



Pasadena Water and Power

2021 IRP Update Environmental Advisory Commission

January 11, 2022

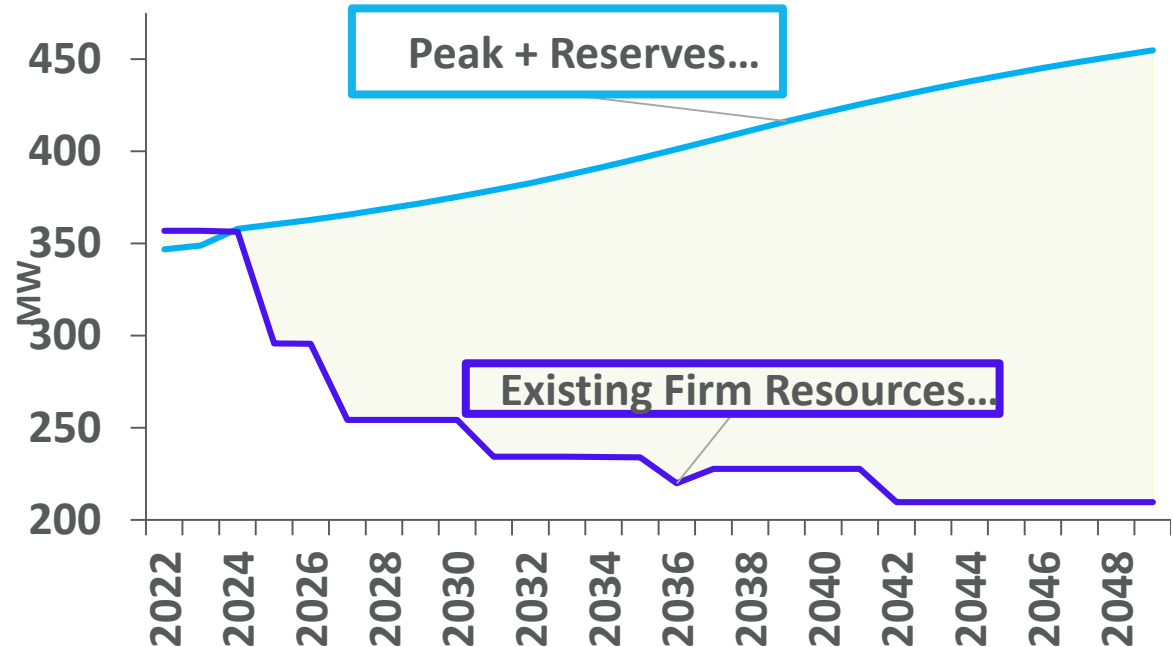




Capacity Position: Peak Load vs. Existing Resources

Pasadena Water and Power

- Growth in peak + reserves, due to increasing Electric Vehicle penetration
- Expected capacity shortages grow over time
- Due to new Resource Adequacy requirements and retirements, PWP expects to need capacity by 2025





Production Cost Model - Major Inputs

Pasadena Water and Power

- **Load Forecast**
 - > Capacity, Energy, Energy Efficiency, Electric Vehicles
- **Available Resources**
 - > Existing resources
 - > Wind, solar, geothermal
 - > Energy storage
 - > Demand response programs
- **Social Cost of Carbon**
 - > Dispatch penalty reduces expected fossil-fuel generation
 - > 2021 Update Portfolio is ~30% cheaper when the carbon adder is removed



Portfolio #1 - 2018 Refresh

Pasadena Water and Power

Objective: Reflect the 2018 Portfolio as originally proposed

Firm Capacity means the amount of energy available for production that must be guaranteed to be available at a given time for injection to a certain power grid

2018 Refresh

- Starts with the 2018 IRP using the *Preferred Portfolio: SCC+SB100*
- Updates current market information and new regulations with no optimization
- CAISO Resource Adequacy capacity requirements **not met** due to market requiring 'firmer' resources



Portfolio #2 – 2021 Update

Pasadena Water and Power

Objective: Develop new Portfolio that meets all PWP Requirements

**2021
Update**

- Allow model to optimize resource selection
- New portfolio to meet all requirements:
 - Reliability
 - Capacity
 - Renewable Portfolio Standard
 - Greenhouse Gas



Firm Capacity

Pasadena Water and Power

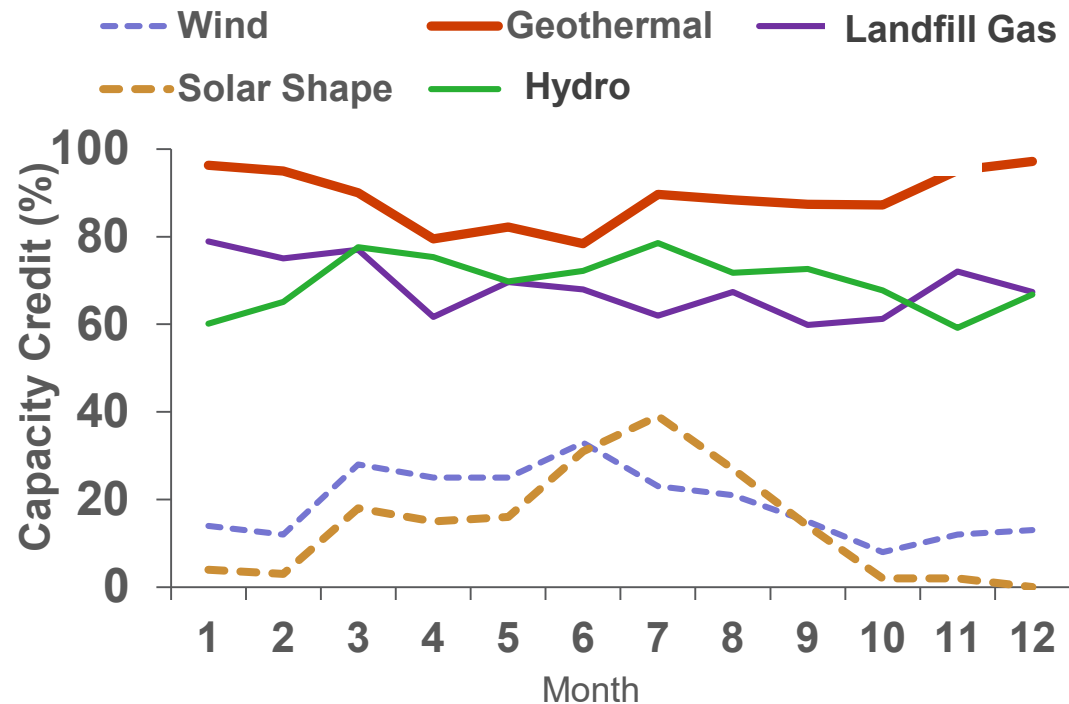
- Growing firm capacity needs are driven by increasing renewables in the California market
- Installed v. firm capacity
 - > Firm capacity is a percentage of installed, varying by resource, month, year
 - > Solar and wind have low ratios of firm to installed capacity
 - > Eight-hour storage, geothermal and Demand Response have greater firm capacity
- New Firm Capacity definition results in accelerated resource acquisition, compared to 2018 IRP.



Accreditation: Monthly Firm Capacity

Pasadena Water and Power

- Solar and wind have varying values of firm capacity by month
- Landfill gas and hydro are somewhat stable in capacity value
- **Geothermal has the highest capacity value**



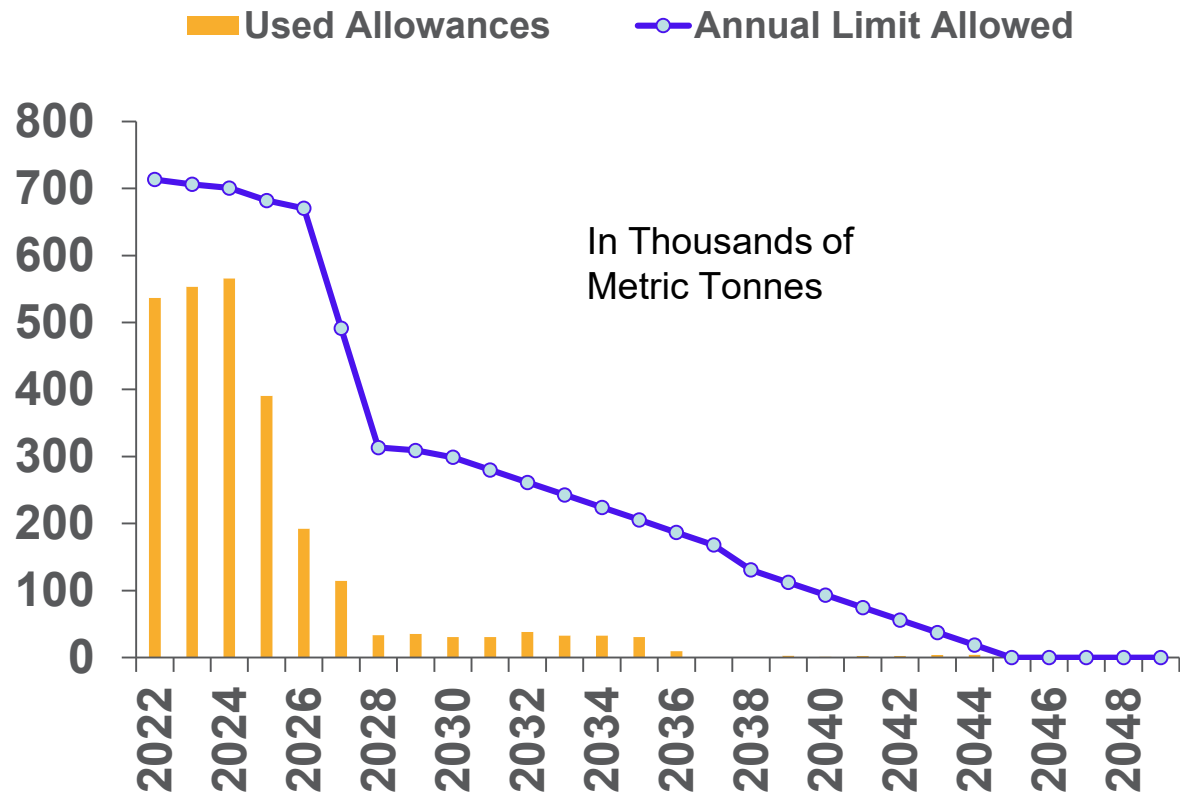


Greenhouse Gas – Cap and Trade Program

Pasadena Water and Power

- Pasadena is consistently under its cap from 2022 through 2045
- At the end of the study, PWP has more than 4.4 million excess allowances

Cap & Trade Program



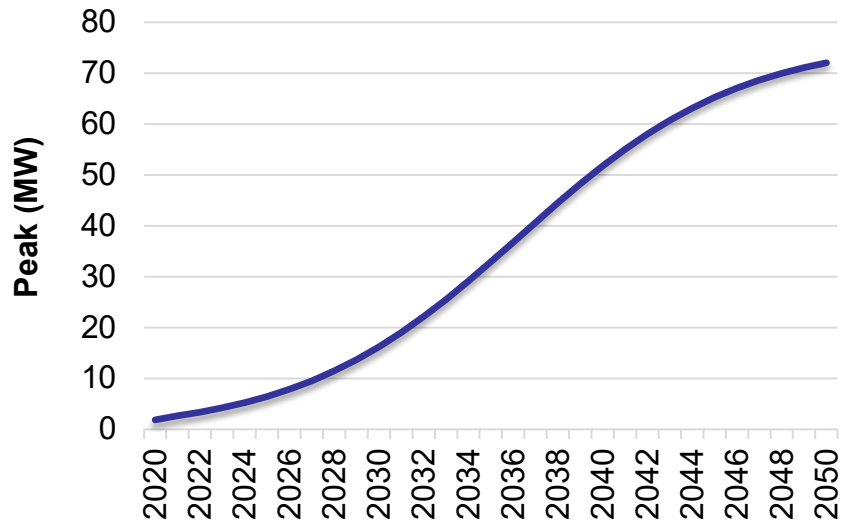


Electric Vehicles

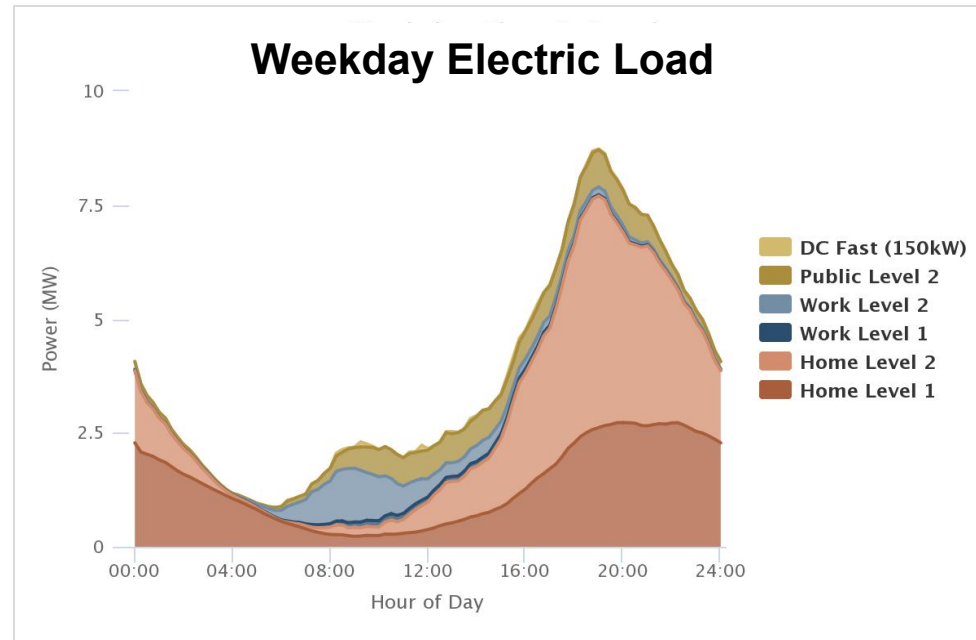
Pasadena Water and Power

- Projected EV penetration increases over time and changes load shape

Electric Vehicle Peak



Weekday Electric Load





Electrification Efforts/Plans

Pasadena Water and Power

- Load and Sales Growth
 - > Facilitates additional renewable resource procurement
 - > Additional revenues to help offset fixed costs
- Target Off-Peak Energy Sales
- Low Carbon Fuel Standard (LCFS) Credits
- Market EV Charging to Outside Customers
- Create Closer Customer Relationships
- Electric Appliances
- Homes & Buildings – Water/Air Heating/Cooling
- All Electric New Construction
- Through:
 - > Education
 - > Marketing & Outreach
 - > Code requirements
 - > Incentives



2021 IRP Update - Results Summary

Pasadena Water and Power

2021 IRP Update Results

- **Affirming that there will be no new long-term commitments for fossil-fueled power resources;**
- **PWP will comply with SB 100 by achieving the following:**
 - ✓ **60% Renewable Portfolio Standards by 2030,**
 - ✓ **100% zero carbon electricity supply by 2045;**
- **Maintaining existing local gas-fired generation to meet peak demands and ensure local reliability through the planning period (Glenarm has a low capacity factor);**
- **Purchase at least 70 MWs of firm resources by 2025 to ensure power supply reliability and comply with CAISO Resource Adequacy requirements:**
 - **The IRP model indicates that a combination of bulk energy storage, solar plus storage, geothermal resources, and demand-response programs appear to be the most cost-effective resource additions to achieve reliability, RPS, and GHG reduction goals; and**
- **A range of 120-170 MW installed “nameplate” capacity may be necessary to deliver 70 MW firm capacity. Actual installed capacity is heavily dependent upon technology.**



Pasadena Water and Power

QUESTIONS/COMMENTS?

