MEMORANDUM

TO: **UTILITIES ADVISORY COMMISSION**

FROM: **UTILITIES DEPARTMENT**

DATE: **August 2, 2017**

4

SUBJECT: **Discussion of Electric Integrated Resource Plan – California Wholesale Energy Market Overview and Electric Portfolio Cost Drivers**

REQUEST

In furtherance of the development an Electric Integrated Resource Plan (EIRP) for the 2019 to 2030 planning horizon, this report along with the attached presentation is intended to provide the Utilities Advisory Commission (UAC) an overview of California's wholesale energy market, the City of Palo Alto Utilities' (CPAU) role and interaction with the wholesale market, and its projected electric supply cost including key cost drivers and uncertainties.

No UAC action is requested at this time.

EXECUTIVE SUMMARY

The EIRP provides the necessary planning and policy framework to meet CPAU's planning needs. The EIRP – which is to be developed over the next eighteen months – will address several important electric portfolio decisions and strategic actions needed over the next two to three years for the 2019 to 2030 planning horizon. Through the EIRP process, staff will explore key policy issues related to:

- Commitment to large hydroelectric resources, including the upcoming renewal of the Western Base Resource contract post-2024;
- Modifications to the Renewable Portfolio Standard to meet or exceed California's legislative and regulatory requirements;
- Management of supply variability and market risk including operational risks associated with intermittent resources;
- Management and planning for increased transmission costs;
- Maximizing the value of the City's share in the California Oregon Transmission Project;
- Maximizing the City's value in the Calaveras Hydroelectric Project;
- How to minimize the risk of stranding assets;
- How to plan for increased Distributed Energy Resources and their impacts on load;
- How to integrate the impacts of the City's Sustainability and Climate Action Plan (S/CAP) goals, including building electrification and electric vehicles; and
- How to best define Carbon Neutrality for the Palo Alto community.

Included within staff's proposed work plan to develop the EIRP (Attachment A) are a series of discussion topics relevant to the electric supply portfolio. The purpose of the discussion items is to establish a common understanding of some of the internal and external drivers and uncertainties which will influence electric supply portfolio decisions in the future. An overview of the California energy market and the City's role in the market along with projected portfolio costs, cost drivers and uncertainties is provided in this report to help build a common understanding of these issues.

BACKGROUND

At the June 7, 2017 UAC meeting, staff provided a report and presentation outlining the need for CPAU to develop a new EIRP along with a proposed work plan to develop this EIRP. The intent of the proposed approach is to both meet CPAU's planning needs and to comply with IRP requirements as provided for in California's Senate Bill 350 and the Public Utility Code.

Additionally, at the June UAC meeting, staff provided a high level overview of the electric portfolio load and resource make-up, the City's history of long-term planning and sustainability efforts, and the strategic drivers and uncertainties facing the utility. Overall the UAC was supportive of the staff's proposed process, including the tentative work plan, and had several questions and comments related to potential load impacts due to electrification and concerns regarding reliability at the distribution system level (draft excerpted UAC minutes attached). The CPAU Strategic Plan update, which is currently underway, will address the UAC commissioners' concerns related to distribution system resiliency and reliability.

DISCUSSION

The following is a summary of the attached presentation on the California wholesale energy market and CPAU's electric supply portfolio cost drivers.

California Energy Market and CPAU's Role

The California wholesale electricity market is a complex system made up of multiple players, multiple jurisdictions, and a wide array of legislative and regulatory requirements. CPAU is a publicly-owned utility (POU) subject to Council-approved policies, rates, rules and regulations in addition to legislative and regulatory requirements set forth in the California Public Utility Code.

CPAU operates as a load serving entity within the California Independent System Operator (CAISO) balancing authority and as such CPAU must adhere to CAISO's scheduling, reliability and tariff requirements. The CAISO forecasts electric demand every five minutes and uses its full-network model to dispatch the lowest-cost generators to meet this demand while ensuring there is enough transmission capacity to reliably deliver this power to all member utilities. On a national level, CPAU must also adhere to Western Energy Coordinating Council requirements, North American Reliability Corporation standards, and the Federal Energy Regulatory Commission's rules and orders.

CPAU interacts with the CAISO through the Northern California Power Agency (NCPA). NCPA is the City's scheduling coordinator for all of its electrical load needs and almost all of its supply

resources. Additionally, the City along with other member cities and agencies[1] operate as a sub-control area within the CAISO under a special arrangement referred to as the Metered Subsystem Agreement (MSSA). The MSSA allows NCPA to aggregate participating members' loads and some of their resources. The MSSA also obligates the participants to follow their fluctuating load requirements in real-time using their own generating resources, such as hydroelectricity from the Calaveras Project. In an effort to maximize the value of supply resources, CPAU staff works closely with NCPA staff and the other members to develop operating and bidding strategies for these resources.

Portfolio Cost, Drivers, and Uncertainties

The Council-approved fiscal year 2018 Financial Plan for electric includes total projected costs of $158.4 million, of which $88 million is attributable to electric supply costs. By the year 2027, electric supply related costs are expected to increase to $96.5 million – a cumulative increase of nine percent. Current and future cost drivers include:

- Western Base Resource (WBR) costs, including Restoration Fund obligations under the Central Valley Power Improvement Act (CVPIA);
- Renewable Portfolio Standard (RPS) and Carbon Neutral Plan costs;
- Low Voltage and High Voltage Transmission Access Charges (TAC);
- NCPA power management, generation and legislative and regulatory services costs;
- CAISO and other market costs; and
- Calaveras Hydroelectric Project and NCPA Debt.

Meeting the City's RPS, rising TAC charges, and Western Base Resource costs make up a significant portion of current and future supply costs. Additionally, the costs are highly uncertain and dependent on several factors including hydrological conditions, market prices, and state and federal legislative and regulatory requirements. The EIRP will focus on these significant components of the electric portfolio including seeking policy direction and strategies to plan for and manage costs going forward.

NEXT STEPS

Following this overview of the California Energy Market and Portfolio Cost Drivers (item #2 of work plan), staff will provide an overview of Load Forecasting and the elements to be addressed in the Distribution Energy Resource (DER) Plan (items #3 and #4). The attached EIRP work plan reflects the most current schedule of topical discussions and future actions related to the EIRP.

RESOURCE IMPACT

There is no direct resource impact associated with this informational report.

[1]The NCPA Joint Powers Agreement (JPA) was first established in 1968 to finance and construct electric generation projects including geothermal, natural gas and hydroelectric power. The City of Palo Alto is a founding member of NCPA. Other members include the cities and/or agencies of Alameda, Biggs, Gridley, Healdsburg, Lodi, Lompoc, Plumas-Sierra, Redding, Roseville, Santa Clara, Shasta Lake, Ukiah, Bay Area Rapid Transit, the Port of Oakland, and Truckee-Donner Public Utility District.

POLICY IMPLICATIONS

There is no direct policy impact associated with this information report.

ENVIRONMENTAL REVIEW

The Utilities Advisory Commission's discussion of the EIRP work plan does not meet the definition of a project under Public Resources Code 21065 and therefore California Environmental Quality Act (CEQA) review is not required.

ATTACHMENTS

A. Electric Integrated Resource Plan – Proposed Work Plan
B. Presentation on the California Wholesale Energy Market and Portfolio Cost Drivers
C. Draft Excerpted Minutes from the June 7, 2017 UAC meeting

PREPARED BY: **MONICA PADILLA,** Senior Resource Planner
JIM STACK, Senior Resource Planner

REVIEWED BY: **JONATHAN ABENDSCHEIN,** Assistant Director, Resource Management

APPROVED BY:

ED SHIKADA
General Manager of Utilities

ATTACHMENT A

Table 1: Proposed EIRP Work Plan

Discussion Item	Meeting Objectives/Goals	UAC	Council
1. EIRP Overview and Work Plan	Provide a high level framework for what will be discussed, time line; guiding principles; and key drivers.	June 2017 (discussion) - DONE	August 2017 – INFO ONLY
2. Market Overview and Portfolio Cost Drivers	Overview of the California energy market, the City's participation, Northern California Power Agency; Portfolio cost drivers and uncertainties.	August 2017 (discussion)	
3. Load Forecast - Needs Assessment	Overview of electric load forecast and energy/demand impacts from EE, EV and PV	August 2017 (discussion)	
4. Distributed Energy Resources Strategy and Planning for Growth	Distributed Energy Resources Plan - energy efficiency, Local Solar Plan, distributed generation, electrification, electric vehicles, storage and distribution system planning	August 2017 (discussion) October 2017 (discussion), January 2018 (action)	March 2018 (action)
5. Hydroelectric Resources	Overview of Palo Alto's hydroelectric resources; hydro risk management; Western Area Power Administration's 2025 Power Marketing Plan; Calaveras Project; key decisions; and direction.	September 2017 (discussion)	October 2017 INFO ONLY
6. Renewable Portfolio Standard	Overview of RPS; update to meet SB 350 requirements; renewable over-generation and curtailments; and other RPS modifications.	November 2017 (action)	January/February 2018 Finance Committee/ Council (action)
7. Carbon Neutral Plan	Overview and updates – dependent on RPS, large hydro and non-RPS eligible renewable direction; assessment of alternative portfolios and scenarios	February 2018 (discussion)	March/April 2018 Finance Committee/ Council (discussion)
8. Transmission	Transmission planning in California; California Oregon Transmission Project; Second Transmission line update	February/ March 2018 (discussion)	
9. Proposed EIRP Objectives, Key Strategies and Implementation Plan	Draft EIRP objectives, key strategies and implementation plan	June 2018 (possible action)	August/September 2018 Finance Committee/Council (possible action)
10. Final EIRP	Approval of EIRP objectives; strategies and implementation plan; and SB 350 IRP submittal to CEC	October 2018 (action)	November/December 2018 Finance Committee/Council (action)

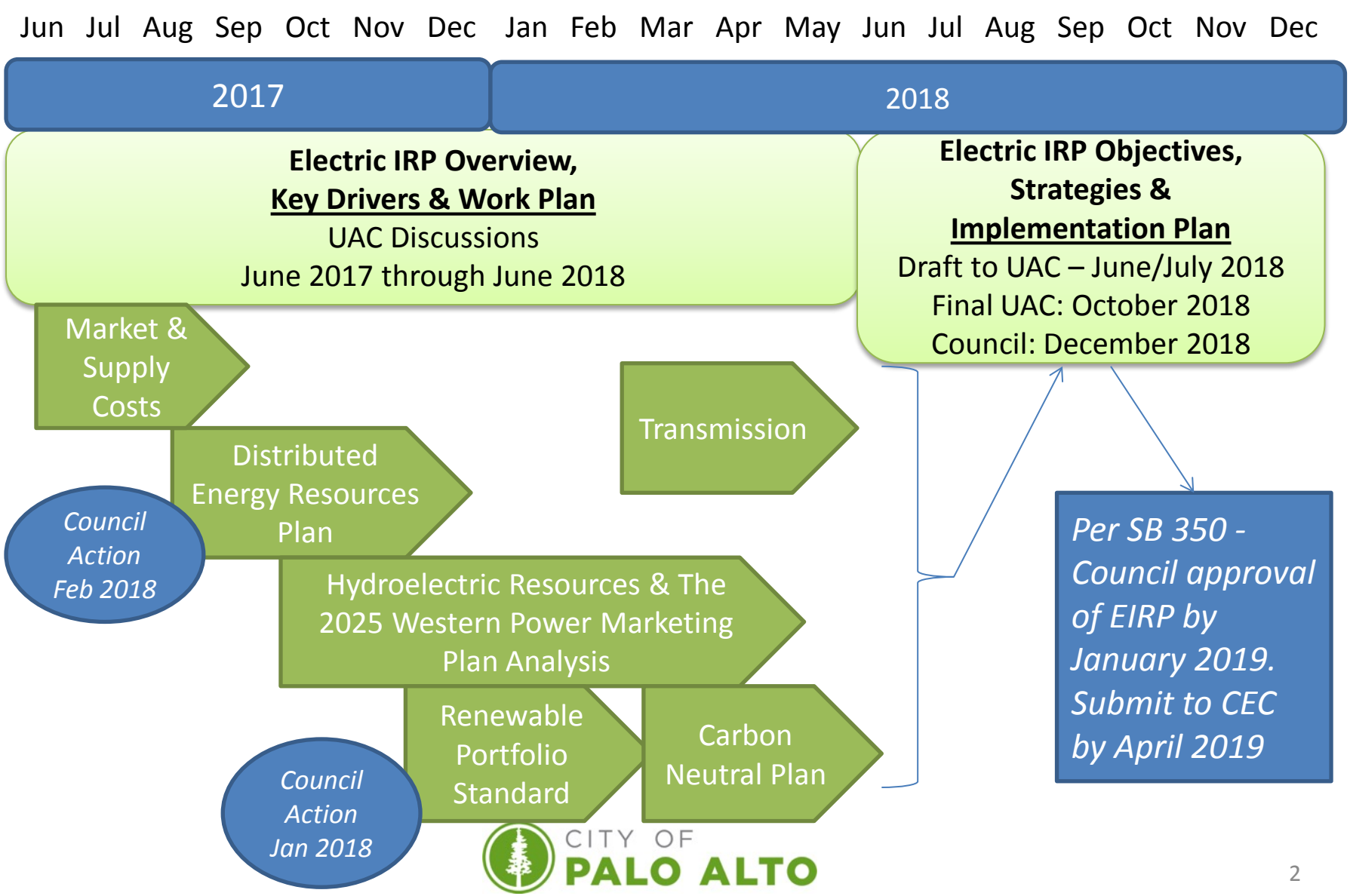
ATTACHMENT B

Electric Integrated Resource Plan – Market Overview & Supply Cost Drivers

August 2, 2017

CITY OF PALO ALTO

EIRP Proposed Work Plan



CITY OF PALO ALTO

EIRP - Key Policy Questions

- Should we renew our full share of the Western contract post-2024
- Should we increase our Renewable Portfolio Standard
- How to define and meet Carbon Neutrality for Palo Alto
- How to best manage supply variability and market risk
- How to manage or plan for increased transmission costs
- How to maximize value of California Oregon Transmission Project

CITY OF PALO ALTO

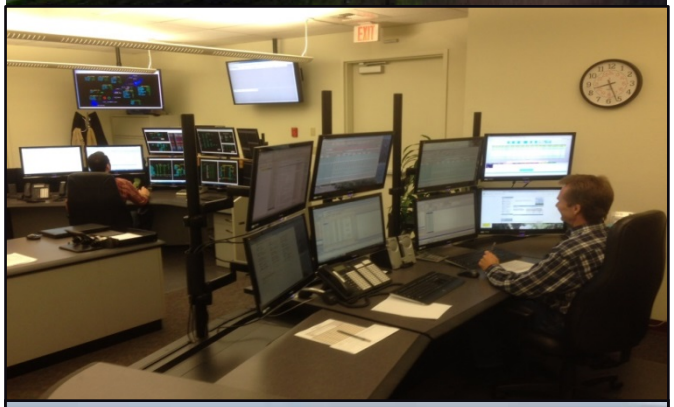
Presentation Focus

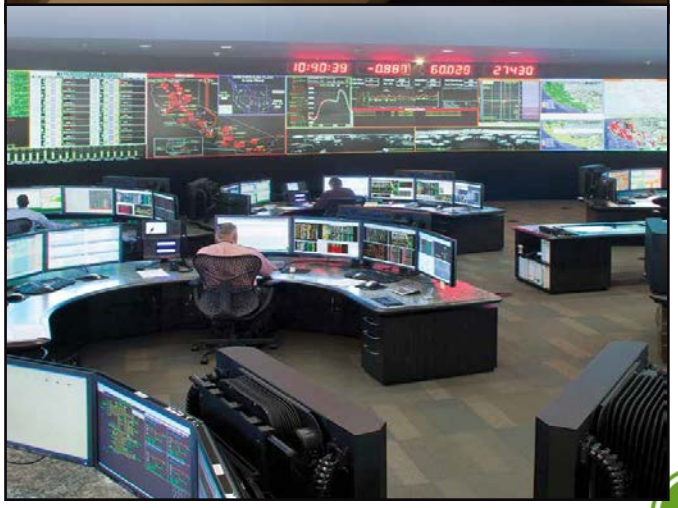
- Overview of California's Wholesale Energy Market and Northern California Power Agency
- Electric Supply Cost Projections
- Electric Portfolio Cost, Drivers and Uncertainties
- Electric Portfolio Directives
- Next Steps

Part One

THE CALIFORNIA WHOLESALE ENERGY MARKET

CITY OF PALO ALTO



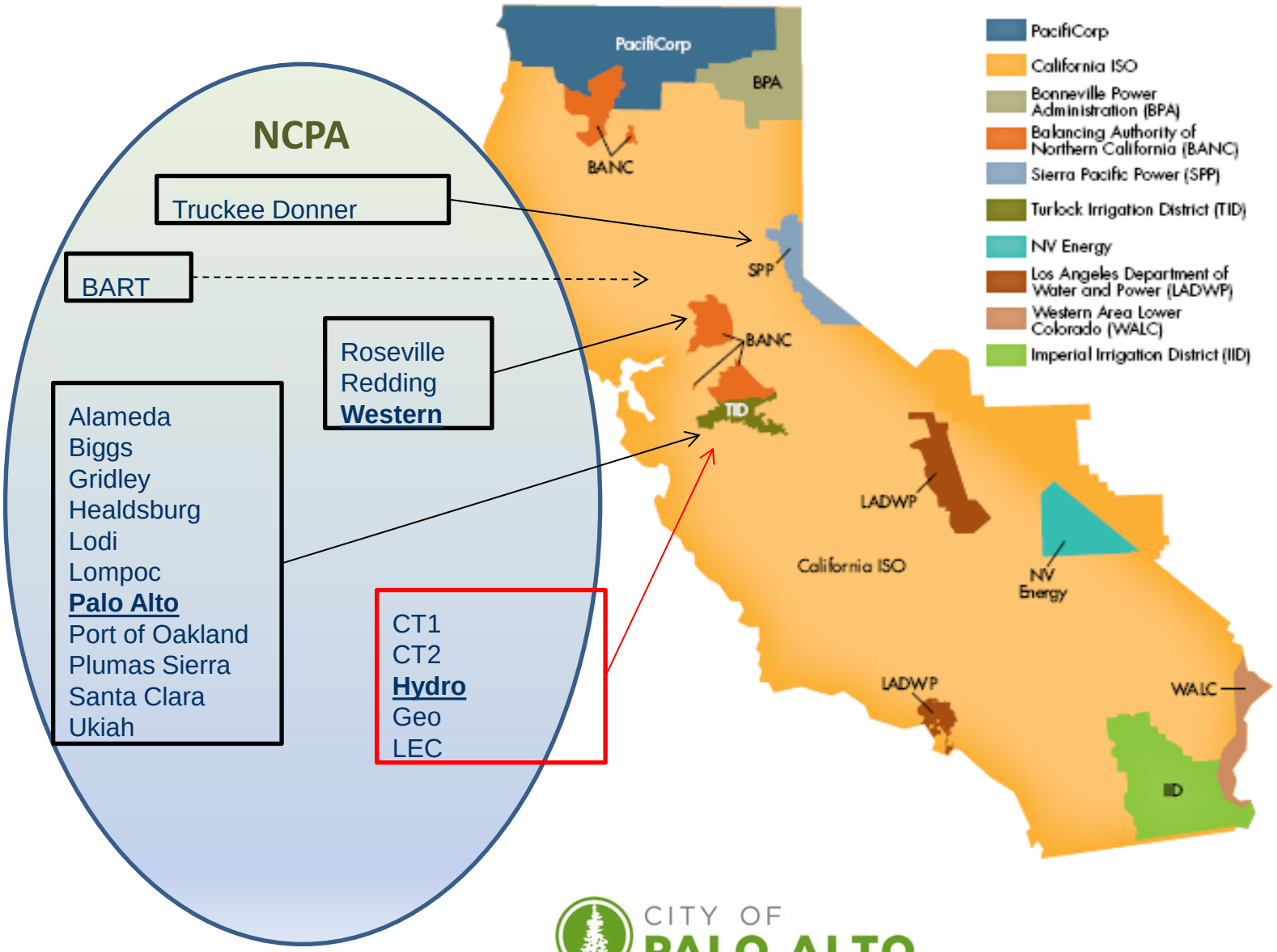


Wholesale Market Participants

- Load Serving Entities:
  - Investor Owned Utilities
  - *Publicly Owned Utilities – Palo Alto*
  - Community Choice Aggregators
  - Direct Access Participants
- Generators and Developers
- Marketers
- Scheduling Coordinators – Northern California Power Agency
- Balancing Areas – California Independent System Operator
- Transmission Owners & Operators

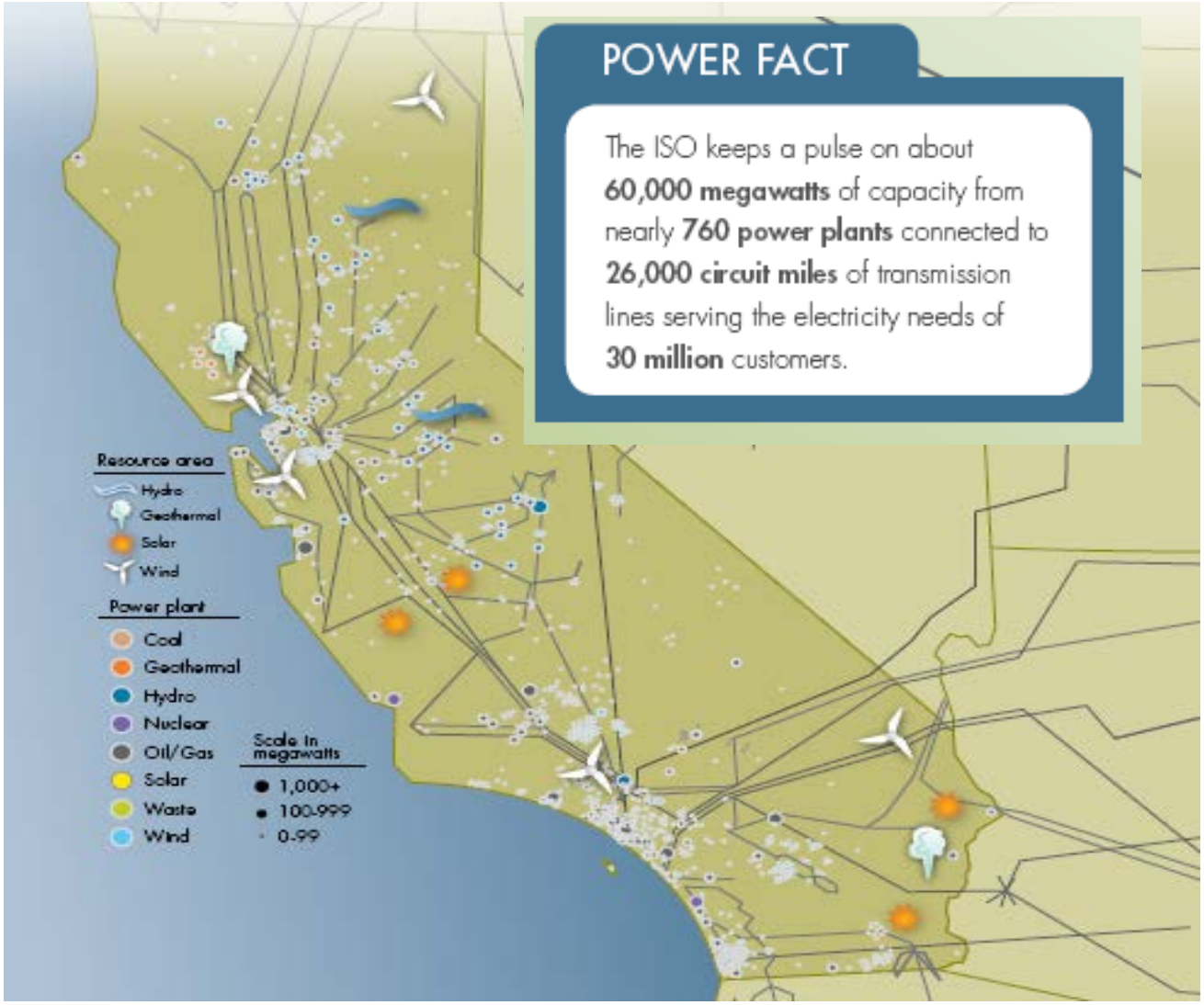
CITY OF PALO ALTO

Balancing Areas in California & NCPA



CITY OF PALO ALTO

California Independent System Operator



NCPA is one of 140 Scheduling Coordinators interacting with the CAISO on a daily basis

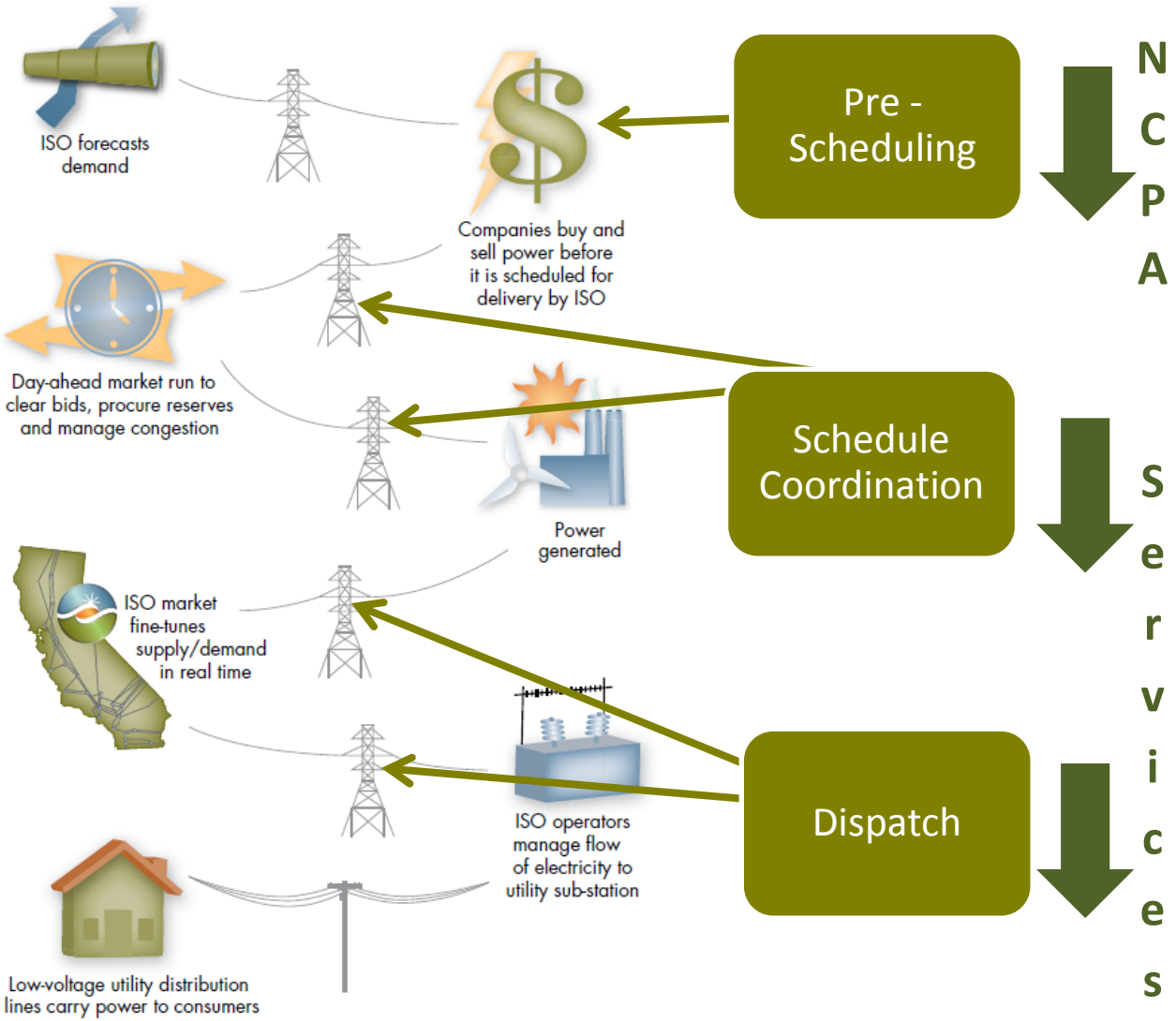
NCPA schedules and manages (during each operating day)

- 11 member loads
- 5 NCPA-owned generators
- 13 member generators
- More than 20 power supply contracts ***(Palo Alto has 12 contracts)***

Source: CAISO Company Facts Brochure

CITY OF PALO ALTO

California Independent System Operator & NCPA



Schedule Coordination Services:

24 hour operations

Submittal and retrieval of load, energy and capacity bids into the CAISO Day Ahead and Fifteen Minute Markets

Outage Coordination

Dispatch Services:

24 hour operations

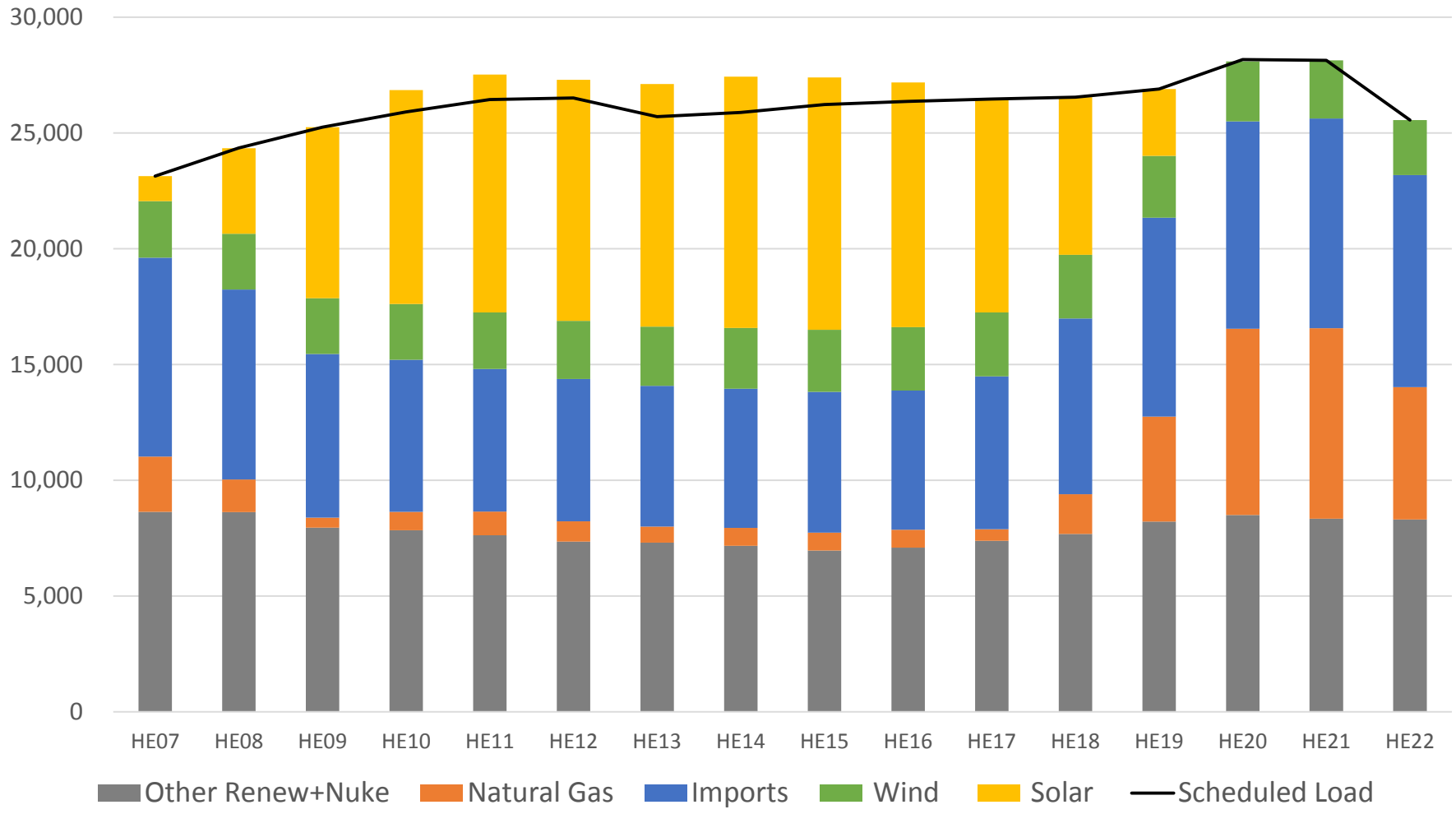
Real time coordination with CAISO

Real time coordination with members

Active day purchasing and selling and real time balancing

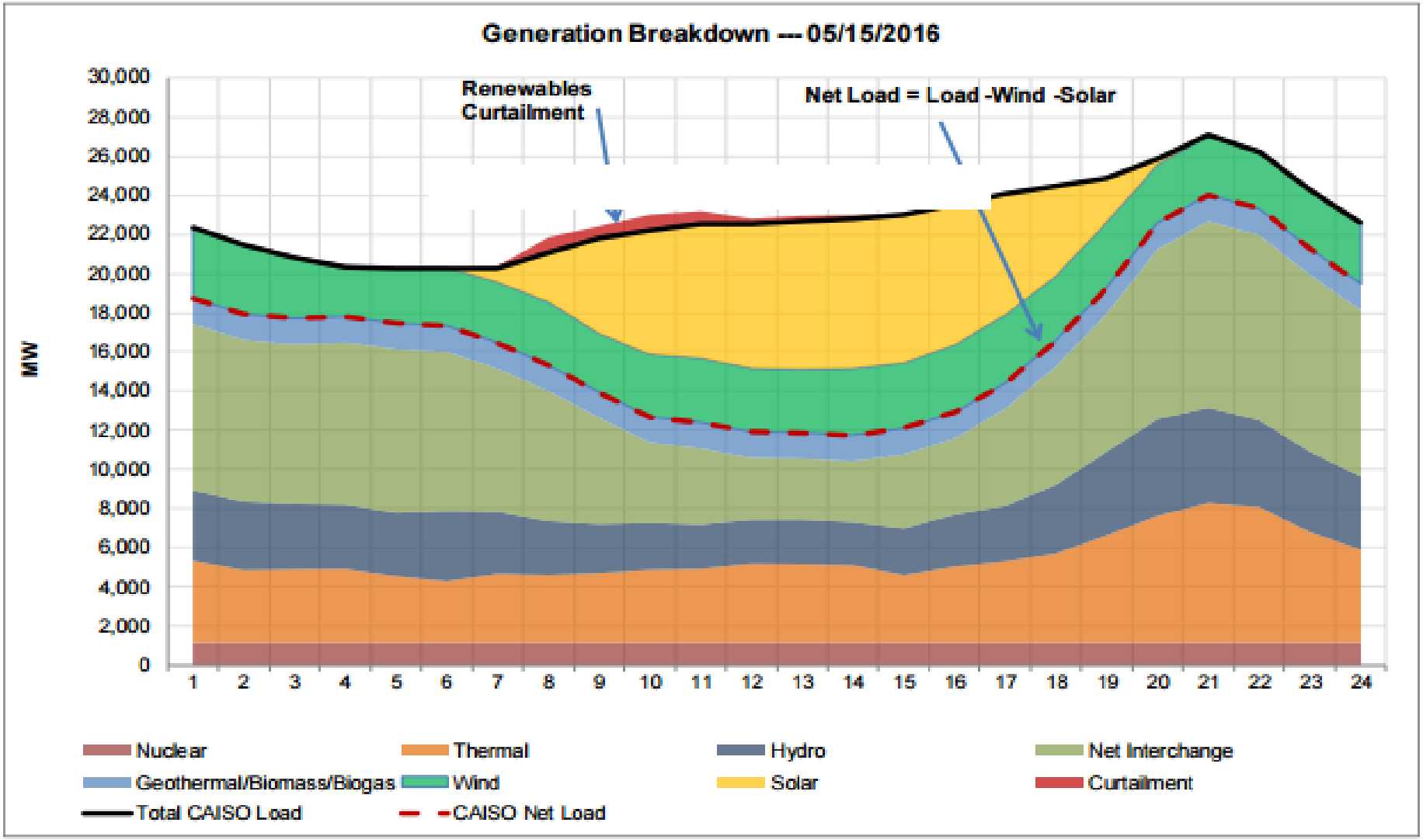
CITY OF PALO ALTO

Example of Day-ahead Curtailment



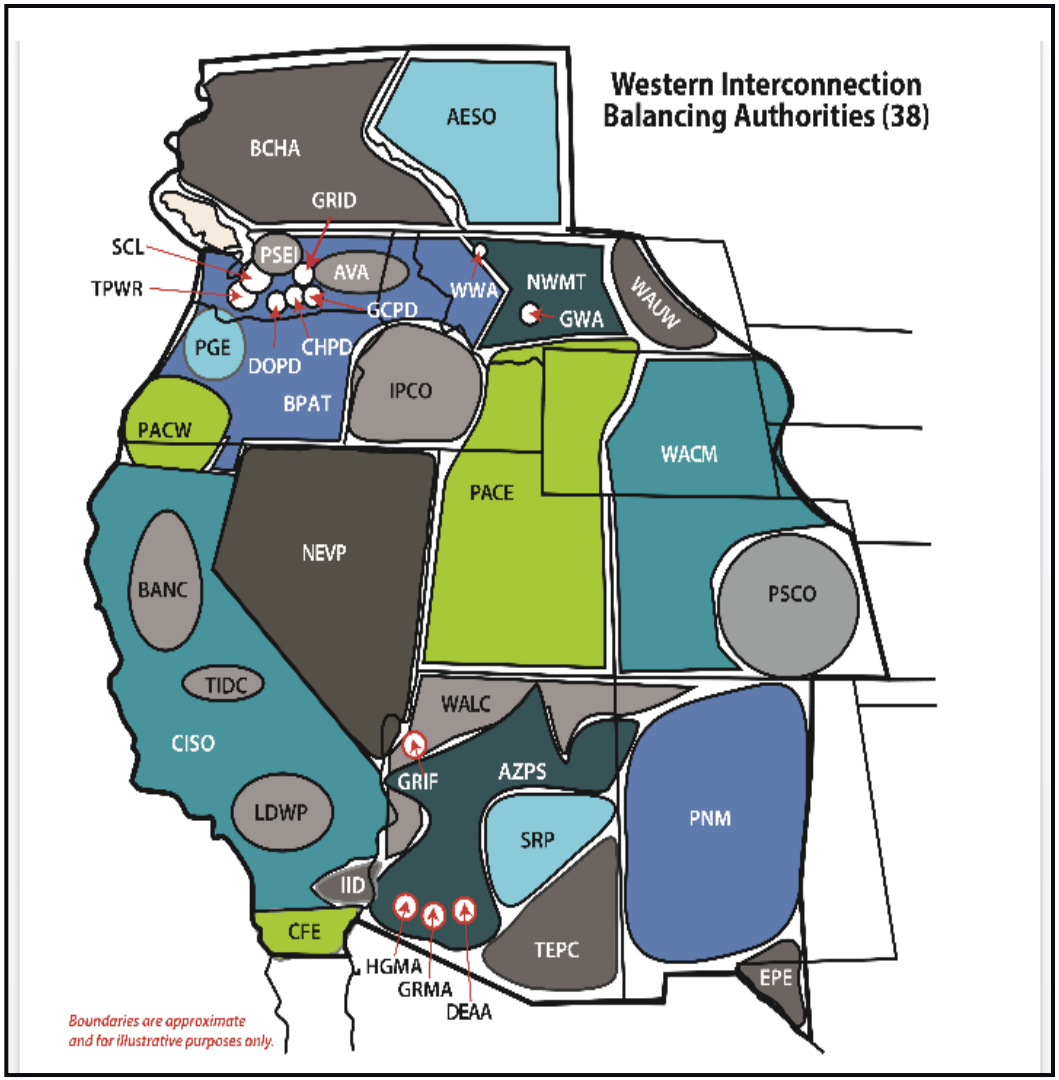
CITY OF PALO ALTO

Example of Real-time Curtailment



CITY OF PALO ALTO

West-wide Grid Operation Trends

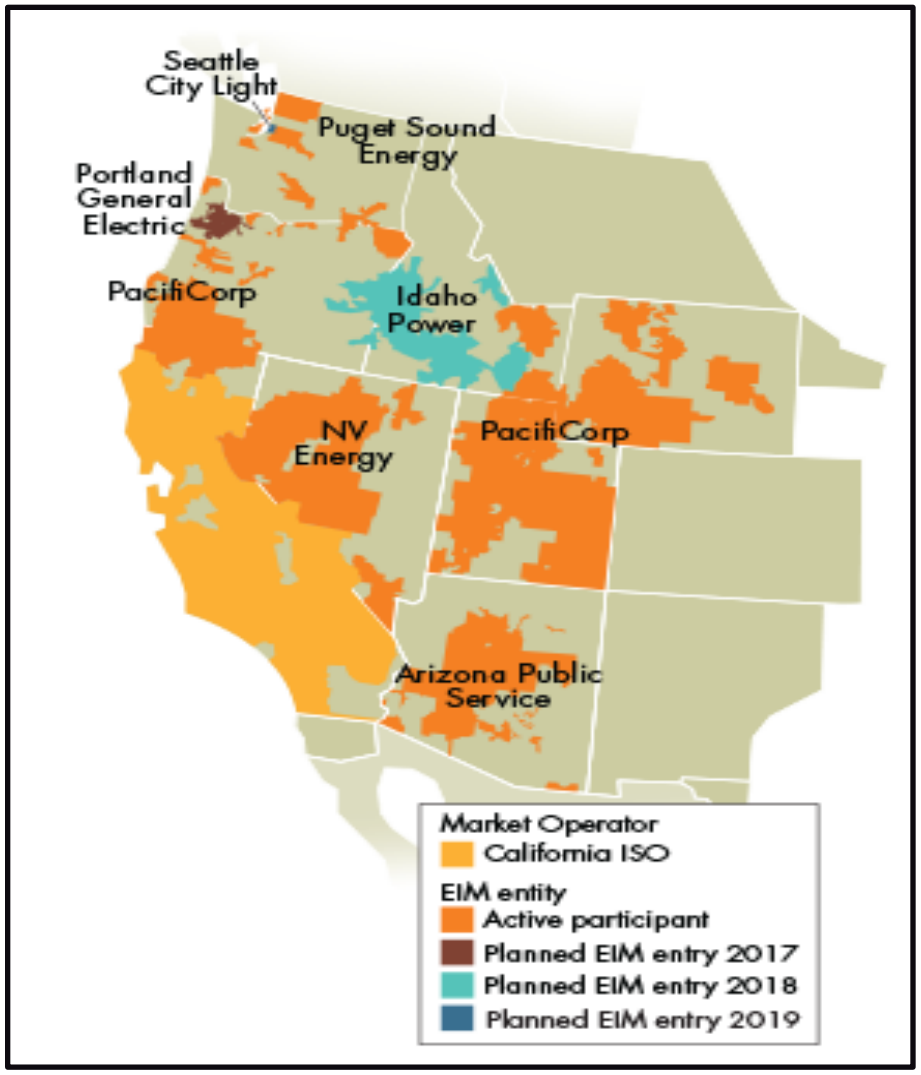


- Thirty eight Balancing Authorities operate autonomously in the Western Interconnection
- Independent Balancing Areas are merging
- Theory is that transmission and generation resources can be used more efficiently when shared across a larger geographic area and managed by a single operator

CITY OF PALO ALTO

Diagram Source: Western Electricity Coordinating Council

California Energy Imbalance Market Activity



Active Participants

- PacifiCorp – November 1, 2014
- NV Energy – December 1, 2015
- Puget Sound Energy – October 2016
- Arizona Public Service – October 2016

Planned Entrants

- Portland General Electric – 2017
- Idaho Power – 2018
- Seattle City Light – 2019
- CENACE/LADWP/BANC/SMUD - TBD

Issues

- Governance
- Transmission Rates
- Resource Value
- Resource Adequacy Rules
- CA Environmental Rules

CITY OF PALO ALTO

Diagram Source: CAISO

Part Two

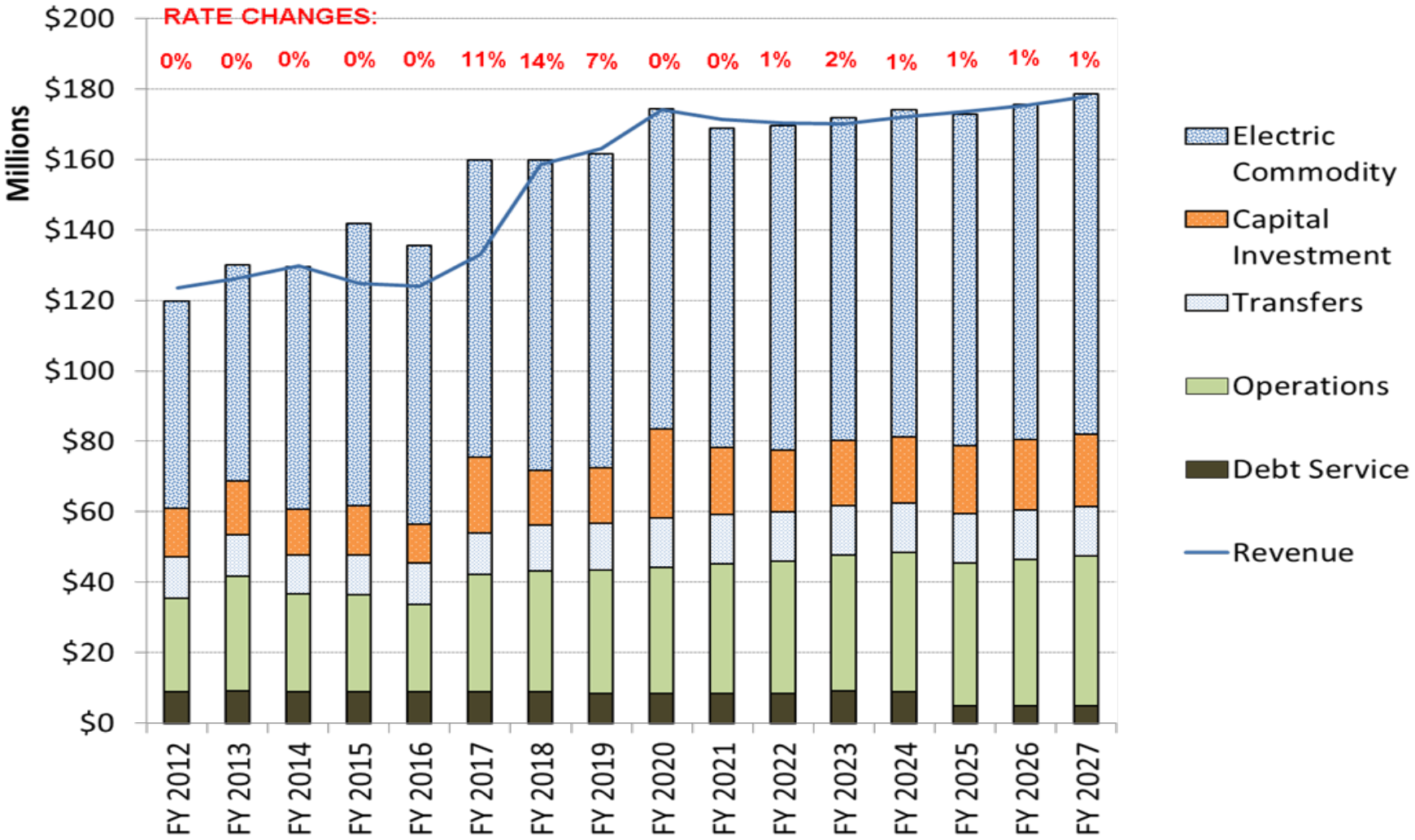
ELECTRIC SUPPLY COST DRIVERS

CITY OF PALO ALTO

Electric Portfolio Cost, Drivers and Uncertainties

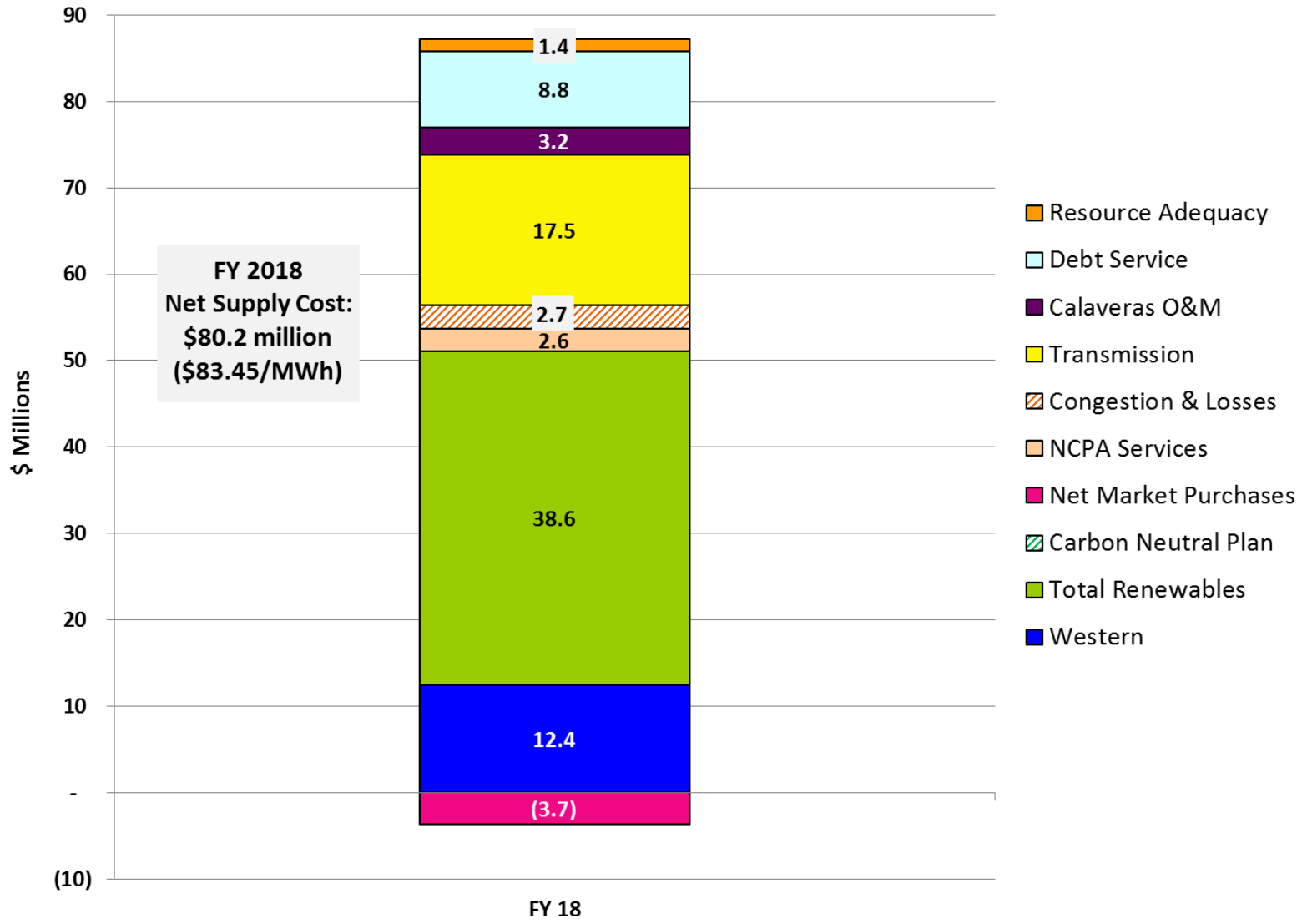
- Supply Cost - Fiscal Year 2018 and Long-term Projection
- Key Cost Drivers
- Uncertainties

Electric Supply Cost – 10 Year Forecast line graph



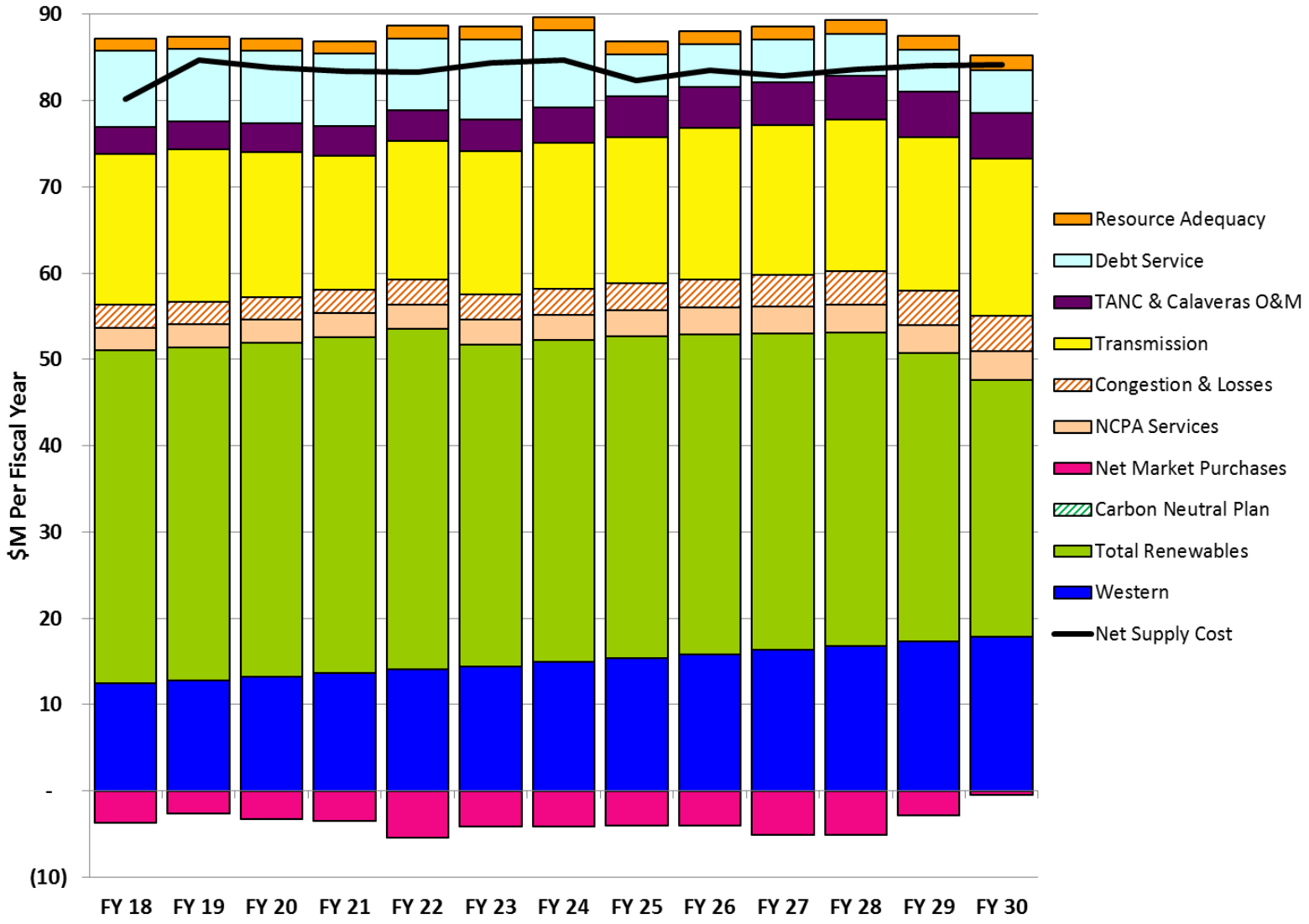
CITY OF PALO ALTO

Electric Supply Budget – Fiscal Year 2018



CITY OF PALO ALTO

Electric Supply Cost – through 2030



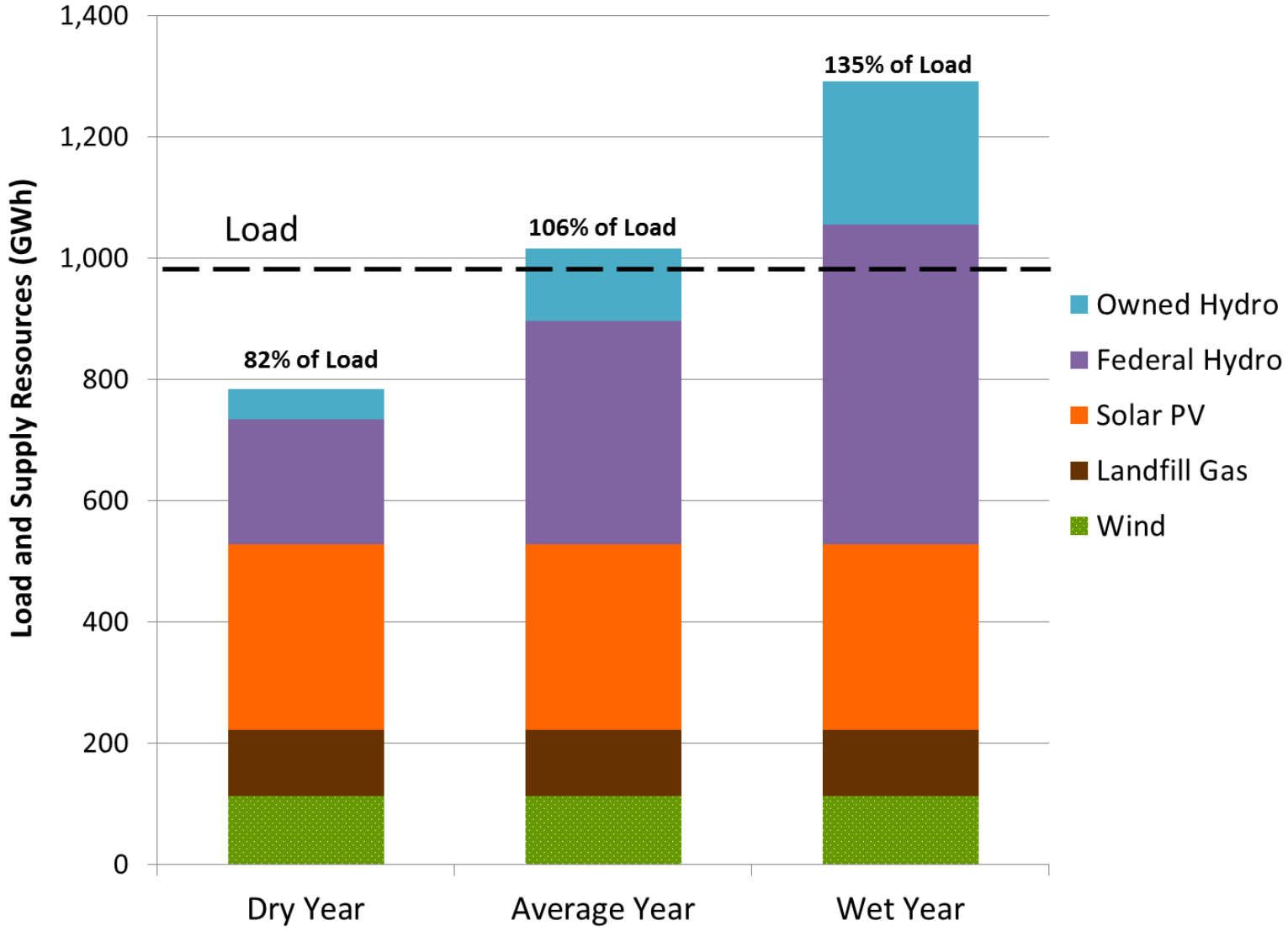
CITY OF PALO ALTO

Portfolio Cost Uncertainties

- Recurring
  - Hydroelectric Supply Variability
  - Market Prices
  - Intermittent Resources
- Large Uncertainties
  - CAISO and Transmission Access Charges
  - Resource Adequacy
  - Western Base Resource
  - Renewable Portfolio Standard
  - Regionalization
- Net Revenue – Load variability

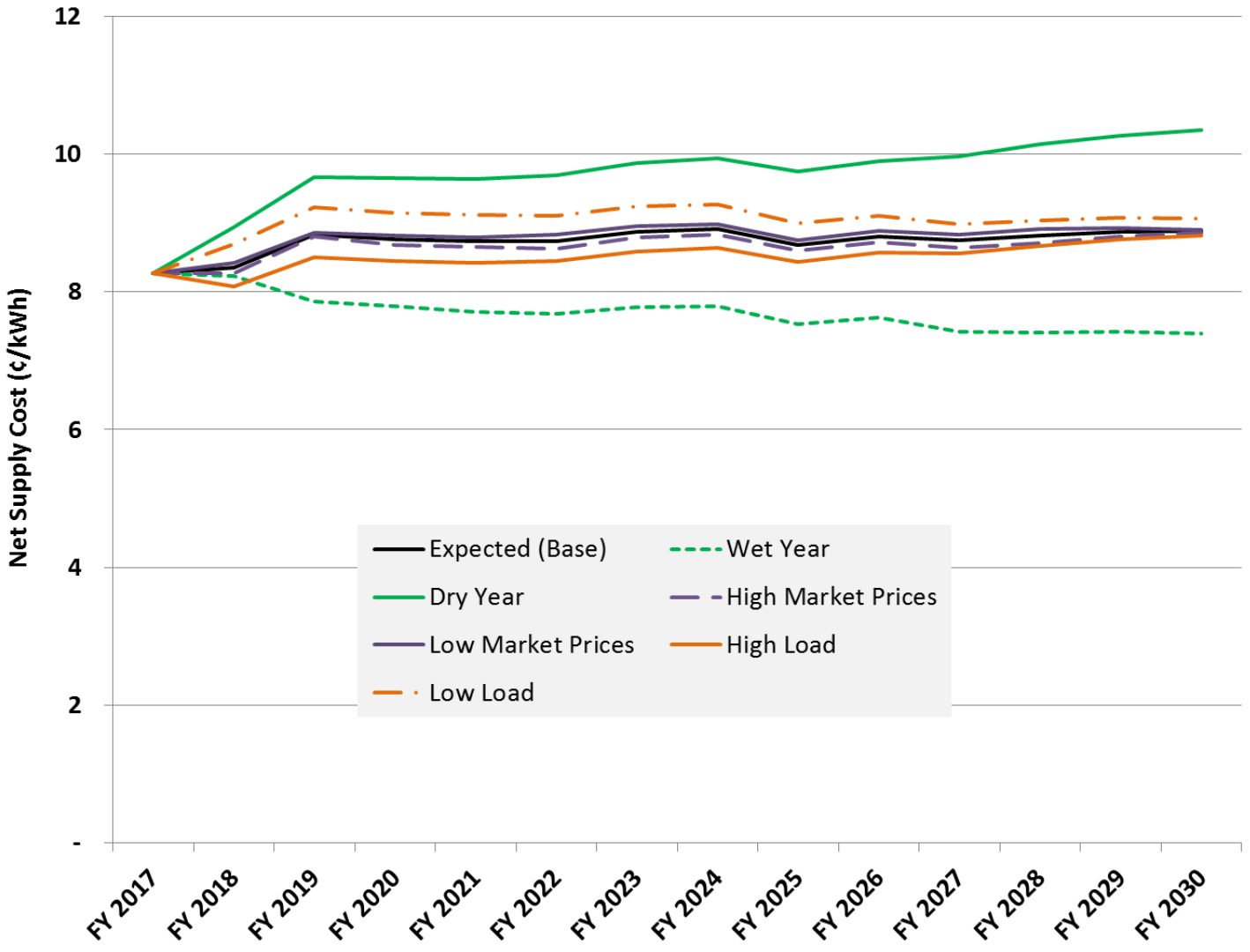
CITY OF PALO ALTO

Supply Variability



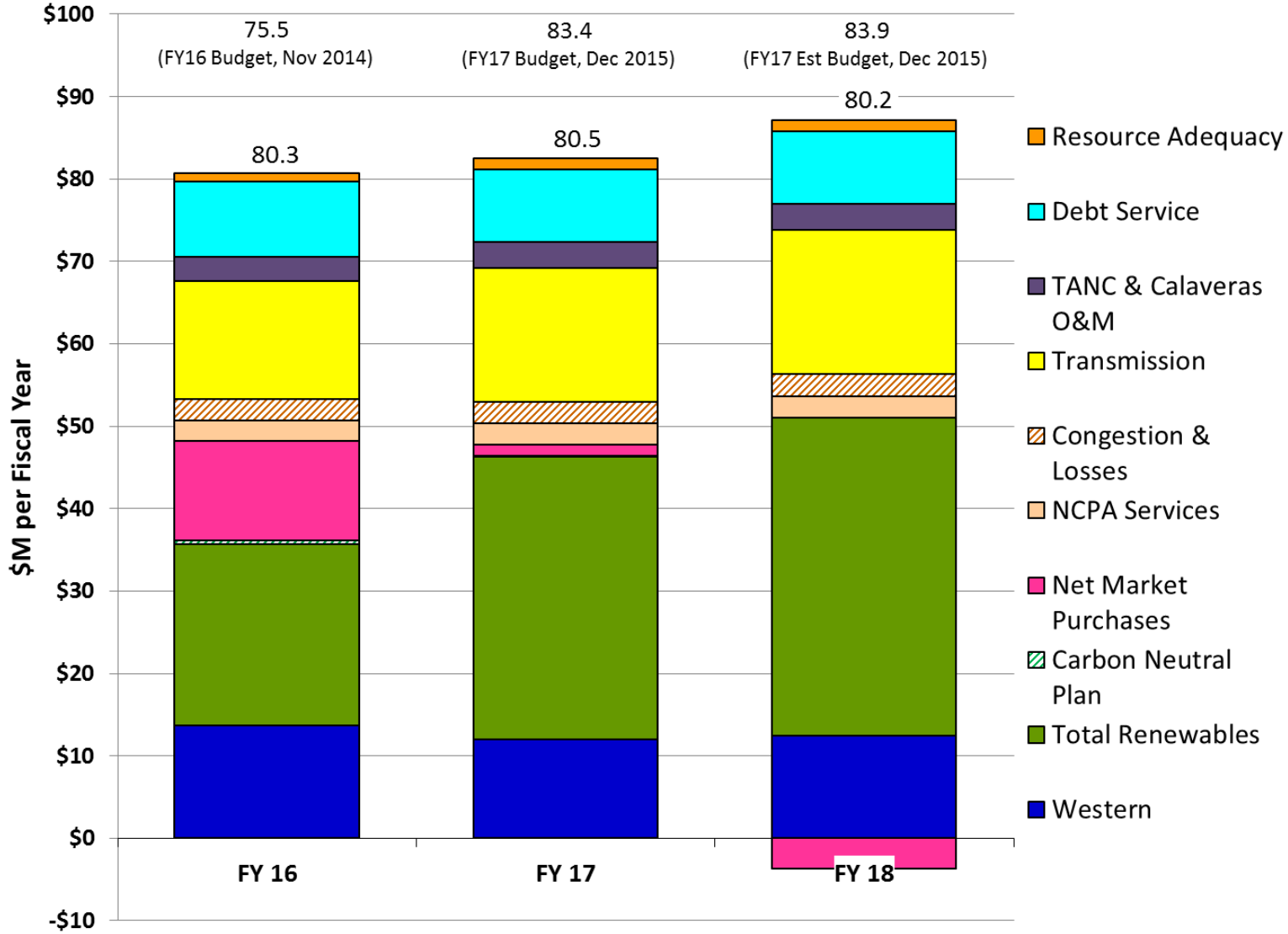
CITY OF PALO ALTO

Electric Rate Components



CITY OF PALO ALTO

Portfolio Cost Uncertainty



CITY OF PALO ALTO

Portfolio Cost and Risk Management

- Energy Risk Management Program
  - Polices, Guidelines and Procedures
- Hedging Strategy
- Scheduling Optimization Legislative and Regulatory Advocacy
  - NCPA, CMUA, APPA and TANC
- Bay Area Municipal Transmission Group (BAMx)
- Congestion Revenue Rights
- Reserves and Rates

Item	Purpose & Objectives	UAC	Council
EIRP Overview and Work Plan	Provide a high level framework for what will be discussed, time line; guiding principles; and key drivers.	June 2017 (discussion) DONE	August 2017 INFO ONLY
Market Overview and Portfolio Cost Drivers	*Overview of the California energy market, the City's participation, Northern California Power Agency; Portfolio cost drivers and uncertainties.*	*August 2017 (discussion)*	
Load Forecast - Needs Assessment	*Overview of electric load forecast and– energy, demand and impacts from EE, EV and PV*	*August 2017 (discussion)*	
Distributive Energy Resources Strategy and Planning for Growth	*Distributive Energy Resources Plan - energy efficiency, Local Solar Plan, distributed generation, electrification, electric vehicles, storage and distribution system planning*	*August 2017 October 2017, January 2018 (action)*	*March 2018 (action)*
Hydroelectric Resources	Overview of Palo Alto's hydroelectric resources; hydro risk management; Western Area Power Administration's 2025 Power Marketing Plan; Calaveras Project; key decisions; and direction.	September 2017 (discussion)	
Portfolio Alternatives	*Overview of alternative resource portfolios to be evaluated and metrics.*	*September 2017 (discussion)*	
Renewable Portfolio Standard	Overview of RPS; update to meet SB 350 requirements; renewable over-generation and curtailments; and other RPS modifications.	November 2017 (action)	January/ February 2018 Finance Committee/ Council(action)
Carbon Neutral Plan	Overview and updates – dependent on RPS and large hydro direction; assessment of alternative portfolios and scenarios	February 2018 (discussion)	March/April Finance Committee/ Council (discussion)
Transmission	*Transmission planning in California; California Oregon Transmission Project; Second Transmission line update*	*February/March 2018 (discussion)*	
Proposed EIRP Objectives, Key Strategies and Implementation Plan	Draft EIRP objectives, key strategies and implementation plan;	*June 2018 (possible action)*	*August/September 2018 Finance Committee/Council (possible action)*
Final EIRP	Approval of EIRP objectives; strategies and implementation plan; and SB 350 IRP submittal to CEC	*October 2018 (action)*	*November/December 2018 Finance Committee/Council (action)*

Feedback

CITY OF PALO ALTO

CITY OF PALO ALTO

EXCERPTED DRAFT MINUTES OF THE JUNE 7, 2017 UTILITIES ADVISORY COMMISSION

ITEM 2: DISCUSSION: Staff Recommendation that the UAC Provide Feedback on the Development of the City of Palo Alto Utilities Electric Integrated Resource Plan

Senior Resource Planner Monica Padilla introduced the Electric Integrated Resource Plan (IRP) project and provided a presentation which included:

- A high level overview of the electric supply portfolio and planning needs over the 2019 to 2030 planning horizon;
- Brief history of long-term planning initiatives and key policies;
- Identification of key issues and drivers facing the electric supply utility, including the impending expiration of the current Western Base Resource (WBR) contract in 2024 and the need to determine how much, if any of the contract would be renewed post 2024;
- Identification of several major uncertainties including State level policies and/or legislation which will drive the Renewable Portfolio Standard (RPS) and Cap and Trade; and
- An 18 month proposed work plan to develop the IRP and submit it to the California Energy Commission (CEC) as required by law.

The objective of the presentation was to facilitate a discussion with the UAC about the key issues that need to be addressed in the IRP and solicit feedback on a proposed IRP development work plan. Throughout the presentation, several UAC commissioners raised questions related to the electric supply portfolio.

Vice Chair Danaher asked how electric vehicles factored into the energy efficiency and load calculations and how would the City handle a large increase in electric vehicle uptake.

Padilla responded that the current load forecast assumes a certain penetration of electric vehicles and corresponding increase in load; however that the load forecast will be updated to reflect the findings of the Distributed Energy Resource Plan (DER Plan). The DER Plan will evaluate various electric vehicle deployment scenarios. Padilla also added that any increases in load resulting from electric vehicles and/or electrification may result in the need to procure additional resources.

Commissioner Johnston asked if three and one-half percent (3.5%) losses between electric supply purchases and retail sales was within the range of industry standards.

Padilla confirmed that they were. She added that the DER Plan will look for opportunities to minimize losses through efficiency measures.

Commissioner Forssell asked whether the portfolio was assessed based on an average precipitation and hydroelectric generation year and whether there would be any assessment of potential droughts in the planning process.

Padilla confirmed the portfolio was assessed based on average precipitation and added that management of the two hydroelectric resources would be the focus of one of the topics for the IRP update.

Padilla continued the presentation, describing the City's contract with the Western Area Power Administration for power from Central Valley Project hydroelectric resources. This resource provides roughly 40% of Palo Alto's needs. These projects were built primarily for flood control. This contract was coming up for renewal and making a decision on this resource would be part of the IRP process.

Commissioner Trumbull asked when the WBR contract was up for renewal and when the decision would need to be made.

Padilla said the contract would expire at the end of 2024, but the decision to sign a new contract and would have to be made in the next few years. She added that the renewal of the WBR contract followed a formal process under Western's 2025 Power Marketing Plan and staff has been actively engaged in provided comments both on its own and through the Northern California Power Agency.

Commissioner Forssell confirmed that because the projects were built for flood control, the City had very little control over how they were dispatched.

Padilla confirmed that was the case.

Commissioner Danaher asked for clarification on why emissions were shown in the chart when the City's power came entirely from hydroelectric resources and renewable energy.

Padilla noted that emissions had gradually reduced as more of the City's renewable energy projects came online, and that emissions were higher when hydroelectric generation was low.

Commissioner Ballantine talked about his experience on a nuclear naval vessel. The vessel included power from a reactor, but also a backup diesel generator and a battery. He said the developing complexity in the electric grid would end up requiring more work to maintain grid stability. Solar projects did not provide reliability as currently configured because they turned off during a grid outage. He thought reliability might be a valuable addition to the IRP plan.

Padilla supported his concerns and added that the IRP will look at reliability at a grid level and also as part of the overall transmission planning. System reliability at the distribution level will be looked at as part of the Utilities Strategic Plan.

ACTION: No Action