Agenda Report

September 18, 2017

TO: Honorable Mayor and City Council

THROUGH: Municipal Services Committee (September 12, 2017)

FROM: Pasadena Water and Power

SUBJECT: **AMENDMENT TO THE PASADENA WATER AND POWER INTEGRATED RESOURCE PLAN ("2015 IRP Update") TO INCLUDE THE REPAIR OF GAS TURBINE UNIT 2 ("GT-2")**

RECOMMENDATION:

It is recommended that the City Council:

1. Find that approval of the proposed action is categorically exempt from the California Environmental Quality Act ("CEQA") pursuant to CEQA Guidelines sections 15262 and 15271;
2. Approve and adopt an amendment to the 2015 IRP Update to include the repair of GT-2 as described herein.

MUNICIPAL SERVICES COMMITTEE RECOMMENDATION:

The Municipal Services Committee ("MSC") recommended that the City Council approve these recommendations at its September 12, 2017 meeting.

BACKGROUND:

In October 2012, Pasadena Water and Power's ("PWP") GT-2 gas turbine generating unit suffered a catastrophic fire rendering the unit unusable. Staff filed an insurance claim and received a settlement in the approximate amount of $7.8 million, which was the maximum covered by the policy in place at that time. Following the incident, staff undertook the preliminary steps to evaluate the options of repairing or replacing GT-2. The cause of the fire was investigated and staff obtained repair estimates ranging from $9.9 million to $13.3 million as well as a permit to construct from the South Coast Air Quality Management District ("SCAQMD").

PWP also explored other alternatives such as battery storage and upgrading the transmission system. However, it was determined that repairing GT-2 would be the best option based on performance, cost, and implementation time. An equivalent size battery would utilize ten times more space, cost almost four times more and only have the ability to produce a limited amount of energy before it would require recharging. Transmission upgrades are very costly (approximately $200 Million), would take more

than ten years to complete, and would require extensive construction that would include demolition of local streets.

Subsequently, further work on GT-2 was deferred until the 2015 IRP Update and construction of the Glenarm GT-5 Repowering Project were completed. In 2012, staff resources were fully committed to the Glenarm GT-5 Repowering Project and it was determined that due to both resource limitations and the extensive laydown space required for these construction projects it would be infeasible to repair or replace GT-2 prior to completion of the Glenarm GT-5 project.

2015 IRP Update

In 2015, PWP engaged the consulting firm Black and Veatch to support the development of an update to the 2012 IRP. Five resource portfolios were examined under four different scenarios (combinations of potential market conditions) over a 20-year planning horizon from 2015 through 2034. A Stakeholder Technical Advisory Group provided input on the resource options, goals, and scorecards used to compare the portfolios in terms of financial, reliability, and environmental impacts.

The supply portfolio in the 2015 IRP Update, which was approved and adopted by the City Council on June 22, 2015, was designed to achieve a 60% reduction in Greenhouse Gas ("GHG") emissions compared to 1990 levels by 2030 through a combination of increased use of renewable resources, reduced reliance on coal-fired generation, and pursuing aggressive energy efficiency goals. The 2015 IRP Update included a preliminary recommendation to repair GT-2 subject to further cost benefit analysis. Due to continuously evolving market conditions, the 2015 IRP Update included a recommendation that a formal, comprehensive market analysis of GT-2 be performed to determine the appropriate course of action with regard to the repair, replacement, or abandonment of GT-2.

GT2 Comprehensive Market Study

On September 22, 2016, Black and Veatch was commissioned to perform the recommended market analysis due to their extensive market intelligence database, analytical expertise, and knowledge of PWP's operations collected during their work on the 2015 IRP Update.

Black and Veatch completed their analysis and published their final report in October 2016. This report reaffirmed Black and Veatch's preliminary recommendation that PWP repair GT-2 and extend its life. In summary, Black and Veatch concluded that the repair of Glenarm GT-2 represents PWP's best long-term resource option when factors such as system reliability, economics, and permitting risk are taken into account.

Black and Veatch cited the following key considerations in developing their recommendation:

1. **Reliability:** The primary reason for repairing Glenarm GT-2 and returning it to service is to maintain and support PWP distribution system reliability. This

reduces the risk due to PWP's reliance on a single point of interconnection at TM Goodrich to the California Independent System Operator ("CAISO") system;

2. **Low Cost:** Of the options (repair Glenarm GT-2, build a new plant, build a battery type energy storage facility, or rely on the CAISO market), repairing GT-2 would be best given its lower cost and location to provide emergency power in the event that PWP could not import enough energy to meet demand. Not only is it the best option, the estimated cost of repairs for GT-1 was $451-606/kW which is considerably less than the market average cost $1078/kW for new construction (based on the 28 projects included in the Black and Veatch study) or the $1900/kW construction cost of a battery based electric storage facility;

3. **Lower Permitting Risk**: Repair of Glenarm GT-2 is also advantageous to PWP because the existing air permit can be used and preserved instead of having to acquire new permits and go through the EPA New Source Review ("NSR") if PWP were to build a new plant in the future. Choosing to build a new plant instead of repairing Glenarm GT-2 introduces an unnecessary risk that the NSR permits would not be issued for one reason or another;

4. **Additional Revenues to Offset Costs:** Although Black and Veatch's simulation of Glenarm GT-2 forecasts that the plant would not operate extensively due to its high operating costs, Black and Veatch estimates $764,000 to $2.165 million of annual net energy revenue can be derived by real time market opportunities and Resource Adequacy ("RA") capacity, which would require the unit to operate at around 1% capacity factor annually. Black and Veatch projects that cost recovery for the plant can be done within about 10 years (average cost/average revenue estimates) to 17 years (high repair cost/low revenue estimates);

5. **Low Down Side Risk**: Over the long term, PWP will need to determine the most cost effective method to acquire System, Flex, Local RA, Spin, Non-Spin, and Regulation Capacities. The financial risks for repairing Glenarm GT-2 are asymmetrical. The downside risk is fairly low especially if PWP will require local and flex reserves in the future to replace capacity lost from IPP and may need that capacity to meet future Flexible Resource Adequacy Criteria – Must Offer Obligation ("FRAC-MOO") requirements.

On March 20, 2017, PWP released an RFP to gauge market interest and the value of GT-2 to assist with determining if additional market revenues could be extracted to offset the cost of the repair. Based on the responses received, it was determined that the market value for this resource is relatively low. As a result, the high end of the Black and Veatch's cost recovery estimate range of 17 years is likely. However, PWP will work to extract the highest value in the future to offset the repair costs. Most importantly, PWP will be able to use GT-2 to support the reliability of the local distribution system.

As PWP continues to work to ensure reliability and flexibility to be able to respond to electric industry changes, the additional advantages of repairing GT-2 include:

1. **Additional Capacity to make up for Decommissioning Coal-Fired Resource**: PWP will eliminate coal-fired generation from the PWP power portfolio as early as 2025. The existing coal-fired power plant supplies about one-third of PWP's generation capacity and up to 60% of PWP annual energy needs. GT-2 will provide cost effective reserve and peaking capacity in the event enough reserves are not acquired by 2025;
2. **Assist with Integration of Renewables**: PWP supports local renewable energy resources and community solar efforts. GT-2 can help integrate intermittent renewable sources by supporting system reliability and stability;
3. **Additional time to implement results of Electric Master Plan Update:** Pasadena's distribution, sub-transmission, and transmission resources have exceeded their normal expected lifetime of 40 years and will require replacement in the near future. Extending GT-2's life will ensure a layer of reliability until such time as the most appropriate path to upgrade the transmission and distribution infrastructure is selected and implemented;
4. **Transferability of Existing Permit:** GT-2 currently has a valid SCAQMD air permit that can be transferred to new units; however, this permit will likely be forfeit unless a repair project commences by the end of 2017, as SCAQMD air permits are valid only for as long as they support an operable generator. A similar permit for new in-basin, natural gas generation would be practically impossible to acquire due to the scarcity of pollution credits on the market. It is in Pasadena's best interest to repair GT-2 and maintain the 30 MW of generation in the facility's air permit.
5. **More Control/Increased Reliability**: As part of the GT-2 repair project the control systems for both GT-1 and GT-2 would be upgraded. The current control system is the original system installed during the construction of the two units in the mid-seventies and is a significant factor in the lower than desired reliability of both units. The control system upgrade would increase reliability to adequate levels and reduce operating and maintenance costs for these two units.

Finally, it should be noted that on December 30, 2016, PWP suffered a significant outage at the TM Goodrich Receiving Station, Pasadena's sole operating point of interconnection to the CAISO grid through which Pasadena currently receives 90% of its power. Fortunately, this outage occurred during the low-load winter months and was easily handled with current local generation as well as the remaining capacity at the receiving station. However, should a failure of this nature occur during the summer, the City could be subject to rolling blackouts while the interconnection point undergoes repair. Repairing GT-2 would provide additional generation capacity, internal to the City, and avoid and/or minimize the extent of rolling blackouts when electric consumption exceeds PWP's abilities to import electricity into the City. Additionally, GT-2 would enable PWP to meet the local capacity and resource adequacy requirements, to comply with the CAISO's reliability requirements.

Table I shows two different scenarios. "System Normal" means that all equipment within PWP's system is available and represents PWP's highest ability to import energy to

meet its customer's electricity demands. "N-1" is the industry standard for planning and shows the results should PWP experience a single most severe contingency event, reducing the ability to import power to serve PWP customers. Under System Normal, GT-2 is not necessary. However, under an N-1 contingency, GT-2 is needed to avoid blackouts.

Table I

	System Normal			N-1		
	2016 Peak	All Time Peak 9/27/2010	10 Year Avg. Peak	2016 Peak	All Time Peak 9/27/2010	10 Year Avg. Peak
MWh	296	320	304	**296**	**320**	**304**
TMG Import Limit	280	280	280	**130**	**130**	**130**
Difference	16	40	24	**166**	**190**	174
Existing Local Generation	170	170	170	**170**	**170**	**170**
Available Capacity (-) indicates blackouts	154	130	146	**4**	**-20**	**-4**
GT 2 Capacity (if Repaired)	22	22	22	**22**	**22**	**22**
Available Capacity (-) indicates blackouts	176	152	168	**26**	**2**	**18**

Figure 1 shows the hourly load curves for 24 hours on the day of the all-time peak load, 10 year average and the 2016 peak. Under a N-1 contingency, all but a few hours in the morning exceed PWPs import capabilities and would require the majority of our internal generation to run to avoid black outs. Under normal system conditions, only a few peak hours of the day require a small portion of our internal generation for this purpose.

Figure 1: Peak Day Electric Demand and Import Capabilities

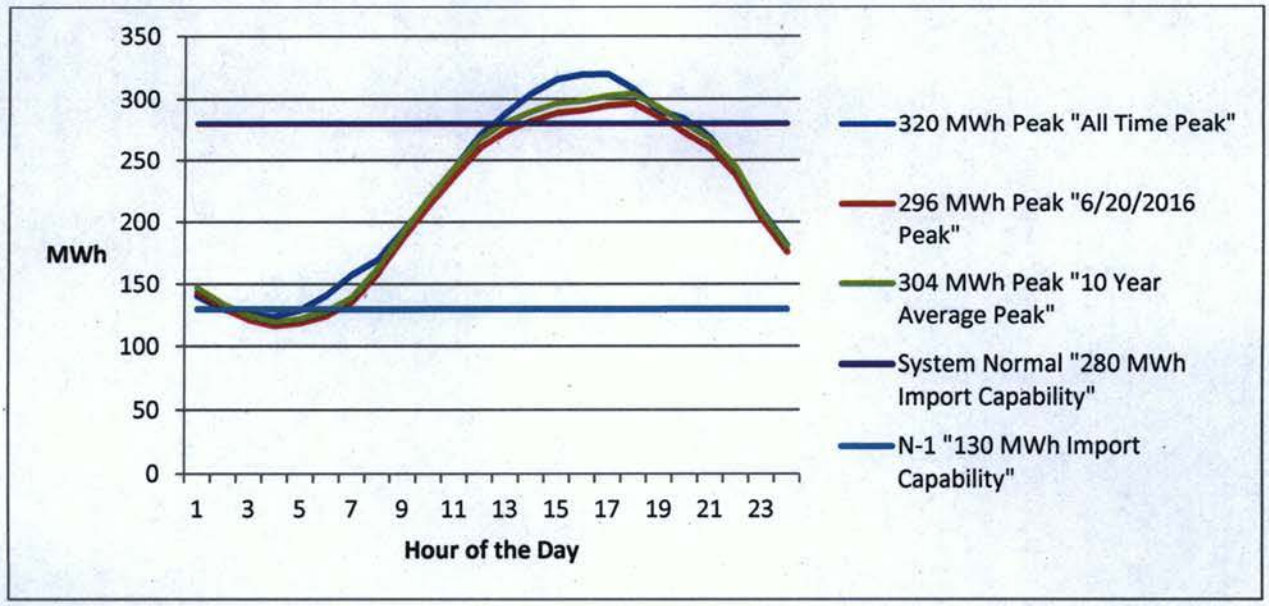

Figure 2: Load Distribution Curves

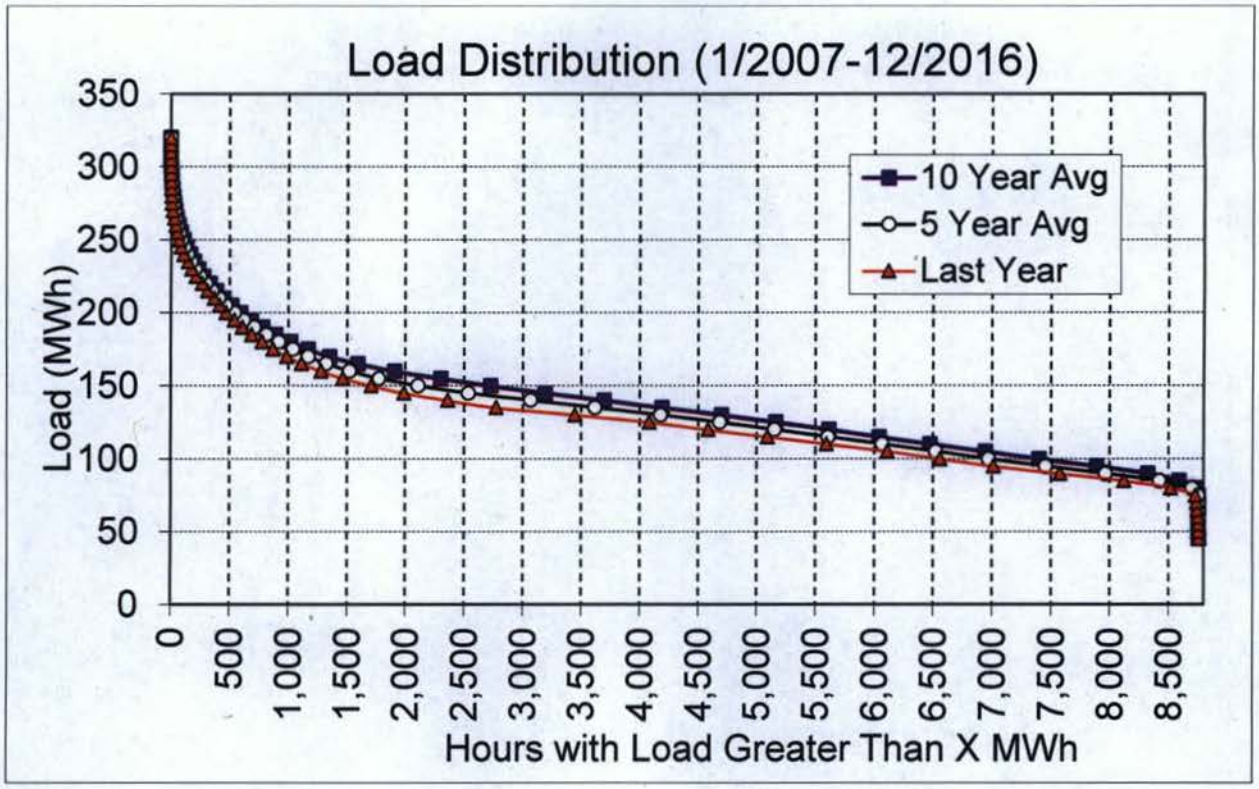

Figure 2 shows that loads exceed the system normal (280 MWh) level only a few hours of the year. However, under the N-1 contingency PWP can only import 130 MWh into its distribution system and additional local generation capacity would be necessary for approximately 3,500 to 4,000 hours per year to avoid black outs.

In addition to the 130 MW limitation under the N-1 condition, there are numerous potential contingencies that could reduce import capabilities such that significant local generation capacity would be needed. Furthermore, the analysis above assumed that all local generation is available at full capacity. However, the local generation fleet itself is subject to an independent set of contingencies that could result in reduced capacity from one or more generators at any given time. Having the additional generation capacity of GT-2 would reduce or eliminate the need for rolling blackouts. The outage at TM Goodrich serves as a timely reminder that Pasadena's Distribution and Transmission infrastructure is well past their normally accepted retirement/replacement age. Having the additional generation capacity of GT-2 available affords PWP valuable time to carefully asses and implement the most efficient path to upgrade the Distribution and Transmission systems.

Looking Forward

PWP has submitted a new application to construct to the South Coast Air Quality Management District ("SCAQMD"). SCAQMD will review the application and render a decision accordingly. As recommended in the 2015 IRP Update and the Market Analysis Report, PWP staff will initiate an RFP to solicit proposals for options available

and associated costs to repair GT-2. Once these proposals are evaluated and SCAQMD approves our request for a new permit to construct, staff will return to City Council with a recommended vendor for repairing GT-2 and associated financial impacts.

CITY COUNCIL POLICY CONSIDERATION:

The recommend amendment to the 2015 IRP Update will support the City Council's strategic goals for a sustainable economy and to sustain natural environmental resources for the use of future generations, and at the same time, contribute to the reduction of greenhouse gas emissions and impacts on climate change.

ENVIRONMENTAL ANALYSIS:

On March 11, 2009, March 5, 2012, and June 22, 2015, the City Council found that the adoption of the 2009 and 2012 IRPs and 2015 IRP Update were exempt from review pursuant to State CEQA Guidelines Sections 15262 and 15271. CEQA exempts from its application those projects that involve "only feasibility or planning studies for possible future actions, which the agency, board or commission has not approved, adopted, or funded ... " and, which do not have a legally binding effect on later activities. (State CEQA Guidelines §15262). To fall under this exemption, however, the lead agency is required to consider environmental factors.

The proposed amendment to the 2015 IRP Update is a guidance document that does not commit the City to undertaking any particular project. Furthermore, it does not serve as a legally binding plan with which subsequent activities must be consistent or adhere.

Any specific construction or repair project undertaken pursuant to the proposed amendment to the 2015 IRP Update will be subject to full CEQA review at the appropriate time.

FISCAL IMPACT:

The authorization of PWP staff to begin the process to repair GT-2 will have no immediate fiscal impact, and is essentially a continuation of current City approvals as part of the 2015 IRP update. Staff will return to Council with recommendations for repairing GT-2 and at that time will have estimates for the cost of repair and fiscal impact on PWP customers, which will be collected from its customers through the electric rates.

Respectfully submitted,

GURCHARAN S. BAWA
General Manager
Water and Power Department

Prepared by:

Steve Endo
Principal Engineer
Water and Power Department

Approved by:

STEVE MERMELL
City Manager

Attachments:
Attachment 1 – Valuation of the Glenarm GT-2 Unit – Final Report