Assessment of Proposed Repowering at LADWP Scattergood, Harbor, and Haynes Generating Stations

Bill Powers, P.E., Powers Engineering, January 21, 2019

LADWP has been methodically repowering its in-basin generating stations since 1998 with gas turbine units. LADWP is proposing to continue this gas turbine repowering plan, at an estimated cost of $2.2 billion,[1] in the midst of a historic shift from centralized gas-fired units to battery storage and distributed solar power as primary supply sources. Battery storage and distributed solar should be the centerpiece of LADWP's 2030 resource plan. To the extent LADWP opts to retire existing gas-fired OTC units serving as grid reliability backup power, and there is a demonstrated need for replacement power, this power should be in-basin battery storage. In addition, aggressive development of available demand response and energy efficiency resources will reduces the overall supply need. No new gas-fired repower facilities should be built.

The new gas-fired units that LADWP proposes to build would displace little utilized but very reliable once-through cooled (OTC) steam units at Scattergood and Haynes that already meet the state's OTC phase-out regulation, and therefore can operate indefinitely as grid reliability backup units. They would also displace two gas turbine combined cycle units, Harbor Unit 5 and Haynes Unit 8. Harbor Unit 5 is a combined cycle OTC unit that meets the state's OTC phase-out regulation, due to very low usage, and as a result can operate indefinitely without repowering. Haynes Unit 8 is a combined cycle unit that has only been operational for 13 years. Haynes Unit 8 can conform to the OTC phase-out regulation for little or no cost by application of operational limits or addition of a cooling tower. Haynes Unit 8 should continue to operate indefinitely with no repower.

Background

LADWP operates four in-basin power plants in the LA Basin: Valley, Scattergood, Harbor, and Haynes. It has already completed gas turbine repower projects at all four of these in-basin power plants. The repower projects consist of either gas turbine combined cycle (GTCC) or advanced simple cycle gas turbine power plants. Table 1 lists the gas turbine repower projects that have already been completed at LADWP's four in-basin power plants.

Table 1. Gas turbine repower projects already been completed at LADWP's four in-basin power plants

LADWP Plant	Unit	Net capacity,[2] MW	Repower date	Cooling system
Valley	5	43	2001	none
Valley	6-8	533	2003	cooling tower
Harbor	1, 2	146	1995	none
Harbor	5	60	1995	OTC
Harbor	10-14	237	2002	none

[1] LADWP, *2017 Power Strategic Long-Term Resource Plan, December 31, 2017*, p. 46.
[2] See: https://www.businesswire.com/news/home/20050202005218/en/LADWP-Completes-Power-Plant-Upgrades-Modernized-Facility.

Scattergood	4, 5	313	2015	air-cooled
Scattergood	6, 7	204	2015	air-cooled
Haynes	8	235	2005	OTC
Haynes	9, 10	325	2005	none
Haynes	11-16	596	2013	air-cooled
	Total:	2,692		
	Total non-OTC:[3]	2,397		

LADWP's January 8, 2019 presentation[4] includes a "Facts of Life" slide which states "*DWP Basin Transmission system was never intended to be reliably operated without generation from Basin Generating Stations.*" As shown in Table 1, four LADWP basin generating stations have the capability to generate substantial power with OTC-compliant units. Approximately 90 percent of the non-steam boiler power generating capacity of these four generating stations, 2,397 MW of 2,692 MW, is generated by non-OTC units.

OTC-cooled Harbor Unit 5 is steam turbine element of the existing combined cycle unit at Harbor Generating Station. Harbor Unit 5 meets the state's most rigorous OTC Track 1 compliance standard for individual units and has done so for several years.[5]

OTC-cooled Haynes Unit 8 is steam turbine element of the existing combined cycle unit at Haynes Generating Station. The Track 2 compliance standard under the OTC phase-out regulation is facilitywide standard, as opposed to the Track 1 individual unit standard. When Haynes Unit 8 is averaged with rarely used Haynes 1 and 2 OTC steam units, as allowed under Track 2, can comply with the standard by setting readily achievable annual usage limits.[6]

LADWP identifies grid resiliency as a basis for addition of new combined cycle units at Harbor and Haynes, stating "*Resiliency is a DOE initiative - Ability to support critical loads through unforeseen events - LAX expansion and Port of LA electrification are new critical loads - Scattergood and Harbor could serve as "backup generation" which can be used to form load pockets under emergencies*." Harbor Unit 5 is providing the grid resiliency and backup generation sought by LADWP. Existing Harbor Unit 5 fully meets the Track 1 compliance standard in the OTC phase-out regulation and currently serves as backup generation. Unit 5 can continue to serve in this role indefinitely without repowering in 2029. Harbor Unit 5 should be permanently retired, with no repower, when sufficient in-basin battery storage, distributed solar, demand response, and energy efficiency are online to enable the retirement.

Scattergood Units 1 and 2 are OTC steam units that have a combined capacity of 326 MW. They are used infrequently, with an average 2017 capacity factor of 3.3 percent. For that reason Scattergood 1 and 2

[3] Total if gas turbines connected to OTC steam turbine at Harbor (Units 1 & 2) and Haynes (Units 9 & 10) can operate with OTC steam turbine offline (or if OTC steam turbines are decommissioned and these gas turbines operate as simple-cycle units).
[4] LADWP, *Local Conventional Generation and Transmission Reliability, PowerPoint presented to Board of Water and Power Commissioners*, January 8, 2019, p. 11.
[5] See: https://www.energy.ca.gov/renewables/tracking_progress/documents/once_through_cooling.pdf.
[6] Ibid.

fully comply with the Track 1 OTC phase-out compliance standard. These steam unit serve that exact backup generation function described by LADWP as desirable for grid resiliency. There is no reason to repower Scattergood Units 1 and 2 with a new combined cycle unit in 2024. Scattergood Units 1 and 2 should be permanently retired with no repower when sufficient in-basin battery storage, distributed solar, demand response, and energy efficiency are online to enable the retirement.

LADWP OTC Units and California's Once-Through Cooling Phase-Out Policy

The LADWP proposed integrated resource policy assumes that once-through cooled (OTC) units at its Haynes, Harbor, and Scattergood plants must be shut down to comply with the state OTC regulation. This is not the case. There are three compliance alternatives: 1) each unit meets the OTC reduction achievable with a cooling tower, 93 percent reduction, known as "Track 1," 2) the facility meets a reduction that is 90 percent of the cooling tower reduction of 93 percent with operational changes (83.7 percent reduction overall), known as "Track 2," and 3) unit shut down.[7]

The OTC policy became an effective in 2010. The original compliance dates established in 2010 ranged from 2010 to 2024. In July 2011, LADWP obtained the SWRCB's consent to delay compliance for its three units until 2029. This 20-year compliance timeline was granted on the basis of LADWP eliminating use of ocean water for its repowered units.[8]

The actual usage rates for the LADWP OTC units are all so low, with the exception of 575 Haynes Unit 8 combined cycle unit, that they easily comply with either the Track 1 or Track 2 OTC compliance standards. The 2017 capacity factors of the LADWP OTC units are shown in Table 2.

Table 2. 2017 capacity factors of the LADWP OTC units and conformance with Track 1[9]

Unit	Compliance date	Unit capacity	2017 capacity factor (%)	Track 1 compliance (%)	Track 1 compliant?
Harbor 5	2029	235	2.0	7	Y
Haynes 1	2029	230	3.4	7	Y
Haynes 2	2029	230	5.3	7	Y
Haynes 8	2029	235	39.6	7	N
Scattergood 1	2024	163	4.8	7	Y
Scattergood 2	2024	163	1.9	7	Y

All LADWP OTC units except Haynes 8 are already in compliance with the Track 1 compliance standard during the normal time period the OTC regulation established for compliance, 2010 to 2024. LADWP should petition the SWRCB to find these units compliant under Track 1, and establish an annual capacity factor limit of 7 percent to assure these units remain in compliance.

Capacity limits should be established for Haynes 1, 2, and 8 to assure these units are collectively compliant with Track 2 operational standard. For example, if the Haynes 8 capacity factor limit is set at

[7] CEC, *Tracking Progress - Once-Through Cooling Phase-Out*, April 2018, p. 2. See: https://www.energy.ca.gov/renewables/tracking_progress/documents/once_through_cooling.pdf.
[8] Ibid.
[9] Ibid.

40 percent, and Haynes 1 and 2 are each set at 3 percent, Haynes 1, 2, and 8 will be compliance with Track 2. By establishing these operating limits, all LADWP OTC units will be in compliance with the OTC phase-out policy now.

Table 3. 2017 capacity factors of the LADWP OTC facilities and conformance with Track 2[10]

Unit	Compliance date	Unit capacity	2017 capacity factor (%)	Track 2 compliant (%)	Track 2 compliant?
Haynes 8	2029	724	17.2	16.3	borderline
Scattergood 1, 2	2024	326	3.3	16.3	Y

LADWP was granted a 10-year compliance delay in exchange for a commitment to completely eliminate once-through cooling. There is no need for a compliance delay to demonstrate compliance, therefore no need for a commitment to go beyond the standard by shutting down these units 5 years (Scattergood) or 10 years from now (Harbor and Haynes).

LADWP also has the option to add a cooling tower to Haynes Unit 8 to demonstrate compliance.[11] The estimated cost of the cooling tower, in 2008 dollars, is $42 million. Haynes Unit 8 is a state-of-the-art combined cycle unit, just like the combined cycle units propose to replace it in 2029. A $42 million cooling tower on Unit 8 would cost substantially less than the approximately $800 million cost of a repowered combined cycle unit of similar capacity.[12,13]

Haynes Unit 8 began operation in 2005. LADWP is currently projecting that Unit 8 will be decommissioned in 2029 and replaced by another combined cycle power plant. It is highly unusual to consider replacing a state-of-the-art combined cycle plant like Unit 8 after only 24 years of operation. Combined cycle units should function properly for 50 years or more if adequately maintained.

The Existing LADWP OTC Units Are More Reliable Than the Proposed Natural Gas-Only Combined Cycle Repower Units

The existing OTC units at Haynes and Harbor are capable of burning either natural gas or clean liquid backup fuel. The clean liquid backup fuel capability was renovated by LADWP at substantial cost in the wake of the Aliso Canyon natural gas storage facility methane leak.[14] LADWP noted in its 2017 Power Strategic Long-Term Resource Plan that "*a substantial effort was undertaken at our Valley, Haynes, and Harbor Generating Stations to ensure that the LADWP had adequate emergency backup fuel to maintain*

[10] Ibid.
[11] See: http://www.opc.ca.gov/webmaster/ftp/project_pages/OTC/engineering%20study/Chapter_7F_Haynes_Generating_Station.pdf, p. F-1.
[12] LADWP, *LADWP's Once-Through Cooling Study Final Findings and Recommendations from Consultant's Study*, Board of Water and Power Commissioners, November 27, 2018, p. 10.
[13] $2.2 billion capital cost for 1,593 MW of net capacity. $2.2 billion x (575 MW/1,593 MW) = ~$800 million.
[14] See: http://www.ladwpnews.com/ladwp-receives-approval-from-south-coast-air-quality-regulators-to-run-power-plants-with-diesel-fuel-to-help-reduce-risk-of-outages-caused-by-gas-shortages-from-aliso-canyon/.

electric reliability."[15] This means these OTC units can continue to operate during natural gas shortages or interruptions, unlike the new natural gas-only combined cycle units.

LADWP Should Have Evaluated a "No Gas-Fired Repower" Case

LADWP had its consultant Navigant evaluate twelve separate 2030 resource plan cases.[16] Navigant is currently recommending Case VI be adopted by LADWP as its 2030 resource plan. Case VI consists of approximately 900 MW of new combine cycle plants (Scattergood = 327 MW, Haynes = 327 MW, Harbor = 245 MW), 520 MW of battery storage, 300 MW of distributed solar, and 161 MW of demand response.[17]

There is no need for additional natural gas-fired capacity, as existing OTC units are meeting or can meet state OTC requirements now and therefore can remain online indefinitely as back-up power for reliability purposes. Therefore, there should be no comparison of cases with a gas-fired repower component, Cases I to X, to the two cases, Case XI and Case XII, that contain no gas-fired repower element. Only cases with no gas-fired component are relevant.

Case XII is the most appropriate 2030 resource plan among the twelve options presented, but requires additional refinement. However, Case XII is overly dependent on battery storage and sets insufficient targets for distributed solar, demand response.

LADWP states in its 2017 Power Strategic Long-Term Resource Plan that "*several customer programs were accelerated or launched in response to the Aliso Canyon situation. Energy Efficiency programs, including the Commercial Direct Install, AC Tune Up, Upstream Commercial HVAC, and Residential LED programs were launched. The Demand Response program was expanded and accelerated. Energy Storage projects and plans for battery programs were also accelerated*."[18] However the Case XII targets do not reflect accelerated deployments of these resources.

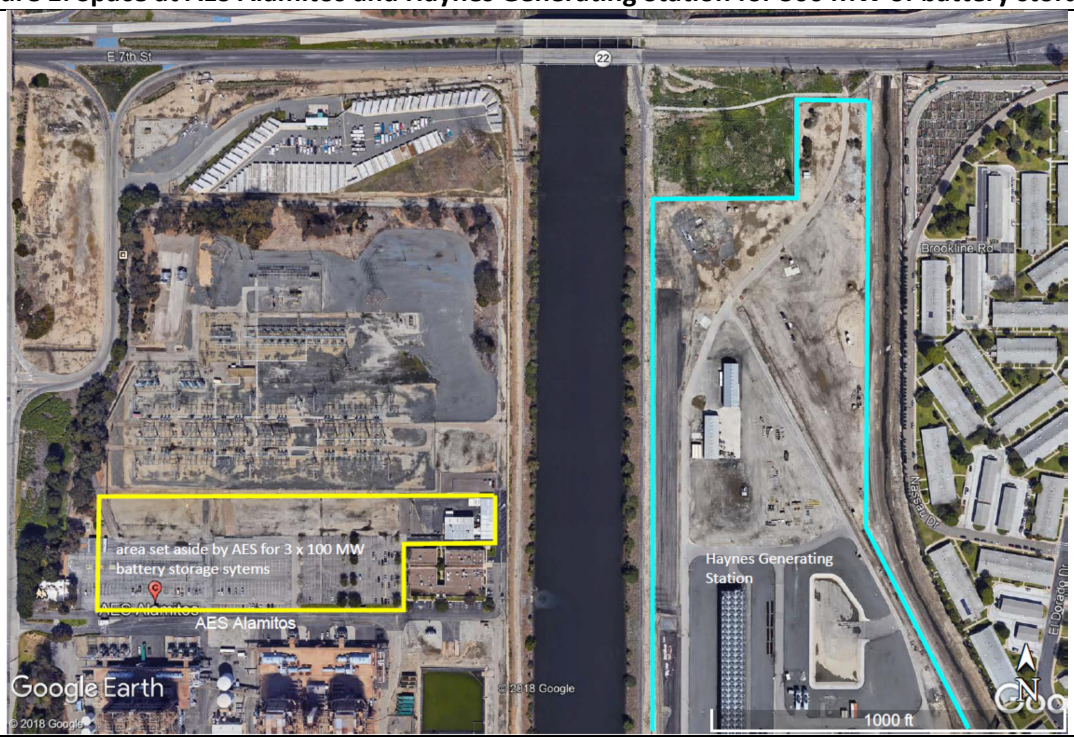
Battery storage: LADWP is far behind the two Southern California investor-owned utilities (IOU), SCE and SDG&E, in battery storage deployments. For example, SCE expects to have between 580 and 747 MW of battery storage online by 2024.[19] SCE will contract for 100 to 300 MW of battery storage at the AES Alamitos site across the canal from the Haynes Generating Station.[20] A 100 MW battery storage block is under construction at the AES site. Navigant implies there is insufficient space for battery storage and that it is in effect in a developmental stage, stating "*real estate acquisition for energy storage is among*

[15] LADWP, *2017 Power Strategic Long-Term Resource Plan, December 31, 2017*, p. 49.
[16] LADWP, *LADWP's Once-Through Cooling Study Final Findings and Recommendations from Consultant's Study*, Board of Water and Power Commissioners, November 27, 2018, p. 44.
[17] Ibid, p. 36.
[18] LADWP, *2017 Power Strategic Long-Term Resource Plan, December 31, 2017*, p. 49.
[19] See: https://www.edison.com/content/dam/eix/documents/innovation/battery-storage-fact-sheet.pdf.
[20] City of Long Beach, *INITIAL STUDY/MITIGATED NEGATIVE DECLARATION Alamitos Generating Station Battery Energy Storage System (BESS) Project*, October 2016. See: http://www.lbds.info/civica/filebank/blobdload.asp?BlobID=6142.

highest risks identified, utility-scale energy storage (100 MW) still in development stage, but will require to be in service within 4 to 5 years."[21] These statements are unsupported and incorrect.

Battery storage is in the process of dominating gas turbines in peaker applications.[22,23] AES is constructing a 100 MW battery storage system under contract to SCE at AES Alamitos, across the San Gabriel River from the LADWP Haynes Generating Station. The area AES has designed for three 100 MW battery storage systems (300 MW total) at AES Alamitos is shown in Figure 1. There is clearly at least as much available space directly across the river at the north end of the Haynes Generating Station for 300 MW of battery storage.

Figure 1. Space at AES Alamitos and Haynes Generating Station for 300 MW of battery storage



There is also no technical reason that battery storage could not be distributed on the Scattergood, Harbor, or Haynes generating station sites to eliminate space constraints, if they exist, for single large blocks of storage. For example, ten units of 10 MW each, that are dispersed throughout the power plant site, provide more locational flexibility that one contiguous 100 MW unit. However, there is no indication that any analysis of battery storage site constraints at Scattergood, Harbor, or Haynes has been conducted by LADWP or Navigant.

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[21] LADWP, *LADWP's Once-Through Cooling Study Final Findings and Recommendations from Consultant's Study*, Board of Water and Power Commissioners, November 27, 2018, p. 31.

[22] Utility Dive, *2019 Storage Outlook: Utility procurement will drive deployments, analysts say*, January 8, 2019: https://www.utilitydive.com/news/2019-storage-outlook-utility-procurement-will-drive-deployments-analysts/545448/. "*Using aggressive assumptions of battery storage cost declines of 10% to 12% every year through 2026, the share of new peaker capacity taken by batteries could rise to as much as 80%.*"

[23] Bloomberg New Energy Finance, *Electric Buses in Cities - Driving Towards Cleaner Air and Lower CO_2*, March 29, 2018, Figure 11, p. 22. Average year-to-year battery price decline of approximately 20 percent, 2010-2017.

In addition, battery storage can be distributed in commercial buildings and residences to function as a "virtual power plant," while occupying no space at Scattergood, Harbor, or Haynes. SCE has an operational 85 MW battery storage virtual power plant in Orange County consisting of battery systems in commercial buildings.[24] See **Attachment A**.

Distributed solar: SDG&E, a smaller utility than LADWP, already has more than 1,000 MW of distributed net-metered solar online, and is adding net-metered solar at a pace of about 170 MW per year.[25] LADWP's 2030 Case XII distributed solar target of 600 MW could be met in less than four years at the current actual SDG&E installation rate. Maintaining a distributed solar installation rate of 170 MW per year for twelve years, 2019 through 2030, would add more than 2,000 MW of distributed solar to LADWP service territory, three times more than the 600 MW distributed solar target in Case XII.

Demand response: LADWP has identified 1,000 MW of demand response reduction potential from commercial and industrial customers,[26] yet Case XII assumes only 125 MW of this potential is added by 2030. There is no mention of enhanced residential air-conditioning cycling programs or shifting to "opt-out" demand response programs to greatly increase customer participation. A more aggressive DR program could reduce peak demand by 100s of additional MW.

LADWP Proposed Almost No In-Basin Battery Storage by 2021

AB 2514 required the state's three IOUs to collectively have 1,325 MW of energy storage under contract by 2020. It also required public utilities like LADWP to establish procurement targets for energy storage. In its December 20, 2016 compliance report, LADWP indicated it would procure 4.3 MW of battery storage for deployment in the LA Basin by 2021.[27] In contrast, SCE expects to have between 580 and 747 MW of battery storage online by 2024.[28]

Air Emissions Will Increase in LA Basin if High Usage Combined Cycle Units Displace Low Usage OTC Units at LADWP Generating Stations

The OTC steam boiler units, Scattergood 1 and 2 and Haynes 1 and 2, have very low usage rates, averaging 4 percent in 2017.[29] In contrast, the one large OTC combined cycle unit, Haynes Unit 8, had a usage rate of approximately 40 percent.[30] LADWP proposes to replace the existing OTC steam units with combined cycle units. LADWP has not explained why it proposed to repower low usage OTC units with high usage combined cycle units. One result is will be an increase in conventional air emissions of

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[24] Smart Electric Power Alliance, *Non-Wires Alternatives - Case Studies From Leading U.S. Projects*, November 2018, pp. 70-73.
[25] See: https://www.californiadgstats.ca.gov/charts/.
[26] See: http://www.ladwpnews.com/ladwp-approves-first-of-its-kind-program-offering-incentives-to-large-commercial-customers-to-shift-energy-use-help-avoid-outages/.
[27] See: https://www.energy.ca.gov/assessments/ab2514_reports/Los_Angeles_Dept/LADWP_AB_2514_2016_Letter_and_Report_2016.pdf.
[28] See: https://www.edison.com/content/dam/eix/documents/innovation/battery-storage-fact-sheet.pdf.
[29] See Table 2.
[30] See Table 2.

nitrogen oxides, carbon monoxide, and volatile organic compounds at the plants sites, and much higher emissions of greenhouse gases at the plant sites due to the much higher utilization rates of the combined cycle units.

Conclusion

The LADWP 2030 resource plan does not reflect the historic shift currently underway in power generation. Battery storage can now compete effectively with peaking gas turbine power plants on performance and cost. It can also do what gas turbines cannot do – absorb and discharge solar power and other forms of renewable energy. No new combined cycle units should be included in LADWP's 2030 resource plan. The existing low usage OTC units can continue to provide reliable back-up power as long as they are needed to do so.