |
| Bilateral<br>trading costs         | 221.0  | 215.8    | 5.3                |
| Congestion revenue <sup>2</sup>    | (74.9) | (63.5)   | (11.5)             |
| Wheeling<br>Revenue <sup>2</sup>   | (5.2)  | (5.6)    | 0.4                |
|                                    |        |          |                    |

| Costs less | 1043.9 | 1055 1 | (11.2) |
|------------|--------|--------|--------|
| revenues   | 1040.7 | 1033.1 | (11.2) |

- Additional transmission capacity to PNM incentivizes more trading activity between PSCo and PNM
- As PSCo is a net exporter to PNM, this increases export costs for the EDAM configuration more so relative to Markets+, resulting in comparatively higher increase in trading costs for EDAM

| Addition of CETA Northwest Concept |        |          |                    |
|------------------------------------|--------|----------|--------------------|
| Metric                             | EDAM   | Markets+ | Delta <sup>1</sup> |
| Production<br>cost                 | 900.4  | 895.6    | 4.8                |
| Bilateral<br>trading costs         | 209.8  | 213.8    | (3.9)              |
| Congestion<br>revenue <sup>2</sup> | (57.2) | (56.2)   | (1.0)              |
| Wheeling<br>Revenue <sup>2</sup>   | (21.5) | (14.4)   | (7.1)              |
|                                    |        |          |                    |
|                                    |        |          |                    |

| Costs less | 1031.6 | 1038.8 | (7 2) |
|------------|--------|--------|-------|
| revenues   | 1051.0 | 1050.0 | (7.2) |

- When PSCo is modeled in EDAM, trading with PACE, which is also modeled in EDAM, is incentivized by the reduced hurdle rates within the same DAM footprint
- As a result, inter-BA line utilization to PACE increases, driving higher congestion revenues for PSCo in EDAM than in the Markets+ scenario

1) Delta calculated EDAM – Markets+. Negative values indicate a cost saving (benefit) for PSCo in EDAM. 2) Ownership assumed to be split 50-50 with connecting BA unless data on ownership is available

### Transfers between markets, RTOs, or uncommitted BAs are expected to face friction charges due to differences in market optimization



|             | Transfers to Markets+ |                              |
|-------------|-----------------------|------------------------------|
| Source BA   | Sink BA               | Friction charge <sup>1</sup> |
| Markets+    | Markets+              | \$0/MWh                      |
| EDAM        | Markets+              | \$3/MWh                      |
| RTO West    | Markets+              | \$1.5/MWh                    |
| Uncommitted | Markets+              | \$3/MWh                      |

|             | Transfers to RTO West |                              |
|-------------|-----------------------|------------------------------|
| Source BA   | Sink BA               | Friction charge <sup>1</sup> |
| RTO West    | RTO West              | \$0/MWh                      |
| EDAM        | RTO West              | \$1.5/MWh <sup>2</sup>       |
| Markets+    | RTO West              | \$0.75/MWh                   |
| Uncommitted | RTO West              | \$1.5/MWh                    |

| Transfers to EDAM |         |                              |  |
|-------------------|---------|------------------------------|--|
| Source BA         | Sink BA | Friction charge <sup>1</sup> |  |
| EDAM              | EDAM    | \$0/MWh                      |  |
| Markets+          | EDAM    | \$3/MWh                      |  |
| RTO West          | EDAM    | \$3/MWh                      |  |
| Uncommitted       | EDAM    | \$6/MWh                      |  |

| Transfers to uncommitted BAs |             |                              |  |
|------------------------------|-------------|------------------------------|--|
| Source BA                    | Sink BA     | Friction charge <sup>1</sup> |  |
| Uncommitted                  | Uncommitted | \$6/MWh                      |  |
| EDAM                         | Uncommitted | \$6/MWh                      |  |
| Markets+                     | Uncommitted | \$6/MWh                      |  |
| RTO West                     | Uncommitted | \$6/MWh                      |  |

1) Friction charges are additive to wheeling rates and carbon adders (imports to CA or WA). The full hurdle rate for trades between BAs is modeled as the sum of wheeling rates, friction charges, and carbon adders. Wheeling rates between BAs in the same DAM are reduced to \$0/MWh 2) EDAM to CAISO transfers see a \$0/MWh friction charge Sources: Aurora Energy Research

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