The Board may vote during the meeting to go into Executive Session, pursuant to A.R.S. §38-431.03 (A)(3), for the purpose of discussion or consultation for legal advice with legal counsel to the Committee on any of the matters listed on the agenda.

The Board may go into Closed Session, pursuant to A.R.S. §30-805(B), for records and proceedings relating to competitive activity, including trade secrets or privileged or confidential commercial or financial information.

Visitors: The public has the option to attend in-person or observe via Zoom and may receive teleconference information by contacting the Corporate Secretary’s Office at (602) 236-4398. If attending in-person, all property in your possession, including purses, briefcases, packages, or containers, will be subject to inspection.
Western Markets

Board and Council Work Study Session

October 31, 2023

John Coggins
Halloween Safety

Parents and Trick or Treaters

• All children accompanied by a responsible adult
• Costumes should not be restrictive
• Well lighted communities
• Flashlights & portable lighting
• All traffic rules followed

Who Pass Out Treats

• Homes well lit

Extra Points

• Drivers on the look out for those ghosts and goblins
• Older children in groups in familiar neighborhoods
• Suspicious activity reported to police

Police Halloween Safety Tips (phoenix.gov)
"...the power sector is changing in ways that make regional coordination and markets more beneficial to customers than ever before, but the fundamentals are different and require new ways of thinking about how utilities interact with their neighbors."

David Hurlbut, Senior Analyst at the National Renewable Energy Laboratory
Meeting Objective

• Provide background on organized markets
• Share SRP staff perspective from recent western markets development efforts
• Introduce anticipated benefits and risks of day-ahead market participation
• Prepare for future market decisions
<table>
<thead>
<tr>
<th>Time</th>
<th>Duration</th>
<th>Topic</th>
<th>Presenter</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:30 - 9:35</td>
<td>5 min</td>
<td>Welcome</td>
<td>John Coggins</td>
</tr>
<tr>
<td>9:35 - 9:50</td>
<td>15 min</td>
<td>Current Status of Western Markets</td>
<td>Josh Robertson</td>
</tr>
<tr>
<td>9:50 - 10:05</td>
<td>15 min</td>
<td>History of Market Developments</td>
<td>Delia Patterson</td>
</tr>
<tr>
<td>10:05 - 11:05</td>
<td>60 min</td>
<td>SRP’s Market Experience</td>
<td>Jay Guerrero Pam Syrjala Chris Hofmann</td>
</tr>
<tr>
<td>11:05 – 11:30</td>
<td>25 min</td>
<td>Viewing Day-ahead Markets through SRP’s Principles</td>
<td>Josh Robertson</td>
</tr>
<tr>
<td>11:30 – 11:45</td>
<td>15 min</td>
<td>Q&amp;A</td>
<td>All</td>
</tr>
</tbody>
</table>
Current Status of Western Markets

Board and Council Work Study Session

October 31, 2023

Josh Robertson
Energy Markets in the West & SRP Involvement

- CAISO Western Energy Imbalance Market (WEIM) **SRP Participant**
- Southwest Power Pool (SPP) Western Energy Imbalance Service (WEIS)
- Western Resource Adequacy Program (WRAP) **SRP Participant**
- Day-Ahead Markets Development
  - CAISO Extended Day-Ahead Market **SRP Involved**
  - SPP Markets+ **SRP Phase 1 Funding Member**
Evolution of SRP’s View on Markets

• Markets functioning well for many years
• SRP’s WEIM experience
• Industry transition & operational shift
  • Retiring of legacy fossil fuel plants
  • Increase in intermittent resources
  • Battery capacity
• Need for new resource integration
## SRP Priorities for New Market or RTO Participation

<table>
<thead>
<tr>
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<td>• Path to RTO</td>
<td>• Utility input on grid operations</td>
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<td></td>
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</tbody>
</table>
WRAP Footprint & Benefits

Benefits

• Consistent Planning Standards

• No double-counting

• Regional engagement

• Large footprint

• Platform for regional assistance
Expanded Market Footprints – CAISO
Expanded Market Footprint – SPP
Key Objectives

- Historical Context Leading to Independent System Operator (ISO)/Regional Transmission Operator (RTO) Formation
- ISO/RTO Responsibilities and Governance
- Market Offerings
Historical Context

• Vertically integrated utility model, which still exists today, dominated in mid-20th century
• Push for more diverse and competitive sources of electricity generation took hold in the 1970s
Key Federal Policies

- Public Utility Regulatory Policies Act of 1978
  - Long-term contracts for small, independent generation and renewables
  - Key policies to enable wholesale electricity markets
- Key FERC Orders
  - Order 888, 889 – Open access transmission, information sharing, and standards of conduct
  - Order 2000 – encouraged formation of Regional Transmission Organizations
## ISO/RTO Governance Models

<table>
<thead>
<tr>
<th>RTO/ISO</th>
<th>Governing Entity</th>
<th>Composition</th>
<th>Board Member Selection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Independent System Operator – New England (ISO-NE)</td>
<td>Board of Directors</td>
<td>9 independent directors + President/CEO (non-voting)</td>
<td>Nominating Committee Voted by Board</td>
</tr>
<tr>
<td>Pennsylvania-New Jersey-Maryland Interconnection (PJM)</td>
<td>Board of Managers</td>
<td>9 voting managers + President (non-voting)</td>
<td>Identified by Nominating Committee Voted by Members Committee</td>
</tr>
<tr>
<td>Midcontinent Independent System Operator (MISO)</td>
<td>Board of Directors</td>
<td>9 independent directors + President/CEO (non-voting)</td>
<td>Identified by Nominating Committee Selected by Board Voted by members</td>
</tr>
<tr>
<td>Southwest Power Pool (SPP)</td>
<td>Board of Directors</td>
<td>9 independent members + President (non-voting on most matters)</td>
<td>Nominated by Governance Committee Voted by members</td>
</tr>
<tr>
<td>California Independent System Operator (CAISO)</td>
<td>Board of Governors</td>
<td>5 members</td>
<td>Nominated by California Governor Confirmed by State Senate</td>
</tr>
</tbody>
</table>
## Stakeholder Participation Models

<table>
<thead>
<tr>
<th>Model</th>
<th>Example(s)</th>
<th>Description/Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advisory only</td>
<td>ISO-NE, MISO, SPP</td>
<td>• Stakeholders serve in advisory role to board of directors</td>
</tr>
<tr>
<td>Shared Governance</td>
<td>NYISO, PJM</td>
<td>• Market rule changes must receive stakeholder approval before submittal to board of directors</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Stakeholders and board must agree before FERC filing</td>
</tr>
<tr>
<td>Advisory-lite</td>
<td>CAISO</td>
<td>• Stakeholder process guided by staff</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Less formal stakeholder notice and comment process</td>
</tr>
</tbody>
</table>
Differences in Real-Time Markets, Day-Ahead Markets, and RTOs

<table>
<thead>
<tr>
<th></th>
<th>WEIS/WEIM</th>
<th>Markets+/EDAM</th>
<th>RTO/ISO Membership</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real-Time Market</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Day-Ahead Unit Commitment</td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Reserve Sharing</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Regional Planning</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Consolidated Balancing Authority</td>
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<td></td>
<td>✓</td>
</tr>
<tr>
<td>Reliability Coordination</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Resource Adequacy</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Transmission Service Provider</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>
SRP’s Market Experience

Board and Council Work Study Session

October 31, 2023

Jay Guerrero, Pam Syrjala, & Chris Hofmann
Trading Objective

Provide reliable electricity at the lowest cost for SRP customers by:

- Optimizing forecasted load and available resources to reliably serve native load
- Buying energy when the wholesale market cost is less than the cost of SRP committed resources
- Selling excess generation in the wholesale market when economical
SRP Market Evolution

Bilateral Market

Western Energy Imbalance Market (WEIM)

2020

2026
Short Term Trading Overview

Inputs:
- SRP’s Generation
- SRP’s Transmission
- SRP’s Load Forecast
- Market Prices
- Fuel Market Prices

Day Ahead:
- Unit Commitment Plan
  - Bilateral Trading

Real Time:
- Economic Dispatch
  - WEIM Market
  - Bilateral Trading

Unit Commitment Plan

- Reflects an economic dispatch optimized by SRP
- Identifies which units SRP plans to commit for the next day
- Plan is handed over to Real Time Trading and SRP Balancing Authority Operators
Bilateral Trading

Direct contact and negotiation
  • Via phone or electronic trading platform (ICE)

Trade standard products
  • Pre-defined hourly blocks (e.g. 16 hours, 8 hours)

Transmission delivery point is defined

Common practice for Day Ahead plan with limited activity in Real Time
WEIM Operations

WITHOUT EIM

WITH EIM
WEIM Concepts

- Provides a bigger footprint
- Participants must have sufficient resources to serve their load
- Participants select which resources participate in WEIM
- CAISO optimizes participating resources to meet load and imbalance requirements at the lowest total production cost to the WEIM market footprint
- Saves money by allowing entities to buy and sell power at the lowest cost available
WEIM Trading

No contact or negotiation

- Energy exchange between entities is automated through CAISO (Market Operator)

Trades are performed on hourly basis

- 15-minute product
- 5-minute product

No transmission delivery point needed

Exclusive to Real-Time operations
WEIM Transmission Access

- Transmission is provided in the WEIM consistent with non-discriminatory Open Access
- There is no explicit charge for transmission usage in the WEIM (reciprocity concept)
- Transmission is provided in two ways
  - Unused transmission provided directly by the Transmission Service Providers (TSP) at no charge
  - Reserved transmission is donated by Merchants
WEIM Experience

- Stakeholder engagement, internal collaboration, and coordination with WEIM participants is significant
  - Increased staffing to manage changes to tariff, new initiatives, and multiple rule changes
- Additional monitoring to understand changes in unit operations
  - Large amounts of data on market transactions and unit performance
  - Integration of solar power and other operating instructions result in changes to unit operations
  - Requires more analytical skillsets
Day-Ahead Market Offerings - Short of Full ISO/RTO

- Two options:
  - California ISO Extended Day-Ahead Market or
  - Southwest Power Pool Markets+
- One step beyond energy imbalance market participation (real-time market)
  - Additional, incremental benefit through more efficient day-ahead hourly trading and unit commitment
  - Reduced production costs and optimized commitment of the least-cost resources to meet demand
  - Reliability benefits due to more diverse pool of resources to meet the next day’s conditions
  - Additional improvement of integration of renewables
Short Term Trading Overview

Inputs

- ALL Participants’ Generation
- ALL Participants’ Transmission
- ALL Participants’ Load Forecasts
- Market Prices
- Fuel Market Prices

Day Ahead

Unit Commitment Plan
- Market Optimization
- Bilateral Trading

Real Time

Economic Dispatch
- Market Optimization
- Bilateral Trading
Day Ahead Market Concepts

- All participants must demonstrate they have sufficient resources to meet their loads
- Market Operator centralizes unit commitment and energy dispatch across the entire footprint
- Bilateral trading can still occur
- Self-scheduling is allowed
- All resources will participate in the new market
- Includes a Real Time market
- SRP remains its own Balancing Authority
- Dispatch includes transmission optimization
SRP’s System Reliability in Day Ahead Market

• SRP will continue to be responsible for:
  • Identify and ensure reliability requirements are met and served by its resources
  • Reliability products are not part of the proposed market solutions at this time
  • Responsible for outage coordination, scheduling, planning and execution
  • Retain override of dispatch signals to ensure reliability is met if needed
  • Real time operations and maintenance of the bulk electric system
  • NERC Reliability Standards Compliance
Day Ahead Transmission Access

• The approach to Day Ahead transmission is all-in unless specifically carved out.
• The Day Ahead Market will optimize both generation and transmission for the market footprint.
• Any unused transmission will be released back to the transmission owners for secondary sales.
• The Market Operator will collect a charge for all transmission used in the market and re-distribute the revenue to each Transmission Service Provider.
Day Ahead Market Evolution

- Energy markets in the West are rapidly evolving
- Risks of reduced liquidity in bilateral market
- Forecasted cost benefits with market participation
- New markets will require staffing and new skillsets
- Ongoing and significant market engagement will be required
Viewing Day-ahead Markets through SRP’s Principles

Board and Council Work Study Session

October 31, 2023

Josh Robertson
CAISO EDAM and SPP Markets+ Timelines

CAISO EDAM

Draft Tariff
Stakeholder Tariff Process
FERC Filing
Q2 2023
Q3 2023
Q4 2023
Q1 2024
2026

Markets+ Phase 1
FERC Filing
Go-live

SPP Markets+

SRP’s Potential Decision Point
10/31/2023 SRP Board & Council WSS; J.C. Robertson
Potential Benefits & Risks of Day-Ahead Market Participation

Benefits

• Renewable Integration
• Economic Optimization

Risks

• Governance
• Cost Allocation
• Evolution of Market Rules

Risk of not participating: potential decreased liquidity in bilateral market
# Viewing Day-ahead Markets through SRP’s Principles

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10/31/2023 SRP Board & Council WSS; J.C. Robertson
Viewing Day-ahead Markets through SRP’s Principles

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<th>CUSTOMER</th>
<th>EDAM</th>
<th>Markets+</th>
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<td></td>
<td>WMEG results</td>
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<td>Path to RTO</td>
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WMEG - Western Markets Exploratory Group
Viewing Day-ahead Markets through SRP’s Principles

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<th>GOVERNANCE</th>
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<td>Transparent</td>
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</tr>
<tr>
<td></td>
<td>Role for Public Power</td>
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CAISO Wheel-Through Example

- SRP purchases firm generation and transmission to assist in meeting our energy needs
- This purchased energy may be generated in the Pacific Northwest and “wheeled” through other balancing areas including CA for delivery into SRP’s footprint
- Over the last three years CAISO has established a new wheeling process
  - Whenever CAISO is short on energy, their tariff allows them cut the transactions to serve their customers.
  - Transactions are curtailed by order of importance until the energy shortage is cleared
  - SRP actively avoids wheeling-through the CA footprints when there are forecasted energy shortfalls
Viewing Day-ahead Markets through SRP’s Principles

<table>
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<td>Resource Sufficiency Test</td>
<td>Single Resource Adequacy</td>
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Western Markets Summary

- Markets are rapidly evolving in the West
- SRP remains actively engaged in market developments
- Markets provide value to our customers
- Future decision points
- Sustained and significant engagement required
thank you!