Exh. KAF-3
Dockets UE-170033/UG-170034
Witness: Kyle A. Frankiewich

**BEFORE THE WASHINGTON
UTILITIES AND TRANSPORTATION COMMISSION**

| | |
|---|---|
| **WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION,**<br><br>**Complainant,**<br><br>**v.**<br><br>**PUGET SOUND ENERGY,**<br><br>**Respondent.** | **DOCKETS UE-170033 and UG-170034 (*Consolidated*)** |

**EXHIBIT TO
TESTIMONY OF**

**Kyle A. Frankiewich**

**STAFF OF
WASHINGTON UTILITIES AND
TRANSPORTATION COMMISSION**

***PSE's Response to UTC Staff Data Request No. 323
(including Attachments A-E)***

**June 30, 2017**

# BEFORE THE WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION

**Dockets UE-170033 and UG-170034**
**Puget Sound Energy**
**2017 General Rate Case**

## WUTC STAFF DATA REQUEST NO. 323

**WUTC STAFF DATA REQUEST NO. 323:**

**RE: Energy Imbalance Market (EIM)**

a. PSE provided a report from Energy and Environmental Economics, Inc. ("E3") as Exh. No. DEM-3. Please provide all other internally- or externally-produced studies and work papers that informed PSE's decision to join the CAISO Energy Imbalance Market ("EIM"). Please include presentations, meeting minutes, and related documentation as it was presented to the decision-making body.

b. Please describe the internal decision making process PSE followed in deciding to join the EIM. If the final decision to join the EIM was made an entity other than PSE's board of directors, please explain why, and to whom, the board of directors delegated the decision.

c. Please confirm that the decision maker was aware of the preliminary estimations referred to in Mr. Mills testimony, Exh. No. DEM-1T, page 13:10, where he states, "According to preliminary estimates, PSE could save its electric customers up to $10 million to $20 million per year through its participation in the CAISO EIM."

**Response:**

a. Attached as Attachment A to Puget Sound Energy's ("PSE") Response to WUTC Staff Data Request No. 323 is a presentation to PSE's Energy Management Committee ("EMC") dated September 18, 2014, that contains information about the Energy Imbalance Market ("EIM").

Attached as Attachment B to PSE's Response to WUTC Staff Data Request No. 323 are the EMC meeting minutes from the September 18, 2014 meeting.

Attached as Attachment C to PSE's Response to WUTC Staff Data Request No. 323 is a presentation to the EMC dated October 16, 2014 that contains a recommendation to join the EIM.

Attached as Attachment D to PSE's Response to WUTC Staff Data Request No. 323 are the EMC meeting minutes from the October 16, 2014 meeting. These minutes indicate that the EMC approved the recommendation to enter the EIM.

Attached as Attachment E to PSE's Response to WUTC Staff Data Request No. 323 are materials that were provided to the board of directors for the 2014 meeting related to the EIM.

b. The decision-making process followed by PSE in deciding to join the EIM was consistent with PSE's bylaws, which delegate to management the discretion to approve outlays of capital up to $25 million.

The EMC is a committee of officers that provides policy direction and oversight for PSE's energy resource plans, energy supply, resource scheduling, energy risk policies, credit policies, incremental transmission investments and resource acquisition activity.

At its September 18, 2014 meeting, the EMC reviewed information provided by PSE staff regarding the benefits of joining the EIM. At the EMC's October 16, 2014 meeting, PSE staff presented a recommendation that PSE join the California Independent System Operator ("CAISO") EIM contingent on the outcome of upcoming meetings with WUTC Commissioners. After meeting with WUTC Commissioners, on October 20, 2014, PSE staff recommended EMC approval to join the CAISO EIM, and the EMC approved the October 20 request.

c. Yes, as indicated in Attachments A and B to PSE's Response to WUTC Staff Data Request No. 323, the EMC was aware of the estimated benefits of participating in the EIM.

# ATTACHMENT A to PSE's Response to WUTC Staff Data Request No. 323

# Energy Imbalance Market

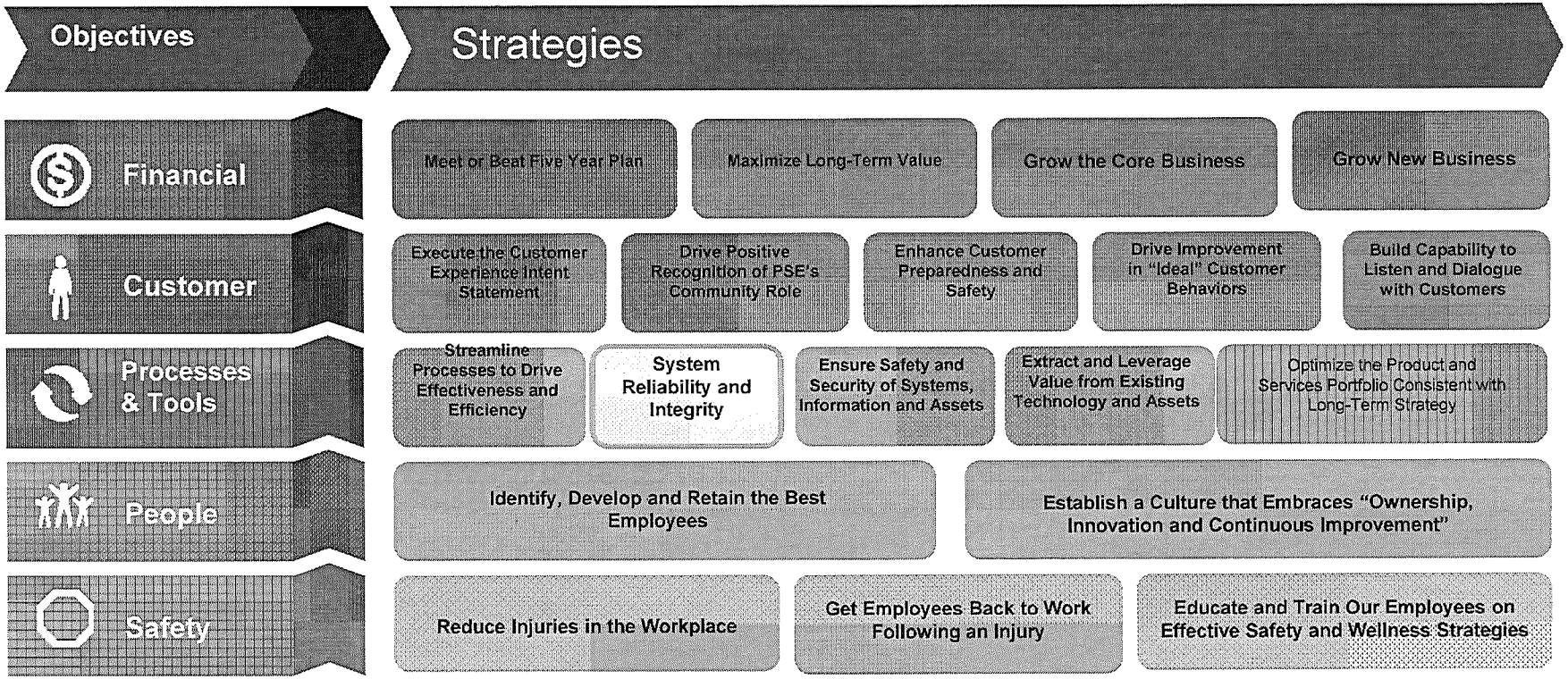
PUGET SOUND ENERGY

## EMC Informational

*September 18th, 2014*

*Joe Hoerner, Energy Supply*

# ISP Alignment




PUGET SOUND ENERGY

# EIM Basics: What an EIM is

- EIM stands for Energy Imbalance Market
- An EIM is an automated sub-hourly economic optimization of loads and resources
- The market is operated by a Market Operator who optimizes resources within the EIM footprint
- Market Participants voluntarily bid in resources and the Market Operator runs an automated economic dispatch every five minutes
- Only the most economic resources are dispatched subject to transmission congestion

# EIM Basics: What an EIM is Not

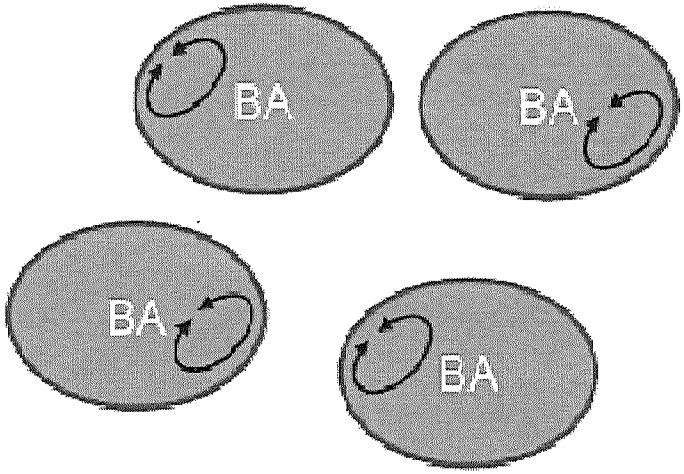
- An EIM is not a Regional Transmission Organization (RTO)
  - All participating balancing authorities maintain control of their assets and associated reliability compliance obligations
  - The EIM does not affect a balancing authority's contingency reserve obligations or reserve sharing agreements
- An EIM does not require that parties consolidate balancing authority areas
- EIM Participants are not required to bid
  - Participants voluntarily make available generation resources that will be optimized to balance load and generation every five minutes across the EIM footprint

# EIM Basics: EIM Benefits

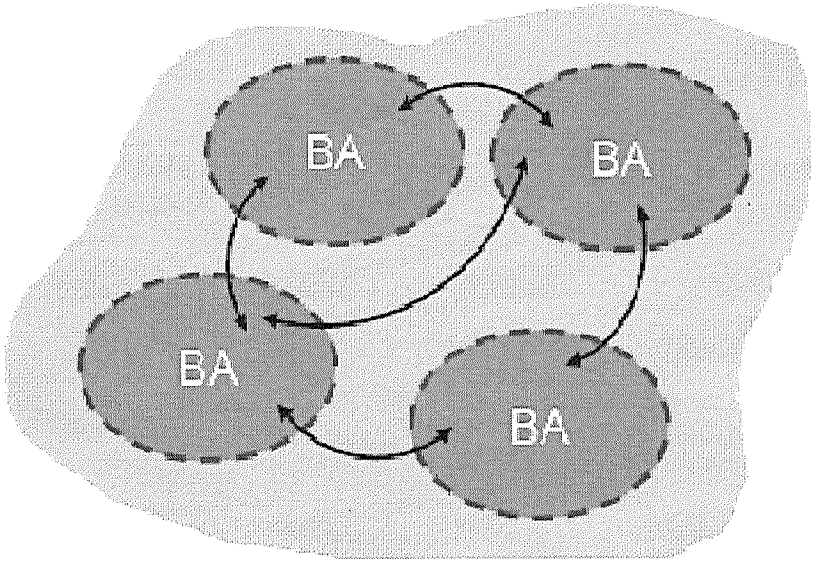
- Enhanced Reliability
  - Greater visualization into within the hour system operations through aggregating and sharing of real-time state data of the interconnected system
  - Resource sufficiency metric to prevent "leaning" on the market
- Interregional Dispatch Savings
  - Realize the efficiency of five minute dispatch between multiple participants within the EIM footprint
  - More efficient transmission utilization through state awareness and Market Operator role
- Reduced Flexibility/Balancing Reserves
  - Aggregate the diversity of multiple systems' load, wind, and solar diversity and forecasts errors to minimize the amount of flexible reserves need to balance individual systems

# EIM Basics: How an EIM Works

**Today:**
**Balancing occurs within each BA**




**In an EIM:**
**Balancing occurs among BAs**




PUGET SOUND ENERGY

# EIM Models

- Two models reviewed
  - Northwest Power Pool (NWPP)
    - Includes the13 Balancing Authorities of the NWPP
    - EIM structure being developed by NWPP MC members over a multi-phased approach
    - No commitment by members to participate in future phases
    - Possible go live date 2017-2018
  - California ISO (CAISO)
    - EIM design developed and scheduled to go live 10/01/14
    - Currently three market participants – CAISO, PacifiCorp, NV Energy
    - Received FERC final approval June 2014

# EIM Cost-Benefit Analysis

| | EIM Formation | | | |
|---|---|---|---|---|
| | PSE-NWPP | PSE-CAISO | PacifiCorp-CAISO | NVE-CAISO |
| Participant Benefits ($MM/YR) | 2.1 - 6.6 | 18.3 - 29.5 | 10.5 -54.4 | 6.0 - 12.2 |
| Participant Start-Up Costs ($MM) | 14.2 | 14.2 | 20.0 | 11.3 |
| Participant On-Going Costs ($MM/YR) | 3.5 | 3.5 | 5.0 | 2.6 |

PUGET SOUND ENERGY

# PSE Benefits from an EIM

- Interregional Intra-Hour Dispatch Savings
- Lower Flexibility Reserves Requirements
- Lower Renewable Energy Curtailments
- BPA VERBS Savings

PUGET SOUND ENERGY

# PSE – CAISO EIM Benefits (2014$)

| Benefit Category | WECC-Wide Total Benefits ($MM/Yr) | Benefits Attributed to PSE ($MM/Yr) | Notes |
|---|---|---|---|
| Intra-Hour Dispatch Savings | $17.3- 19.7 | $16.7 -18.5 | Low Range is 300 MW transfer variability limit (TVL) and 400 MW north to south COI capacity.<br>High range is 900 MW TVL and 700 MW N-S COI capacity. |
| Reduced Load Following Reserve Requirement | $4.60 | $1.60 | Based on WECC-wide 75 aMW expected reduction and PSE reduction of 26 aMW at $7.20/MWh. |
| Renewable Curtailment Savings | $0.0 - 1.2 | $0.0 - 1.2 | $1.2 MM represents the average costs for BPA DSO 216 and PSE reliabiltiy curtailments on wind facilities. |
| Avoided BPA VERBS Charge | n/a | $0.0 - 8.2 | Max = 800MW*$14.40/kw-yr less 52MW LF and Reg Res @ISO historical price $7.2/Mwh<br>Min = Assume wind stays in BPA BA |
| Total | $20.0 - 28.7 | $18.3 - 29.5 | |

PUGET SOUND ENERGY

# Pros and Cons

| CAISO | | NWPP | |
|---|---|---|---|
| PROS | CONS | PROS | CONS |
| Greater economic benefit for customers over NWPP | California state influence on ISO policy issues may outweigh stakeholder issues | More control over governance and market design | Market design and requirements still under development |
| Broader participant geographic footprint generates greater diversity and reliability benefits | Potential for unforeseen adverse regulatory changes in California including carbon regulation | Maintain regional goodwill by participating in regional effort | No commitment from all NWPP MC members on whether they will continue with the effort until implementation, risking reduction of benefits if all members don't move forward |
| Market design, requirements, and market operator costs are established and provides the ability to terminate participation without an exit fee | Regional resentment toward PSE for choosing CAISO over NWPP | Would standardize planning and reliability tools across all NWPP BAs | BPA decision on legal authority to participate may take 12 - 18 months to determine |
| Existing EIM participants provide clear timeline (18-24 months) and roadmap for new entities | Transmission Access Charge remains unsettled and could deteriorate from benefits in the future | | Still a faction of Public Power that is not supportive of the effort |
| Provides a platform for future market development, e.g., ancillary services and day two markets | | | Potential concessions to protect non-jurisdictional entities from FERC oversight |
| Affords experience with broad cap and trade system and early compliance preparedness for potential regional 111(d) model | | | Unlikely the market will develop beyond an EIM due to FERC jurisdictional issues |

PUGET SOUND ENERGY

# Next Steps

- Review modeling results with WUTC
- Request EMC approval at October or November meeting to participate in the CAISO EIM

# ATTACHMENT B to PSE's Response to WUTC Staff Data Request No. 323

# Puget Sound Energy, Inc.

## Minutes of the Energy Management Committee

## Meeting on September 18th 2014

### Attendees

The following voting members of the Energy Management Committee (EMC) attended the meeting: Steve Secrist, Booga Gilbertson, David Mills and Paul Wiegand. Dan Doyle nominated Booga Gilbertson to vote as his proxy.

The following non-voting members of the EMC attended the meeting: Tom DeBoer, Ken Johnson, Joe Hoerner, Michael Mullally (co-secretary) and Erin Apperson (co-secretary).

Guests included: Charles Daitch (coordinator), Leroy Ho, Brandon Lohse, John Mannetti, Kacee Chandler, Ila Gupta, Rob Neate, Paul Smith, Henry Quehrn, Chis Walford, Josh Newkirk, Theresa Burch, Jen Creekpaum, and Colin Crowley.

### Call to Order

The meeting was called to order in the Wild Horse conference room at 2:35 pm.

### Standards of Conduct Requirements and Guidelines

A reminder of the Standards of Conduct was contained in the agenda that was distributed to attendees.

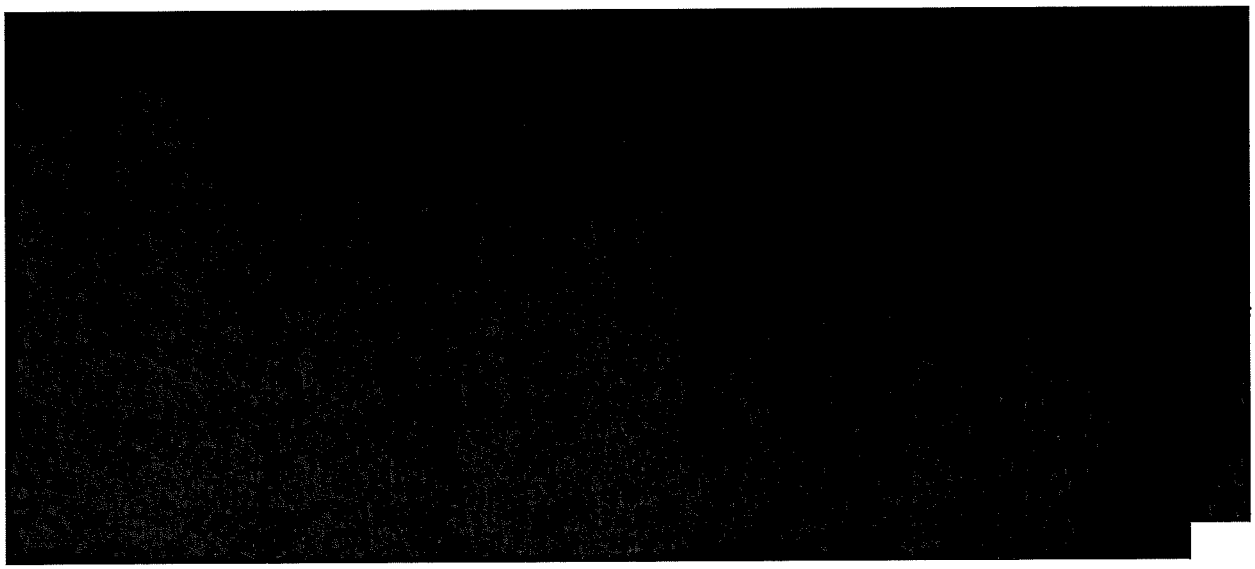
### New Matters

[redacted]

**Energy Imbalance Market (Informational):** Joe Hoerner, Manager of Energy Supply, gave an informational presentation on the benefits of joining an Energy Imbalance Market (EIM). Joining an EIM would provide PSE and its customers with enhanced reliability, increased efficiency through interregional dispatch coordination and a reduced need for balancing reserves. PSE has considered the benefits and disadvantages of joining two EIMs: the proposed Northwest Power Pool (NWPP) EIM and the California ISO (CAISO) EIM. The cost benefit analysis indicated that the CAISO EIM would have significant financial benefits over the NWPP EIM. The startup costs for joining the EIMs would be similar at approximately $14.2 million, as would the ongoing yearly costs (estimated at $3.5 million/year). However, the benefits from the CAISO EIM are significantly higher and are estimated to be between $18.3 and $29.5 million/year compared to the NWPP EIM benefits of $2.1 to $6.6 million/year. The majority of the benefits are derived from intra-hour dispatch savings. In the coming weeks, PSE staff will review the EIM modeling results with the WUTC.

[redacted]

[redacted]



**Next Meeting**

The next meeting of the Energy Management Committee is scheduled for 2:30 P.M. on Thursday, October 16th in the Wild Horse Conference Room (PSE-12).

**Respectfully submitted:**

_____

Michael Mullally, EMC Secretary

**Accepted by the Energy Management Committee:**

_____

Paul Wiegand, EMC Chair

# Energy Management Committee

## Attendance Record

**Meeting Date:** 18-Sep-14

| Voting members | Title / Organization | Present |
|---|---|---|
| Wiegand, Paul | Senior Vice President, Energy Operations (Chair) | x |
| Doyle, Dan | Senior Vice President and Chief Financial Officer | |
| Gilbertson, Booga | Vice President, Operations Services | x |
| Secrist, Steven | Vice President, General Counsel & Chief Ethics and Compliance Officer | x |
| Mills, David | Vice President, Energy Supply Operations | x |
| **Non-Voting Members** | | **Present** |
| Mullally, Michael | Manager, Resource Acquisition (Secretary) | x |
| Apperson, Erin | Regulatory Compliance Consultant (Co-Secretary) | x |
| DeBoer, Tom | Director, Rates & Regulatory Affairs | x |
| Garratt, Roger | Director, Financial Planning & Strategic Initiatives | |
| Johnson, Ken | Director, State Policy and Government Affairs | x |
| Hoerner, Joe | Manager, Energy Supply Merchant | x |
| Riding, Clay | Director, Natural Gas Resources | |
| Osborne, Sam | Assistant General Counsel | |
| Barnard, Kathie | Director, Revenue Requirement & Regulatory Compliance | |
| Tada, Jennifer | Director, Planning | |
| **Guests** | | **Present** |
| Daitch, Charles | Energy Resource Analyst (coordinator) | x |
| Mannetti, John | Director, Wind Resources and Asset Management | x |
| Chandler, Kacee | Manager, Energy Analysis | x |
| Gupta, Ila | Sr. Portfolio Analyst | x |
| Neate, Rob | Assistant General Counsel | x |
| Smith, Paul | Plant Manager, Lower Snake River | x |
| Querhn, Henry | Senior Performance Analyst | x |
| Walford, Chris | Supervisor, Plant Technical Services | x |
| Newkirk, Josh | Senior Analyst, Energy Delivery | x |
| Lohse, Brandon | Corporate Treasurer | x |
| Ho, Leroy | Manager, Risk Control, Analytics & Credit | x |
| Burch, Theresa | Manager, Energy Delivery | x |
| Crowley, Colin | Manager, Portfolio Hedging | x |
| Creekpaum, Jennifer | Associate Engineer | x |

Called to Order: 2:30 pm
Adjourned: 3:45 pm

| | |
|---|---|
| count voting members | 4 |
| count non-voting members | 5 |
| count guests | 14 |
| total | 23 |

# ATTACHMENT C to PSE's Response to WUTC Staff Data Request No. 323

# Energy Imbalance Market
# EMC Decision

PUGET SOUND ENERGY

Joseph Hoerner
Integrated and Emerging Energy Markets
October 16, 2014

# Recommendation

- Recommend that the EMC approve the request for PSE to participate in the California Independent System Operator's (CAISO) Energy Imbalance Market (EIM)

# Economic Analysis (2014$)

- Modeled PSE benefits through participation in the CAISO EIM range from $18.3 million to $30 million per year
- Start-up costs, including contingency, are estimated to be $14.2 million
- On-going costs are estimated to be $3.5 million per year
- Startup costs, taken together with a 20-year series of ongoing costs and annual benefits would produce a Net Present Value (NPV) of $153.7 million to $174.4 million
- Participation in the CAISO EIM is likely to provide a low-risk means of achieving reliability and economic benefits for PSE
- Majority of EIM costs would be treated as power costs since one of the primary functions of the EIM is to reduce power costs
- Ability to terminate participation in the EIM without a penalty or exit fee

# Timeline/Implementation

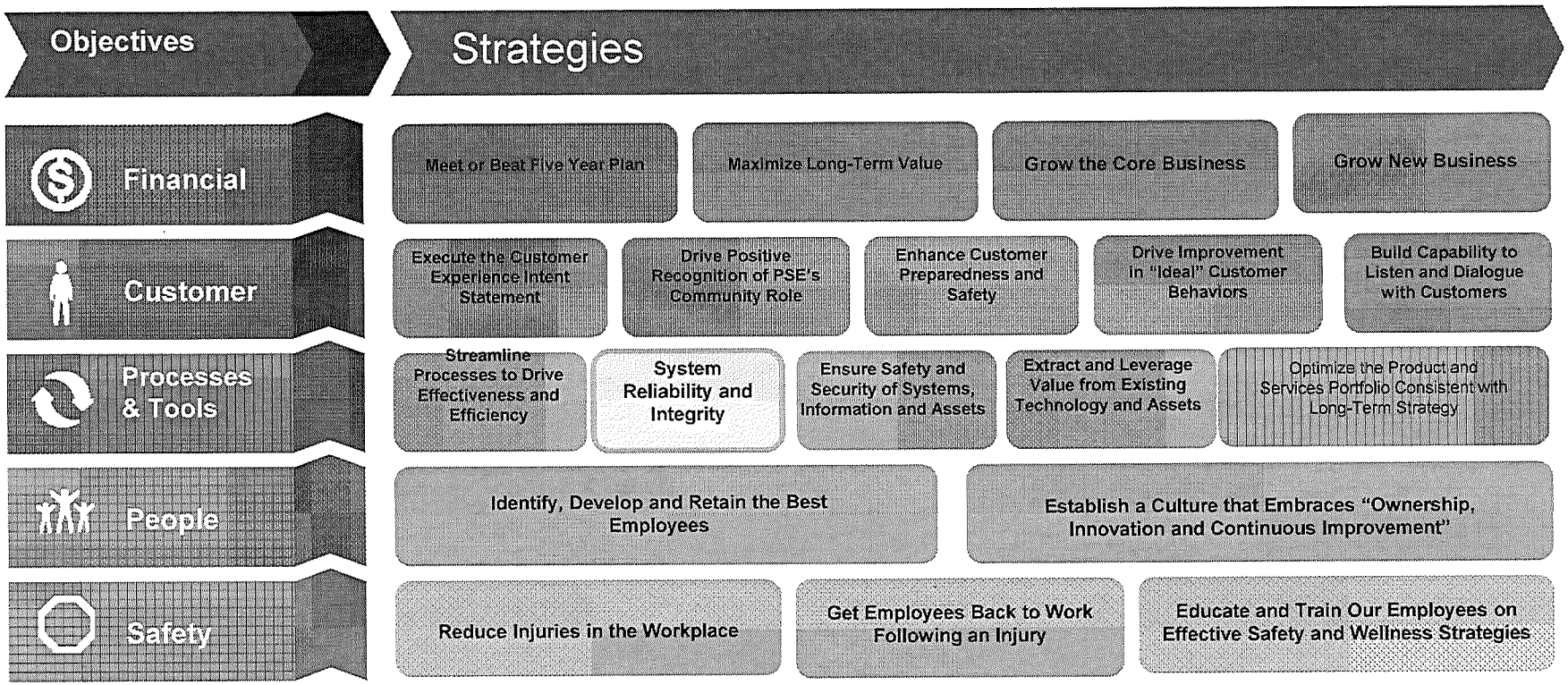
- October '14 – WUTC discussion and strategy
- November '14 – FERC and NW congressional delegation outreach
- December '14 – FERC filing of CAISO Implementation Agreement
- December '14 – Public announcement of PSE's participation in CAISO EIM
- January '15 through March '16 – Project design, engineering and implementation
- April 1, 2016 – Go Live

# Recommendation

- Recommend that the EMC approve the request for PSE to participate in the California Independent System Operator's (CAISO) Energy Imbalance Market (EIM) contingent upon WUTC briefings occurring on October 17 and 20, 2014
- After WUTC briefings, an email request for official EMC approval will be sent

# APPENDIX

# ISP Alignment



# PSE – CAISO Benefits (2014$)

| Benefit Category | WECC-Wide Total Benefits ($MM/Yr) | Benefits Attributed to PSE ($MM/Yr) | Notes |
|---|---|---|---|
| **Intra-Hour Dispatch Savings** | **$20.0 - 22.9** | **$16.7 -18.5** | Low Range is 300 MW transfer variability limit (TVL) and 400 MW north to south COI capacity.<br>High range is 900 MW TVL and 700 MW N-S COI capacity. |
| **Reduced Load Following Reserve Requirement** | **$4.60** | **$1.60** | Based on WECC-wide 74.5 aMW expected reduction and PSE reduction of 26.3 aMW at $6.98/MWh. |
| **Renewable Curtailment Savings** | **$0.0 – 0.8** | **$0.0 – 0.8** | $0.8 MM represents the average costs for BPA DSO 216 and PSE reliability curtailments on wind facilities. |
| **Avoided BPA VERBS Charge** | **n/a** | **$0.0 – 9.1** | Max = 800MW*$14.40/kw-yr less [22MW LF *$6.98/MWH and 15 MW Up Reg Res*$5.34/MWH and 15 MW Down Reg Res*$3.32/MWH]<br>Min = Assume wind stays in BPA BA |
| **Total** | **$24.6 - 28.3** | **$18.3 – 30.0** | Total PSE benefits are greater than WECC-Wide benefits due to the inclusion of BPA VERBS charge. |

# Pros and Cons

| CAISO | | NWPP | |
|---|---|---|---|
| PROS | CONS | PROS | CONS |
| Greater economic benefit for customers over NWPP | California state influence on ISO policy issues may outweigh stakeholder issues | More control over governance and market design | Market design and requirements still under development |
| Broader participant geographic footprint generates greater diversity and reliability benefits | Potential for unforeseen adverse regulatory changes in California including carbon regulation | Maintain regional goodwill by participating in regional effort | No commitment from all NWPP MC members on whether they will continue with the effort until implementation, risking reduction of benefits if all members don't move forward |
| Market design, requirements, and market operator costs are established and provides the ability to terminate participation without an exit fee | Regional resentment toward PSE for choosing CAISO over NWPP | Would standardize planning and reliability tools across all NWPP BAs | BPA decision on legal authority to participate may take 12 - 18 months to determine |
| Existing EIM participants provide clear timeline (18-24 months) and roadmap for new entities | Transmission Access Charge remains unsettled and could deteriorate from benefits in the future | | Still a faction of Public Power that is not supportive of the effort |
| Provides a platform for future market development, e.g., ancillary services and day two markets | | | Potential concessions to protect non-jurisdictional entities from FERC oversight |
| Affords experience with broad cap and trade system and early compliance preparedness for potential regional 111(d) model | | | Unlikely the market will develop beyond an EIM due to FERC jurisdictional issues |

# ATTACHMENT D to PSE's Response to WUTC Staff Data Request No. 323

# Puget Sound Energy, Inc.

## Minutes of the Energy Management Committee

## Meeting on October 16th 2014

### Attendees

The following voting members of the Energy Management Committee (EMC) attended the meeting: Steve Secrist, Booga Gilbertson, David Mills and Paul Wiegand. Dan Doyle nominated Booga Gilbertson to vote as his proxy.

The following non-voting members of the EMC attended the meeting: Tom DeBoer, Ken Johnson, Joe Hoerner, Sam Osborne, Roger Garratt, Clay Riding, Kathie Barnard and Michael Mullally (co-secretary).

Guests included: Charles Daitch (coordinator), Leroy Ho, John Mannetti, Kacee Chandler, Rob Neate, Chis Walford, Jen Creekpaum and Sandeap Reddy.

### Call to Order

The meeting was called to order in the Wild Horse conference room at 2:35 pm.

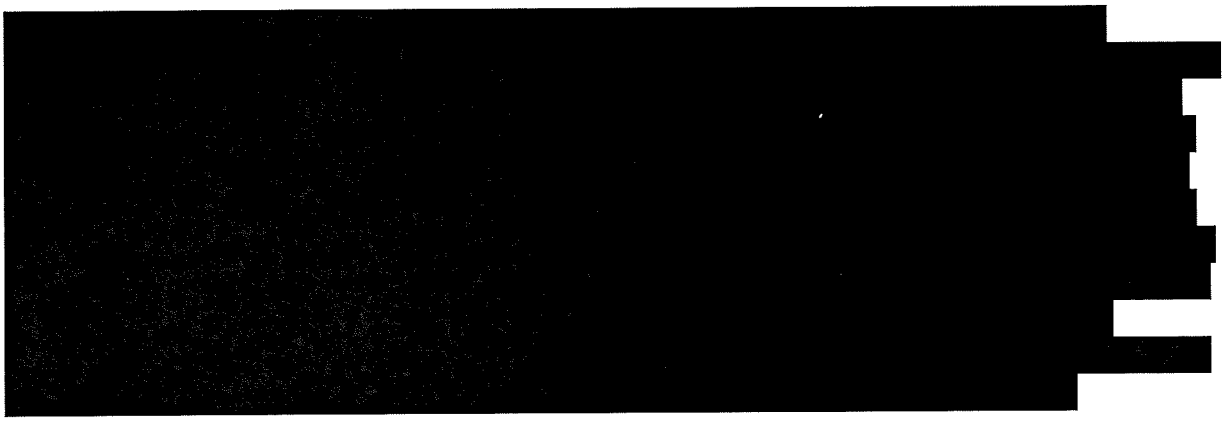
### Standards of Conduct Requirements and Guidelines

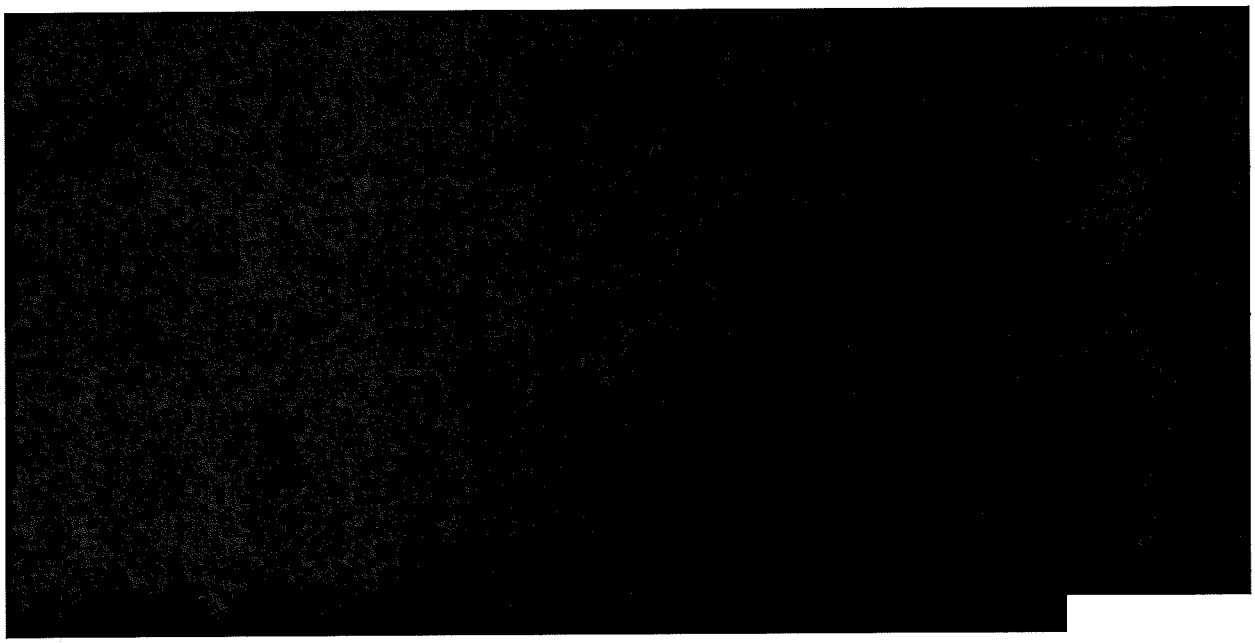
A reminder of the Standards of Conduct was contained in the agenda that was distributed to attendees.

### New Matters

**Energy Imbalance Market (*Pending* Decision):** Joe Hoerner, Manager of Energy Supply, presented on the benefits of joining an Energy Imbalance Market (EIM). At the September EMC meeting, Joe discussed how participating in an EIM would provide PSE and its customers with enhanced reliability, increased efficiency through interregional dispatch coordination and a reduced need for balancing reserves. CAISO has indicated that PSE could begin participating in the EIM beginning in October of 2016. In the coming weeks and months, PSE will meet with the WUTC, FERC and the NW congressional delegation to inform the parties of the benefits to PSE customers as well as PSE's intent to join the CAISO EIM (no official approvals are needed from regulators). The EMC agreed that a decision on this matter would be given electronically pending the outcome of scheduled meetings with the WUTC to review the EIM modeling.

*Update 10/22/14*: On October 20th 2014, after a positive meeting with WUTC commissioners, Joe Hoerner recommended that the EMC approve PSE's participation in the CAISO EIM via email. All of the EMC responded (electronically) in favor to approve the recommendation. A copy of the email correspondence is included in the electronic and hard copy EMC folders.





**Next Meeting**

The next meeting of the Energy Management Committee is scheduled for 2:30 P.M. on Thursday, November 20th in the Wild Horse Conference Room (PSE-12).

**Respectfully submitted:**

_____

Michael Mullally, EMC Secretary

**Accepted by the Energy Management Committee:**

_____

Paul Wiegand, EMC Chair

# Energy Management Committee

## Attendance Record

**Meeting Date:** 16-Oct-14

| Voting members | Title / Organization | Present |
|---|---|---|
| Wiegand, Paul | Senior Vice President, Energy Operations (Chair) | x |
| Doyle, Dan | Senior Vice President and Chief Financial Officer | |
| Gilbertson, Booga | Vice President, Operations Services | x |
| Secrist, Steven | Vice President, General Counsel & Chief Ethics and Compliance Officer | x |
| Mills, David | Vice President, Energy Supply Operations | x |
| **Non-Voting Members** | | **Present** |
| Mullally, Michael | Manager, Resource Acquisition (Secretary) | x |
| Apperson, Erin | Regulatory Compliance Consultant (Co-Secretary) | |
| DeBoer, Tom | Director, Rates & Regulatory Affairs | x |
| Garratt, Roger | Director, Financial Planning & Strategic Initiatives | x |
| Johnson, Ken | Director, State Policy and Government Affairs | x |
| Hoerner, Joe | Manager, Energy Supply Merchant | x |
| Riding, Clay | Director, Natural Gas Resources | x |
| Osborne, Sam | Assistant General Counsel | x |
| Barnard, Kathie | Director, Revenue Requirement & Regulatory Compliance | x |
| Tada, Jennifer | Director, Planning | |
| **Guests** | | **Present** |
| Daitch, Charles | Energy Resource Analyst (coordinator) | x |
| Mannetti, John | Director, Wind Resources and Asset Management | x |
| Chandler, Kacee | Manager, Energy Analysis | x |
| Reddy, Sandeap | Energy Resource Analyst | x |
| Neate, Rob | Assistant General Counsel | x |
| Walford, Chris | Supervisor, Plant Technical Services | x |
| Ho, Leroy | Manager, Risk Control, Analytics & Credit | x |
| Creekpaum, Jennifer | Associate Engineer | x |

Called to Order: 2:30 pm
Adjourned: 2:55 pm

| | |
|---|---|
| count voting members | 4 |
| count non-voting members | 8 |
| count guests | 8 |
| total | 20 |

# ATTACHMENT E to PSE's Response to WUTC Staff Data Request No. 323

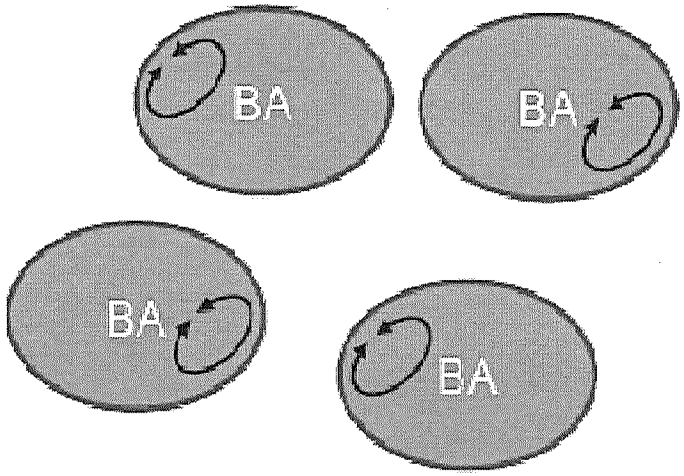
# What is an Energy Imbalance Market (EIM)?

- An automated sub-hourly economic optimization of electricity demand and generating resources across a broader geographic footprint
- Market Participants voluntarily bid in generating resources and the Market Operator runs an automated economic dispatch every five minutes
  - All participating balancing authorities maintain control of their assets and associated reliability compliance obligations
- A short video summarizing Energy Imbalance Markets will be shown at the Board meeting

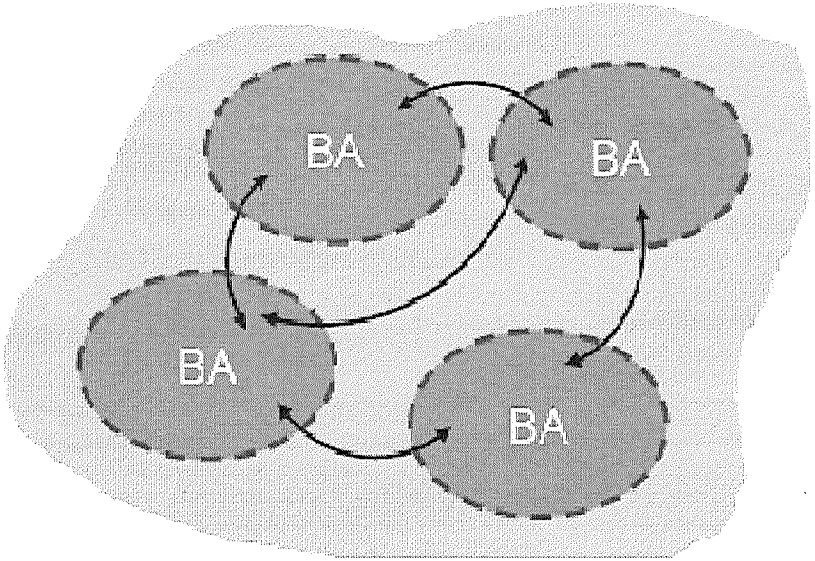
PUGET SOUND ENERGY

# Balancing Authorities gain more diversity of both supply and demand under an EIM and are therefore more efficient.

**Today:**
**Balancing occurs within each BA**




**In an EIM:**
**Balancing occurs among BAs**

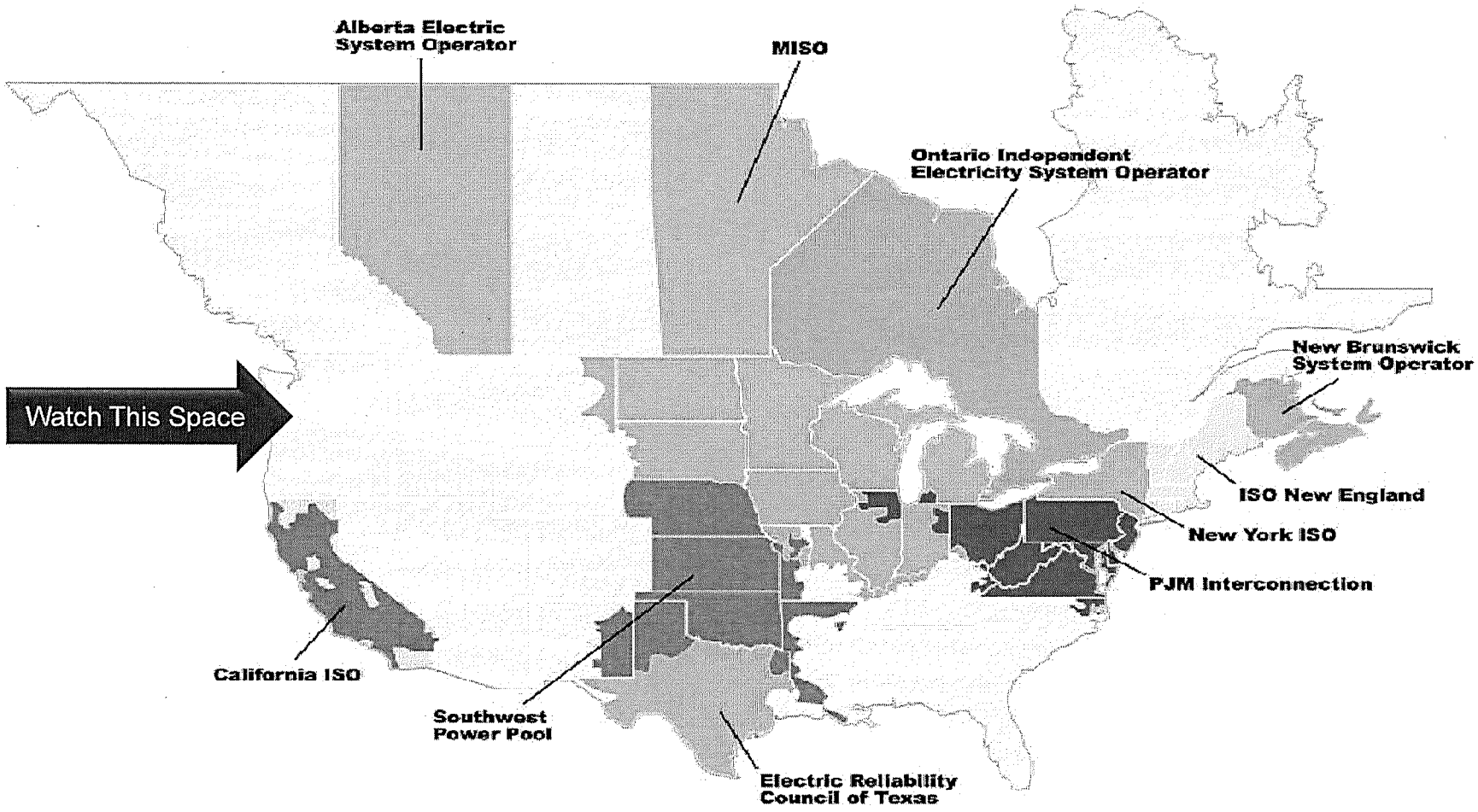



PSE PUGET SOUND ENERGY

# We have been assessing two different EIM models from both an operational and cost/benefit perspective.

| | EIM Formation | |
|---|---|---|
| | PSE-NWPP | PSE-CAISO |
| PSE Benefits ($MM/YR) | 2.1 - 6.6 | 18.3 - 30.0 |
| PSE Start-Up Costs ($MM) | 14.2 | 14.2 |
| PSE On-Going Costs ($MM/YR) | 3.5 | 3.5 |

# Organized sub-hourly imbalance markets are in operation throughout most of North America.




PUGET SOUND ENERGY