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Pasadena Water and Power

Approval of the Optimized Strategic Plan

Establishing an Action Plan to Achieve the Goals Set Forth by City Council-Adopted Resolution 9977

December 15, 2025

City Council

Item #18

MSC Recommendation

- On November 5, 2025, the Municipal Services Committee ("MSC") unanimously recommended that the City Council adopt and approve PWP's OSP, with five revisions that were incorporated:
  1. Clarify that the goal of the OSP is to reach carbon-free on an hourly basis, supporting Resolution 9977;
  2. Increase the goal for Additional Local Solar Resources from Staff's 50 Megawatts ("MW") recommendation to 70 MW with 50 coming from customer-owned solar;
  3. Include a timeline for incentives, initiatives, and an education campaign to increase the adoption of local solar;
  4. Remove references to proposed changes to Net Energy Metering ("NEM"); and
  5. Provide additional narrative regarding the viability of hydrogen as an emerging technology.

MSC Recommendation

- The MSC Recommendations were incorporated into the OSP:
  - **Goal of the OSP is to reach carbon-free on an hourly basis, supporting Resolution 9977**
    - Executive Summary – Page 7 - States the OSP presents a plan to achieve 100% hourly
    - Executive Summary – Page 9 - States the planning targets are designed to achieve 100% hourly
    - OSP Report – Page 65 - Direction from MSC to pursue 100% hourly accelerated
  - **Increase the goal for local solar to 70 MW**
    - Executive Summary – Page 10 - Table showing planning targets
    - Executive Summary – Page 16 (Gantt Chart)
    - OSP Report – Page 77 - Planning target figures
    - OSP Report – (Gantt Chart)
  - **Include a timeline for incentives, initiatives, and an education campaign**
    - OSP Report – Page 14 - Upfront incentives and PBC funds
    - OSP Report – Page 16 (Gantt Chart)
    - OSP Report – Page 88 (Gantt Chart)
    - OSP Report – Page 89 - Discussion of incentives to be rolled out in 2026
    - OSP Report – Page 90 - Lowering customer barriers
    - OSP Report – Page 133 – 136 - Outreach plan in the learner
  - **Remove references to NEM**
    - OSP Report – Page 89 - Evaluate all programs in rate study
    - OSP Report – Page 90 - Evaluate all programs and rates
  - **Provide addition narrative on viability of hydrogen**
    - OSP Report – Page 19 - Discusses dependence upon regional network
    - OSP Report – Page 21 – 22 - Discusses dependence upon regional network
    - OSP Report – Page 53 - Reason for consideration
  - **Customer Solar Sizing**
    - OSP Report – Page 14
    - OSP Report – Page 16 (Gantt Chart)
    - OSP Report – Page 88 (Gantt Chart)
    - OSP Report – Page 90 - Plan to revise sizing

MSC Requested Study Sessions

- As part of the implementation of the OSP, PWP will return to the MSC with a series of study session focused on advancing local solar adoption
  - These study sessions are intended to provide the MSC with a comprehensive understanding of the current solar landscape, identify opportunities to reduce barriers to customer participation, and evaluate potential policy and program enhancements that support the City's clean energy goals
- Proposed Study Session Topics:
  - Solar Capacity Limits – 150% to 200% of customer's maximum annual electricity use
  - Municipal Solar CIP Budget – Inclusion of solar installations on municipal facilities
  - Public Benefit Funds – Utilization of Public Benefit Funding to reach target of maximum conservation and maximum renewable generation
  - Net Energy Metering – Overview of current program, rate design, customer impacts and alignment with policies
  - Barriers to local solar adoption – Identification and analysis of financial, technical, and operational barriers limiting customer adoption and solutions
  - PWP Structure and Staffing – Review PWP's organizational structure and staffing resources as they relate to OSP goals including solar administration, interconnection, customer support, and long-term program scalability
  - Implementation Pathways and Next Steps – Discussion of potential programmatic, policy, and operational changes informed by the study sessions, along with timelines, decision points, and trackable accountability metrics

Background

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On January 30, 2023, City Council adopted Resolution 9977

- Declares that climate change is an emergency that threatens the health and welfare of the city, region, state, nation, and the environment
  - Sets forth a policy goal to source 100% of Pasadena's electricity from carbon-free sources by the end of 2030
  - Provides direction to plan multiple approaches to transition to this policy goal and optimize for affordability, rate equity, stability, and reliability of electricity while achieving this goal
  - Approved contract with Energy and Environmental Economics (E3) to assist with development of the Optimized Strategic Plan (OSP)

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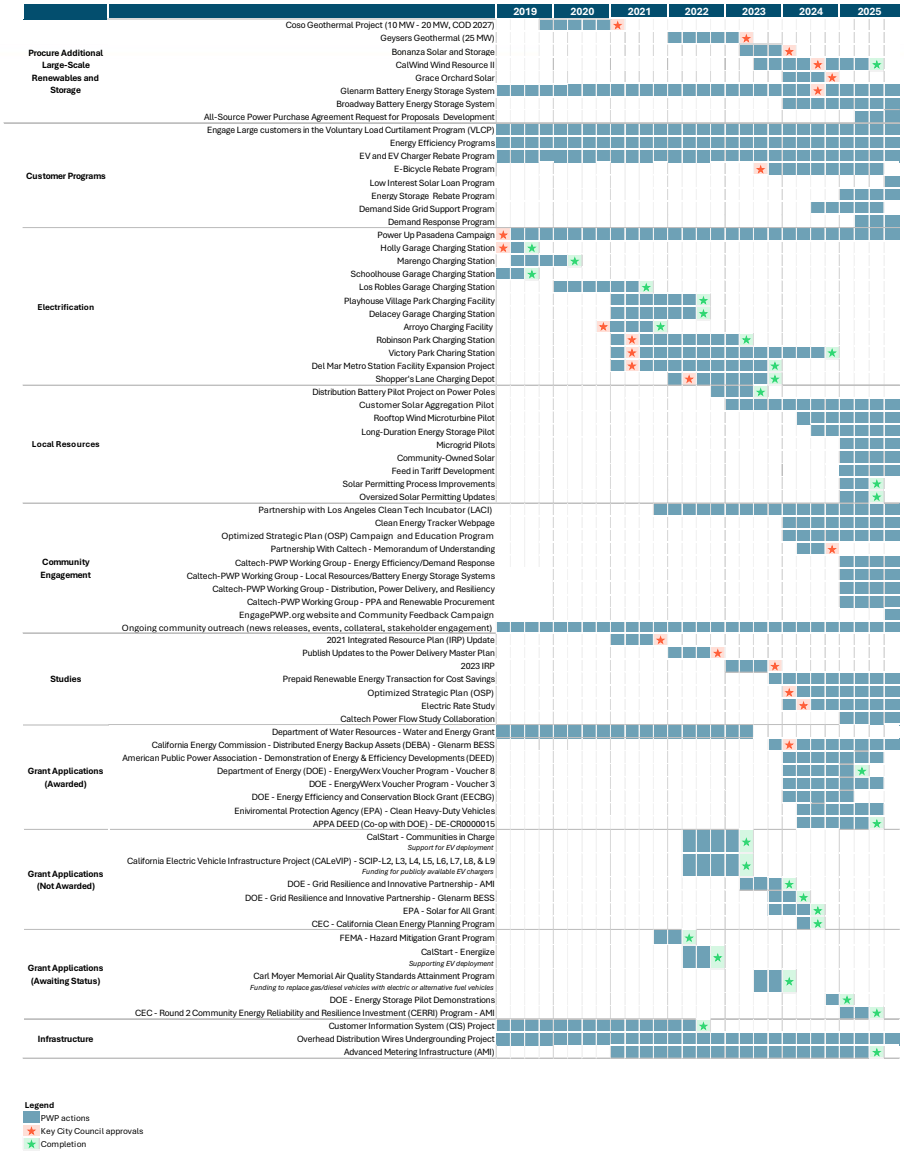
Accomplishments Summary

PWP Power Accomplishments Since 2018 IRP



Pasadena has consistently outpaced State mandates for renewable energy

- In 2015, the Pasadena City Council set a voluntary Renewable Portfolio Standard (RPS) goal of 40% by 2020
  - > Goal achieved by exceeding the State's mandated RPS of 33% by 2020
- In 2018, PWP made the pivotal decision not to renew participation in the Intermountain Power Project beyond 2027
  - > Eliminates the single largest source of carbon emissions; coal retired 11/26/25
  - > Procured 300+ MW ($1.2 billion) in long-term contracts for carbon-free energy
- Furthering this commitment, on December 11, 2023, the Pasadena City Council unanimously approved PWP's 2023 Power IRP
  - > 2023 Power IRP incorporated Resolution 9977 goals
  - > Accomplishments already put PWP on track to meet State's 100% goal 15 years ahead (around 90% on hourly basis)

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Accomplishment Highlights

Clean Energy Transition

- $1.2 billion in geothermal, solar, storage and wind (300+MW)
- All-Source PPA RFP development
- Local community-owned solar/storage RFP development
- Grants/Pilots – DOE LDES vouchers, APPA rooftop wind, CEC DEBA $9.66M for Glenarm BESS, battery on poles, solar RECs

Programs and Community Engagement

- Voluntary Load Curtailment, Demand Side Grid Support, Demand Response & Energy Efficiency Programs
- EV/Charger, E-Bike & Storage Rebates; Solar Loans
- Caltech Partnership (MOU + Working Groups)
- LACI, EngagePWP.org, Clean Energy Tracker

Infrastructure Projects

- Customer Information System (CIS)
- 12+ EV Charging Station Facilities (Holly Garage, Delacey, Arroyo, Victory Park & Del Mar Metro Station Expansion
- Advanced Metering Infrastructure (AMI)
- Overhead Distribution Undergrounding

OSP Collaborative Process

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Stakeholders and community engagement have been instrumental in the development of the OSP

Community Engagement Calendar

	2024											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Pasadena City Council			★							★		
Municipal Service Committee		★						★	★			
Environmental Advisory Commission									★		★	
Technical Advisory Panel						★★	★	★	★	★		★
Pasadena Community Meetings									★			

	2025											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Pasadena City Council					★							★
Municipal Service Committee			★	★		★					★	
Environmental Advisory Commission			★					★				
Technical Advisory Panel		★	★		★	★		★		★		
Pasadena Community Meetings			★			★						

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Technical Advisory Panel

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The Technical Advisory Panel ("TAP"), comprised of a broad segment of community stakeholders was created to provide valuable input to aspects of the OSP development process

Pasadena 100's ongoing dedication and thoughtful contributions have played a vital role in shaping and advancing the carbon-free planning efforts

- TAP Members:
  - Sam Berndt, Member, Pasadena 100
  - Cynthia Cannady, Member, Pasadena 100
  - David Coher, Resident
  - David Kang, Associate Vice President for Facilities, California Institute of Technology
  - Paul Little, President, Pasadena Chamber of Commerce
  - Dr. Stephen Low, Professor of Computing and Mathematical Sciences and Electrical Engineering, California Institute of Technology
  - Lauren Siegel, Chair, Environmental Advisory Committee

OSP Public Engagement

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- PWP engaged in a public comment period from October 6 through October 27, 2025 on PWPEngage.com

Members of the public were able to share their thoughts on the Draft OSP by submitting feedback on various topics including:	During the public comment period, EngagePWP accumulated:
• OSP Overview • Renewables & Storage • Local Solar • Programs & Rates • Glenarm Power Plant • Power Delivery • New Technologies • Partnerships	• 2,686 Site Visits • 2,162 Unique Visitors • 117 Draft OSP Downloads • 34 Draft OSP Executive Summary Downloads • 87 Comments Across 8 Different Response Topics

- Large support for Pasadena's 100% carbon-free electricity goal by 2030
- Some critical and cautionary feedback as unrealistic and increased costs
- Concerns around reliability, emergency preparedness, wildfire risks & safety

Pillars of the OSP

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OSP Highlights

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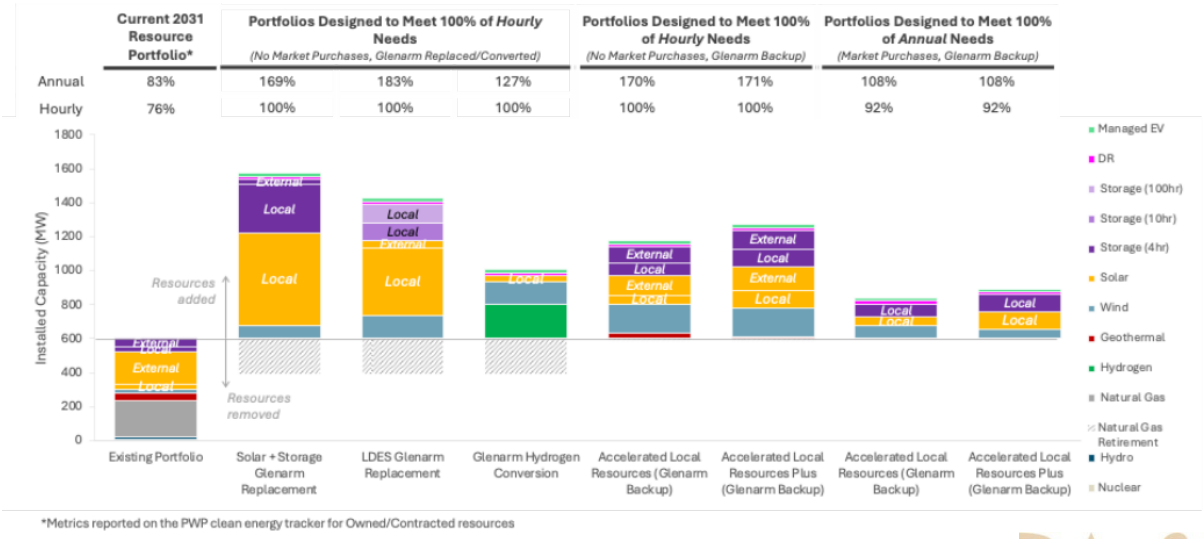
- The OSP modeled seven case studies to explore carbon-free pathways
  - > Explored portfolios designed to meet 100% annual carbon-free goals and 100% hourly carbon-free goals



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Hourly vs. Annual Case Studies

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- Additions of local solar and storage, along with additions of external wind allow PWP to meet 100% of *annual* energy needs with carbon-free energy
- The *hourly* and *annual* case studies have the same local resource additions
- 220 MW of additional resources are required to achieve100% annual matching
- 550 MW of additional resources are required to achieve100% hourly matching

Subset of Case Studies

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Resource Type	Subset of Case Studies Evaluated by E3				Optimized Strategic Plan Planning Targets
	Annual Matching, Accelerated Local Resources	Annual Matching, Accelerated Local Resources Plus	Hourly Matching, Accelerated Local Resources	Hourly Matching, Accelerated Local Resources Plus	
Solar (External)	-	-	115	143	**125**
Solar (Local)	50	100	50	100	**70**
Storage (External)	-	-	95	113	**100**
Storage (Local)	75	100	75	100	**75**
Wind	74	53	175	175	**175**
Geothermal	-	-	26	4	**25**
Total					**570**

Note: All case studies include 15 MW of demand response and 20 MW of managed electric vehicle charging.

OSP Planning Targets by 2030

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Planning targets were informed by the full suite of case studies evaluated in the OSP, but are largely derived from the 100% Hourly Matching, Accelerated Local Resources case study.

Additional Utility-Scale Resources	Wind **Up to 175 MW**	Solar **Up to 125 MW**	Battery Storage **Up to 100 MW**	Geothermal **Up to 25 MW**
New Local Resources	Local Solar **+70 MW**	Local Battery Storage **+75MW**		
New Customer Programs and Rates	Commercial Demand Response **+15 MW**	Residential DR Participants **+5,000 homes**	Managed EV Charging **100%**	

Note: Planning targets represent incremental additions to existing and future resources already under contract

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Implementation Roadmap

Action Plan Item (Organized by OSP Pillars)	Applicable OSP Pillars	Timeline
0 General reporting and progress updates		
Provide quarterly progress updates to Municipal Services Committee	1 2 3 4 5	2025-2030
Maintain Clean Energy Tracker website	1 2 3 4	2025-2030
Publish 2028 Integrated Resource Plan	1 2 3 5	2028
1 Rapidly scale proven technologies (utility-scale renewables & storage)		
Integrate new contracted resources into portfolio (210 MW renewables & 55 MW storage)	1	2025-2029
Continue to procure resources through SCPPA and seek approval (as needed)	1	2025-2030
Conduct all-source RFP for new utility-scale renewables and storage	1	2025-2027
Reassess cost impacts to continue procurement above 100% annual matching	1	2026-2028
Evaluate need to issue additional RFPs for renewables and storage	1	2028
Issue and administer additional RFPs (as needed)	1	2029-2030
Integrate additional contracted resources into portfolio (up to 325 MW renewables and 100 MW storage)	1	2029-2030
1 Rapidly scale proven technologies (local solar & storage)		
Revise policy on customer solar sizing	1 3	2025
Reevaluate best use of Public Benefit Charge funds	1 2 3	2025-2030
Launch public outreach and education campaign	1 3	2025-2026
Identify municipal sites for solar development	1 3	2025-2026
Conduct studies to identify potential microgrid sites	1 3	2025-2026
Develop Glenarm BESS project (25 MW, online 2027)	1 3	2025-2027
Bring proposal to further revise policy on customer solar upsizing to City Council	1 3	2026
MSC study session on lowering barriers to customer adoption	1 3	2026
Develop feed-in tariff (FIT) program for solar & storage targeting large institutional customers	1 3	2026
Streamline permitting and interconnection processes	1 3	2026
Develop the low interest loan program for low-income customers	1 3	2026
Develop incentive program for customer-owned solar and storage	1 3	2026
Develop municipal solar installations at initial high priority sites	1 3	2026-2028
Explore other opportunities for solar and storage development (e.g. Rose Bowl, 710 Stub)	1 3 5	2026-2030
Develop Broadway BESS project (75 MW, online 2030)	1 3 5	2026-2030
Develop microgrids at initial selected municipal properties	1 3	2027-2028
Partner with commercial and institutional sites for microgrid development	1 3	2027-2028
Continue public outreach and education campaign	1 3	2027-2030
Develop municipal solar installations at additional sites	1 3	2027-2030
Partner with large customers and institutions to develop solar and storage under FIT program	1 3	2027-2030
Evaluate tariffs that incentivize customer solar and storage adoption	1 3	2028
Continue development of microgrids at additional sites	1 3	2029-2030
2 Develop Innovative Programs and Rates to Leverage Customer-Facing Solutions		
Continue to deploy energy efficiency resources to meet energy efficiency goals	2 3	2025-2030
Enroll large customers in Voluntary Load Curtailment Program (VLCP)	2 3	2026
Evaluate building load management program models best suited for Pasadena	2 3	2026-2027
Evaluate program design for active managed charging of electric vehicles	2 3	2026-2027
Pilot building load management programs with small customer groups	2 3	2027-2028
Develop and pilot active managed charging programs	2 3	2027-2028
Develop TOU rates to incentivize load management, flexibility, and energy storage	1 2 3	2028
Deploy building load management programs acorss all customer classes	2 3	2028-2030
Deploy and scale active managed charging programs	2 3	2029-2030
3 Additional Actions Related to Mitigating Glenarm Operations		
Provide annual reporting on Glenarm operations	3	2026-2030
Reevaluate options for long-term Glenarm transition	3	2028
Assess renewable natural gas supply options	3	2028-2030
4 Upgrade Power Delivery Infrastructure		
Upgrade internal distribution infrastructure	3 4	2025-2027
Implement Advanced Metering Infrastrcuture (AMI) throughout the City	3 4	2025-2028
Publish 2027 Power Delivery Master Plan	3 4	2027
Increase import capability at TM Goodrich Receiving Station	3 4	2025-2035
Develop second point of interconnection with CAISO	3 4	2025-2040
5 Leverage Emerging Technologies		
Montitor emerging technology status	3 5	2025-2027
Coordinate with neighboring utilities to planning for hydrogen conversions	3 5	2025-2030

Notes
Items are categorized according to the most directly relevant area, but secondary linkages to other pillars are shown in "Applicable OSP Pillars"
Additional detail on schedule and milestones for action items are provided in detailed action plan schedules

- OSP Action Plan includes:
  - > Procurement of new utility-scale clean energy contracts
  - > Development of local solar on city-owned property
  - > Customer programs, outreach, and marketing campaigns
  - > Pilot projects showcasing new and emerging technologies

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Customer Rooftop Solar

Pasadena Water and Power

- OSP Planning Target for Customer-Owned Solar:
  - 50 MW of new solar by 2030
    - Average Size of Residential install in 2024: 6.02 kW
    - Average Size of Commercial installs in 2024: 82.6 kW
- In 2024, 306 (93%) residential installations and 24 (7%) commercial under Net Energy Metering and federal tax credits
  - In terms of capacity commercial outweighs residential
    - Of the 3.82 MW of solar installed, Commercial customers installed 1.9 MW or 49.7%
    - Currently 1/3 of the existing rooftop capacity size is residential
- Goal of 50 MW by 2030 could require:
  - ~4,000 new residential installs, ~800/year
    - Currently there 3,062 residential systems installed since 2008 (96%)
  - ~313 new commercial installs, ~62/year
    - Currently there are 121 commercial systems installed
- The expiration of federal tax credits on 1/1/26 may have an impact on the solar adoption rate

Community-Owned Solar

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The Community-Owned Solar Initiative would install solar at City-owned facilities

- 20 MW Community-Owned Solar Planning Target:
  - Installation of 20 MW by the end of 2030 would require
    - 30+ small- to- medium sites
    - 10+MW site at the Rosebowl
  - An estimated CIP budget of ~$90 million over 5 years

Note: These are preliminary sizing estimates that will require confirmation. PWP is investigating the procurement of an advanced software to support detailed site analysis.

Type of Site	Total Number of Site	Number of Sites suitable for Solar	Estimated Total Solar Capacity (MW)
Libraries	10	7	~1.2 MW
Fire Stations	8	7	~0.5 MW
Parking Garages	9	6	~2.3 MW
Water Infrastructure	List still being compiled	6	~4.7 MW (additional sites under evaluation)
Parks	12	4 evaluated so far	~1.9 MW
Rosebowl	1	1	~10-15 MW

Note: These are the initial sites being evaluated, others will include Government Buildings, Electrical Infrastructure, Police Infrastructure, Community Centers, and Parking Lots

Performance Reporting

OSP presents a flexible and adaptable set of action plans that position PWP to address new or changing conditions and priorities

PWP has developed a plan for transparency with regular checkpoints and updates to track progress

Quarterly Updates to MSC	**Annual updates to EAC**	**Clean Energy Tracker Webpage**	**2026 and 2028 Waypoints**	**Annual Customer Program Reports**	**City Council Review of New Power Purchases**	**100% Annual Carbon-Free Milestone Update**

Next Steps

Future City Council approvals

- Contracts for utility-scale renewables and storage resources
- Contracts for the development of solar and storage on city-owned properties
- Rate and customer program changes
- Capital plans for power delivery infrastructure upgrades (incorp into Capital Budgets)

2028 Waypoint

- Ongoing Quarterly Updates to MSC
- Assess the progress made and associated impacts
- Ensure priorities are incorporated into the development of the 2028 IRP

MSC Recommendation

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  1. Clarify that the goal of the OSP is to reach carbon-free on an hourly basis, supporting Resolution 9977;
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  4. Remove references to proposed changes to Net Energy Metering ("NEM"); and
  5. Provide additional narrative regarding the viability of hydrogen as an emerging technology.

Recommendation

1) Find that the action statutorily exempt from the California Environmental Quality Act ("CEQA") pursuant to State CEQA Guidelines Section 15262; and

2) Adopt and approve Pasadena Water and Power's ("PWP") Optimized Strategic Plan ("OSP"), outlining actionable steps to meet the goals set forth by City Council-adopted Resolution 9977;

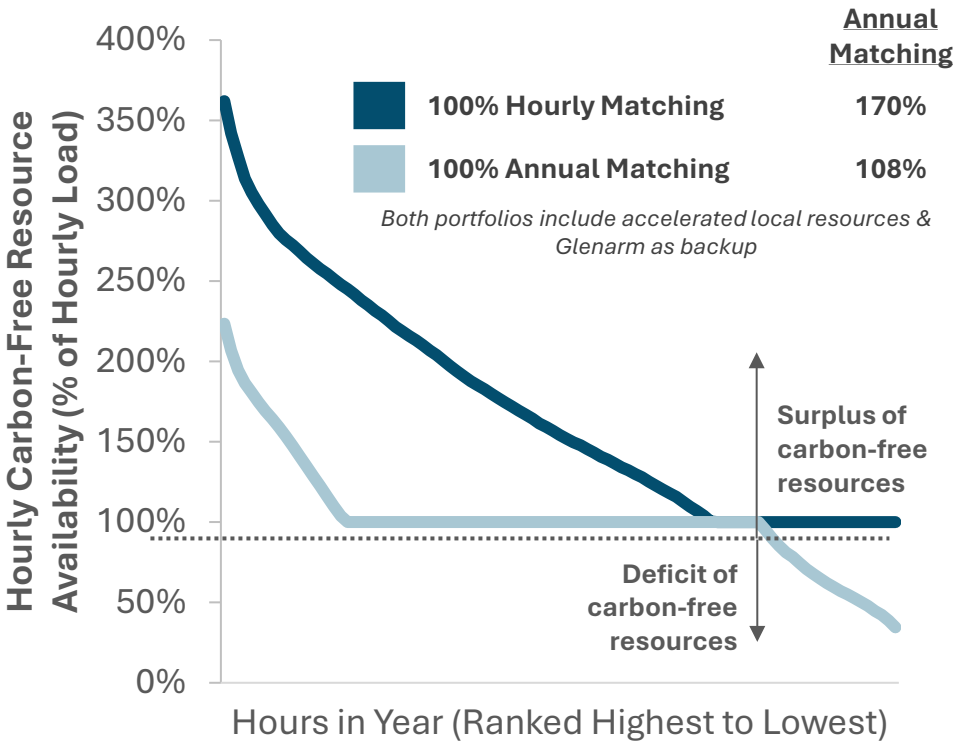
Back-up Slides

2031 Installed Capacity Across Case Studies

2031 Cost Comparison Across Case Studies

Note: Incremental cost measured relative to a “least-cost” portfolio designed to meet 100% of Pasadena’s annual energy needs with carbon-free resources

2031 Duration Curves of Carbon-Free Energy Resources



100% Hourly Matching:

Supplying load with 100% carbon-free energy during the most constrained conditions across the year requires a portfolio that produces a large surplus of carbon-free energy outside of those constrained periods

- \+ Surplus carbon-free generation must be curtailed or sold to the market, making PWP heavily dependent on off-system sales
- \+ Many hours in which PWP would have a surplus of generation could occur when prices in the market are low or negative (e.g. daytime hours in spring)

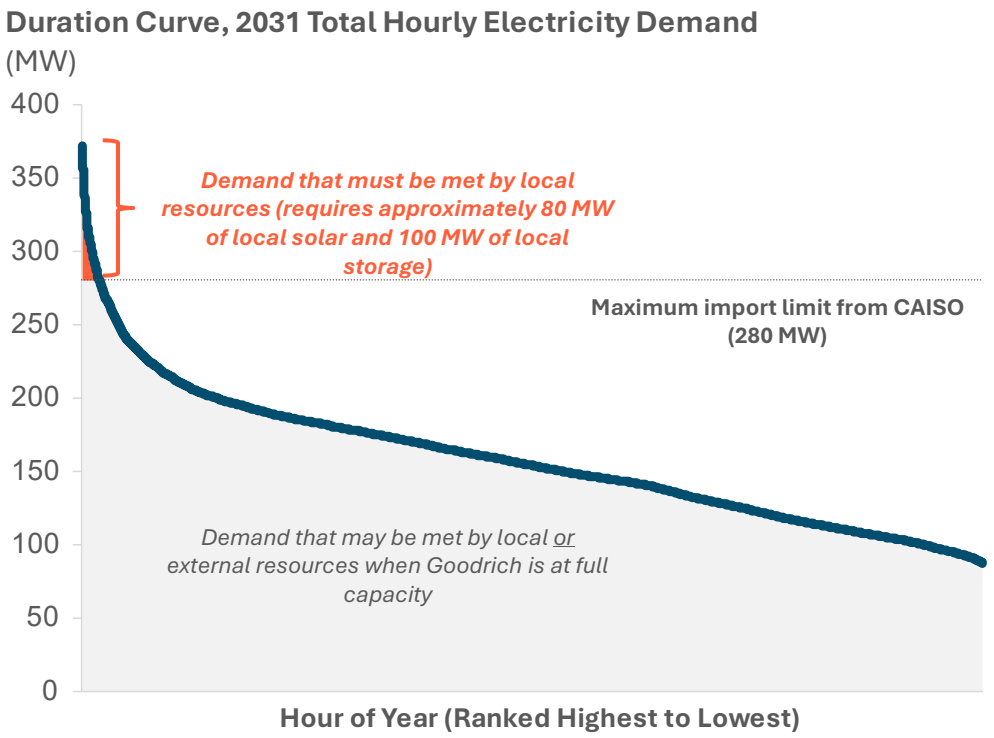
100% Annual Matching:

A portfolio that is sized to supply 100% of annual energy needs with carbon-free energy results in a "balanced" position in wholesale markets:

- \+ Carbon-free resources meet or exceed hourly demand across most of the year; in aggregate, surpluses match or exceed deficits
- \+ Lower reliance on revenues from off-system sales; increased opportunities to maximize value of flexible storage resources

Role of Local and Internal Resources Due to Transmission Constraints

- **PWP's maximum import capability from CAISO is 280 MW**
- **Throughout most of the year, loads within Pasadena service territory are below this threshold**
  - During these periods, local and external resources can both meet city's entire energy needs
- **During summer peak periods, energy demands are expected to increase to levels above 280 MW**
  - The need to serve loads above 280 MW with local resources is one of the reasons Glenarm currently operates during the year
  - Meeting this portion of the city's needs with local solar and storage instead would require roughly 80 MW of local solar and 100 MW off local storage



Estimated Timelines

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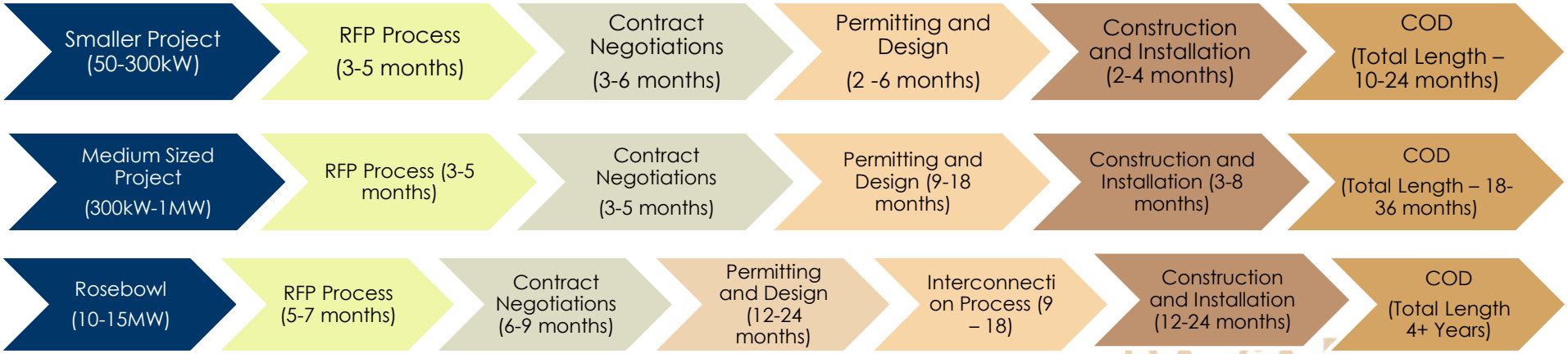
- Community-Owned Solar will take time to implement and there is great risk for missing the deadline depending on any number of potential delays
- Estimated Timelines from RFP release to Commercial Operation Date (COD) for Community Owned Solar
  - For smaller projects (i.e. Library Rooftop) – Estimated timeline of 12-24+ months
  - For medium sized projects (i.e. Victory Park Parking Lot) – Estimated timeline of 2-4+ years
  - For the Rosebowl Project – Estimated timeline of 4+ years
- Timeline risk may be partially mitigated by directing all City departments to collaborate on these projects
  - Many City departments will touch at least one aspect of all projects
  - Other Solar Groups in other cities have recommended having a City Council/City Manager directive for all departments to collaborate together on the solar program would improve the chance of success



Changes to the OSP since MSC

- Executive Summary
  - > Clarified the OSP's hourly carbon free target, supporting Resolution 9977
  - > Incorporated MSC's direction to update the local solar goal from 50MW to 70MW, with 50 MW coming from customer-owned solar
    - Emphasized flexibility in planning targets, particularly related to specific programs (Customer-Owned solar, FIT, Community-Owned Solar, etc.) for local solar adoption
    - Discussed PWP's planned incentives for solar and storage
    - Added details on the ways PWP is helping to lower the barriers to solar adoption throughout the City
  - > Clarified that PWP has made no commitment to pursue a Hydrogen conversion at Glenarm, but that PWP will continue to monitor the industry as it develops, as we would evaluate any emerging technology

Changes to the OSP since MSC

- Pillars of the Plan for Carbon-Free Electricity
  - > Provided additional details on the City's commitment to rolling out incentives for local solar and storage
  - > Indicated PWP to bring solar sizing changes from 150% to 200% before MSC/Council
  - > Espoused the need for City-wide cooperation on the municipal solar effort
- Throughout
  - > Clarified the OSP's hourly carbon free target, supporting Resolution 9977
  - > Clarified PWP's commitment to maintaining flexibility by evaluating, but not committing, to emerging technologies as they mature
  - > Updated all references, charts, and figures to show the 70MW local solar target
  - > Updated all charts and figures to reflect other directed changes throughout