Recent Questions to PWP on the 2023 Integrated Resource Plan Effort

Includes questions from the Power IRP Virtual Community Meeting #2 held on April 27, 2023

1	**Question:** What are Utility-scale Resources? **Response:** Utility-scale Resources are energy generation or storage facilities that are considerably larger than typical residential or commercial facilities (typically 1 MW or larger).
2	**Question:** What are Internal Resources? **Response:** Internal Resources are facilities that are connected electrically anywhere within PWP's Power System. Such facilities exist on the PWP side of the T.M. Goodrich (TMG) transmission connection - the single point through which all power flows into Pasadena, and are usually, but not always located within city limits. In general, "Internal" refers to PWP's service territory.
3	**Question:** What are External Resources? **Response:** External Resources are facilities located outside of PWP's service territory. Any resource that falls on the California Independent System Operator (CAISO) side of TMG (i.e., "the grid") is external. External resources do not necessarily need to be connected to CAISO but must deliver into the CAISO. In general, "external" side represents PWP's access to CAISO markets.
4	**Question:** What are Renewable Energy Credits and Portfolio Content Categories? **Response:** <u>Renewable Energy Credit (REC)</u> A certificate of proof associated with the generation of electricity from an eligible renewable resource. RECs are categorized based specific characteristics such as location of generation, point of interconnection, and contract terms. REC = 1 MWh of generation <u>Portfolio Content Categories (PCC)</u>

	PCC-1 – A renewable resource located within or directly delivered to the state of California without energy substitution from another resource. A minimum of 75% of compliance requirements must be met by PCC-1 resources. PCC-2 – A renewable resource that is out-of-state and delivers to California, where the RECs are paired with a substitute energy resource imported into the state. No more than 25% of compliance requirements can be represented by PCC-2 product. PCC-3 – Evidence of ownership of the renewable attribute (i.e., "certificate") from a resource, delivered without the energy component. No more than 10% of compliance requirements can be met by PCC-3. A fourth classification, PCC-0, refers to agreements executed prior to June 1, 2010, and not subject to specific criteria of other classifications (i.e., "grandfathered"). In general, RECs classified as PCC-0 reduce the overall disposition size requirement so that less PCC-1, PCC-2, and PCC-3 RECs are needed to meet compliance obligation. For more specific details about qualifying electricity products, please see the RPS Regulations available through the California Energy Commission.
5	**Question:** What is Demand-side Management? **Response:** Demand-side Management (DSM) refers to programs and/or activities by electric utilities designed to modify consumer electricity usage. Examples include Energy Efficiency, Demand Response (DR), Distributed Energy Resources (DER), virtual power plant, financial incentives, and education.
6	**Question:** What is the difference between Utility-scale, Community, and Distributed solar projects? **Response:** 1. Utility-scale – Large (~1 MW or more); usually owned/contracted by the utility. 2. Community – Large (usually utility-scale) – usually owned/contracted by the utility; allows consumers with limited roof space to "opt-in" and get a share of the solar output. 3. Distributed - (Commercial) – Medium (~174 kW); usually owned/contracted by consumer. 4. Distributed - (Residential) - Small (~6kW); usually owned/contracted by consumer.
7	**Question:** What is Carbon-Free by 2030 Scenario #1 – No limit on Internal Resources? **Response:** Scenario #1 is the first of several strategic pathways/approaches considered by the IRP to achieve the Carbon-free by 2030 (CF2030) goal of City of Pasadena (City) Resolution 9977.

	Scenario #1 explores sourcing Pasadena's energy needs according to CF2030, but without any predetermined constraints on resource location. It would allow the IRP model to include any number and/or quantity of resources electrically located within Pasadena and could ultimately result in a portfolio comprised entirely of local resources. Scenario #1 will provide an understanding of the requirement of carbon-free resources needed to meet PWP's load every hour. It will also serve as the foundation for future resource acquisition practices, including the number, size, and scale of locations needed. Focusing on local generation development will potentially have the additional benefit of lowering the need for transmission of remote renewable energy, resulting in lower CAISO Transmission Access Charges (TAC).
8	**Question:** What is CF2030 Scenario #2 – Maximum limit on internal resources? **Response:** Scenario #2 will demonstrate how best to optimize internal resources inside PWP's service territory with maximum limits set on utility-scale resources such as community solar, hydrogen-power fuel cells, and energy storage. The limits are based on PWP's best estimate of the maximum threshold of each resource that could fit in Pasadena. The model would first elect to install internal utility scale resources up to this maximum and then move to the next "best" resources to fulfill needs. The secondary selections could potentially be residential or commercial solar or storage within PWP's service territory, or carbon-free resources located external to Pasadena. Scenario #2 will help identify alternate resources that would be the best-fit at the least-cost if resources identified in the Scenario #1 results are not feasible due to existing internal constraints. With limited new in-service high voltage transmission construction within California, or new external transmission to the California electric grid expected by 2030, Scenario #2 represents a viable pathway to CF2030.
9	**Question:** What is CF2030 Scenario #3 – Maximum limit on internal resources and doubled distributed resources? **Response:** Scenario #3 mirrors the internal resource availability described in Scenario #2 while doubling the amount of distributed solar and storage represented in the load forecast - representing enhanced customer participation in Distributed Energy Resources (DERs) as a pathway to achieving CF2030. Scenario #3 will provide information about the effect of increased DERs on a portfolio mix, including cost savings associated with reduced utility-scale resources. Enhanced customer adoption rates are key to the success of the role of DERs in a potential pathway to CF2030. Public policy considerations may become a future consideration in the achievement of these objectives.

10	**Question:** What is Scenario #4, the "Reference Case?" **Response:** Scenario #4 or the "Reference Case," is based on Senate Bill (SB) 1020 and meets all California compliance requirements for renewable and carbon-free resources. It sets interim targets for SB 100's "100% by 2045" goal; specifically, it requires that a utility's retail sales are met by the following percentages of eligible renewable energy resources and zero-carbon resources by 2045: 90% by December 31, 2035 95% by December 31, 2040 100% by December 31, 2045 It should be noted that the Reference Case Scenario is already constrained by previous PWP policy decisions to include no new long-term Greenhouse Gas (GHG)-emitting resources in its portfolio, and to exit from the Intermountain Power Project (IPP) in June 2027. Essentially, the 2018 IRP, which includes these as well as other past policy decisions, are also represented in this scenario. Ultimately, Scenario #4 will demonstrate PWP's ability to comply with all applicable regulatory mandates and provide a "standard requirement" base case against which to compare other scenarios
11	**Question:** What is Scenario #5, the Reference Case Plus Social Cost of Carbon (SCC)? **Response:** Scenario #5 begins with the assumptions of the Reference Case Scenario but includes the Social Cost of Carbon (SCC) - which is the estimated financial impact of carbon emissions upon society translated to $/metric ton of carbon dioxide. PWP intends to the use the lowest discount rate published by the Environmental Protection Agency (EPA) in its SCC report, which will produce higher costs. The addition of the SCC in the computer simulation has the effect of making carbon-emitting generators appear to be more costly to operate. As a result, the "least-cost algorithm," which is a standard tool for IRP simulations, would choose carbon-emitting resources less frequently, opting instead for non-carbon-emitting resources such as solar or wind and prompting the need for procurement of more clean energy resources. The quantification of the SCC can be an important outcome of the IRP process, and inclusion of this Scenario #5, in comparison to Scenario #4 (Reference Case) will help to provide that qualitative benchmark.
12	**Question:** What is the "Emerging Technologies Study" Scenario? **Response:**

	The Emerging Technologies Study is an additional Scenario that would evaluate the effects of new/or emerging technologies upon a specific Scenario. "Emerging Technologies" is a general term that refers to new development that may become available during the IRP horizon (2023 through 2050) which could represent opportunities to achieve carbon-free goals at lower costs or greater reliability. Overall, the understanding of costs and operational parameters for more advanced technologies is developing over time. However, there are certain parameters that would be helpful for PWP to achieve its carbon reduction goals: • Less energy usage overall • Less energy usage at peak load times Peak time reduction could be enhanced by technological advancements such as Energy Efficiency, Distributed Resources, and various Demand Response technologies.
13	**Question:** What are the Sensitivity Tests and what do they show? **Response:** To understand the effects of stresses that are outside of PWP's control, Sensitivity Tests will be applied to each of the Scenarios after the initial modeling is completed which will help inform about potential vulnerabilities and specific considerations that may need to be addressed. • <u>Extreme Weather Event – Heat Wave</u> – This study will evaluate each Scenario against the effects of a persistent, record-setting heat wave affecting both Pasadena and the region. Daily temperatures would be set between 90 degrees Fahrenheit (F) and 120 degrees F consistently for four weeks during the summer. This stress test will evaluate the ability of each portfolio to meet retail load during an extreme weather event and may provide insight on the ability of specific resources to meet load demands. • <u>T.M. Goodrich (TMG) Transfer Contingency – Partial Loss of Physical Connection to the outside grid</u> – This study will assess the performance of each Scenario against a substantial interruption of power flow through TMG, Pasadena's "City Gate" and only connection to the outside grid. This interruption shall be modeled as a loss of one 220-kV transmission line into TMG for one week during the summer and may help compare the value of internal versus external resources. • <u>Price Fluctuations – Impacts of New Resource Price Changes</u> – This test will evaluate the Scenarios using both the low and high price curves, as estimated by the National Renewable Energy Laboratory (NREL), to provide a band of possible future prices. All Scenarios will first be run using the moderate price curve, and then will be stressed at high and low-price curves for comparison purposes.
14	**Question:** Is the IRP a technical or policy document?

	Response: The IRP is a technical document that studies the feasibility of parameters such as cost, reliability, environmental impacts, and regulatory mandates. It employs simultaneous studies to determine the best combination (or co-optimization) of resources and helps inform policy decisions through complete and accurate data and analyses. A benefit of integrated resource planning is its analytical approach to identifying multiple solutions to complex matters such as GHG reduction and other objectives which can be presented to the City Council for informed policymaking.
15	**Question:** What are Demand Reduction Programs and Virtual Power Plant? **Response:** Demand Reduction (DR) Programs include two different types of technology levels, a "passive" level, and an "active" level. <u>Passive DR</u> Technology that reduces the need for electricity through its use or requires less energy to operate than previous installations. In the simulation model, Passive DR is represented by Energy Efficiency technology such solar, light-emitting diode (LED) bulbs, and EE-rated appliances and heating, ventilation, and air conditioning (HVAC) systems. <u>Active DR</u> Automated engineering actions to reduce the amount of energy going into a customer's service connection or to a specific customer-connected load. For example, remote-control access to a customer's HVAC. With permission, a utility would be able to adjust the heating and cooling settings of the HVAC to achieve a lower energy usage. Active DR is more efficiently implemented with a robust Advanced Metering Infrastructure (AMI) to facilitate the electronic communication between utility and customer meters. PWP expects to have AMI available to all PWP customers by 2030, which is reflected in the model as the year in which DR programs can be initiated. <u>Virtual Power Plant</u> An Active DR management tool that allows better control and usage of distributed energy resources (DERs) by serving as a central control function that provides commands to Distributed Energy Resources (DER). Accordingly, a Virtual Power Plant would require AMI plus significant incorporation of DERs into PWP's existing service connections. It would be an excellent tool once the technology is in place and if sufficient DERs exist to make it worthwhile.
16	**Question:** Does the IRP consider rate policy, rate equity, utility bill discounts? **Response:**

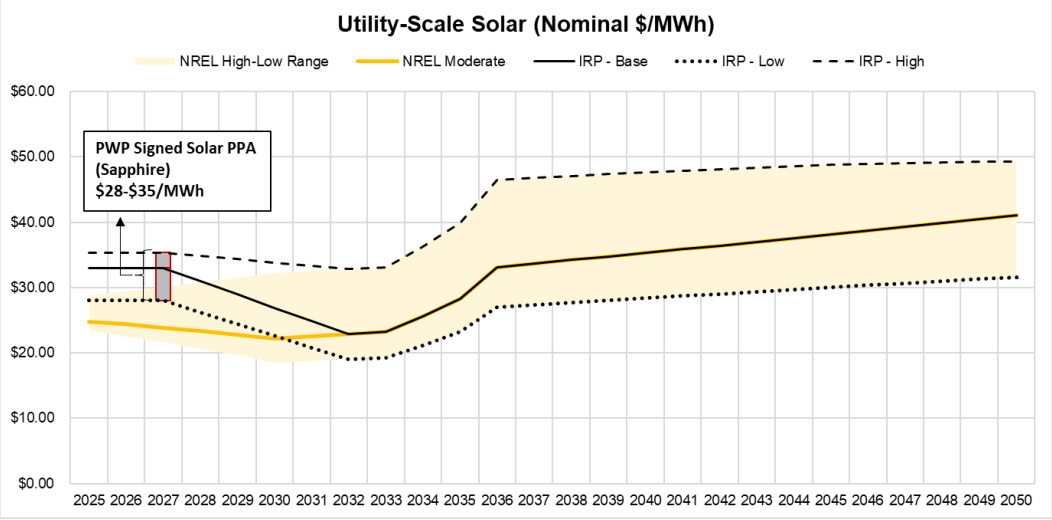
	While the IRP document will include discussion about these topics, it will not set policy direction which is a role of the City Council. PWP will oversee modeling of the Scenarios, analyze the results, calculate the associated costs, and may provide information about funding mechanisms, such as grants.
17	**Question:** Who pays for Distributed Generation? **Response:** NREL's cost estimates for customer installation of distributed generation will be used, but with generation costs factored out. Enhanced customer adoption rates are key to the success of the role of DERs in a potential pathway to CF2030. Public policy considerations may become a future consideration in the achievement of these objectives. PWP will evaluate the benefits and costs of DERs to provide the best available information to policymakers. Future policy decisions aimed at increasing the penetration of customer installations of solar and/or battery are reserved for policy makers and this IRP may help inform that discussion.
18	**Question:** Does the estimated calculation for distributed solar buildout in any way limit the maximum expansion of distributed solar in the IRP model? **Response:** The estimates to which this question refers resulted in numbers that are greater than the maximum numbers assumed in the load forecast. Therefore, the 2023 IRP will not impose any limits on the maximum customer-side solar expansion.
19	**Question:** Can the expansion of T.M. Goodrich be accelerated? **Response:** PWP will be evaluating opportunities to accelerate where possible expansion of T.M. Goodrich and associated system infrastructure changes. These upgrades are outlined in the PWP Power Delivery Master Plan (PDMP), which was approved by the City Council in 2022 detailing steps required to maintain overall system reliability and to increase import capacity to the contacted amounts. The requirements of the 2022 Integrated Resource Plan (IRP) may require modifying the current PDMP to better support these initiatives. These infrastructure upgrades come with their own requirements related to sequencing jobs to maintain service and reliability while taking major portions of the system out of service during construction. This often must occur during periods of low customer loading. Additionally, the utility industry overall has had challenges with supply chain procurement and deliveries being timely.
20	**Question:** Feedback has been received that the forecasted cost of new resource options during the critical period of 2027 to 2032 appears to be inflated by a process of delayed "blending,"

taking the price of a single 2022 contract and blending it into the National Renewable Energy (NREL) benchmark data for a period of 5 to 10 years. The result of the blending is to create an increase in the forecasted cost for renewables until after the 2030 goal. . To select one contract from 2022 and use it as a way to increase NREL's ATB cost data for a period 5-10 years after the contract seems unreasonable.

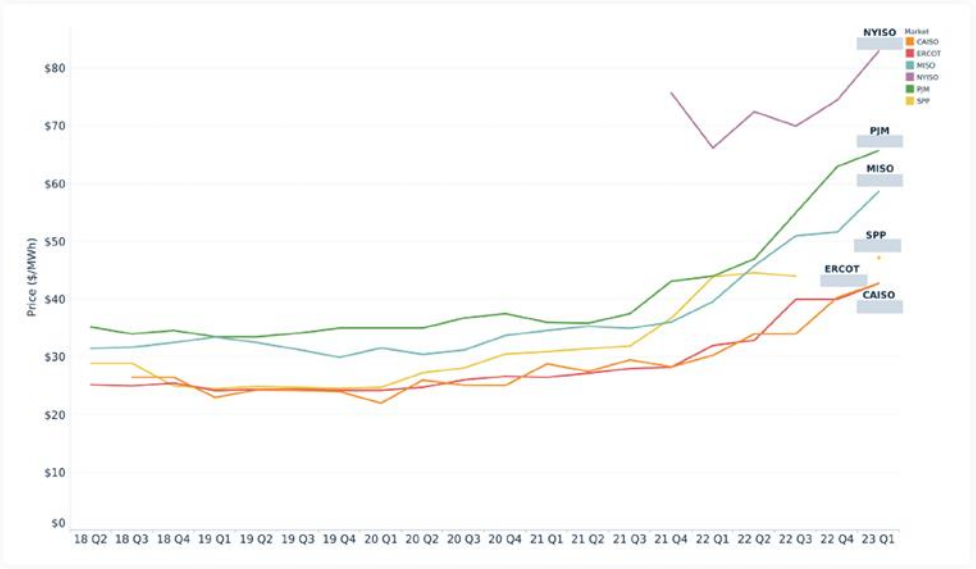
ACES Response:
The methodology developed by PWP and ACES was intended to use the best available information to develop near-term benchmarks for long-term projections for the cost of new technologies. The EDF Sapphire (Sapphire) project was signed in early 2023 for delivery by December 31, 2026. Sapphire provides a real project model with pricing that PWP can use to benchmark cost in 2026 and 2027.

In multiple publications, NREL has repeated the statement that its cost curves do not reflect current market conditions. Therefore, it is not a reliable source of actual cost information in the near-term. Figure 1 below shows the Sapphire price range compared the nominal Levelized Cost of Energy (LCOE) calculations using NREL capital cost data. Using NREL capital costs would drastically understate the actual cost of procuring solar in this market environment.

Figure 1 | PWP Base, Low, and High Cost Curves for Utility-Scale Solar



LevelTen Energy (LevelTen) is a firm that provides a central, standardized service for renewable developers to submit project cost data that allows interested buyers to view projects and pricing. Every quarter, LevelTen publishes a "PPA Index Report." While the full report is available only through a paid subscription, an associated free report option provides insights into the trends of solar and wind pricing. Figure 2 below shows a summary of the solar bids by ISOs across the United States. The Quarter 1 2023 index for the 25% percentile of CAISO solar bids is in the mid-$40/MWh range, representing a rise of 10-15% from prior quarter, and an increase of approximately 50% from a year ago. These are bids for future delivery of solar, meaning that the Commercial Operations Dates (COD) for these projects are in the 2024-2027 range.

	Figure 2 | LevelTen Energy: Q1 2023 PPA Price Index, Executive Summary **Solar P25* Price Indices by ISO**  The cost of solar has increased over the past 12-24 months. Ignoring this market change is not in the best interest of PWP customers and would be against industry best practices for incorporating market changes into long-term power supply planning. PWP has acknowledged the potential for technology costs to decrease, which could be a result of innovation, the full weight of the Inflation Reduction Act (IRA) being unlocked, and other factors combined. This is the reason that technology cost sensitivities are proposed.
21	**Question:** Feedback has been received that the input data that PWP will use in the IRP model is cited to be coming from NREL, but the data that PWP provided to the STAG for evaluation is significantly higher than the data from the NREL ATB database that is cited. For example, on average, for Utility Scale Solar PWP's cost estimate is 28% higher than NREL, Land Based Wind is 29% higher than NREL, and Geothermal is 8% higher than NREL. **ACES Response:** The STAG is referencing LCOE calculations in the NREL ATB file that are Real LCOEs in 2020 dollars. The PWP Cost of New Resources file calculates Nominal LCOEs and discounts those Nominal LCOEs to current dollars (calculations are shown in the file for both Nominal LCOEs in 2020 dollars and 2023 dollars). Nominal LCOEs in Real Dollars are not the same as Real LCOEs in Real Dollars. For forecasting the cost to procure different technologies in the future, Nominal LCOEs are the appropriate calculation.
22	**Question:** Does PWP consider transmission solutions?

	Response: PWP considers transmission constraints when considering the procurement of energy resources and as members of CAISO, continually evaluates transmission solutions. As a CAISO participant, PWP is a key stakeholder in the identification of opportunities for CAISO system upgrades that improve reliability and efficiency.
23	**Question:** What does 100% Carbon-Free Energy by 2030 mean? And will PWP plan on buying from the spot market if it is not classified as clean? **Response:** CF2030 means 100% carbon-free energy supplied to customers by the end of year 2030, 24 hours per day, 365 days per year. • No energy sold to PWP's customers will be produced by a carbon-emitting resource such as fossil fuels. • No spot market electricity purchases, which is currently classified as carbon-emitting • Sourcing of all energy from pre-signed carbon-free contracts or owned resources. • Procure resources based on the highest forecasted loads to ensure 100% carbon-free electricity throughout the year. This safeguard will result in 100% carbon free electricity during high load periods, which would exceed the current load forecast procurement. Moreover, the planned sensitivity test for an "Extreme Weather Event – Heat Wave" will help provide relevant insight.
24	**Question:** What has PWP done so far to work towards the carbon reduction goals? **Response:** PWP continues to make significant investments and demonstrated efforts in clean energy procurement and decarbonization. As required by state mandates, PWP has been committed achieving SB 100/SB 1020's 100% Clean Energy by 2045 target, Pasadena Resolution 9977 accelerates this goal by 15 years. Specific steps PWP has taken include: • Terminating the Intermountain Power Project (IPP) coal resource contract, effective 2027. • Reducing emissions by approximately 68% compared to 1990 levels (Calendar Year (CY) 2022 unverified forecast) which is projected to increase to approximately 90% by the end of CY 2030. Results far exceed the 40 percent requirement of SB 32/AB 1279. • Securing additional clean resource contracts such as Sapphire (solar plus battery storage) and Geyers (geothermal) Projects.

	• New local generation projects. Specifically, PWP will soon be issuing a Request for Proposals for a Battery Energy Storage System (BESS) to be constructed in Pasadena.
25	**Question:** Does the IRP respect past council decisions or guidance such as the 2018 IRP? **Response:** Yes. As previously noted in Question #4, decisions such as the termination of the IPP contract and disqualification of fossil fuel resources in any new long-term contract considerations were made for the 2018 IRP. Each IRP is developed as a successor to previous versions, but updated to include new laws, regulations, local policies, and market conditions.
26	**Question:** How does the policy process work? How does the City Council make decisions? **Response:** The City Council of Pasadena is the highest authority regarding City operations. It functions as the Board of Directors and makes policy goals decisions to which City departments such as PWP will adhere. It is PWP's responsibility to provide the City Council with the best information available to aid informed decision making. As noted in Question #17, the IRP process is fundamental and vital to the resource planning process and will help inform policy makers of pathways by providing research, analysis, and pertinent data.
27	**Question:** What weather assumptions are you using, and what is the data source in the load forecast? **Response:** The load forecast is based in the "California Energy Demand Update, 2022-2035" from the "2022 Integrated Energy Policy Report Update". See here: https://www.energy.ca.gov/data-reports/reports/integrated-energy-policy-report/2022-integrated-energy-policy-report-update. The process looks at thirty years of history, with recent years selected more often. Per the IEPR, baseline peak and energy forecasts were weather-normalized, and future years were adjusted for anticipated changes for climate change. See https://www.energy.ca.gov/event/workshop/2022-12/iepr-commissioner-workshop-updates-california-energy-demand-2022-2035-0, at "Peak Electricity Demand – Update to the California Energy Demand Forecast 2021 – 2035."
28	**Question:** Why doesn't PWP use Lazard's published prices for new resource options instead of NREL-based prices? **Response:**

	NREL is one of industry's most comprehensive publications providing widely used estimates of potential trends to energy technology.