COMMUNITY VALUE FIRST

PUB Workshop Follow-Up

February 13, 2019

TACOMA PUBLIC UTILITIES

PUB Meeting Building Access – Current Practices

Study Sessions

- Main elevator is placed into free access allowing attendees to have unescorted access to LT1 (study session room)
- Security assists with directions and accommodations if needed.
- South door is opened allowing access to LT1.

PUB Meeting Building Access – Current Practices

Regular Board Meetings

- Staircase to auditorium is disarmed and unlocked with signage placed outside door.
- Lobby is unlocked, open and staffed by Security to assist with directions and access accommodations.

PUB Meeting Building Access – Current Practices

Regular Board Meetings (cont'd)

- Main elevator is always in free access allowing visitors to have unescorted free access to the west side of the ground floor.
- East and west entrances have intercoms that ring to Security in case someone needs assistance or ends up at the wrong door.

Board Meeting Materials – Current Practices

- Study session/regular meeting agendas and Board meeting materials are posted before noon the Friday before the meetings.
- Study session presentations are posted first thing in the morning the day after the study session.
- Attempt to send special meeting notifications one week in advance

Audio/Visual

- Evening meetings broadcast live and available online by 11:00 a.m. the next day.
- Meetings are replayed eight times during the next two weeks
- Study session options
  - Remain in LT1 and record sessions to accompany slides on website
  - Relocate study sessions to the auditorium to have recording of presentations

Board Workshop Communication

- The Board and executive team met in a two-day workshop. The PUB:
- Agreed on initial governance principles as guidelines for their work over the next year
- Identified initial strategic directions and areas of focus for TPU that will further support TPU's mission, the City's Vision 2025, and continue to enhance coordination with the City, franchise cities and stakeholders

Board Workshop Communication

- Began to set performance expectations for the Director that will support TPU's continued operation as a high performing organization
- The two-day session strengthened relationships among all attendees and set the foundation for further work to clarify governance, strategic directives, priorities and deeper collaboration with the City
- Discussed clarity of Board and Director roles and established guidelines for effective communication

Guiding Principles

- TPU Board will develop and define desired results and performance measures
- The Board will collaborate with City Council as appropriate to gather input about TPU desired results and performance measures
- The Board will engage the public and stakeholders in the development of these desired results
- The Board will regularly monitor progress/results and share the information with the City Council.
- Based on strategic directives, Board will develop performance measures on which the Director's performance will be evaluated and shall get agreement on performance criteria from the Council.

Guiding Principles (cont'd)

- Unity of control applies: Only to decisions made by the Board are binding on the Director
- Board Members may ask for information by funneling inquiries through the Senior Management Team; Managers will provide access to SME. Frame as 'for inquiry only'
- Board Member inquiries should be shared with the Clerk who logs them and responses are shared with all Board Members
- To assure clarity of Board direction, pause and ask after each study session item for clarity. Specifically, the Chair and Director should assure a 'summary of direction' is completed before moving on to the next item.

Strategic Directives

- Strategic Directives (SD) must apply to all divisions
- Rates (competitive)
- Reliability
- Customer experience/expectations
- Financial sustainability
- Environmental leadership
- Employee relations
- Resource planning (IRP)
- Ethics
- Equity and Inclusion (workforce and digital)

Strategic Directives (cont'd)

- Economic development
- Resiliency (information management, enterprise risk management)
- Stakeholder engagement
- Government relations (Tribal included)
- Innovation (technology, products, smart city)
- Telecom
- Undergrounding/electrification of transportation/wholesale markets

Port Electrification

Indicative Shore Power Rate Design
Volkswagen Settlement Grant Proposal

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Shore power

Under current practice ships, at the Port of Tacoma use Marine Gas Oil (MGO) to supply onboard electric needs while in port

Shore power, also known as “Cold Ironing” or “Alternative Marine Power”, would use Tacoma Power electricity to supply ship electric needs while in port. Shore power has many benefits:

- New retail sales for Tacoma Power.
- Reduced carbon emissions for the Port of Tacoma.
- Lower operating costs for shipping lines.

Project Overview

Volkswagen Settlement Funds represent a generational opportunity for port electrification

- Settlement from diesel emissions cheating scandal.
- WA DOE has $112 million for emissions reductions.
- Up to 45% earmarked for marine vessels – BUT a significant portion will go to WA state ferries.

To create the strongest proposal possible Tacoma Power is asking the PUB to approve a resolution of support:

1. Directs utility staff to partner with the Port of Tacoma to pursue grant funding opportunities.
2. Supports an indicative rate design that eliminates the demand charge by increasing the energy charge and allows the energy charge to be reallocated to shipping lines by terminal operators.
3. Recognizes the actual rate will follow our standard rate making process.

Removing the demand charge is important

Projects at the Port of Tacoma involve multiple stakeholders, each with interests that do not necessarily align.

The Port of Tacoma acts as the landlord, leasing space at the port to terminal operators.

Terminal operators manage dock side operations, paying the Port for leased space and collect moorage fees from shipping lines. Terminal operators are responsible for paying the electric bill.

Shipping lines operate the ships that are unloaded by terminal operators. Shipping lines pay terminal operators moorage fees while unloading.

Demand charge makes it difficult for terminal operators to allocate costs to shipping lines. Recovering the demand charge as part of the kWh rate eliminates this barrier by simplifying cost allocation for terminal operators.

Proposed shore power indicative rate design

$0.108/kWh

Uniform per-kWh rate (demand charge included in $/kWh rate)

Shore power only

Recovers Schedule G	• Recovers schedule G revenue based on observed 2017-18 usage patterns.
Right to schedule	• Reserve the right to deny service due to availability or other system needs.
No capital recovery	• Assumes VW settlement pays 100% of the capital cost.
Right to allocate	• Rate will include language to allow terminal operators to allocate costs to shipping lines.

Volkswagen Settlement funding

$112,000,000

Up to 45% of funds anticipated marine vessel projects

What we know

- Department of ecology responsible for distributing funds; process and due date is in flux.
- Tacoma Power and the Port of Tacoma plan to submit a joint proposal(s) to maximize VW grant opportunities. **Port electrification is one of the most cost effective opportunities to reduce diesel particulate emissions.**
- The Washington State ferry system needs significant investment. VW settlement funds offer state policy makers a convenient funding source to mitigate the budget impact of state ferry modernization.

Strategy to pursue VW settlement funding

Basic port electrification proposal

Request funds to pay for port side infrastructure required for port electrification; includes funds for minor distribution system improvements.

Provide shore power to two ships at dock and plug-in 900 additional refrigerated containers.

~ $900,000/year revenue
~ 8,200 tons reduced emissions

Full port electrification proposal

Adds a new substation and additional port side infrastructure to the basic port electrification proposal; includes funds for major distribution system improvements.

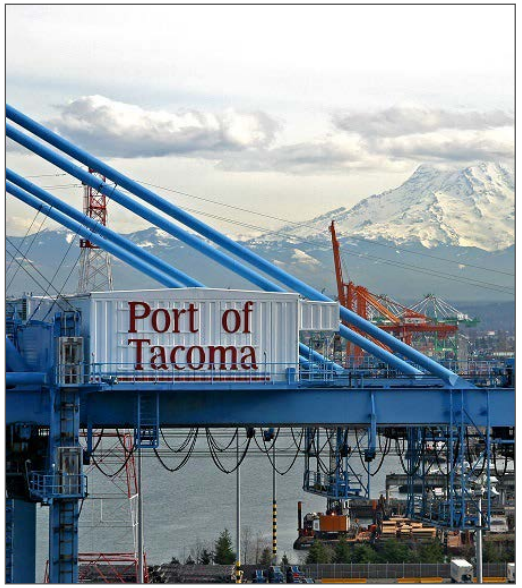
Provide shore power to six ships at dock and plug-in 1,100 additional refrigerated containers.

~ $1,410,000/year revenue
~ 12,000 tons reduced emissions

Strategy in absence of VW funding

In absence of VW settlement funding, we plan an incremental approach

Extend our partnership with the Port of Tacoma to pursue port electrification through a combination of small grants, port investment, or other financial mechanisms. Opportunities include DERA (Diesel Emissions Reduction Act) and the Washington Department of Commerce Clean Energy Fund.



Regardless of the VW settlement grant funding outcome, Public Utility Board support of our indicative rate design demonstrates commitment to shore power and will be helpful in pursing other grant opportunities.

Asking for approval of resolution

Our supportive resolution:

1. Directs utility staff to partner with the Port of Tacoma to pursue grant funding opportunities.
2. Supports an indicative rate design that eliminates the demand charge by increasing the energy charge and allows the energy charge to be reallocated to shipping lines by terminal operators.
3. Recognizes the actual rate will follow our standard rate making process.

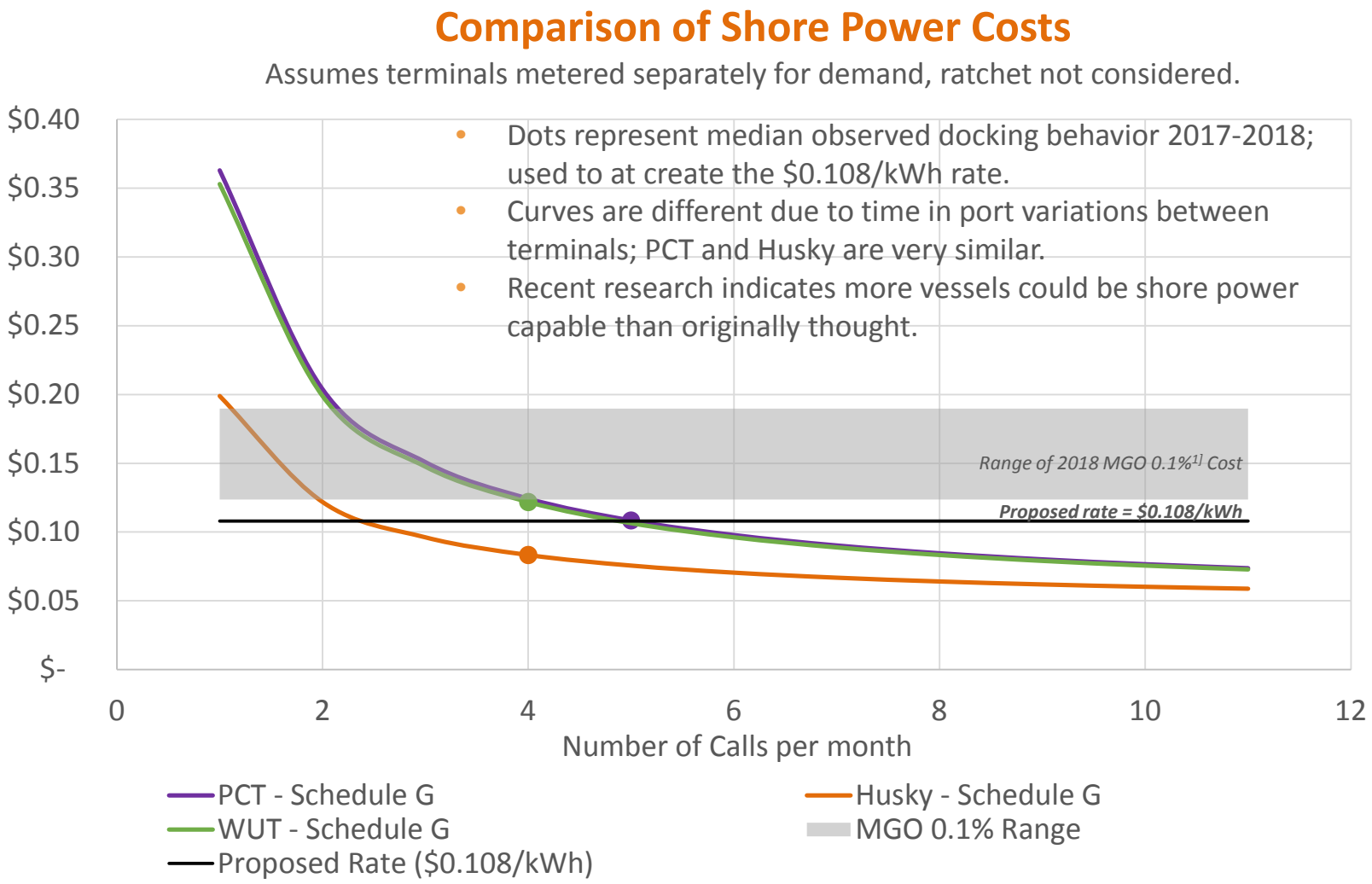
Once the resolution is approved:

1. Create a project team responsible for grant writing and coordination with the Port of Tacoma.
2. Continue to search for electrification opportunities with the Port of Tacoma. Currently examining cargo handling and drayage opportunities.
3. Submit grant proposals as funding becomes available.

Thank You

Details

Indicative rate design methodology



[1] Lowest MGO 0.1% price observed in Vancouver (BC Jan 3, 2019). 2018 MGO 0.1% prices are extremely volatile, ranging between $608/ton ($0.129/kWh) and $820/ton ($0.185/kWh). MGO 0.1% price will likely increase in the future with additional environmental requirements.

Strategy details

Terminal	Partial funding proposal (May be done incrementally w/o funding)	Full funding proposal (Requires new substation)
Pierce County Terminal (PCT)	• Shore power for two berths, but only one may be used at a time. • Add refrigerated container plugs (Add 400. New total 1000.)	• Shore power for two berths • Add refrigerated container plugs (Add 400. New total 1000.)
Grand Central Peninsula (GCP)		• New substation (20 MW?) • Charging infrastructure for cargo handling equipment and vehicles
Husky Terminal	• Shore power for two berths, but only one may be used at a time • Add refrigerated container plugs (Add 400. New total 1000.)	• Shore power for two berths • Add refrigerated container plugs (Add 400. New total 1000.)
Washington United Terminal (WUT)		• Shore power for two berths • Additional reefer plugs (Add 200. New total 1000.)
TOTE Terminal	• Add 100 refrigerated container plugs	• Add 100 refrigerated container plugs
Summary	• Gross revenue estimate = $900,000/year • Carbon reduction estimate = 8,200 tons **Total Grant Request** ~$150,000 TP Side of meter ~$8,850,000 Port side of the meter **~$9,000,000 Total**	• Gross revenue estimate = $1,410,000/year • Carbon reduction estimate = 12,000 tons **Total Grant Request** ~$7,000,000 TP Side of meter ~$14,680,000 Port side of the meter **~$21,680,000 Total**

Tacoma Power

Wholesale Market Trends / Energy Imbalance Market

Clay Norris, Power Manager

Gareth Tomlinson, Real-Time Energy Trader

February 13, 2019

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Agenda

1 Introduction

2 Generation

3 Load

4 Centralized Wholesale Markets

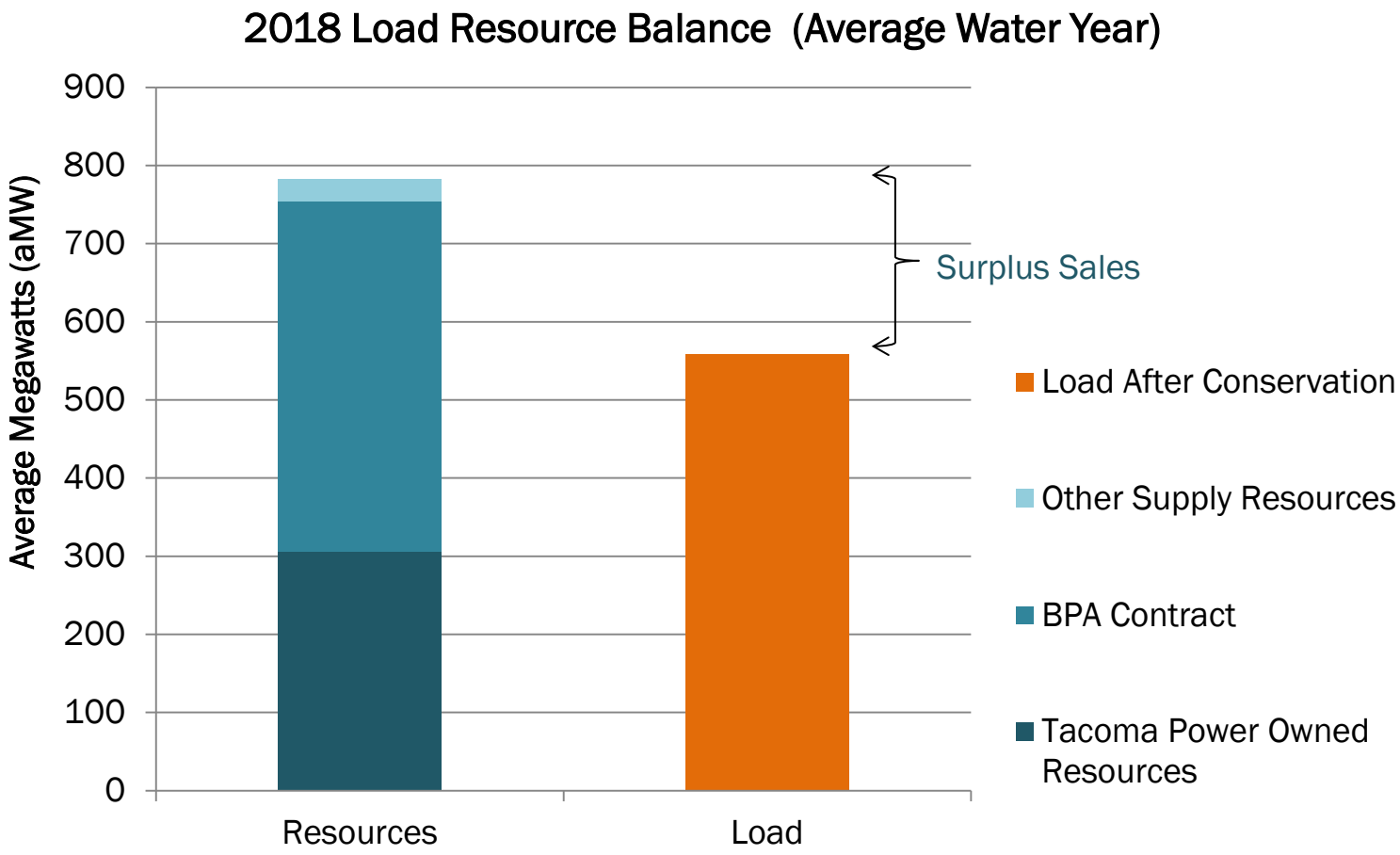
5 Bilateral Wholesale Markets

6 Next Steps

Introduction

Section 1

Why We Care About Wholesale Markets (part 1)



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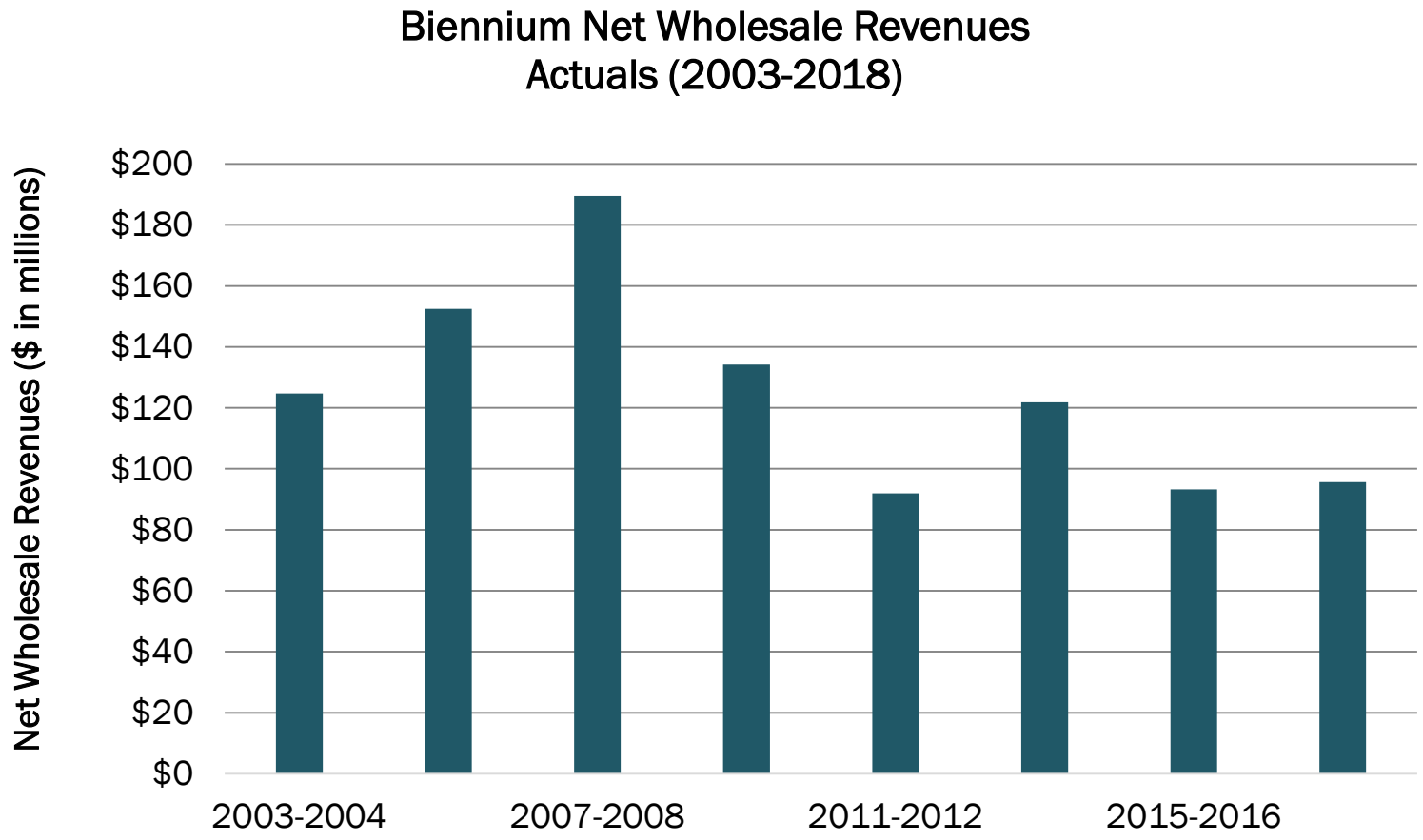
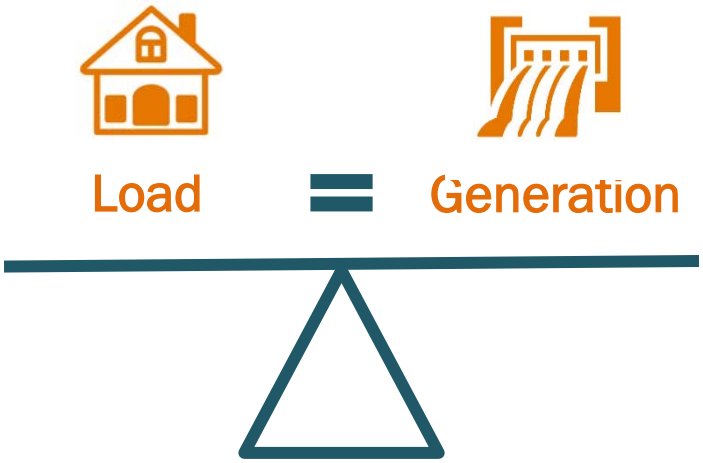
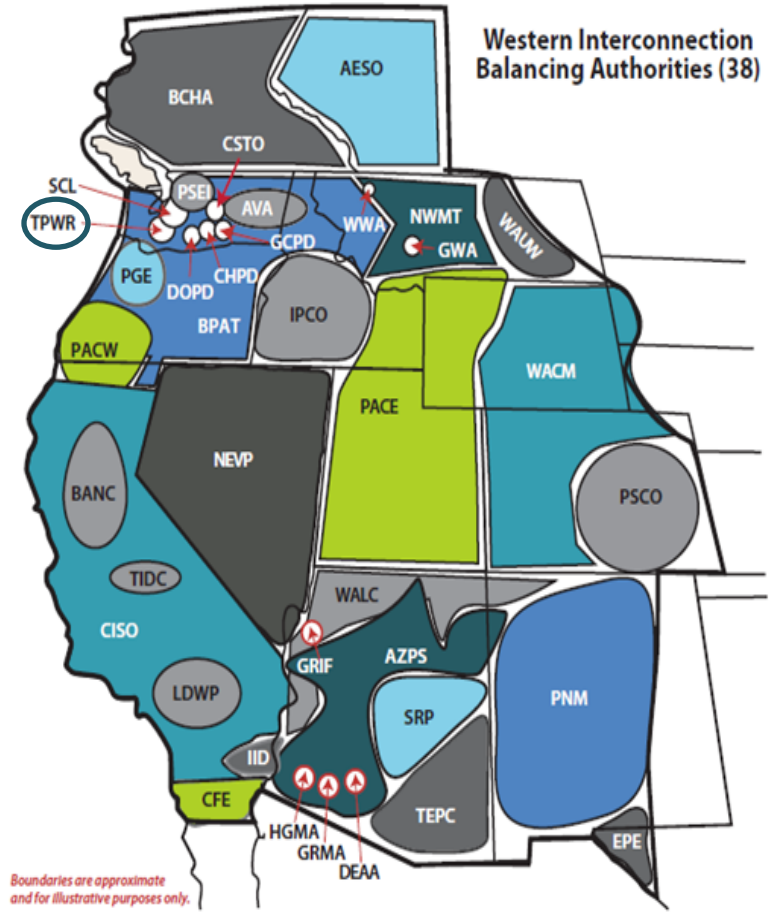
Why We Care About Wholesale Markets (part 2)



Why We Care About Wholesale Markets (part 3)





Source: Western Electricity Coordinating Council

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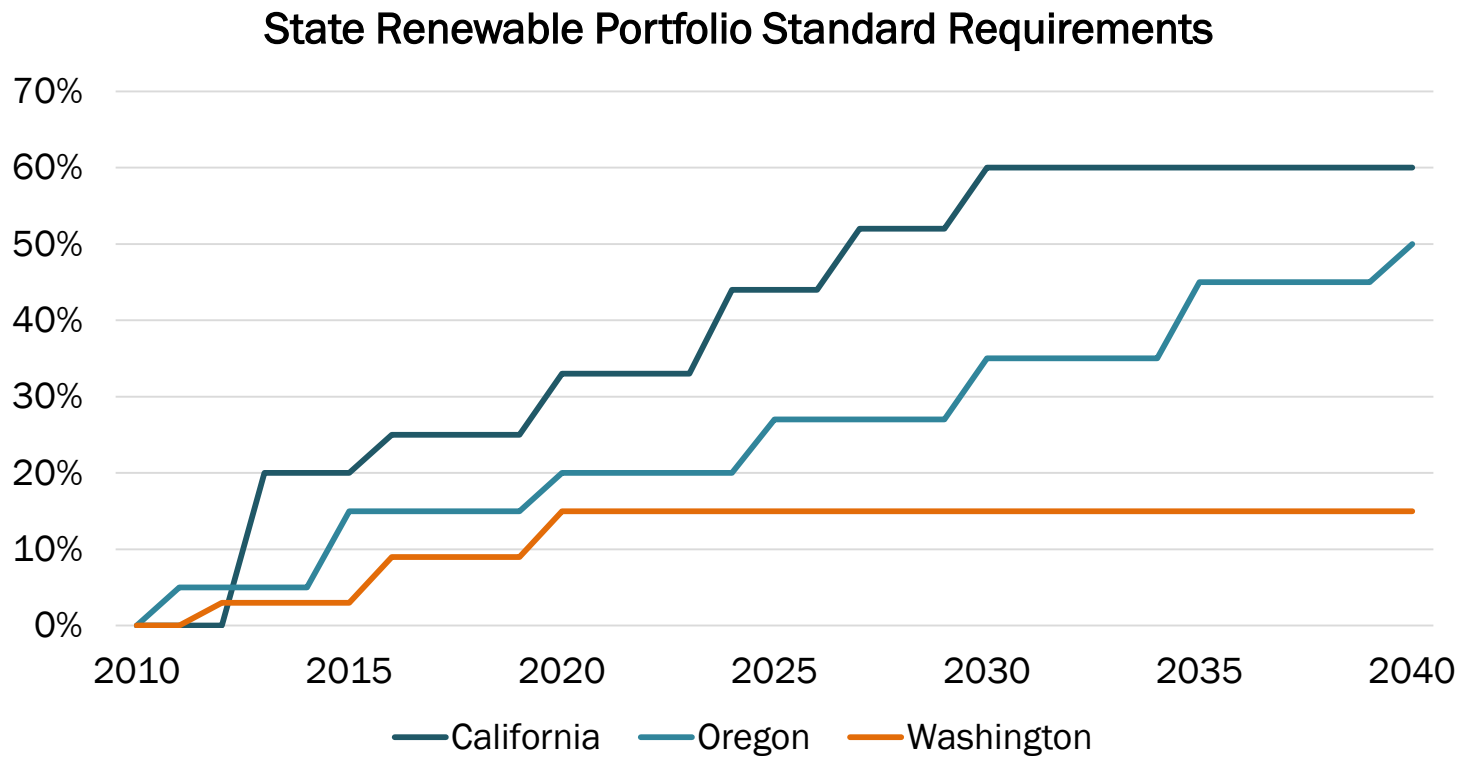
Generation

Section 2

Renewable Generation is Increasing



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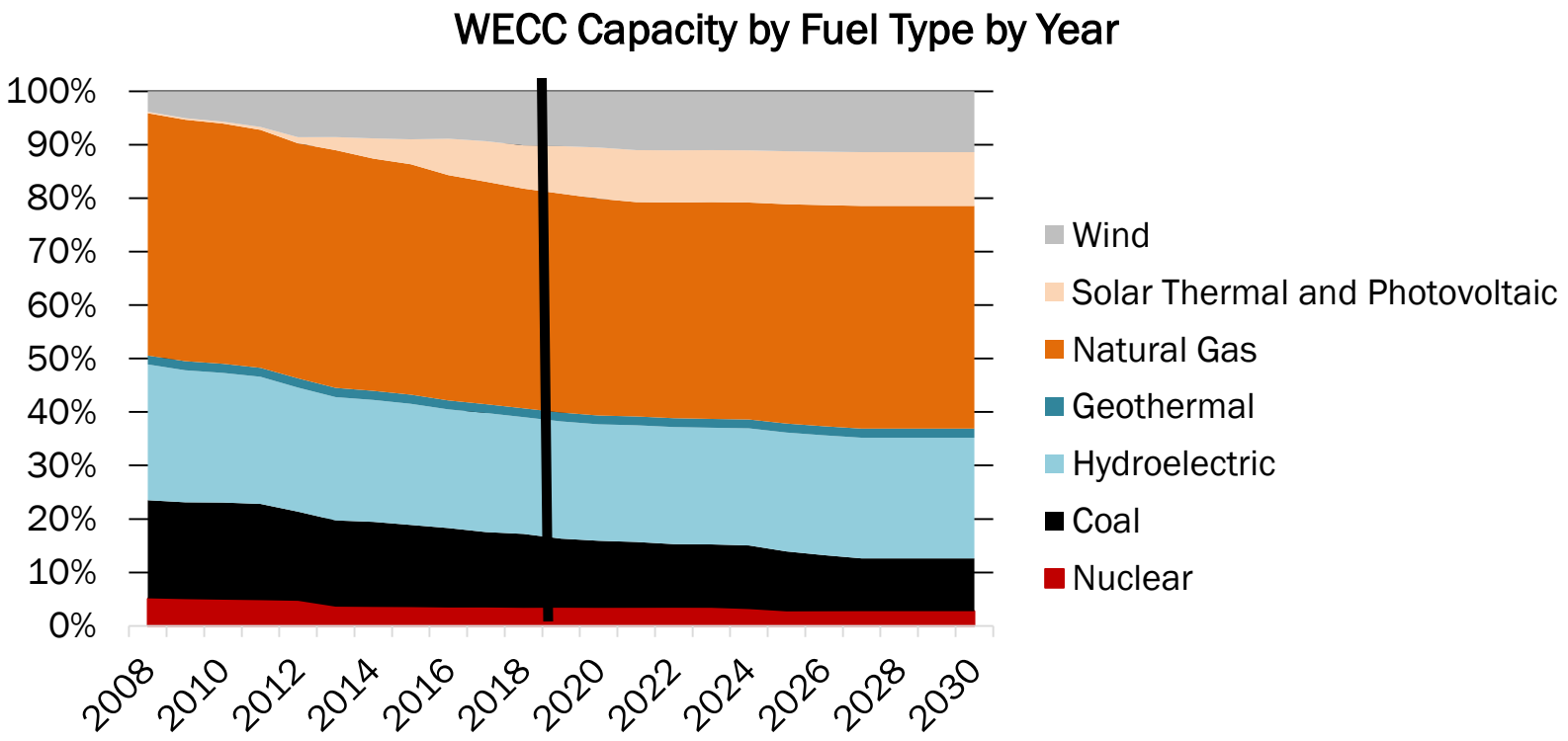
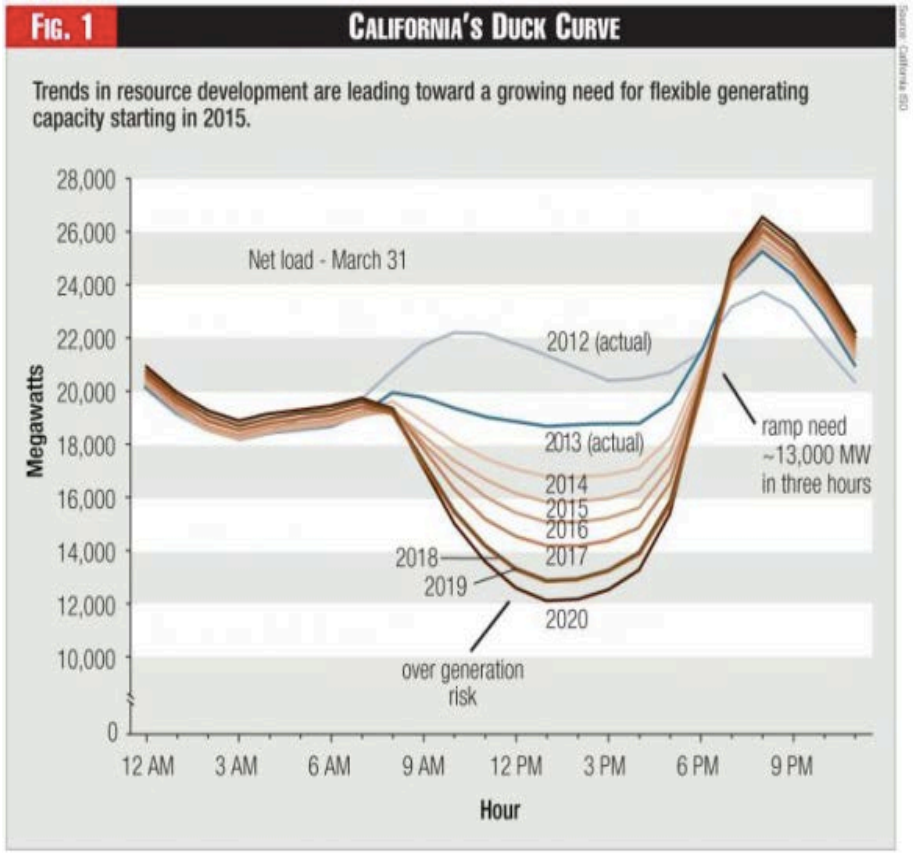
The Generation Mix Is Changing



Source: EIA, Retiring Gen-https://www.eia.gov/electricity/monthly/epm_table_grapher.php?t=epmt_6_06
Planning Gen - https://www.eia.gov/electricity/data/eia860/

California's Duck Curve and Impacts



Impacts of Duck Curve

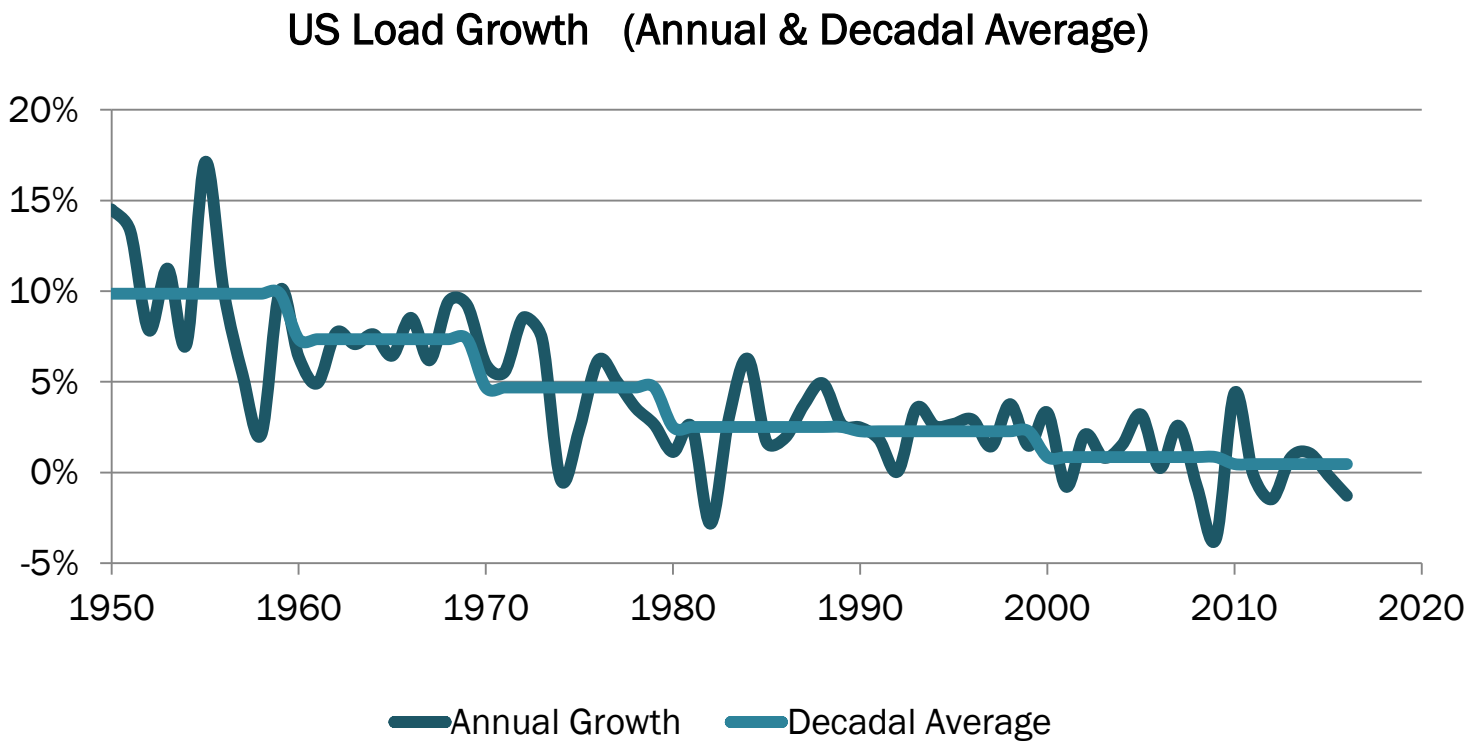
Mid-day markets are often lower than the night-time markets. Historically the lowest price periods were from midnight through 5am

Tacoma Power can use its resource flexibility to take advantage of this changing market provided there is sufficient market liquidity

LOAD

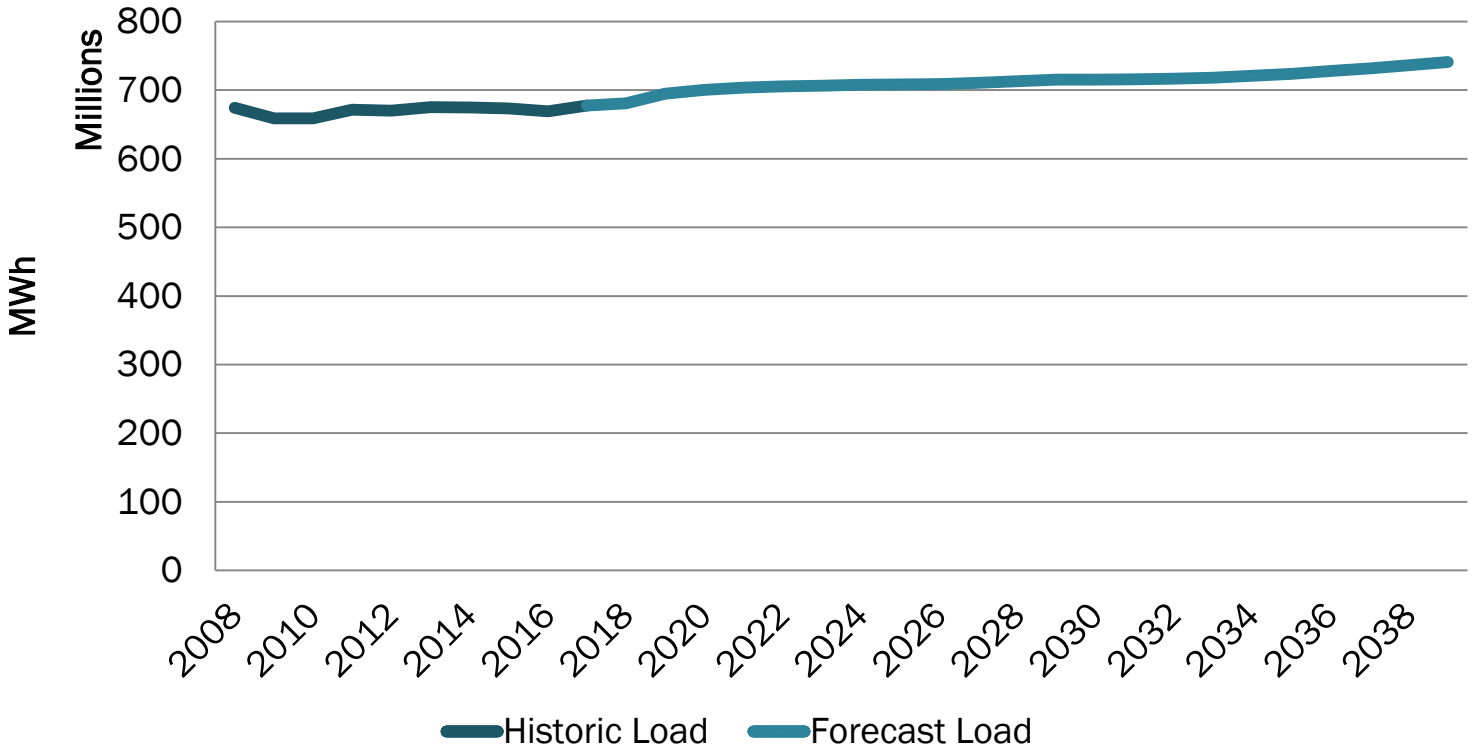
Section 3

US Load Growth Is Declining



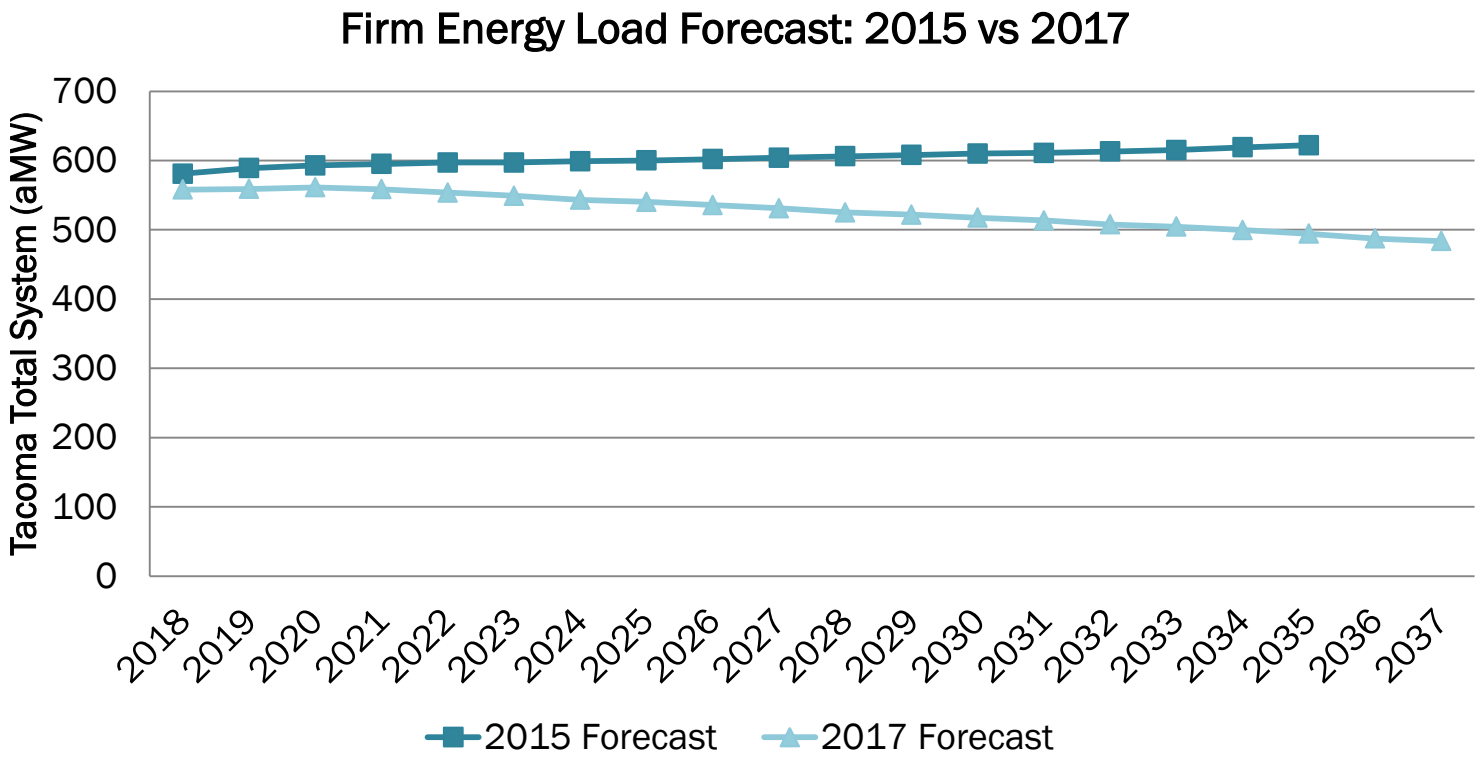
Source: "Table_7.2b_Electricity_Net_Generation__Electric_Power_Sector", EIA, https://www.eia.gov/totalenergy/data/monthly/#electricity

WECC Historic and Projected Load



Source: "Retail Sales of Electricity by State by Sector by Provider", EIA https://www.eia.gov/electricity/data/state/ and EIA Annual Energy Outlook

Tacoma Power Load Forecasts



CENTRALIZED WHOLESALE MARKETS

Section 4

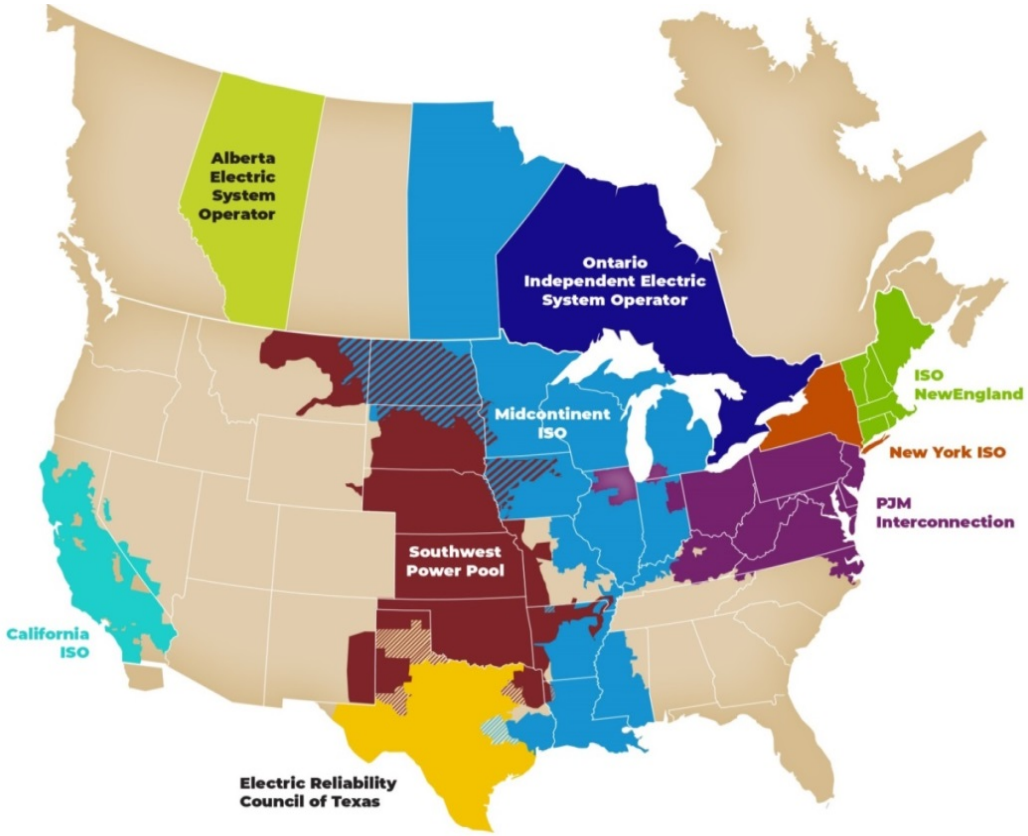
RTOs & ISOs

Centralized, organized markets are managed by regional oversight entities called Regional Transmission Organizations (RTOs) and Independent System Operators (ISOs) that:

- Facilitate competition among wholesale suppliers
- Provide non-discriminatory access to transmission by scheduling and monitoring the use of transmission
- Perform planning and operations of the grid to ensure reliability
- Oversee competitive energy markets to guard against market power and manipulation

Increasingly (and especially in WECC) centralized markets are used to integrate renewable generation

Current Map of ISOs/RTOs in North America



California ISO (CAISO)

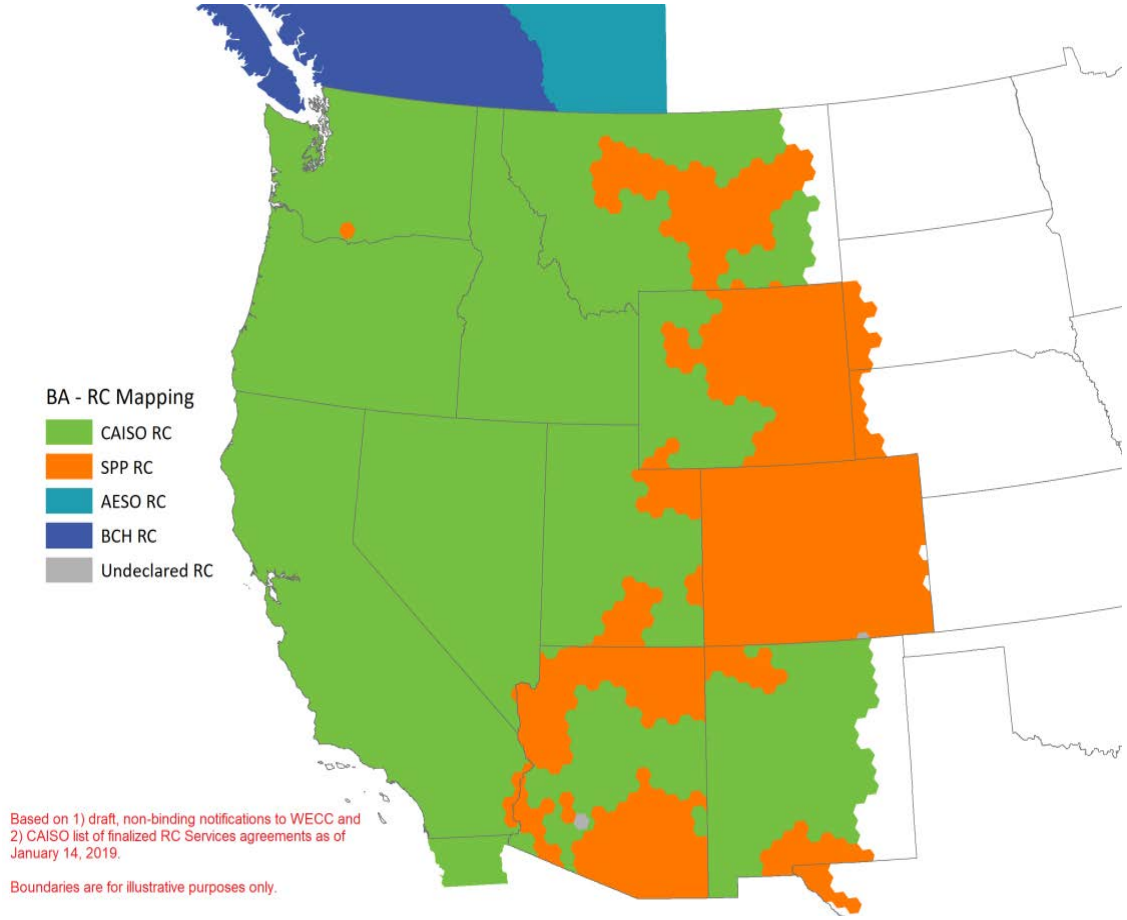
An Independent System Operator (ISO) that provides:

- Open and non-discriminatory access to the bulk transmission grid
- A competitive wholesale energy market regulated by FERC
- Reliable operation of the bulk power grid in compliance with NERC reliability standards
- Governed by a 5-member Board of Governors appointed by governor of California

Why Do We Care About the CAISO?

1. CAISO will become Tacoma Power's NERC-certified Reliability Coordinator (RC) in November 2019
2. We currently participate in CAISO's Day-Ahead and Real-Time markets as a CAISO-certified Scheduling Coordinator
3. California is a significant share of the electricity market
4. CAISO's Energy Imbalance Market (EIM) continues to expand into the Northwest
5. Bonneville Power Administration (BPA) appears likely to join the EIM in 2022

CAISO is the Primary RC in WECC



CAISO's Two Clearing Markets

Day-Ahead Energy Market

- Enables parties to schedule contracted supply/demand
- Enable Load Serving Entities to secure pricing for load
- Commits the most cost-effective and reliable mix of generation for the region

Real-Time Energy Market

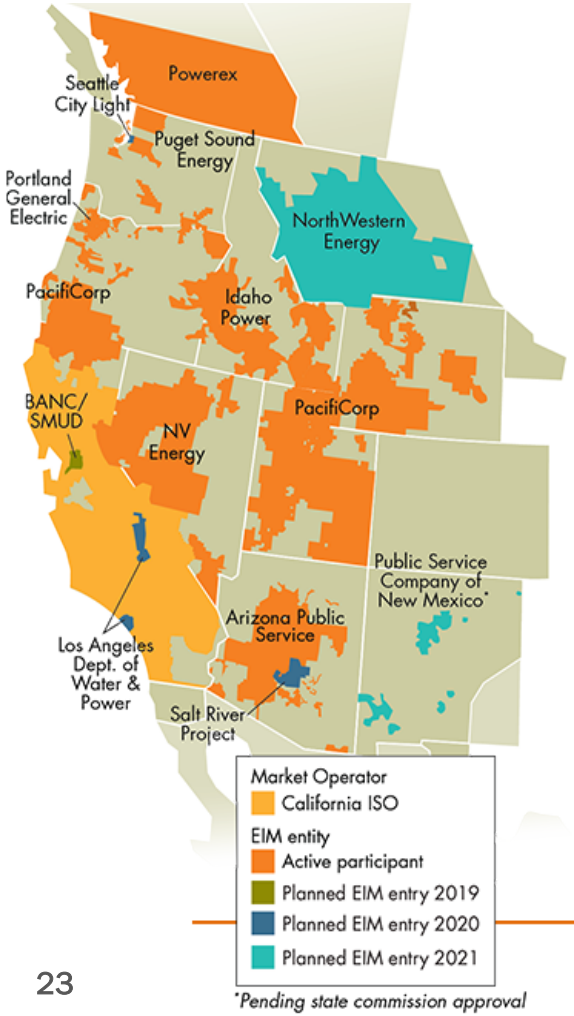
- Economically dispatches generation to balance real-time generation and load, while ensuring system reliability.
- Composed of:
  - 15-min market supports intra-hour variability
  - 5-min market intended to meet instantaneous demand
  - Hour-ahead scheduling for intertie resources

Note: EIM overlaps with CAISO's 15-min & 5-min Real-Time Energy Market.

CAISO's Energy Imbalance Market

- CAISO's EIM is an extension of the CAISO's real-time energy market footprint.
- CAISO's EIM improves the balancing of supply and demand within the hour by automatically finding lower cost resources from across a larger region to meet real-time power needs.
- EIM participants:
  - maintain operational control over their generating resources
  - retain all their obligations as BAs, TOPs and TSPs
  - must still comply with all applicable NERC reliability standards
- If Tacoma joins the EIM our obligation to comply with reliability standards, our transmission scheduling rights and our bilateral market trades would not change or go away.

Participants in the CAISO EIM



- Powerex and Idaho Power joined in 2018
- BANC/SMUD plans to join in 2019
- Seattle City Light, Salt River Project, and Los Angeles Dept. of Water & Power plan to join in 2020
- NorthWestern Energy and Public Service Company of New Mexico will join in 2021
- BPA has indicated a likelihood they will join in 2022

Bilateral Wholesale Markets

Section 5

Types of Bilateral Transactions

Term Trading

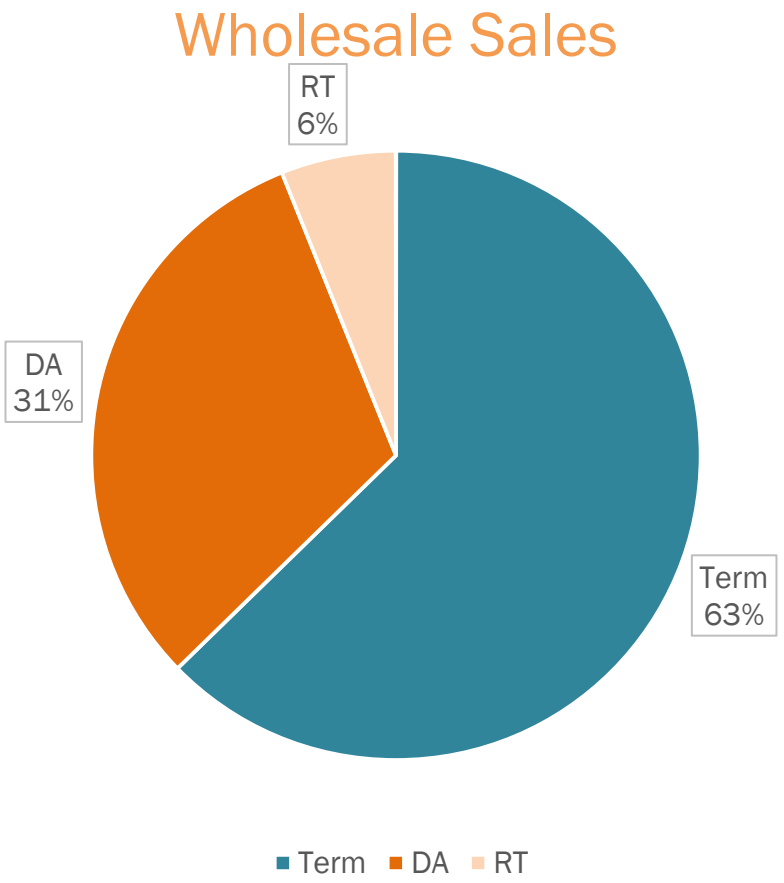
- Monthly and Quarterly Transactions up to 24 Months in the Future

Near-Term Trading

- Day-Ahead through Balance-of-the-Month

Real-Time Trading

- Hour-Ahead through 24 hours
- Maintain reliability
- Manage resource constraints



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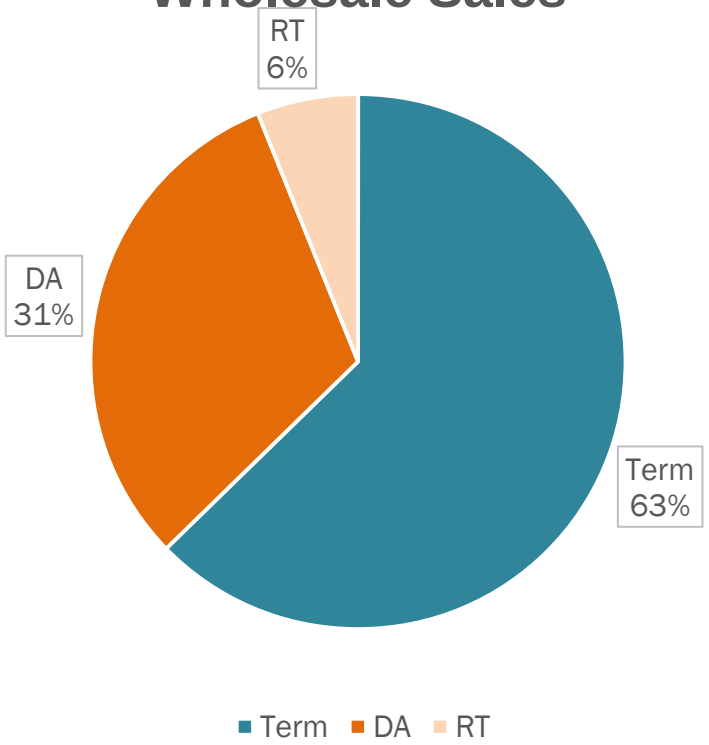
What the Real-Time Trader Does

- Balances Resources and Load
- Manages Reservoirs in Real-time
- Optimizes the Resource Portfolio

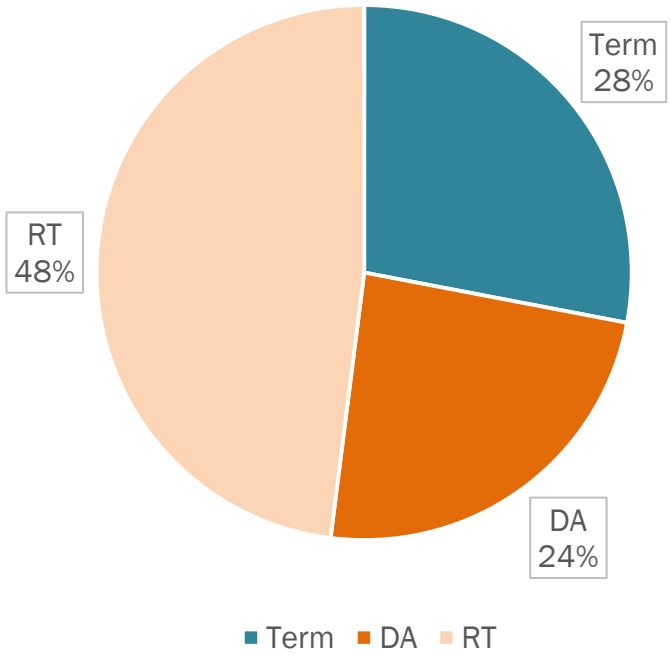
What the Real-Time Trader Does

Bilateral Wholesale Markets

Wholesale Sales



Wholesale Purchases



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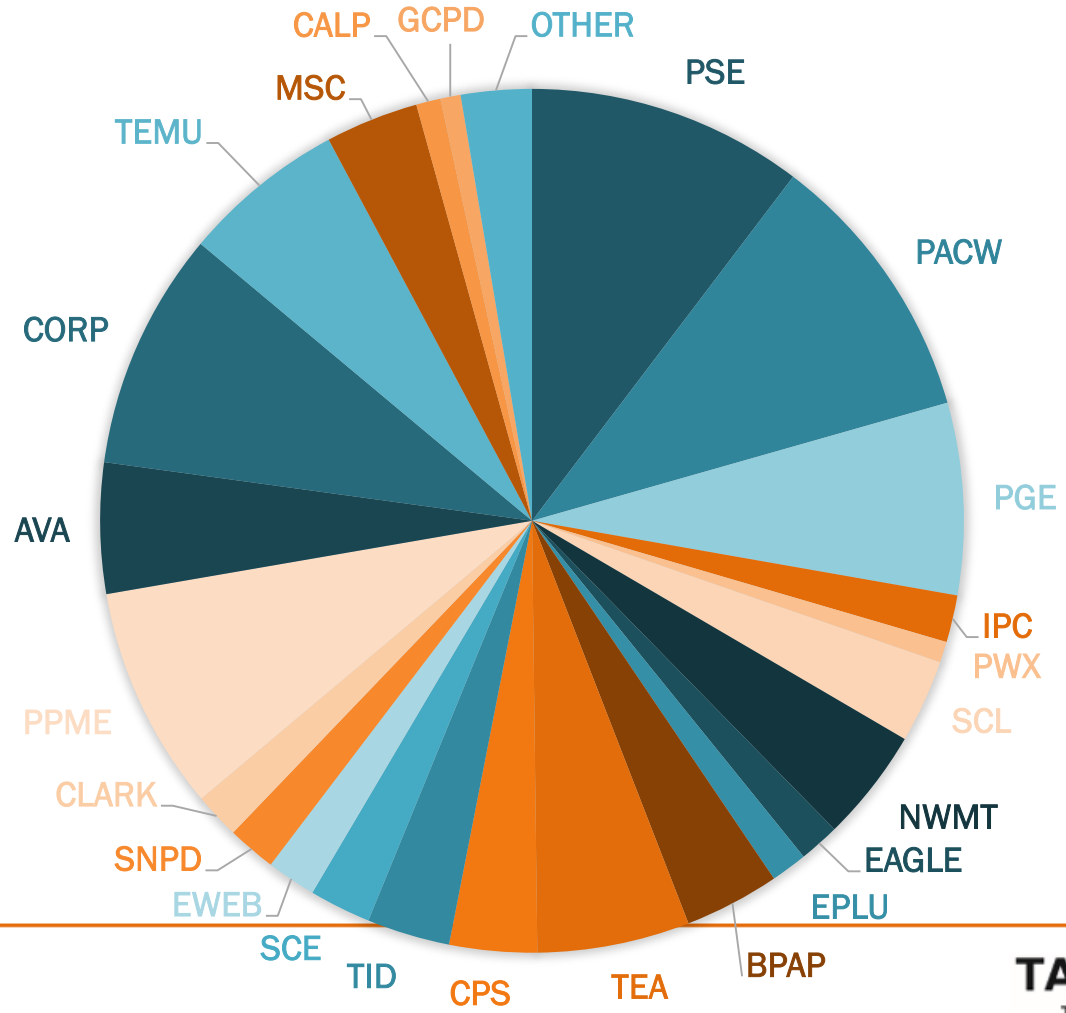
Total Real-Time Volume by Counterparty, Last 5 Years



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Trading Deadlines Have Changed for EIM Participants

Historic Hour-Ahead Trading Deadline

Prior to EIM, all hour-ahead transactions could be made up to 20 minutes before the upcoming hour

EIM Trading Deadlines

EIM participants must complete hour-ahead transactions by 75 minutes before the upcoming hour

Liquidity Impact of EIM Deadlines

As more parties join the EIM, there are less counterparties that are able to transact after the 75 minute deadline

Tacoma Power has begun running the resources more conservatively because of the limit of counterparties that are able to transact in the near real-time

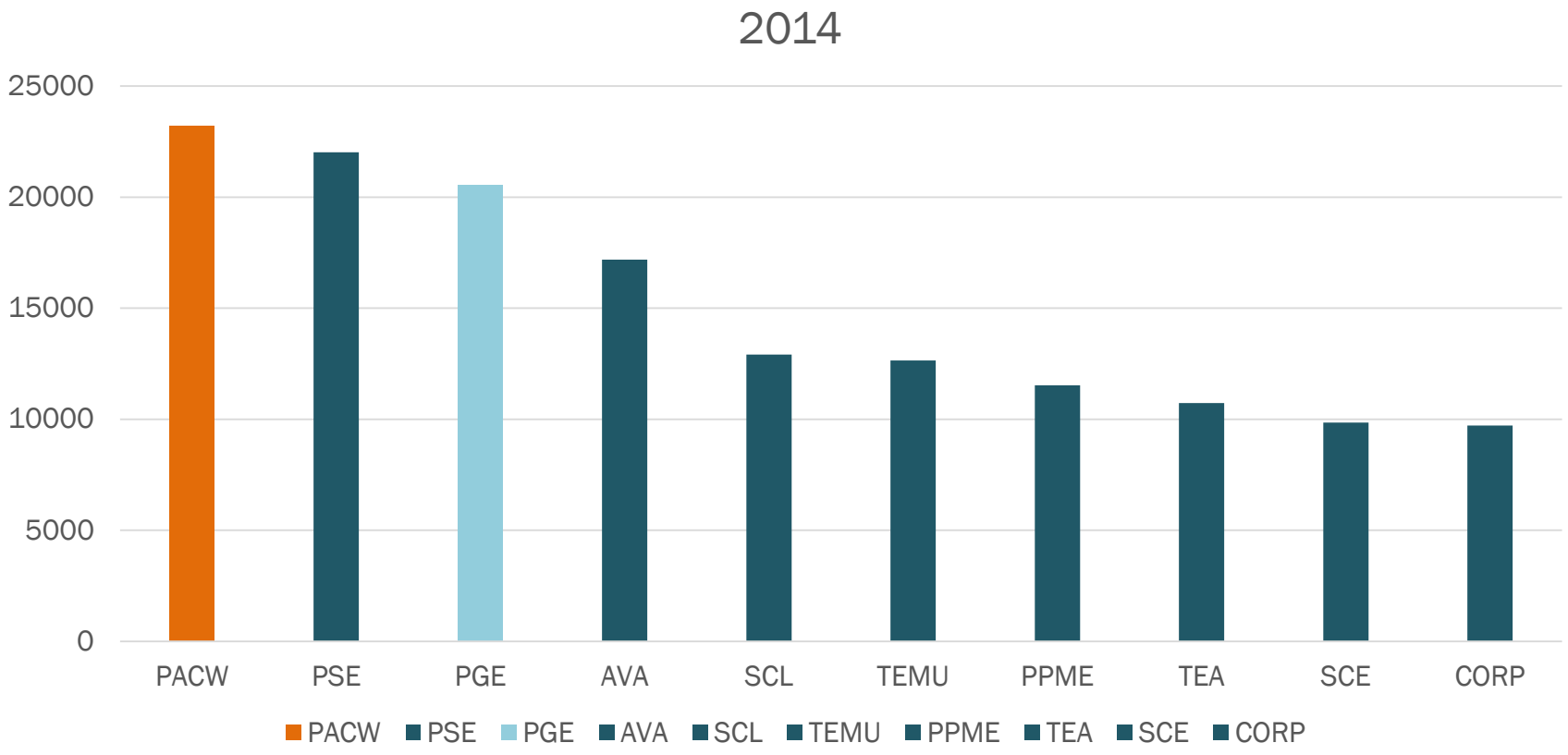
How Have Real-time Counterparties Changed?

PACW
Pacificorp

PGE
Portland

Others

Bilateral Wholesale Markets



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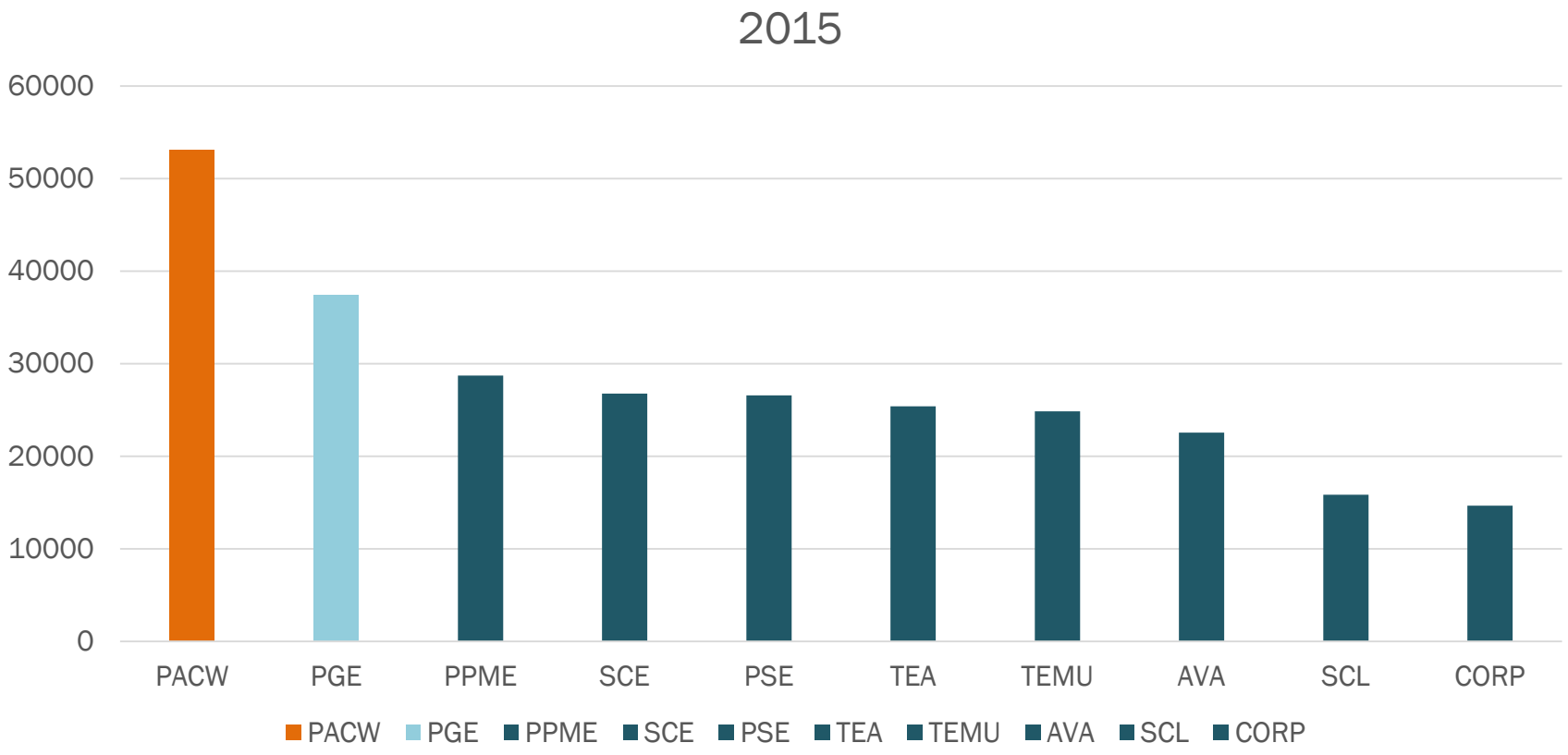

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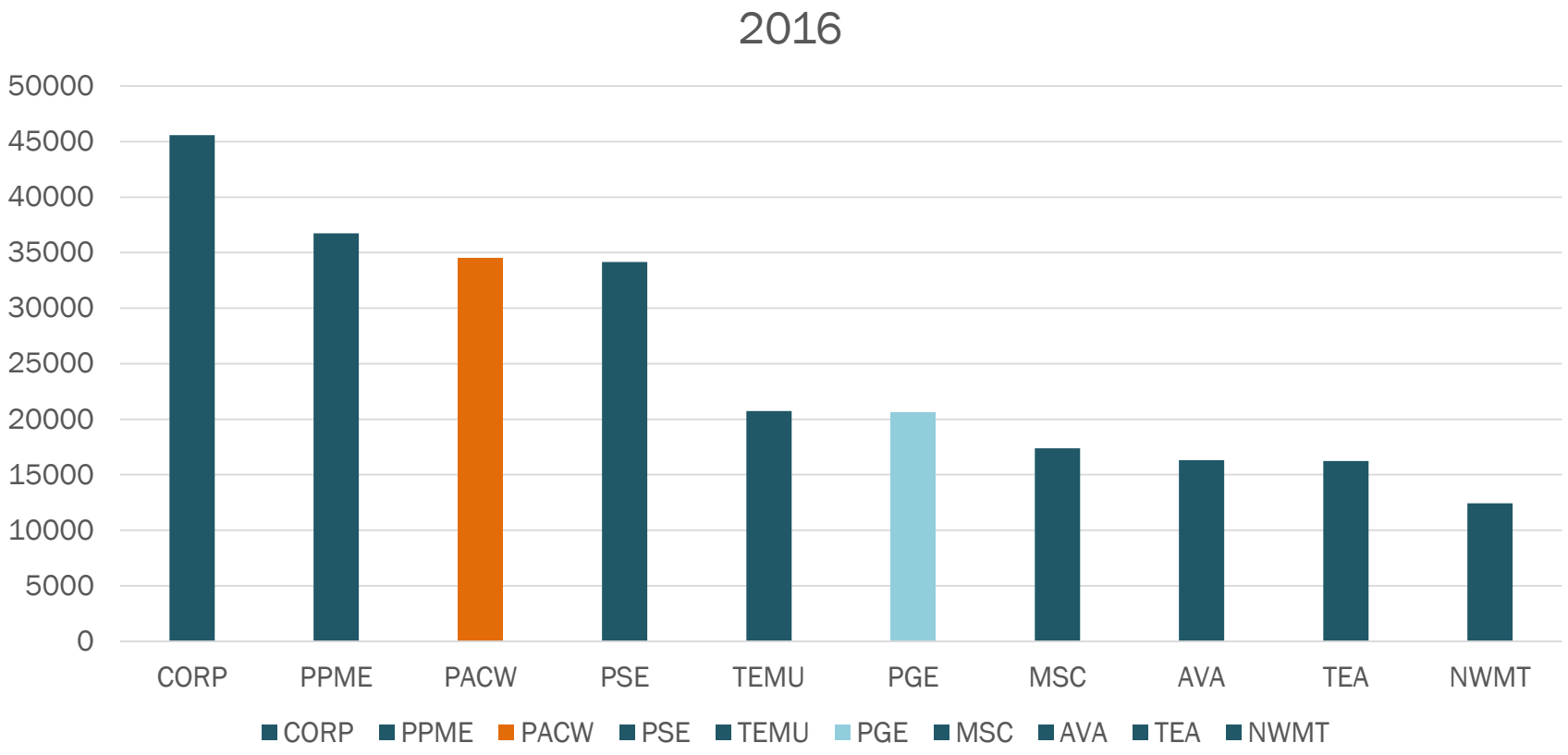
Bilateral Wholesale Markets



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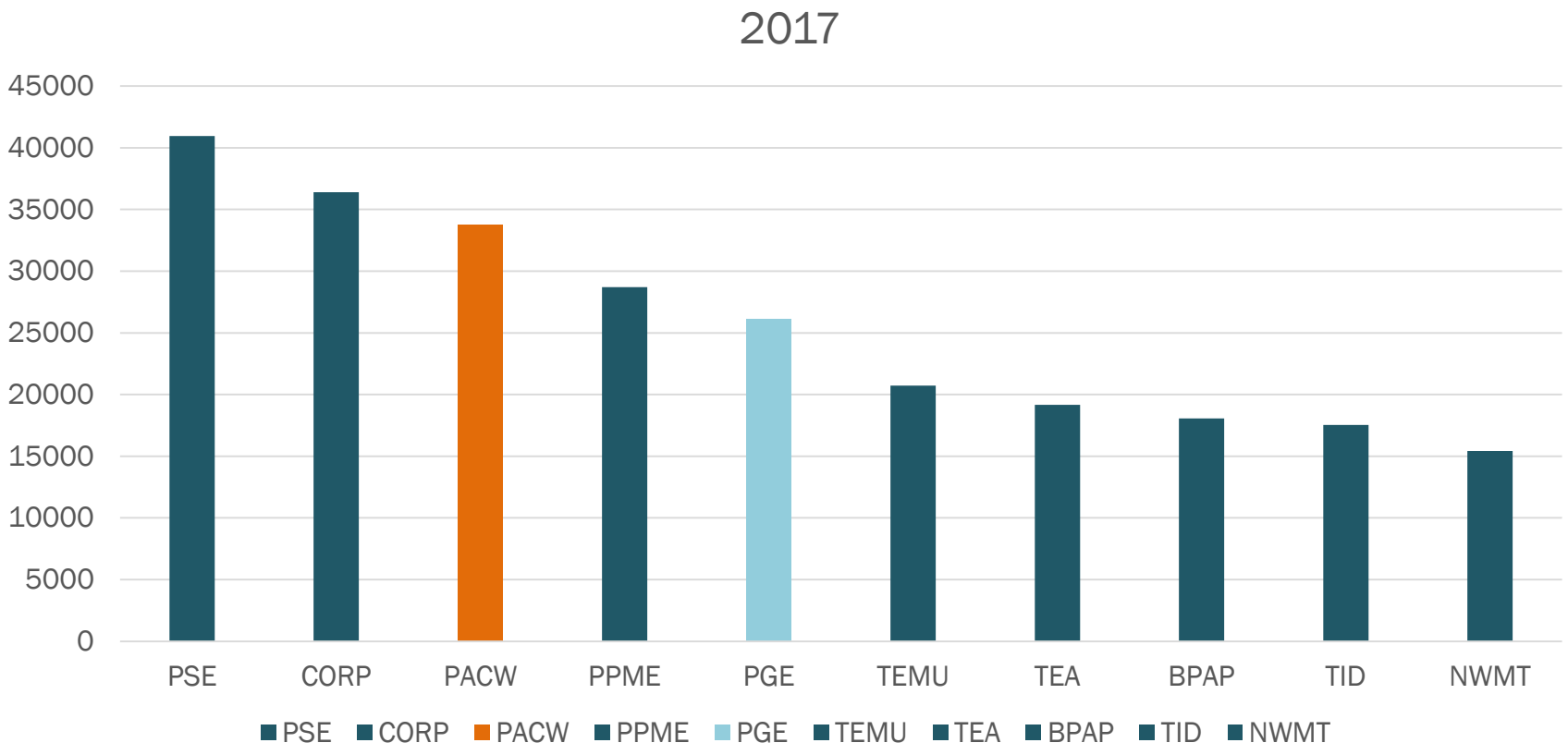

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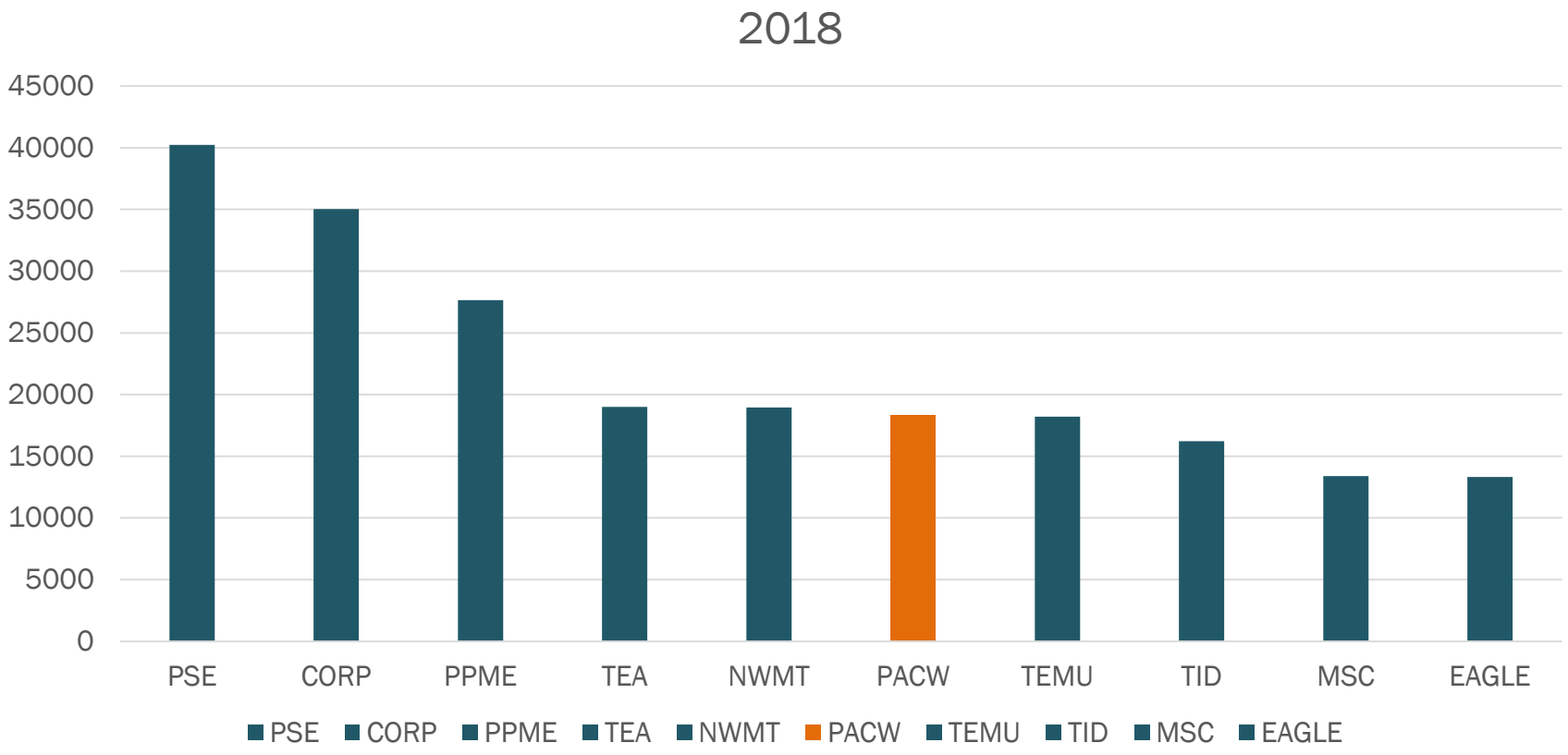
Bilateral Wholesale Markets



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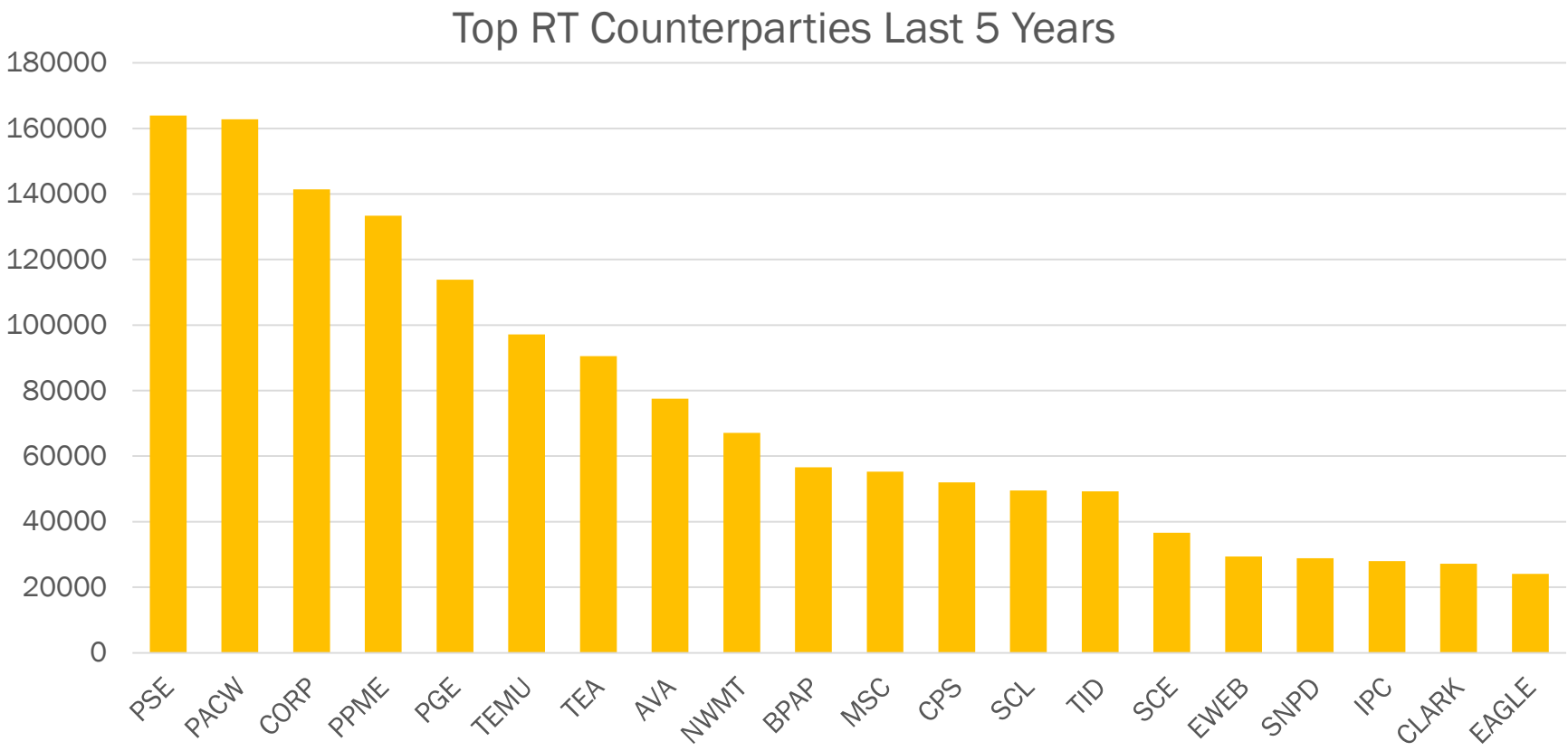
Bilateral Wholesale Markets



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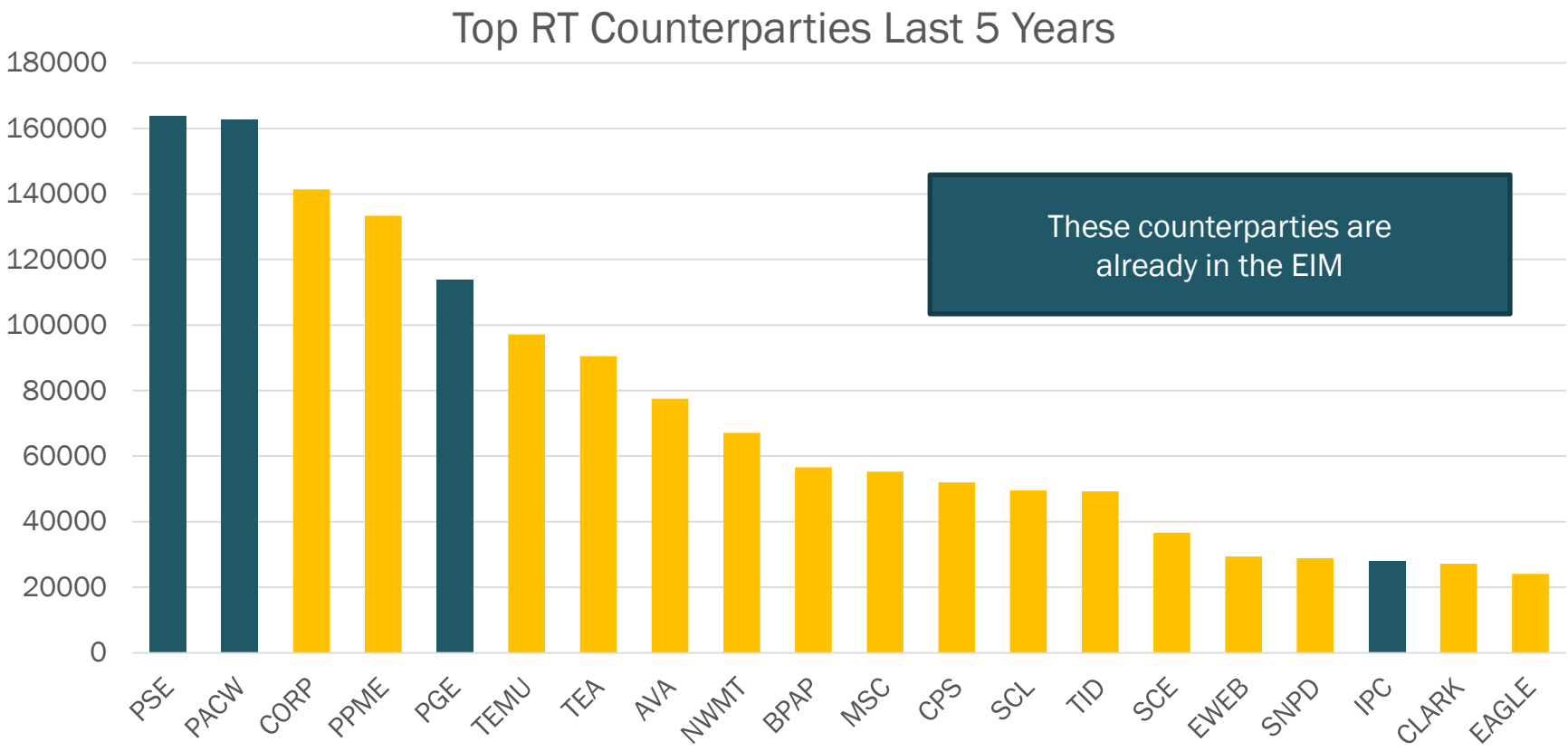

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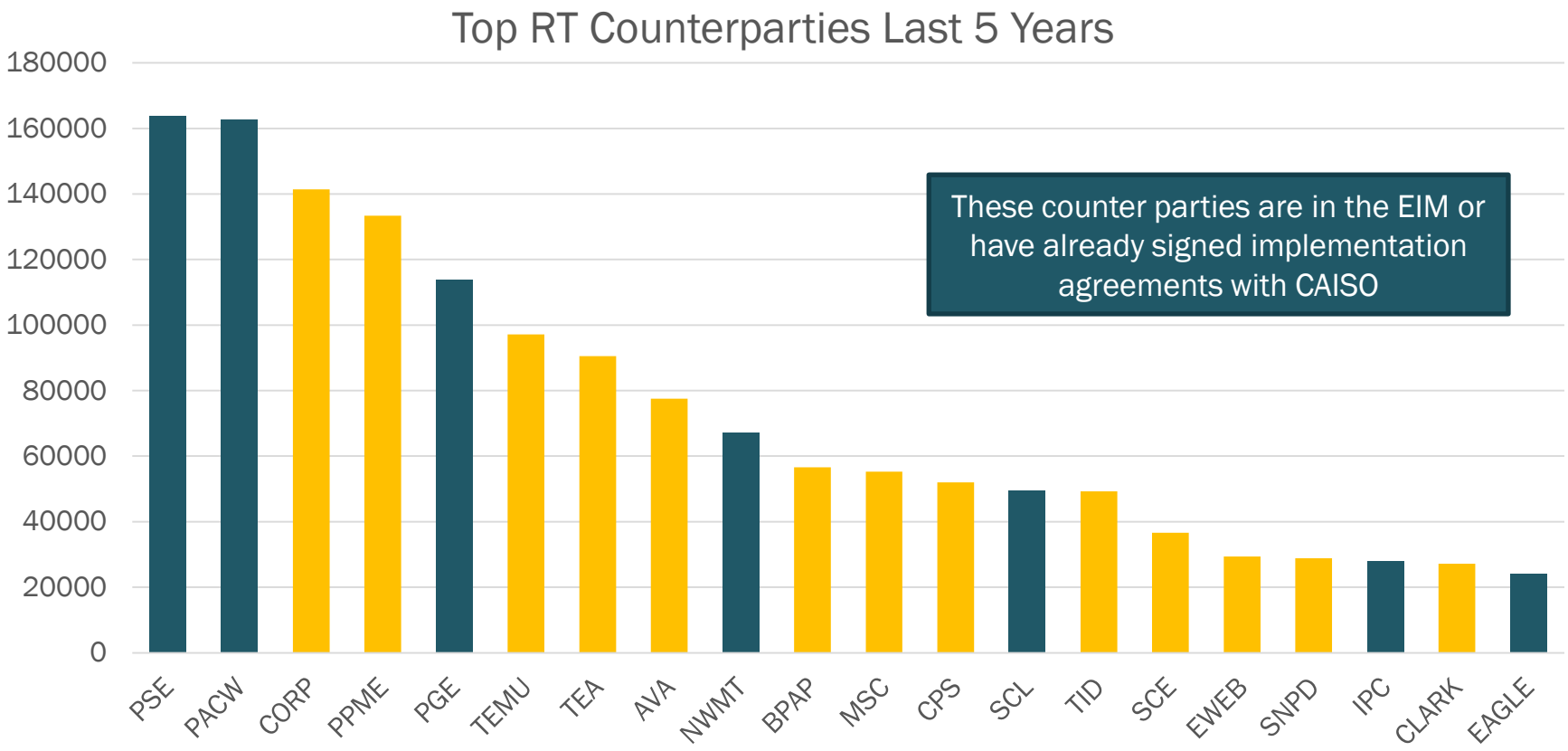
Bilateral Wholesale Markets



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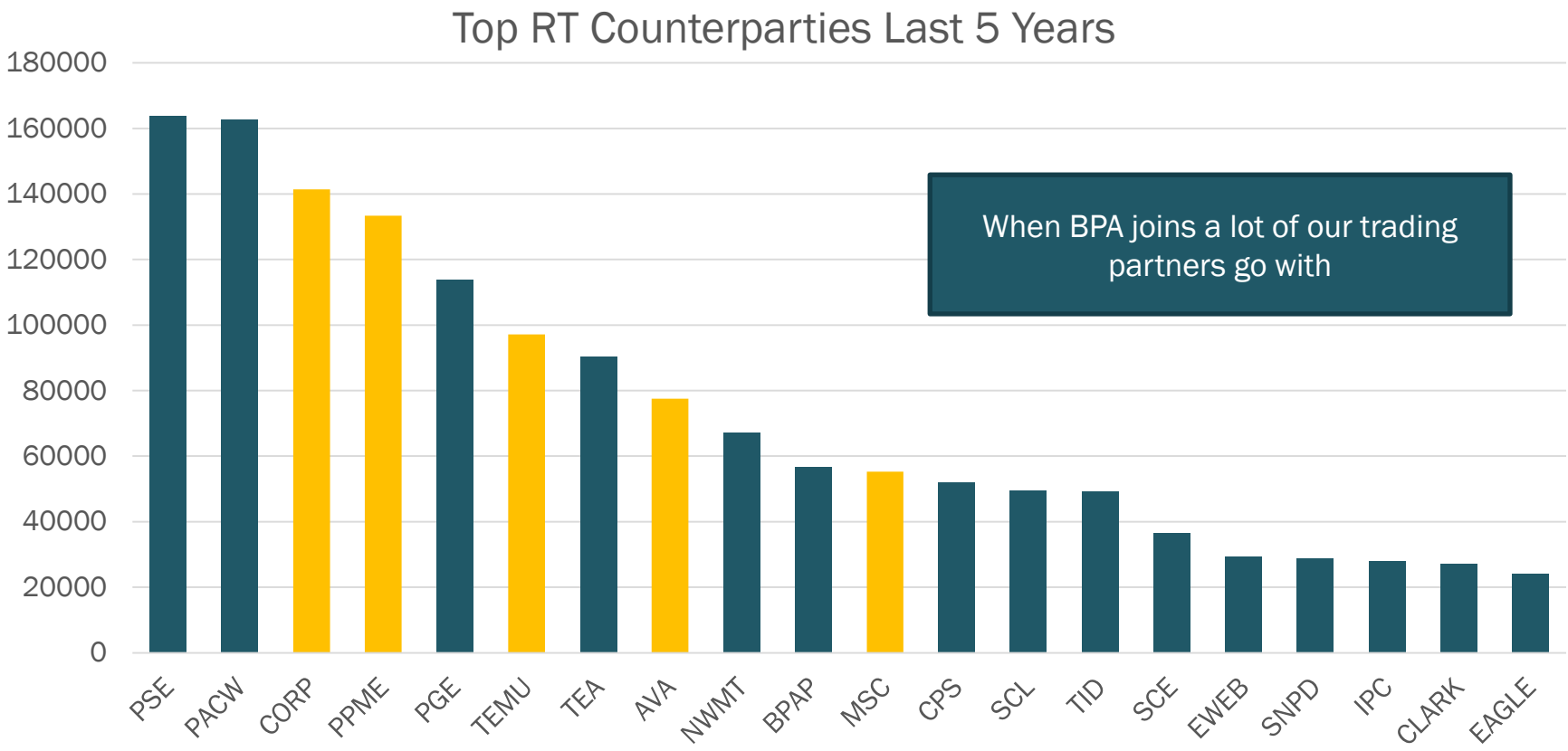

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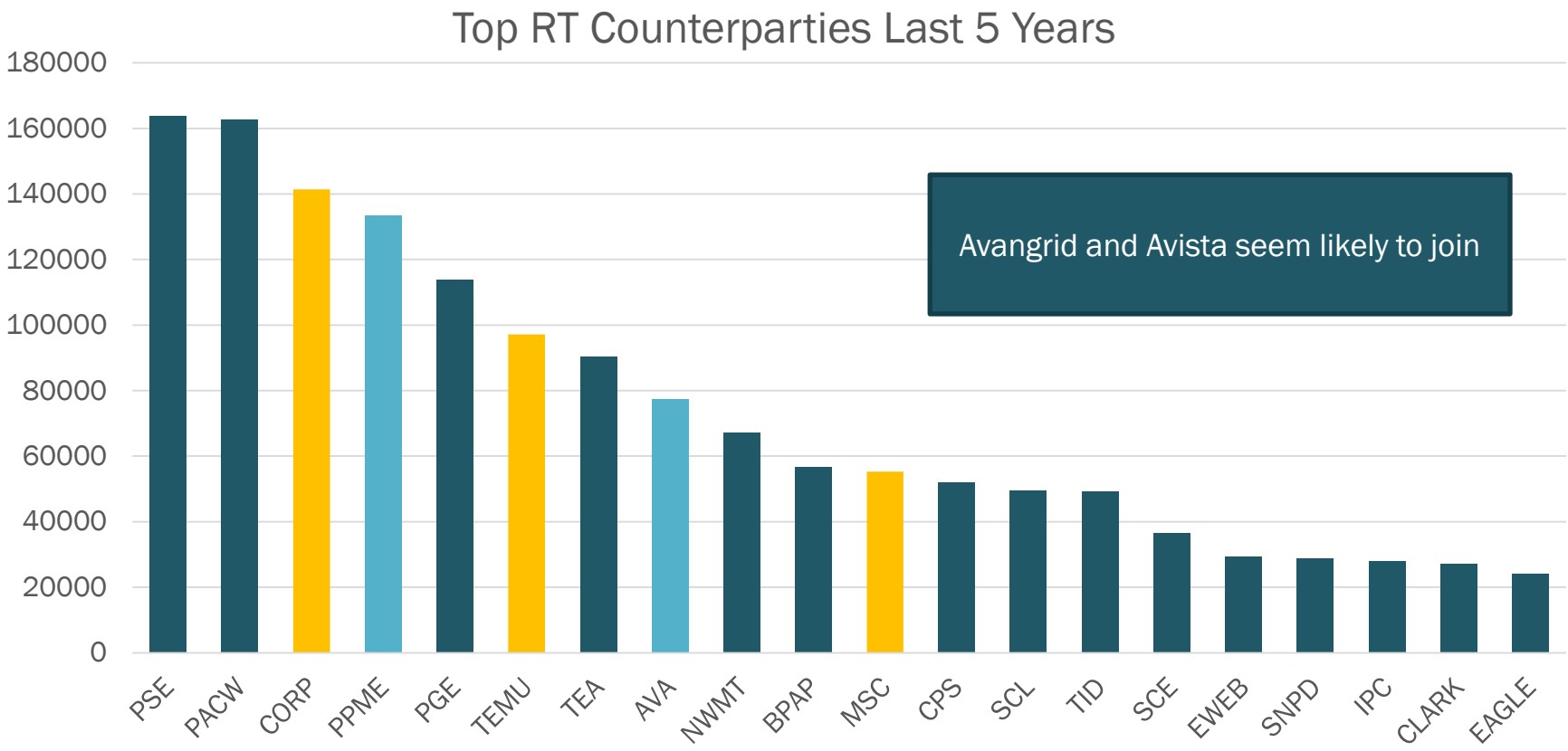
Bilateral Wholesale Markets



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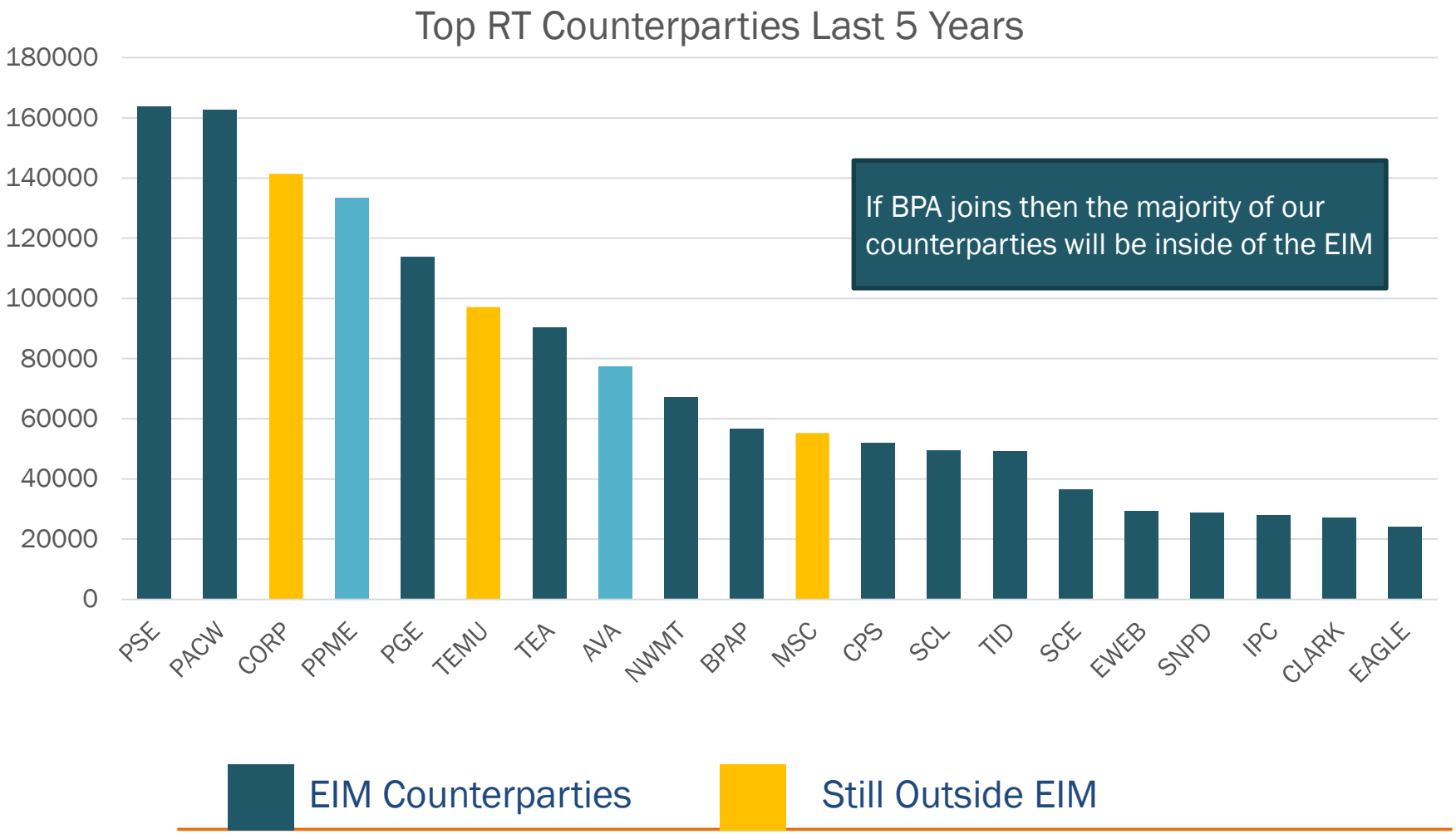
Bilateral Wholesale Markets



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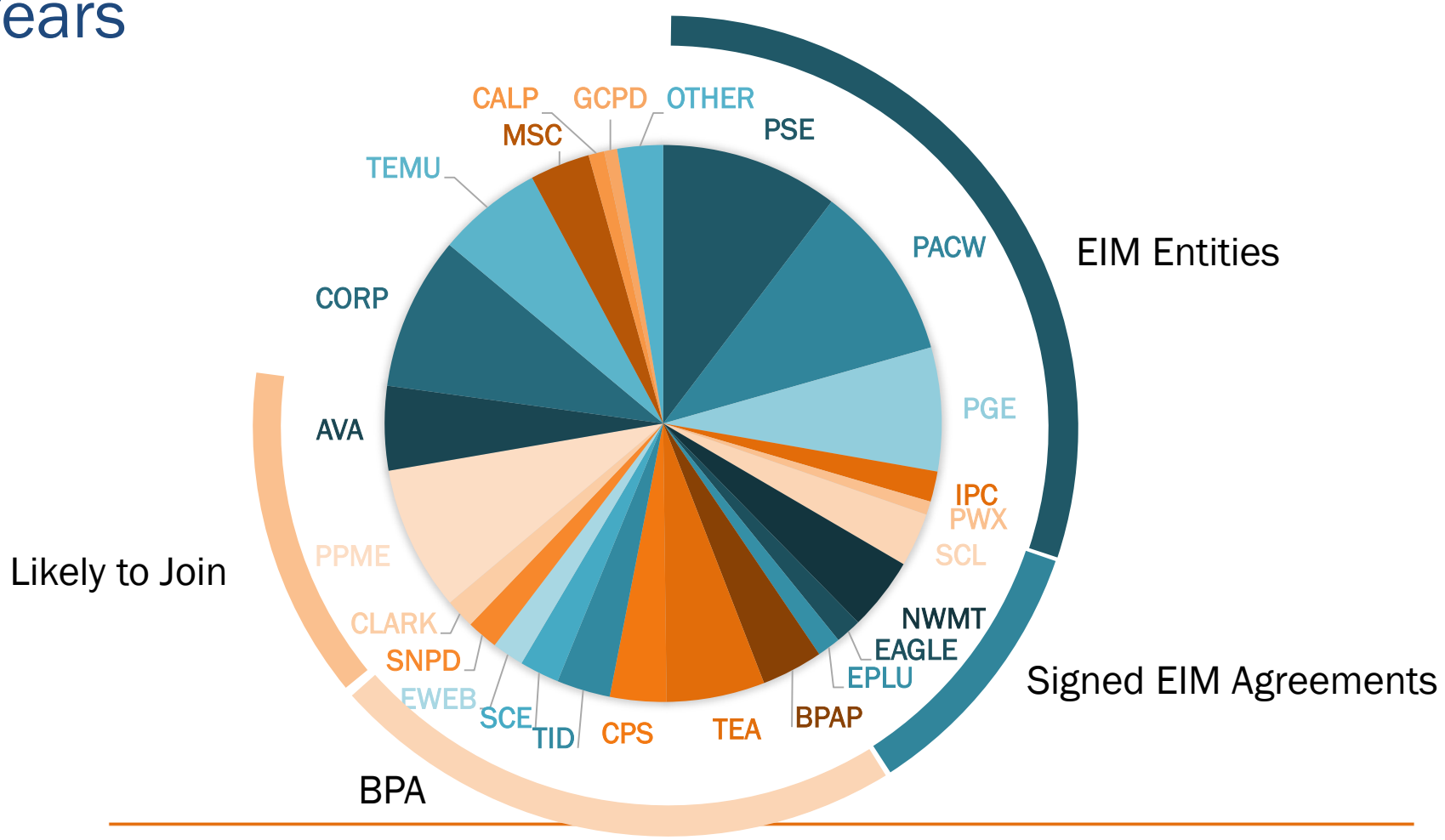
EIM Impacts on Liquidity in the Hourly Market

- Transactions take place significantly earlier with EIM entities than non-EIM entities
- Liquidity of “later” transactions is significantly reduced or even eliminated
- Volumes with some historically large volume counterparties has dramatically decreased
- If BPA joins then the majority of our counterparties will be inside of the EIM

Total Real-Time Volume by Counterparty Last 5 Years



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Next Steps

Section 6

Joining the CAISO EIM Is Not Trivial

- Significant upfront investment ~ $10M to $20M
- Significant time and organizational commitment – 2 to 3 years typical
- Significant staffing required for implementation and on-going operations
  - **5-10 new FTEs** plus consultant support

What's Next

EIM Cost/Benefit/Risk Analysis

- Power Management is updating and enhancing an analysis of impacts from joining the EIM
- Plan to discuss with the Board in April

Questions?

Cybersecurity and Data Privacy of Advanced Metering Infrastructure (AMI)

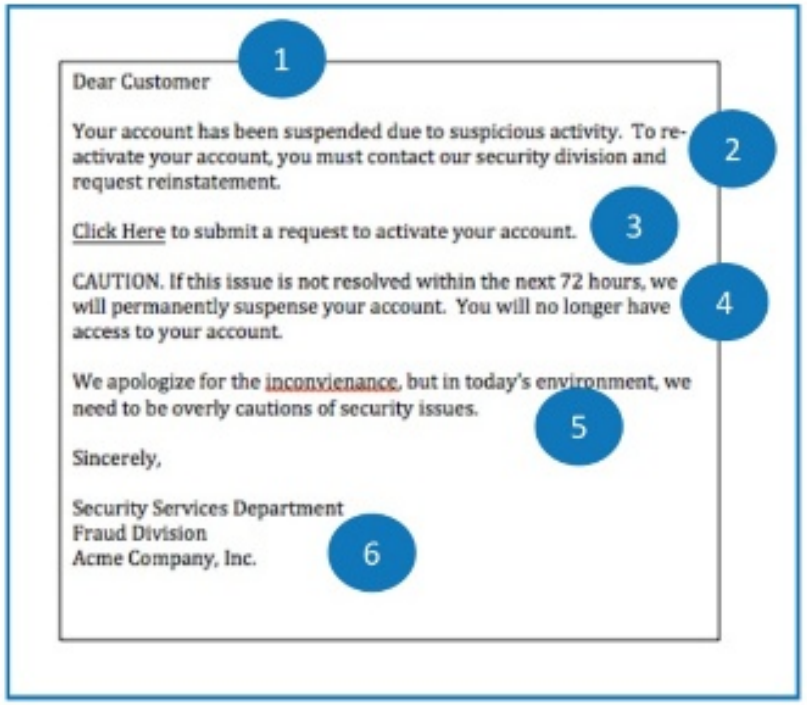
'The Digital Foundation to Enhance the Customer Experience'

Public Utility Board
Study Session
February 13, 2019

Cyber safety moment

PHISHINGBOX

COMMON PHISHING TRAITS



1. Generic Greeting
2. Invokes Fear
3. Requires Action
4. Threatening Language
5. Grammar Issues
6. Generic Closing

Objectives

1. How Cybersecurity requirements were reflected in the AMI procurement process
2. How UTS will apply cybersecurity methods to the AMI system
3. Understanding customer data privacy concerns and AMI meter data

Cybersecurity requirements

- External Requirements were modeled from the Federal Risk and Authorization Management Program (FedRAMP)
- Internal requirements were modeled using NIST 800-53 Security Controls
- Over 900 security controls concerning confidentiality, integrity, and availability of the systems were vetted during the procurement phases.

FedRAMP

National Institute of Standards and Technology
U.S. Department of Commerce

Protecting AMI

System Wide Security

- Multi-Layer Encryption to the Endpoint
- Tamper Prevention and detection
- Time-Windowed Commands
- Pass-through devices
- Behavior Monitoring

Meter Security

- Non-Repudiation
- Modifications must originate from Headend
- All Modifications are logged
- No commands accepted from the field network

Protecting customer data

- Data collected from the AMI meters is the same as data collected from traditional meters. Smart meters have no visibility within the home.
- All data is encrypted from the home to the Headend and digitally verified before being collected.
- Per policy, TPU does not release customer data without prior written consent from the customer. This is published on our website along with the Customer compliant process and is located Here.

Smart Energy Consumer Collaborative

- SECC is a nonprofit organization that works to learn the wants and needs of energy consumers in North America, encourages the collaborative sharing of best practices in consumer engagement among industry stakeholders, and educates the public about the benefits of smart energy and energy technology.

SMART ENERGY
CONSUMER COLLABORATIVE

Questions