

LOS ANGELES DEPARTMENT OF WATER AND POWER



# 2024 GRID RELIABILITY REPORT

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PREPARED FOR CALIFORNIA STATE WATER  
RESOURCES CONTROL BOARD

JANUARY 31, 2025, SUBMITTAL

# 2024 Grid Reliability Report

PREPARED FOR CALIFORNIA STATE WATER RESOURCES CONTROL  
BOARD

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## PREFACE

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Electric utilities are complex entities confronted with an ever-changing array of challenges—operational, financial, and regulatory. These challenges must be met while the utility fulfills its primary purpose of delivering reliable power.

To that end, LADWP routinely forecasts short- and long-term demand for electricity, identifies generating sources, and conducts studies to demonstrate to regulatory agencies the reliability of its system under the different demand and operational scenarios. Ten years out, as cited in the attached 2024 Grid Reliability Report, high- and mid-load power scenarios already project the need in 2024 for more generation in the Los Angeles Basin than the capacity expected to be present. The Local Capacity Requirement (LCR) study referenced herein suggests that Los Angeles can ill-afford to have any of its basin (local) generating units unavailable.

Since 2010, the Los Angeles Department of Water and Power (LADWP) has filed with the State Water Resources Control Board (State Water Board) an annual Grid Reliability Report. The “Statewide Water Quality Control Policy on the Use of Coastal and Estuarine Waters for Power Plant Cooling” (OTC Policy) requires such reporting until the last LADWP ocean water-cooled thermal generating unit is removed from service in 2029.

In a letter dated April 24, 2014, the State Water Board granted and directed the change to the deadline for the annual grid reliability report filing from December 31 to January 31 of each year. This change was made at LADWP’s request so the report may include information annually released in December. In consideration of the Statewide Advisory Committee on Cooling Water Intake Structures (SACCWIS) Committee’s March 31 reporting deadline to the State Water Board, LADWP’s annual Grid Reliability Report is intentionally concise.

This 2024 Grid Reliability Report emphasizes that little has changed in terms of how LADWP’s power system elements contribute toward reliability. Past Grid Reliability Report filings have addressed reliability for the State Water Board by presenting and discussing discoveries from the most recent studies available at the time of the filing. This 2024 filing compares the core findings from those earlier Grid Reports with results from studies conducted in 2023. The comparison suggests that LADWP’s reliability issues have not changed.

The once-through cooling (OTC) compliance projects driving this 2024 Grid Report are important aspects of a transformation that began with California’s Renewable Portfolio Standard (RPS) Program, established in 2002, and continues today with SB 350 mandating 50 percent RPS by 2030: *Clean Energy and Pollution Reduction Act*, chaptered on October 7, 2015, and the City of Los Angeles’ 100 percent clean energy initiative. LADWP and the City of Los Angeles are so committed to environmental stewardship that aspirational goals of at least 33 RPS by 2020, and at least 80 percent by 2030 have been set and are embedded in the studies described herein. California SB 100 superseded SB 350. SB 100 requires 60 percent RPS by 2030, in addition, SB1020 set the interim goals of 90 percent by 2035 and 95 percent by 2040. LADWP and the City of Los Angeles are committed to a clean energy future. To that end, in February 2019, the City of Los Angeles Mayor Eric Garcetti (Mayor) announced that LADWP would replace the OTC units with renewable alternatives. LADWP partnered with the National Renewable Energy Laboratory (NREL) on the Los Angeles 100% Renewable Energy Study (LA100), a first-of-its-kind objective, highly detailed, rigorous, and science-based study to analyze potential pathways the community can take to achieve a 100 percent clean energy future, including alternative for the future modernization of retiring OTC units at the Coastal Generating Stations

To maintain reliability while replacing Scattergood Units 1 and 2 with a renewable technology, LADWP sought an extension from the State Water Board for its OTC Policy compliance deadline from December 31, 2024, to December 31, 2029. On August 15, 2023, the State Water Board approved the extension. This extension was necessary to maintain grid reliability as LADWP makes the transitions to 100 percent carbon free.

With respect to LADWP’s current system reliability, the Western Electricity Coordinating Council’s (WECC’s) tri-annual reliability audit of LADWP’s power system was performed in August 2023. As in each of the previous audits, conducted in 2008, 2011, 2014, 2017, and 2020, WECC found LADWP’s power system reliable. In fact, in this latest audit, LADWP received a perfect score from the auditors for its operations and planning functions.

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## EXECUTIVE SUMMARY

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The body of information collected for this 2024 Grid Report, consistent with previous Grid Reliability Reports, demonstrates the continued importance of maintaining firm generation capacity in the LA Basin to provide online generation necessary to import external generation and provide cost-effective contingency reserve, voltage support, and balanced network loading. Each of these services provided by the in-Basin generation contributes toward power system reliability. This 2024 Grid Report is drawn from:

- the 2023 Long-Term Transmission Assessment (2023 Assessment), which clearly shows key segments of LADWP’s transmission system must be reinforced, to the

extent possible, to ensure continued reliable operations. Chief among these necessary improvements includes the conversion of the Victorville-Century 287 kV lines to HVDC to increase the transfer capability into the LA basin. This will be critical to assisting LADWP in achieving its renewable targets.

- the Summer 2024 Transmission Reliability Assessment (Summer 2024 TRA), which shows every LA Basin generating unit, including OTC units, is needed for reliability purposes.
- the Resource Adequacy Projection, which shows that even with the current contributions from LA Basin generation, resource shortfalls are expected. LA Basin generation is also critical to LADWP's transition to an energy portfolio dominated by renewable resources because it compensates for the variability of the desired renewable resource so that load continues to be served without disruption and so that North American Electric Reliability (NERC) Reliability Standards can continue to be met.

Table 1 summarizes the status of LADWP's OTC compliance work:

TABLE 1. LADWP'S COMPLIANCE SCHEDULE

Generating Station	Generating Unit	Status	Compliance Deadline
Harbor	Unit 5		31 Dec 2029
Haynes	Unit 1	Project Complete	31 Dec 2029
	Unit 2		31 Dec 2029
	Unit 5		31 Dec 2013
	Unit 6		31 Dec 2013
	Unit 8		31 Dec 2029
Scattergood	Unit 1*	Project Pending	31 Dec 2029
	Unit 2*	Project Pending	31 Dec 2029
	Unit 3	Project Complete	31 Dec 2015

\*An extension request has been granted.

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## 2023 ANNUAL LONG-TERM TRANSMISSION ASSESSMENT

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In its execution of NERC Rules of Procedure 403.11, WECC, the Regional Reliability Organization for NERC's western region, has audited LADWP every three years since 2008. Every such investigation, including the August 2023 audit, has found LADWP's electric grid reliable.

LADWP's Annual Long-Term Transmission Assessments have been critical to these findings, as they demonstrate power system compliance with NERC reliability standards during normal operations and under contingencies.

The 2023 Assessment complies with NERC standard TPL-001-5.14: *Transmission System Planning Performance Requirements* and WECC *Regional Criterion TPL-001-WECC-CRT-3.2*, in addition to other planning regulations. It is based on the aspirational RPS targets promulgated in the City of Los Angeles' Internal Resource Plan to meet 80 percent RPS by 2030. In comparison, SB100 mandates 33 percent RPS by 2020; 44 percent by 2024; 52 percent by 2027, 60 percent by 2030 and 100 percent zero carbon by 2045. Even with these more aggressive targets, LADWP is expected to continue to perform reliably under all but extraordinary contingencies over the next 10 years. As with every year's assessment, the 2023 Assessment recommends several system improvements to mitigate vulnerabilities that have been identified in the study. The recommendations for 2023 are as follows:

2023 Long-Term Transmission Assessment Recommendations
Prior to meeting the compliance deadline, exploration will occur for installation of redundant protection equipment at Adelanto, Haskell, Haynes, Rinaldi, Scattergood, Sylmar, Tarzana Stations.
Replace circuit breakers at Adelanto 500kV, Fairfax 138kV, and Sylmar 230kV Stations.
Remove existing 138kV bus reactors at Wilmington 138kV station.
Convert 287kV Victorville -Century lines to HVDC and install two new underground cables from Scattergood to Century.

In addition, several transmission projects have been completed since the previous Grid Reliability Report to support reliability, load growth and increase renewable imports. Projects include, but are not limited to, installation of new Haskell-Sylmar 230 kV line 2, re-termination of Scattergood-Olympic Cable A into Pershing, New Scattergood-Pershing and Pershing-Olympic Cable B, upgrade of Olympic 230 kV bus as well as the Eland I generation tie line termination.

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**RELIABILITY MUST-RUN NEEDS FOR SUMMERS 2013-2024**

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Seasonal TRAs are performed to identify the minimum Reliability Must-Run (RMR) generators required to meet LADWP's Operating Reliability Criteria and NERC Standards under forecasted seasonal peak demand conditions. A review of the Summer TRAs since 2011 shows the results are essentially unchanged. The obvious differences arise from the retirement of Haynes Units 5 and 6 after Units 11-16 were placed in service in June 2013 and the retirement of Scattergood Unit 3 after Units 4-7 were placed in service in November 2015. Summer 2016 required both Haynes Units 1 and 2 online to compensate for the extended outage of Mead-Victorville 287kV Line 1 until repairs to the Mead 287/230kV Bank M transformer were completed. Summers 2017 and 2018, with all circuits expected to be available, essentially return to the Reliability Must-Run requirements of previous summers.

TABLE 2. RELIABILITY MUST-RUN GENERATING UNITS

	HARBOR	HAYNES	SCATTERGOOD	VALLEY
SUMMER 2011	UNITS 1,2 AND 10-14 @ FULL LOAD WITHIN 2 HRS	UNITS 1,5,8,9,10	UNITS 1 OR 2 AND 3	UNITS 6-8
SUMMER 2012	UNITS 1,2 AND 10-14 @ FULL LOAD WITHIN 2 HRS	UNITS 1,5,8,9,10	UNITS 1 OR 2 AND 3	UNITS 6-8

HAYNES UNITS 5-6 REPLACED IN JUNE 2013 WITH UNITS 11-16				
SUMMER 2013-15	UNITS 1,2 AND 10-14 @ FULL LOAD WITHIN 2 HRS	UNITS 1 OR 2, AND 8,9,10.  UNITS 12 AND 14, CONDENSE MODE; UNITS 11-16 @ FULL LOAD WITHIN 2HRS	UNITS 1 OR 2 AND 3	UNITS 6-8
SCATTERGOOD UNIT 3 REPLACED IN AUGUST-NOVEMBER 2015 WITH UNITS 4-7				
SUMMER 2016	UNITS 1,2 AND 10-14 @ FULL LOAD WITHIN 2 HRS	UNITS 1 AND 2, AND 8,9,10.  UNITS 12 AND 14, CONDENSE MODE; UNITS 11-16 @ FULL LOAD WITHIN 2HRS	UNITS 1 OR 2 AND 4-5  UNITS 6-7, CONDENSE MODE	UNITS 6-8
SUMMER 2017-18	UNITS 1,2 AND 10-14 @ FULL LOAD WITHIN 2 HRS	UNITS 1 OR 2, AND 8,9,10.  UNITS 12 AND 14, CONDENSE MODE; UNITS 11-16 @ FULL LOAD WITHIN 2HRS	UNITS 1 OR 2 AND 4-5  UNITS 6-7, CONDENSE MODE	UNITS 6-8
SUMMER 2019	UNITS 1,2 AND 10-14 @ FULL LOAD WITHIN 2 HRS	UNITS 1 OR 2, AND 8,9,10.  UNITS 12 AND 14, CONDENSE MODE; UNITS 11-16 @ FULL LOAD WITHIN 2HRS	UNITS 1 OR 2 AND 4-5  UNITS 6-7, CONDENSE MODE	UNITS 6-8



SUMMER 2020	UNITS 1,2 AND 10-14 @ FULL LOAD WITHIN 2 HRS	UNITS 1 OR 2, AND 8,9,10.  UNITS 12 AND 14, CONDENSE MODE; UNITS 11-16 @ FULL LOAD WITHIN 2HRS	UNITS 1 OR 2 AND 4-5  UNITS 6-7, CONDENSE MODE	UNITS 6-8
SUMMER 2021	UNITS 1,2 AND 10-14 @ FULL LOAD WITHIN 2 HRS	UNITS 1 OR 2, AND 8,9,10.  UNITS 12 AND 14, CONDENSE MODE; UNITS 11-16 @ FULL LOAD WITHIN 2HRS	UNITS 1 OR 2 AND 4-5  UNITS 6-7, CONDENSE MODE	UNITS 6-8
SUMMER 2022	UNITS 1,2 AND 10-14 @ FULL LOAD WITHIN 2 HRS	UNITS 1 OR 2, AND 8,9,10.  UNITS 12 AND 14, CONDENSE MODE; UNITS 11-16 @ FULL LOAD WITHIN 2HRS	UNITS 1 OR 2 AND 4-5  UNITS 6-7, CONDENSE MODE	UNITS 6-8
SUMMER 2023	UNITS 1,2 AND 10-14 @ FULL LOAD WITHIN 2 HRS	UNITS 1 OR 2, AND 8,9,10.  UNITS 12 AND 14, CONDENSE MODE; UNITS 11-16 @ FULL LOAD WITHIN 2HRS	UNITS 1 OR 2 AND 4-5  UNITS 6-7, CONDENSE MODE	UNITS 6-8
SUMMER 2024	UNITS 1,2 AND 10-14 @ FULL LOAD WITHIN 2 HRS	UNITS 1 OR 2, AND 8,9,10.  UNITS 12 AND 14, CONDENSE MODE; UNITS 11-16 @ FULL LOAD WITHIN 2HRS	UNITS 1 OR 2 AND 4-5  UNITS 6-7, CONDENSE MODE	UNITS 6 OR 7, AND 8

**100 Percent Renewables.** In March 2016, Los Angeles City Council Motion No. 16-0243 directed LADWP to form research partnerships, utilizing relationships with the region’s universities, neighboring utilities, SCPPA, and other stakeholders with the objective of determining what investments should be made to achieve a 100 percent renewable energy portfolio for LADWP. In the following years, the motion was amended to assess the potential for local high-quality careers with equitable economic development, analysis and impacts to the current rate structure, incorporation of the CalEnviro database and environmental justice.

Senate Bill 100 (SB 100), the 100 Percent Clean Energy Act of 2018, enacted on September 10, 2018, which mandates California utilities plan for 100 percent of electricity sales to come from renewable and zero-carbon resources by 2045 is simply being folded into the work. Informing this study will be the outcome of LADWP’s investigation into alternatives to repowering the remaining OTC units. Building upon the findings from the OTC Study, with the final report completed in 2019, will ensure that the most prudent solution is implemented under the constraints of the OTC compliance schedule and that LADWP’s renewable energy portfolio is maximized while maintaining the current level of power system reliability and keeping electricity affordable.

In March 2021, the multi-year LA100 in partnership with NREL was completed. LA100 found no matter what path is taken, there are common investments among all of them. The need to build large amount of utility solar and wind, customer rooftop solar, and short-duration storage were identified, along with the need for a fair number of upgrades to transmission and distribution systems. Every scenario identified the need to maintain firm, dispatchable in-basin capacity as a long-duration or multi day storage to ensure system reliability during emergencies or high demands. LA100 recognized renewably derived fuel turbines (i.e., green hydrogen) that are dispatchable and run very infrequently but are essential for system reliability to be part of the solution for long-duration storage.

At the heart of the issue is the identification of an integrated mix of affordable fossil-free resources capable of mimicking the quick-start and sure-start advantages of LADWP’s real and reactive power supplied by the Basin fossil-fueled plants, which provide the minimum Basin generation necessary to maintain power system reliability around-the-clock. In addition to supporting SB100, the work would support SB338, which codified the requirement for LADWP to consider using distributed energy resources, demand-side management, and energy efficiency to serve and reduce peak energy demand and avoid new generation and transmission resources. Every effort is being made to reasonably achieve a Clean Energy Future for Los Angeles.

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## RESOURCE ADEQUACY PROJECTION

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The Strategic Long-Term Resource Plan (SLTRP), which in the past was referred to as the Integrated Resource Plan (IRP), is bi-annually produced to ensure LADWP, its customers,

and other stakeholders that its transmission system and supply options are well-positioned to meet the electricity demands of its customers at every step of its renovation plan. SLTRP gathers, considers, and incorporates new information, including public feedback. The result is that every piece of equipment replaced or added to LADWP's power system is installed with confidence that both power system reliability and public interest are respected.

One consequence of LADWP aggressively acquiring solar resources is that the maximum system demand, when offset by solar and other variable energy resources, has been occurring later in the evening. By 2030, when LADWP's RPS is expected to be 60 percent or higher, the maximum demand (load minus variable energy resources) is expected to occur after 8 pm. By contrast, the August 31, 2017, all-time peak demand of 6502MW occurred at 4:15 pm. Historically, LADWP had a reliable 4 pm peak load. As a result, resource adequacy analysis has shifted methodology from traditionally evaluating the peak load hour, to now evaluating all hours of the year, including the net peak load hour. Additionally, utilities are now shifting from targeting a power system to meet 2.4 loss of load hours to now targeting a 0.1 loss of load expectation, which is more conservative. As a result, resource adequacy analysis has shifted methodology from traditionally evaluating the peak load hour, to now evaluating all hours of the year, including the net peak load hour.

LADWP developed its 2022 Power SLTRP as instructed by the Los Angeles City Council to achieve 100 percent carbon-free energy by 2035; however, as mentioned in the SLTRP, there are significant implementation challenges that must be addressed. Future SLTRPs will seek to optimize LADWP's resource roadmap and address implementation challenges. The 2022 SLTRP contemplated three carbon-free cases, which all achieve 100 percent carbon-free energy by 2035, and one baseline case based on SB 100. Case 1, which was the case recommended by the 2022 SLTRP, achieves 100 percent carbon-free energy by 2035, with high amounts of local distributed energy resources (DERs) such as behind-the-meter solar and storage along with high building electrification. All cases contemplated in the 2022 SLTRP, including the 100 percent carbon-free cases and the SB 100 case, were modeled to adhere to the NERC industry standard for the loss of load hour (LOLH) metric, which is one day in 10 years and translates to being at or below 2.4 LOLH per year. As of 2024, LADWP Executive Management has directed staff to pursue the 2022 SLTRP Case 1 (recommended case). The 2024 SLTRP is currently being developed and rebranded as the "LA100 Plan", which will refine the resource mix identified in the 2022 SLTRP recommended case. The 2024 SLTRP will also evaluate the resources needed to target a 0.1 loss of load expectation, while refining the amounts of available candidate resources that are potentially available on the market.

LOLH, which quantifies the number of expected hours in which aggregate generation capacity is insufficient to meet demand, was below 2.4 loss of load hours per year (industry standard) for the SB 100 Case, and below 0.5 loss of load hours per year for Case 1, Case 2, and Case 3. LADWP's current loss of load hours is approximately 0.1 due to having a planning reserve margin of over 20 percent. The high degree of reliability demonstrated by

the LOLH for the carbon-free cases, is largely a result of overbuilding renewable and energy storage resources to comply with the accelerated target for 100 percent carbon-free energy by 2035. In contrast, the more flexible constraints of the SB 100 Case do not require 100 percent carbon-free energy until 2045 (a decade later than the Case 1, 2, and 3 carbon-free cases). The SB 100 Case also effectively allows for system losses to be made up with carbon-emitting resources since the 100 percent target is with respect to electric retail sales, rather than electric generation.

For the carbon-free cases, the effective load carrying capability (ELCC), or effective system capacity, declines as a result of the oversaturation of non-dispatchable and variable energy resources. These include resources such as solar, wind, and duration-limited energy storage. The need for dependable and dispatchable long-duration electric generation capacity within the Los Angeles Basin, as determined by NREL in the LA100, led to the selection of long-duration dispatchable green hydrogen combustion turbines (that emit no carbon emissions if fueled entirely with green hydrogen starting in 2035) for all of the carbon-free cases. This assumes that either LADWP self-produces green hydrogen with surplus renewable energy, or there will be a market for green hydrogen. These green hydrogen turbines are meant to serve as backup resources to maintain reliability during periods of low renewable energy output, and to bolster grid resiliency to ride through and recover from grid outages that can be caused by extreme events such as wildfires, earthquakes, heatwaves, and other types of unplanned events. It is also important to note that all scenarios in the 2022 SLTRP rely on the OTC extension of Scattergood Units 1&2 from December 31, 2024, to December 31, 2029, to bridge the gap in capacity for the new hydrogen ready Scattergood Modernization Project, planned to be in-service by December 31, 2029.1

Generating units at the Los Angeles Basin Stations that currently utilize OTC have a total net maximum capacity of 1,486 MW. The Department is currently evaluating potential actions to be taken to achieve this goal and has initiated its LA100 Plan that includes efforts for replacing the capacity of the OTC units as they retire by December 31, 2029, including the incorporation of Distributed Energy Resources, expansion and upgrades to LADWP's transmission network, construction of new in-basin generators that will run on zero-carbon fuels, and incorporation of new renewable energy facilities that will use wind and solar along with high-duration batteries. These changes are aimed at providing new zero-carbon electricity that will help to replace capacity shortfalls associated with the decommissioning of these OTC units. To maintain system reliability amid OTC-driven retirements, LADWP is currently advancing critical in-basin projects at Haynes and Scattergood with completion expected by 2029. Additionally, LADWP continues to evaluate emerging technologies that can deliver clean, firm capacity at the utility scale. Hydrogen-fueled gas turbines are the most promising solution, though further infrastructure development and scale are required.

As LADWP's power system transitions to become increasingly dominated by renewable energy, resource adequacy analysis has evolved. In the past, a planning reserve margin and

capacity shortfall were suitable metrics to assess resource adequacy of dispatchable resources, like thermal and large hydro; however, increasing amounts of renewable energy firmed with energy storage that is variable and intermittent, requires stochastic analysis with metrics such as LOLE.

**Challenges and Caveats:** It's important to recognize that resource adequacy analyses come with inherent limitations. The input assumptions, such as forecasted commercial operation dates for generation, energy storage, and transmission projects, are gathered at the beginning of the 2022 SLTRP analysis and provide a snapshot of the best available information at that time. However, it's crucial to understand that resource adequacy analysis is just one element in the broader strategic, long-term planning process. To ensure that the envisioned portfolio of generation, energy storage, and transmission assets meets various constraints, including compliance with applicable RPS targets, additional computer models, such as production cost models, must be employed. This comprehensive planning process is often time-consuming, often exceeding 12 months, and the input assumptions may become outdated during this period. Additionally, the confluence of recent market volatility, including price fluctuations and supply chain disruptions, exacerbated by the Inflation Reduction Act and the IRS' interpretations, as well as increased tariffs, duties, competition, and higher capital costs, has significantly limited the availability of renewable and energy storage projects for procurement. The majority of the projects initially assumed to be available and included in the resource adequacy analyses have experienced delays or are no longer available. For example, over 900 megawatts of solar and storage capacity, originally expected to come online in the next few years, have been delayed or canceled. With the retirement of Intermountain Power Project's coal-fired generating units, LADWP's is forecasting a capacity shortfall in 2025, which may persist for several subsequent years even with the construction of new hydrogen-natural gas meant to replace these units. Inherently, this affects resource adequacy, and currently LADWP is forecasting a capacity shortfall as soon as summer 2025. Furthermore, numerous internal and external studies have determined that LADWP will need to retain firm-dispatchable generation within the Los Angeles Basin to ensure reliability and resiliency. This requires LADWP to request extensions (e.g. Scattergood Units 1&2) and convert OTC units, such as Haynes 8, 9 & 10 and Harbor 1, 2 & 5 to recycled-water wet cooling to maintain in-basin generating capacity. In the event of transmission project delays, renewal of Haynes 1 & 2 units will also be required to ensure reliability of electric system and prevent shortfalls in power supply during peak hours.

**Drought.** After several years of aggressive water management to combat drought, Los Angeles experienced its wettest year on record in 2023, with 301 percent of normal snowfall in the snowpacks that feed the LADWP reservoir system. LADWP predicted that its reservoir system would have to handle twice the amount of water from snowmelt that it normally handles. This concern prompted Mayor Eric Garcetti to issue an Emergency Declaration aimed at protecting the region's personal, environmental, and structural interests in the area using lessons learned from the high snow years between 2017 and

2019. With the natural terminus for the Owens River at Owens Lake, LADWP took measures to determine the available storage and how to effectively spread the water to mitigate any potential damage. Overall, the near-record snowmelt provided much welcome water and hydroelectric power from Los Angeles' first power plants.

The Los Angeles Basin and the surrounding areas are arid regions that are prone to high summer temperatures and frequent droughts. These events present challenges that LADWP plans around in both the long-term strategic and day ahead plans. On September 6, 2024, LADWP saw its highest customer load since 2017, 6,242 MW and was able to serve this load without issue through careful planning and resource utilization that relied on a mixture of in-basin thermal generation, renewable energy resources, and energy imports. Low rainfall and drought impact LADWP's hydroelectric resources and has instituted water management plans that conserve water and provide power generation during extreme weather events.

The water level at Lake Mead, which feeds Hoover Dam, a valuable resource since it was placed in service in late 1936, will require many years to recover to its historical average of 1160 feet. LADWP has received only 50 percent of its share from Hoover Dam in past several years and this will most likely not increase for many years.

#### **California Independent System Operator (CAISO) Western Energy Imbalance Market.**

LADWP continued its participation in CAISO's real-time wholesale Western Energy Imbalance Market (WEIM) throughout 2024. In so doing, it availed its real-time Generation resources and transmission to the WEIM footprint to be optimized with other WEIM participants' fleet of resources, notably PacifiCorp; NV Energy; Arizona Public Service; Puget Sound Energy; Portland General Electric; Idaho Power; Seattle City Light; Salt River Project; Balancing Authority of Northern California/Sacramento Municipal Utility District; Canada's Powerex Public Service Company of New Mexico, Bonneville Power Administration and the CAISO, among other participants. The WEIM is an energy-only market that restricts participation if sufficiency tests are not met and does not offer ancillary services essential for reliability

While LADWP's power system is self-sufficient and vertically integrated, participation in the WEIM results in a wide range of significant benefits, such as helping to mitigate the operational challenges associated with over-generation from increased renewable generation, enabling LADWP to continue to increase its renewable energy supply and reach its RPS targets. Because the WEIM now includes nearly 80 percent of the WECC's electric loads and resources, LADWP sees this market as a valuable means to help reliably serve its customers while helping to integrate new renewable resources, reducing LADWP's carbon footprint, reducing its resource ramping requirements, and providing its ratepayers excellent economic value.

CAISO reported \$13.08m of benefits for LADWP's participation in the WEIM for the month of September 2024. This takes our total WEIM reported benefit to \$376m. LADWP's WEIM

Operations performance remained in the upper quartile of WEIM participants. As part of the resource sufficiency test performed for each WEIM entity prior to the real-time market being run, LADWP passed 99.6 percent of the balancing tests and 100 percent of the bid-range capacity tests in October. Additionally, power balance constraint infeasibilities for under and over-supply conditions were minimal for the LADWP balancing authority area with 0.03 percent of the total intervals in the Fifteen-Minute Market and 0.01 percent of the total intervals in the Five-Minute Market real-time dispatch for the month of October. LADWP passed 100 percent of the upward flexible ramping sufficiency tests and 100 percent of its downward flexible ramping sufficiency tests for the same period. The WEIM has 22 market participants that serve nearly 80 percent of electricity demand in the Western U.S., the WEIM will continue to provide increased reliability and environmental gains through the real-time transfer of energy. We are continuing to work with CAISO's team on market enhancements and in the development of CAISO extended day-ahead market through their stakeholder process. Meter interrogation system continues to be developed as part of the Bulk Electric System Meter Policy

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#### EVENTS AND OUTAGES

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In Q1 2024, the Scattergood-Olympic 230kV Cables A was switched out to support capital additions for a parallel transmission line and new receiving station to support Basin load demand. The following table, Table 3, lists the RMR generation commitment required during the 2023-24 Winter peak load, and the RMR generation required to reliably accommodate this outage.

TABLE 3. INCREASED RMR GENERATION DUE TO CIRCUIT UPGRADES

<b>SCATTERGOOD-OLYMPIC CABLE A</b>	<b>HARBOR</b>	<b>HAYNES</b>	<b>SCATTERGOOD</b>	<b>VALLEY</b>
<b>LINE IN</b>	None	Units 12 and 14, condense mode; Units 11-16 @ full load within 2hrs	Unit 6 or 7 within 2hrs	None
<b>LINE OUT</b>	None	Units 12 and 14, condense mode; Units 11-16 @ full load within 2hrs	50MW equivalent ON, and Unit 6 or 7 within 2hrs	None

In Q1 2024, Victorville-Rinaldi 500kV Line 1 was switched out for transformer repairs. The following table, Table 4, lists the RMR generation commitment required during the 2023-24 Winter peak load, and the RMR generation required to reliably accommodate this outage.

TABLE 4. INCREASED RMR GENERATION DUE TO CIRCUIT UPGRADES

<b>VICTORVILLE-RINALDI LINE 1</b>	<b>HARBOR</b>	<b>HAYNES</b>	<b>SCATTERGOOD</b>	<b>VALLEY</b>
<b>LINE IN</b>	None	Units 12 and 14, condense mode; Units 11-16 @ full load within 2hrs	Unit 6 or 7 within 2hrs	None
<b>LINE OUT</b>	Units 10-14 @ full load within 2 hours	Units 12 and 14, condense mode; Units 11-16 @ full load within 2hrs	50MW equivalent ON, and Unit 6 or 7 within 2hrs	None

In Q4 2024, Rinaldi-Tarzana 1, 2, and Northridge-Tarzana 1 were switched out to support capital transmission line upgrades. The following table, Table 5, lists the RMR generation commitment required during the 2024-25 Winter peak load, and the RMR generation required to reliably accommodate this outage.

TABLE 5. INCREASED RMR GENERATION DUE TO CIRCUIT UPGRADES

<b>RINALDI-TARZANA 1, 2, AND NORTHBRIDGE-TARZANA 1</b>	<b>HARBOR</b>	<b>HAYNES</b>	<b>SCATTERGOOD</b>	<b>VALLEY</b>
<b>LINE IN</b>	None	Units 12 and 14, condense mode; Units 11-16 @ full load within 2hrs	Unit 6 or 7 within 2hrs	None
<b>LINE OUT</b>	200MW equivalent ON, and Units 10-14 @ full load within 2 hours	Units 12 and 14, condense mode; Units 11-16 @ full load within 2hrs	450MW equivalent ON, and Unit 6 or 7 within 2hrs	None



In Q4 2024, Rinaldi-Tarzana 1 and 2 were switched out to support capital transmission line upgrades. The following table, Table 6, lists the RMR generation commitment required during the 2024-25 Winter peak load, and the RMR generation required to reliably accommodate this outage.

TABLE 6. INCREASED RMR GENERATION DUE TO CIRCUIT UPGRADES

<b>RINALDI-TARZANA 1 AND 2</b>	<b>HARBOR</b>	<b>HAYNES</b>	<b>SCATTERGOOD</b>	<b>VALLEY</b>
<b>LINE IN</b>	None	Units 12 and 14, condense mode; Units 11-16 @ full load within 2hrs	Unit 6 or 7 within 2hrs	None
<b>LINE OUT</b>	Units 10-14 @ full load within 2 hours	Units 12 and 14, condense mode; Units 11-16 @ full load within 2hrs	300MW equivalent ON, and Unit 6 or 7 within 2hrs	None