WATER & POWER ASSOCIATES, INC.

JULY 2025

NEWSLETTER

The Day the Lights Went Out in Spain and Portugal

By William Barlak

What happened in Spain that caused the Iberian Peninsula Blackout at 12:33:06 local Spanish time on April 28? The answer to that question will take some time to formulate.

Viewers of "Air Disasters" on the Smithsonian Channel or on YouTube realize the key to determining the root cause of aviation disasters is finding and analyzing the contents of the so-called "black boxes" that record both flight data and cockpit conversations leading up to the event. The process of determining the root cause of the Iberian Peninsula blackout will be very similar. The performance of today's transmission grids is monitored and recorded in more detail than ever before. So, gathering, reviewing, and analyzing all the relevant data will take weeks if not months. As in air disasters, one mistake or technical failure is rarely the cause; multiple coincident failures are usually necessary to cause the event. In this case, finding the ultimate cause will involve a simulated reconstruction of the system conditions and then a simulation of the critical event to verify the cause. Don't expect a definitive answer soon.

Well, what *do* we know right now?

There is yet no official "sequence of events" analysis of what happened. The only available information I could find is based on the Spanish Grid Operator's real time demand tracking. See https://demanda.ree.es/visiona/peninsula/demandaau/acumulada/2025-04-28. The information in this tracking right after the disturbance may not be reliable due to the failure of grid data telecommunications resulting from the blackout. There is also an excellent EPRI YouTube video in which very preliminary data and conclusions are presented. It is important to understand that media reports blaming or exonerating renewables as the ultimate cause of the disturbance cannot be based on a technical analysis of the disturbance, because no such analysis has yet been performed.

It appears at the time of the disturbance, the native load in Spain was about 25,000 MW, and energy exports from Spain to France, Portugal, and Morocco were at 870 MW, 2,600 MW, and 780 MW, respectively. But, immediately prior to the disturbance, market activity between France and Spain appear to reduce the flow from Spain to France to almost zero. Spain was pumping about 3,000 MW of pumped hydro energy storage, similar to Castaic. Total Spanish generating obligation was thus about 32,000 MW. This is around the same as California's demand on a typical non-summer day.

Graphic courtesy Sky News

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Spain's generation mix was 19,500 MW of solar, 3,600 MW of wind, 3,300 MW of nuclear, 1,600 MW of gas, and 4,000 from other resources. So, wind and solar, which connect to the AC grid through DC-to AC-inverters, provided slightly more than 70% of the generation mix at the time of the disturbance.

Three low-speed but large frequency oscillations occurred within the 30 minutes before the disturbance: the first at 12:03, a second at 12:14, and a third at 12:16. Frequency oscillations are very rapid deviations above and then below the normal European frequency of 50Hz. It appears Spain was swinging against Europe during these oscillations. That is, as frequency in Spain increased above 50Hz, the frequency in Europe decreased below 50Hz, and vice versa. Spain is connected to France (and Europe) by three 220kV lines, two 132kV lines and three 400kV lines, two of which may be a DC bipole. All of the lines traverse (or tunnel under) the Pyrenees Mountains.

19 seconds before the disturbance, a small resource in southern Spain tripped resulting in a small frequency dip due to the mismatch of supply and demand.

From data available today, it appears the disturbance started at 12:33:06 when a large resource in Spain tripped. This was followed 1.5 seconds later by the loss of another large resource and a massive loss of renewables in Spain. Spain and France then went "out of step" (lost synchronism) with each other resulting in a large frequency drop in Europe, and very large flows on the tie lines into Spain from France. These ties opened, possibly by out-of-step protection, and the Iberian Peninsula was then isolated with very low frequency due to a very large mismatch between supply and demand. Per reports, the elapsed time from start of the event to the complete blackout of the Iberian Peninsula was at most 5 seconds.

Small oscillations between France and Spain occur normally and it is rare for even a large oscillation alone to cause a blackout. But very large oscillations and disconnections occurred in 2016 and in 2021 but with far less severe consequences compared with April 28. So, what was different on April 28? Obviously, a complete disturbance analysis and report is necessary to pinpoint the root cause.

There is a lot of talk in the media about inertia and its role in this disturbance. Rotational inertia is the property of conventional generators to resist changes in system frequency. Large, massive turbine-generators found in nuclear and large coal units have large inertia, while modern combustion turbines and hydro generators are less massive and have less inertia. Renewable resources generally have no inertia because they have no rotating mass. The larger the mass of the turbine generator, the more slowly the unit will react to a change in system frequency, but the larger the ultimate response will be. So, massive units buffer the power system against sudden changes in frequency.

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President's Column

As LADWP moves forward with the development of the LA100 Plan proposing how future power supplies and reliability will be obtained, we focus this July Newsletter largely on these issues. In late June, a series of public outreach sessions were scheduled to provide updates to the community as well as gather input from the public on LA 100. Water and Power Associates planned to participate in these sessions. We will provide updates on these activities in a future newsletter.

Our cover article provides preliminary information on the recent major outage that caused the loss of electricity for most of Spain and Portugal. That event highlights issues that need to be addressed as Los Angeles moves forward with a major emphasis on renewables. The media reports blaming or exonerating renewables are not definitive as the technical analysis is beginning and will take some time to draw any conclusions.

This article is augmented by the personal report of one of our members who experienced it.

On page 8, there is an excerpt from a report from the Luskin Center of UCLA, providing their insights into the role that urban water supply systems play in addressing wildfires. While this view will undoubtedly be challenged in the upcoming legal battles over the Palisades Fire, it provides perspective from an independent source.

There are also several articles of interest on current topics regarding local, national, and international power issues.

You can get updated on important issues facing both the Water and Power Systems through the summaries of the presentations that were given to the Associates at their Board Meetings.

Also try out your knowledge through our ever-popular Mystery History Questions and see how well you do.

Enjoy

Jerry Gewe, President

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When a resource is lost, the sudden imbalance between supply and demand causes grid frequency to drop. Conventional generating units ultimately respond to this drop by a process called primary frequency response in which the unit's governor increases power from the unit's prime mover to increase the unit's power output and arrest the frequency decay. But primary frequency response (governor action) is mechanical and takes several seconds. Fortunately, a small incremental amount of power is immediately available from the unit's rotational inertia.

Immediately after the disturbance (and inherent in its very physics), the generator slightly slows down and a little more power is output. This is called the unit's inertial response, and it provides a few seconds for the ultimate corrective action to occur which is the unit's primary frequency response.

Photo Courtesy Violeta Santos Moura/Reuters

Inverter-based resources (IBRs) such as wind and solar have no inertia, but most modern IBRs can respond almost immediately to frequency changes by a system in which control signals sent from the plant's central control computer are very quickly sent to the individual inverters. So, even though IBRs have no inertia, they can exhibit almost immediate primary frequency response. However, this ability must be properly coordinated, set, and activated to be effective. Solar and wind IBRs respond quickly but can only respond up to (or down to) their power production limits. Inverters on battery storage systems can go from zero output to full output (or input) in one second. Utilities in the Western Electric Coordinating Council have an obligation to provide primary frequency response to the grid, and at least one company completely meets that obligation with a battery and an inverter with very fast primary frequency response.

Conventional generators only generate voltage. They only produce power when their prime movers such as steam, combustion, or hydro turbines provide enough torque to the turbine-generator shaft to cause its electrical power angle to advance against the local power angle of the grid. Today, inverters in most of the world's IBRs are classified as Grid **Following** Inverters because they cannot generate a voltage; they rely on conventional generators to generate the system voltage to which they then synchronize. Once synchronized, they produce current if the sun is shining or the wind is blowing. It is very likely that most of the Iberian renewable IBR's connect to the grid through Grid Following Inverters. Reports indicate these inverters were operating in "constant power factor" mode rather than in a mode allowing them to immediately respond to low frequency.

Grid **Forming** Inverters, on the other hand, *can* generate a voltage, act like a virtual conventional generator, and provide **synthetic** inertia. Today, more and more Grid Forming Inverters are being deployed around the world to provide voltage and frequency support to their grids. The National Renewable Energy Lab has produced a study that indicates Grid Forming Inverters are far superior to today's Grid Following Inverters in providing reliable frequency response to disturbances. Coupled with large batteries, Grid Forming Inverters may not replace all conventional generators, but they will help stabilize the grid of the future.

April 28 was a low demand period and, reports indicate, many conventional generators, including three nuclear units, were offline in order to make room for the renewable production. A fourth nuclear unit in Spain was off for refueling. Hence, inertia on the Iberian grid appears to have been very low. Hopefully, the final disturbance report will fully discuss the extent to which the available online inertia affected the events of April 28.

DWP Retirees' Personal Lisbon Experience

By Gary & Dianne Langewisch

Photo Courtesy CitySightseeing

It turned out the Holland America cruise ship we were on was in Lisbon, Portugal on Monday, April 28, 2025. Having previously been in Lisbon a couple times, we decided we'd just do the Hop-On Hop-Off (HOHO) bus as a way to see the highlights again. We did the HOHO red line route which ended in central Lisbon and then switched to the HOHO blue line route which would get us back to the cruise terminal and to the ship around 2:30pm for the all aboard time of 3:30pm.

About the time we got on the HOHO blue line bus around 1:00pm it appeared traffic seemed to be at a standstill and we soon heard there had been a "Europe Wide" power outage (turns out the outage was all of Portugal, Spain, and parts of France and Italy)! Then it became evident there were no traffic lights, power was off in all buildings and people were filling the sidewalks.

The HOHO blue line bus seemed to inch its way through traffic with no traffic lights and eventually got us (and several other cruise passengers) to the dock at 4:15pm, and luckily, the ship was still waiting for us. When we checked in, we were told there were still ten passengers unaccounted for. The ship Captain broke cruise ship protocol due to the power outage and delayed departure until all passengers were accounted for, which was maybe an hour after we got back.

There are horror stories in the cruise industry about passengers being left behind when not back by all aboard time, and the hassle of getting to the next port without your passport, money and everything else left behind in your cabin. So, we feel blessed and lucky that it was a "Europe Wide" power outage and the captain had delayed the ships departure due to the circumstances!

NERC's Summer Grid Outlook is Positive, With Some Concerns

By William Glauz

The North American Electric Reliability Corporation (NERC) is a not-for-profit international regulatory authority whose mission is to assure the effective and efficient reduction of risks to the reliability and security of the North American electric grid.

NERC oversees six regional reliability entities, including the Western Electric Coordinating Council, which LADWP is a member, and encompasses all of the interconnected power systems of Canada and the contiguous United States, as well as a portion of the Mexican state of Baja California. This region is known as the North American bulk power system (BPS). The North American BPS also includes 23 assessment areas.

Each year NERC publishes a Summer Reliability Assessment (SRA). The recently published 2025 SRA can be found here:
https://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC_SRA_2025.pdf

The SRA identifies, assesses, and reports on areas of concern regarding the reliability of the North American BPS for the upcoming summer season. In addition, the SRA presents peak electricity demand and supply changes and highlights any unique regional challenges or expected conditions that might affect the reliability of the BPS.

For the summer of 2025, all regions across the North American bulk power system (BPS) are generally positioned well to meet peak demand under normal summer conditions. However, elevated risks of electricity supply shortfalls could persist under extreme heat, surging demand, and resource variability.

Photo Courtesy OilPrice.com

Rising electricity demand forecasts, generation growth, and the increasing pace of change in the resource mix feature prominently in the summer risk profile. Since last summer, the aggregate of peak electricity demand for NERC's 23 assessment areas has risen by over 10 GW—more than double the year-to-year increase that occurred between the summers of 2023 and 2024. Over 7.4 GW of generator capacity (nameplate) has retired or become inactive for the upcoming summer, including 2.5 GW of natural-gas-fired and 2.1 GW of coal-fired generators. Meanwhile, growth in solar photovoltaic (PV) and battery storage resources has accelerated with the addition of 30 GW of nameplate solar PV resources and 13 GW of new battery storage. The new solar and battery resource additions are expected to provide over 35 GW in summer on-peak capacity. New wind resources are expected to provide 5 GW on peak. Operators in many parts of the BPS face challenges in meeting higher demand this summer with a resource mix that, in general, has less flexibility and more variability.

Weather services are expecting above-average summer temperatures across much of North America and continued below-average precipitation in the Northwest and Midwest. In summer-peaking areas, temperature is one of the main drivers of demand and can also contribute to forced outages for generation and other BPS equipment. Average temperatures last summer across the United States and Canada were not as hot as Summer 2023, but Summer 2024 still managed to rank in the top four hottest recorded summers. Natural-gas-fired electricity generation broke records last year—highlighting the criticality of natural gas in meeting electric demand. This continuing trend will be key in operator preparations that help to ensure fuel availability for the coming summer.

Aging generation facilities present increased challenges to maintaining generator readiness and resource adequacy. Forced outage rates for conventional generators and wind resources have trended toward historically high levels in recent years.

Battery resource additions are helping reduce energy shortfall risks that can arise from resource variability and peaks in demand. In Texas, California, and across the U.S. West, the influx of battery energy storage systems (BESS) in recent years has markedly improved the ability to manage energy risks during challenging summer periods. These areas can be exposed to energy shortfalls during hours of peak demand and into evening as solar PV output diminishes, but BESS resources that maintain their charge during the day can help meet peak demand and

also overcome energy shortfalls on the system that might otherwise occur with solar down-ramps or variability. Natural-gas-fired generation also continues to play an important role in meeting peak demand and flexibly responding to fluctuations in output from variable energy resources.

Grid operators need to remain vigilant for the potential of inverter-based resources, like solar photovoltaics, to unexpectedly trip during grid disturbances. As solar, wind, and battery resources remain the predominant types of resources being added to the BPS, it is imperative for industry, vendors, and manufacturers to take steps to improve inverter performance.

Wildfire risks in the areas that comprise the Western Interconnection remain ever present. Wildfire conditions can affect transmission operations by prompting preemptive circuit outages to reduce the risk of fire ignition as well as through fire impacts to transmission infrastructure. Transmission system congestion and reduced import capacity can accompany wildfire conditions. Moreover, fires near wind generation result in curtailment for safety reasons, and solar facilities can be susceptible to range fires. Fire damage to transmission lines interconnected to remote hydro sites in the Pacific Northwest can be particularly problematic with restoration typically taking weeks to months to accomplish.

Utah Pursuing Small Scale Nuclear Energy Development

By William Glauz

On April 30, 2025, the Governors of Utah, Idaho and Wyoming signed an agreement establishing a cooperative framework to align energy-related efforts across the three states, focusing on advancing energy resilience, coordinating infrastructure, advocating for common sense federal policies, and accelerating the development of "reliable, affordable" nuclear energy.

Photo Courtesy KUTV

In late April, the Utah legislature signed several bills supporting Utah's energy ambitions, including one that advances the deployment of nuclear and other energy technologies; another on advanced transmission technologies; another providing for the creation of the energy compact between Utah, Wyoming and Idaho; and one that allows large load energy consumers needing 100 MW or more to enter into flexible contracts with existing utilities or alternative energy providers, to meet growing demands outside of normal regulatory processes while ensuring that large load consumers bear full costs and existing ratepayers are not negatively impacted.

Last year, Utah Governor Spencer Cox launched the Operation Gigawatt initiative to double Utah’s power production over the next 10 years. This initiative’s key goals include: increasing transmission capacity; expanding and developing energy production; enhancing Utah’s policies to enable energy sources such as nuclear and geothermal; and investing in energy innovation and research.

Also, the State of Utah signed a strategic cooperation agreement with Holtec International and Hi Tech Solutions to support the deployment of Holtec's small, 300 MW, modular nuclear reactor, the SMR-300. The rollout of these units is still at least five years away, but training and manufacturing facilities are expected sooner.

Lastly, also in April, EnergySolutions announced a partnership with the Intermountain Power Agency and the state of Utah to explore the potential development of small modular reactor for baseload power at the Intermountain Power Project site near Delta, Utah. A project between NuScale Power Corporation and Utah Associated Municipal Power Systems (UAMPS) - a political subdivision of the State of Utah - to build a small modular reactor power plant at a site near Idaho Falls was terminated in late 2023.

Do Urban Water Supply Systems Put Out Wildfires?

Excerpted by Jerry Gewe from the UCLA Luskin Center Guide Addressing Questions Arising from the January Wildfires

https://innovation.luskin.ucla.edu/wp-content/uploads/2025/02/Fire-and-Water-FAQ-English-Final.pdf

The following quotes are from Gregory Pierce, Research and Co-Executive Director of the UCLA Luskin Center for Innovation:

"Urban water systems are not designed to fight wildfires and put out fires on mountainsides. Even if you had all the water, all the power, and all the holding tanks in the world, you still couldn't have combatted this unless you had a lot more labor and were able to undertake a better aerial approach with helicopters and fire retardants."

"The LA Department of Water and Power has flaws, but it is one of the most sophisticated, technically competent water suppliers in the region, and they were as well-prepared as anyone could expect. In terrain like the Palisades, it takes a lot of power, energy, and cost to get water there. The Santa Ynez reservoir being offline to ensure compliance was very bad luck, but not something any system would have been expected to handle differently. No one can say exactly what condition the pieces of infrastructure were in except the utility, but there's no good reason to think that they performed anomalously."

Photo Courtesy Pasadena Star News

"We've seen the profound effect wildfires can have on urban drinking water quality. From short-term impacts that result in 'do not drink' or 'boil water' notices, to long-term damage to public and private plumbing infrastructure. All of this can undermine public trust in tap water, which leads people to much more costly alternatives. We need to coordinate ASAP on testing, treatment, and public communication and involve non-profit organizations that are trusted in their communities. Otherwise, residents will be confused, concerned, or worse regarding the safety of their water."

EIA Publishes China Energy Brief

By William Glauz

On May 19, 2025, the US Energy Information Agency published its China Country Analysis Brief, a detailed analysis of China's energy portfolio. Here is a condensed summary of the brief. For much more information you can find the brief here:

https://www.eia.gov/international/content/analysis/countries_long/China/pdf/China-2025.pdf

For the third year in a row, China's population declined in 2025 after decades of continuous growth, falling to 1.42 billion people.

China's economy is the world's second-largest. Its gross domestic product (GDP) grew by 5.0% in 2024, in line with government estimates, however, other sources indicate that China's GDP grew by only 2% to 3%. Stimulus measures in the second half of the year as well as increased exports at the end of the year fostered growth.

Photo Courtesy China Daily.com

Coal continued to account for most (62%) of the energy consumed in China. Although coal accounted for the largest share of primary energy production, it grew the least year on year, at 1.3%. Natural gas accounted for the largest increase in primary energy production (6.2%) in 2023 from the previous year, followed by nuclear (3.7%). However, natural gas had the second-largest increase in primary energy consumption (7.4%) after petroleum and other liquids (8.6%).

In 2024, non-fossil fuels accounted for 56% of total installed electricity generation capacity. Although most of the electricity generation (63%) came from fossil fuels, the fossil fuels share of generation decreased by 1% from the previous year.

China added 356 gigawatts (GW) of non-hydro renewable generation capacity in 2024. Of this, solar accounted for 277 GW, and wind accounted for 79 GW.

Electric vehicles (EVs) accounted for 48% of new vehicle sales in 2024, which surpassed the country's 2030 target of 40% by six years. Strong government support, a competitive market that has allowed more than half of EVs to be sold at lower prices than their internal combustion engine (ICE) competitors, and advancements in battery and smart vehicle technologies contributed to this milestone.

China, the world's top coal producer and consumer, increased production by 5.0% to a record-high 4.8 billion short tons in 2023. The rise in production is attributed to China's push for energy security and to countering market price volatility.

China's coal consumption increased by 9.7% in 2023 from the previous year, to 5.2 billion short tons. Growth in electricity demand was the largest driver of coal consumption increases in 2023. China's 1,200 gigawatts (GW) of coal-fired generation capacity alone accounts for about one-third of global coal consumption.

Renewable generation, not including hydropower, increased by the largest percentage year over year in 2023.

- Solar generation increased the most in 2023, rising 36.7% from 2022 to 0.6 TWh.
- Wind generation increased by 16.2% between 2022 and 2023 to 0.9 TWh.
- Hydropower generation decreased by 4.9% to 1.2 TWh from 2022 to 2023, because of droughts.

Pros, Cons and Applications for Battery Energy Systems

Excerpted by Saif Mogri from Montel Energy

Photo Courtesy Saur Energy International

Battery energy storage systems (BESS) are at the forefront of the renewable energy revolution, providing critical solutions for managing power demand, enhancing grid stability, and promoting the efficient use of renewable resources.

Benefits of Battery Energy Storage Systems

- Enhancing Grid Stability and Reliability

As more renewable energy sources are integrated into the grid, their variability can lead to power supply fluctuations. BESS provides a solution by stabilizing the grid, delivering power during short-term volatility, and ensuring a steady electricity supply.

- Facilitating the Integration of Renewable Energy Sources

BESS makes increasing the amount of renewable energy in the grid possible. By smoothing out the supply-demand imbalance, BESS enables the grid to accommodate a higher proportion of renewable energy without compromising stability or reliability.

- Providing Backup Power During Outages

A desirable perk of BESS is that it offers businesses and households a reliable backup power source during outages. This capability is crucial for critical infrastructure, such as hospitals, data centers, and industrial facilities, where power continuity is essential.

- Reducing Energy Costs Through Peak Shaving and Load Shifting

BESS can significantly reduce energy costs by enabling peak shaving and load shifting. Peak shaving involves using stored energy during periods of high electricity prices, reducing demand charges. Load shifting allows energy use to be moved to off-peak times when electricity is cheaper, further lowering costs.

- Environmental Benefits: Reducing Carbon Footprint and Reliance on Fossil Fuels

BESS plays a crucial role in lowering carbon emissions by facilitating the use of renewable energy and reducing the need for fossil-fuel-based power plants.

Applications for Battery Energy Storage Systems

- Residential: Home Energy Storage Systems

Home energy storage systems, such as Tesla's Powerwall, allow homeowners to store energy generated by rooftop solar panels. This stored energy can be used during the evening or in case of a grid outage, providing energy independence and cost savings.

- Commercial and Industrial: Large-Scale Energy Storage Solutions for Businesses

As mentioned, in commercial and industrial settings, BESS can provide significant financial benefits through demand change reduction, energy cost management, and improved energy reliability. Large-scale energy storage systems can also support sustainability goals by enabling greater use of renewable energy.

- Utility-Scale: Storage Solutions for Grid Operators and Energy Providers

Utility-scale BESS projects are increasingly being deployed to enhance grid reliability, support renewable integration, and provide ancillary services such as frequency regulation and voltage support. These systems are essential for modernizing the grid and transitioning to a low-carbon energy system.

Current Challenges of BESS:

The high upfront cost of BESS remains a significant barrier to widespread adoption, although prices are gradually decreasing.

Battery Lifespan: The lifespan of batteries is limited by the number of charge-discharge cycles they can endure. Degradation over time can reduce system efficiency and increase maintenance costs.

Safety Concerns: The use of large-scale battery systems raises safety concerns, including the risk of thermal runaway and fires. Robust safety measures and advancements in battery technology are essential to mitigate these risks.

Recycling and End-of-Life Management:

As the roll-out of BESS grows, so does the need for effective recycling and end-of-life management solutions to address environmental and resource concerns.

LA 100 Plan Update and Public Outreach Meeting Schedule

By William Engels

The LA 100 Plan, the planning document also previously known as LADWP's Strategic Long Term Resource Plan, had its sixth and final Advisory Group meeting, of which the Water & Power Associates is a member, on May 15, 2025.

As has been written about several times before in this newsletter, the plan, as required by the L.A. City Council in 2021, mandates LADWP achieve 100 percent carbon-free energy by 2035, in a way that is equitable and has minimal adverse impact on ratepayers.

LADWP's planning process is now at the stage of soliciting and incorporating public comment. For background, topics covered in the May 15 meeting included the LA 100 Plan rates analysis and overview; LADWP's customer bill impacts and resulting energy cost burdens; an analysis of implementation risks and challenges; and upcoming public outreach workshops.

The slide deck for the meeting is available at:

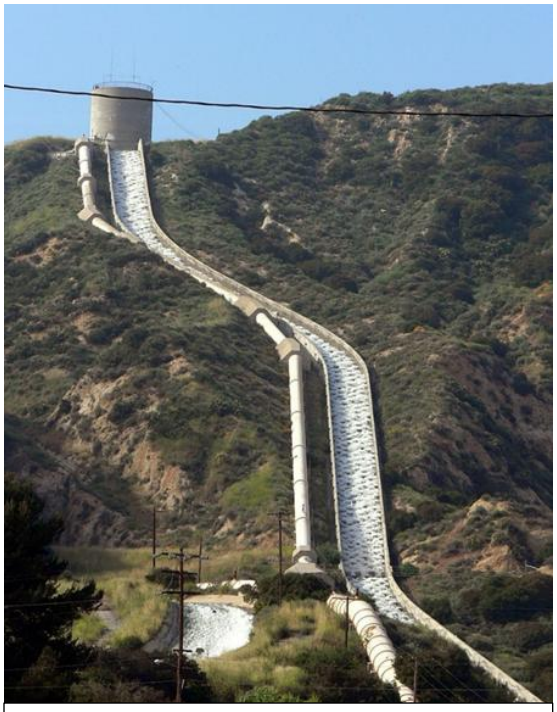
www.ladwp.com/sites/default/files/2025-05/LA100%20Plan%20Presentation%20for%20AG8_Final.pdf

A series of public outreach meetings is scheduled for late June.

Once public comment is included in the LA 100 Plan, an article depicting the final plan will appear in the pages of this newsletter.

Mystery History Questions

Presented by Jack Feldman



The Cascades of the Los Angeles Aqueduct

Little-known fact: The recognizable cascades visible from the I-5 Freeway in the northeast San Fernando Valley are not the original Los Angeles Aqueduct cascades associated with William Mulholland's historic 1913 opening. What we see today is actually part of the Second Los Angeles Aqueduct, completed in 1970.

A section of the original cascade can still be seen at the lower left of this image.

Mystery History Quiz – The Hidden Story of L.A.'s Second Aqueduct

1. Why was the Second Los Angeles Aqueduct constructed?

A) To replace damaged sections of the First Aqueduct

B) To meet rising demand and secure L.A.'s rights to Owens Valley and Mono Basin water

C) To irrigate farms in Inyo County

D) To route water around earthquake faults

2. When was the Second Los Angeles Aqueduct completed?

A) 1941

B) 1958

C) 1970

D) 1983

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3. Where does the Second Aqueduct branch off from the original?

A) Mono Lake

B) Owens Lake

C) Haiwee Reservoir

D) San Fernando Reservoir

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4. Who managed the construction of the Second Aqueduct?

A) California Department of Water Resources

B) Private contractors under LADWP

C) U.S. Army Corps of Engineers

D) Original city public works crews from the 1913 project

5. What is the function of the large pipes visible adjacent to the cascades in Sylmar?

A) Backup overflow for emergencies

B) Abandoned conduit from early electric generation

C) Penstock delivering high-pressure water to hydroelectric turbines

D) Water transfer from Sylmar to San Diego

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6. How did the Second Aqueduct impact L.A.'s water delivery system?

A) It had no real effect on supply

B) It reduced evaporation losses from the First Aqueduct

C) It increased the city's water import capacity by approximately 50%

D) It was only activated during drought emergencies

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7. What dual-purpose function is exemplified at the Cascades in Sylmar?

A) Water treatment and recreation

B) Wildlife migration and sediment collection

C) Scenic viewing and noise reduction

D) Water delivery and hydroelectric power generation

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8. When is water most likely to flow visibly down the cascades?

A) Every day at noon as a showpiece

B) During major rainstorms

C) During peak electricity demand

D) When the hydroelectric power plants are offline or cannot handle the full flow

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📲 **Think you got them all right?**

Check your answers and explore the full story of the Second Los Angeles Aqueduct—including its role in power generation and how it works in tandem with the original 1913 aqueduct—at:

👉 https://waterandpower.org/museum/A_Second_Aqueduct.html

Also, see answers on Page 19

GUEST SPEAKERS

Summaries by Robert Yoshimura

GUESTS OF THE MONTH
APRIL 2025

Greg Reed, Director of Engineering & Technical Services, LADWP

STATE OF THE WATER SYSTEM

Greg Reed is the Water System manager responsible for the Water Capital Improvement Program (CIP). He provided a summary of the major projects now in progress, as well as an update of the financial issues associated with the cost of implementation of the CIP.

The financial firm of Standard and Poor's has downgraded the Water System's bond rating from AA+ to AA- due to perceived risks of financial stress resulting from the recent and likely future fires in Los Angeles. Other bond rating agencies are also evaluating the water side of LADWP, and they may follow suit as well. Such downgrading is likely to increase future costs of borrowing, which may affect the cost of capital projects.

The Water System has not had a rate action since 2016. One was planned for 2020 but never implemented because of the Covid pandemic that significantly changed political priorities at that time. The Water System is currently working on an estimate of future revenue requirements for which the CIP will exert a significant amount. It is also considering rate restructuring as well as rate changes to fulfill such future revenue requirements. Because California's constitution requires that utility rates be based on the actual cost of service, the Water System is planning to hire a consultant to perform an assessment of such costs to input into the rate case.

The Water System is actively and aggressively pursuing external sources of revenue for its CIP, with particular emphasis on California Proposition 1 (2014 Water Bond) grant funding. City of Los Angeles' lobbyists in both Washington DC and Sacramento are presenting their cases for additional federal and state funding as well. Such external funding will be needed because the size and cost of the CIP has grown significantly in recent years and unexpected cost escalations have occurred on many recent projects.

The Capital Improvement Program. The system-wide CIP is estimated at $800 million for 2025 of which $300 million is under the control of Water Engineering and Technical Services (WETS) Division. A brief description of each project in the water CIP is provided below:

1. Fairmont Sedimentation Plant (see rendering below), to be located upstream of the Los Angeles Aqueduct Filtration Plant (LAAFP) is needed to improve raw water quality by reducing turbidity and arsenic levels to reduce the burden on the filters and improve operational flexibility of LAAFP. The plant is being delivered via a progressive design-build process and a contract has been awarded for $850 million.
2. The System-Wide Chloramination Trailer project is needed to maintain a

chloramine residual in tanks susceptible to stagnation which results in chloramine loss. 11 pre-packaged residual control stations with remote monitoring in trailers will be installed at 11 tanks.

3. The $514 million Tom LaBonge Headworks Complex and the $289 million River Supply Conduit (RSC) Upper Reach are nearly complete. The two reservoirs (110 MG combined) are operational, and the flow control station will be commissioned in June 2025. The Headworks Restoration Project (a passive use park atop the West Reservoir will begin the design phase this month. The RSC pipelines are complete, and the disinfection station will begin operating also this month.

4. The $185 million North Haiwee Dam No. 2 is needed because the existing dam is seismically unsafe, and if lost, will disable the operation of the Aqueduct for many months.
5. The $30 million Redmont Tank and Pumping Station will replace the existing reservoir with a 436,000-gallon steel tank and dual pumping station to serve anticipated future demands and boost fire-fighting capacity.
6. Trunkline Replacements – Both the $180 million Western Trunkline and the $300 million Roscoe Trunkline (to replace the aging City Trunkline) have been recently awarded. Both projects replace aging trunklines with seismically secure facilities.
7. The DeSoto Tanks project will replace the existing 3 MG reservoir with two tanks of 20 MG capacity total. The expected completion date is December 2031 and will cost $120 to $180 million.
8. San Fernando Basin Groundwater Treatment Facilities are needed to remove a variety of organic chemicals from groundwater. Three projects have been completed and are nearing commissioning: North Hollywood West ($137.6 million), North Hollywood Central ($255 million), and Tujunga Central ($292 million). Recently, PFAS (per- and poly- flouro alkyl substances) were detected in the water to be treated by the Tujunga Central Plant. DWP is exploring different types of granular carbon media to resolve the problem. Some additional treatment processes may also have to be added. When operational, these facilities will provide nearly 200 cubic feet per second of capacity, which will significantly add to DWP's drought water supplies.
9. The $740 million Groundwater Replenishment Project (GRP) will produce up to 22,000 acre-feet per year of recycled wastewater from the Tillman Reclamation Plant for groundwater replenishment via spreading at Hansen Spreading Grounds.
10. Pure Water LA Project, which has been thoroughly described by previous speakers at this Board, will recycle nearly all the effluent from the Hyperion Water Reclamation Plant. The estimated cost is $21 to $26 billion.

In addition to the projects described above, Greg Reed's presentation slides included four additional projects including the $207 million Water Quality Laboratory, the $432 million Mid-Valley Water Facilities Yard, the $510 million Western District Yard Renovation, and $72 million San Fernando Valley Chlorination Upgrades. The magnitude of the CIP is thus immense and will present a significant challenge to the Water System.

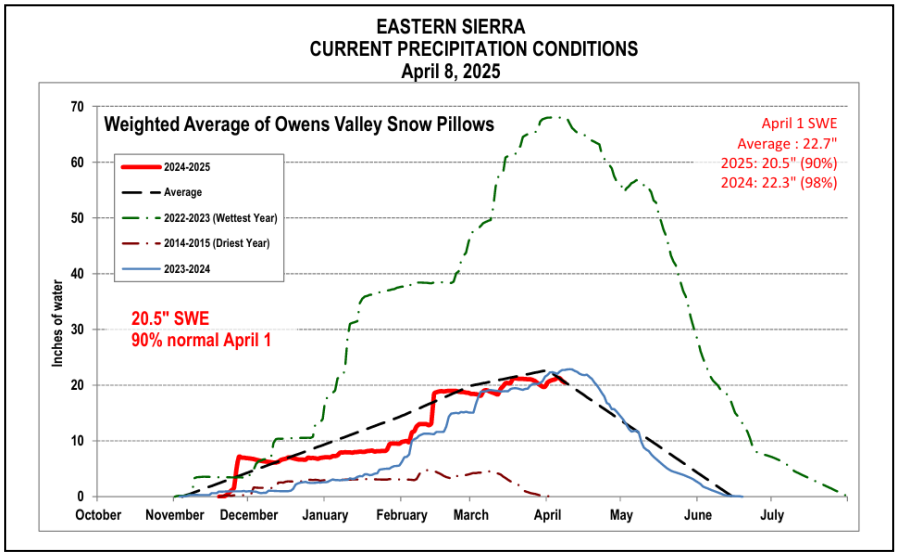
Ben Wong and Timothy Ushijima

SUMMARY OF 2025 WATER SUPPLY CONDITIONS

Ben Wong from the DWP Water Resources Division and Timothy Ushijima from the Water Operations Division provided an update of current water supply conditions on the City of Los Angeles' three primary water sources (Los Angeles Aqueduct, Metropolitan Water District, and local groundwater).

Los Angeles Aqueduct (LAA). Each year's runoff from snowmelt in the eastern Sierra Nevada provides most of the annual water supply delivered to Los Angeles via the LAA. Runoff forecasting is thus a critical part of the planning process for water supply operations. Forecasting methods accurately estimate runoff, as last year's forecast predicted 102% of normal runoff and the actual was 99%.

Recent historical runoff data shows that above-normal runoff is rare and that three consecutive years of normal or above is particularly so. 2023 was the wettest year in history yielding 300% of normal runoff and 2024 was a good year as described above. Expectations for 2025 were thus not optimistic. As shown in the graph of snowpack below, the water year began true to expectations with below-average snowpack until mid-February. Since then, a series of storms have raised the snowpack to 90% of normal as of April 1.



The forecasted runoff for 2025 is about 250,000 acre-feet (AF), similar to last year, partly because of carryover from the wet year of 2023.

Metropolitan Water District (MWD). MWD's two sources of water are the State Water Project (SWP) and the Colorado River. The snowpack in the northern Sierra that contributes to the SWP is at 118% of normal and has resulted in an increase in promised allocations to MWD of 50% of the contracted amount. The Colorado River snowpack is 87% of normal. As of March 5, 2025, when the SWP allocation was only 35%, the combined deliveries of water from those sources will enable MWD to fulfill all its obligations to its member agencies and, in addition, store 17,000 AF of surplus water. A 50% SWP allocation will thus further increase the surplus available for storage. (*Ed. note: per Ben Wong's presentation a year ago, a 30% SWP allocation is the break-even point balancing demand and supply.)*

Local Groundwater. Groundwater pumping from wells in the San Fernando Basin have recently been severely restricted because of contamination from a variety of industrial organic compounds. To resolve this issue, DWP has been constructing wellhead treatment facilities at three locations in the San Fernando Valley. Those facilities, known as North Hollywood West, North Hollywood Central, and Tujunga Remediation Facilities are nearing completion and will begin operation within the next year or so as shown in the table below. When fully operational, San Fernando Valley groundwater will provide roughly 20% of the city's water supply in a typical year.

Facility	DDW* Commissioning	DDW* Permit	LADWP Commissioning	Planned Pumping Rate
North Hollywood West	Apr 2023 - May 2023	Jun-24	Aug 2024 - Jul 2025	13 TAFY (18 cfs)
North Hollywood Central	Feb-24	Q2 2025	Jul 2025 - Sep 2025	28 TAFY (38 cfs)
Tujunga	Apr 2024 - May 2024	Q4 2025	Feb 2025 - Mar 2026	43 TAFY (39 cfs)
* CA Division of Drinking Water				

Water Demand Trends. To wrap up his presentation, Ben Wong discussed water demand trends during the '24 –'25 runoff year that ended at the end of March. He provided a brief discussion of the following factors that affect demand:

- The average maximum daily temperature for the year was very close to average and likely did not cause deviations in demand.
- Rainfall, however, was significantly below average at 8.5 inches total for the year compared to 14.7 inches in a normal year.
- Actual water demand during the year was higher than forecast with the deviation from the forecast generally increasing as the year progressed. This trend suggests a rebound in total water use after a period of decline.
- The city's population declined steadily between 2018 and 2023 but rebounded in 2024. The projection for 2025 and 2026 is for a continuation of the growth, with the recognition that it is an uncertain forecast.
- Per capita water usage declined precipitously from 1987 when it was 187 gallons per capita per day (gpcd), to 2024 when it bottomed out at 101 gpcd. However, since then, a rebound has occurred reaching 106 gpcd in February 2025. However, conservation efforts will continue to target a usage rate of 100 gpcd by 2035.

GUEST OF THE MONTH
MAY 2025

Jason Rondou, Assistant General Manager of Power

Engineering, Planning, Major Projects, and New Business

UPDATE ON POWER SYSTEM ISSUES

Jason Rondou was reassigned from his former position as Chief of Staff in the General Manager's office to his current role amid the Palisades fire disaster in January. That move was made to sustain organizational focus on critical ongoing efforts associated with the LA 100 transition to clean energy by 2035, to sustain focus on system reliability, and forestall distractions that may result from disaster recovery efforts. A related focal point will be the major revamping of business processes in the new business area with the help of consultants and new management staff at the top of that organization. Such efforts are needed to accommodate the anticipated increase in new business resulting from the electrification of transportation and buildings and mitigation of homelessness.

LA 100. The Power System is contemplating more than 50 transmission improvements to accommodate increased demand and reliability including the conversion of the Victorville Transmission Line from AC to DC. They are also considering an undersea transmission line from the central coast and privately developed and funded projects by third parties. Another priority is to increase the geographical diversity of transmission lines to improve the resiliency of power supply in the face of disasters such as wildfires or earthquakes.


Tree Wind Farm and Solar Power Plant

Distributed Resources. DWP has long been a leader in distributed resources and continues to use net metering which has been instrumental in incentivizing new solar. However, cost is becoming an issue and DWP is searching for ways to reduce that cost, which will require a rate case analysis. Nevertheless, additional new sources of cost-effective distributed energy including solar, battery storage, and demand response are being sought and a new contract for an expanded portfolio of demand response will go to the Board of Commissioners this summer.

A power rate case analysis is needed to determine the real cost to ratepayers of net metering. Then, rates must somehow be adjusted to be equitable to both those who have roof-top solar and those who do not. The current rate structure incentivizes power use at night which needs to be changed to encourage heavy power use such as electric vehicle charging to occur midday when surplus energy is available.

Renewable Energy. The Eland Solar plus Storage project in Mojave California is now operational and will provide a total of 400 MW of generation plus 300 MW of 4-hour battery storage capacity. Remarkably, DWP signed a power purchase contract for that capacity for $40/MWh which is roughly half of the price such power could be obtained today. The contract was signed pre-Covid before supply-chain problems and lithium shortages manifested higher costs. The contract was negotiated through the Southern California Public Power Authority and is valid for 25 years and has a buyout option. Other local utilities such as Glendale Water & Power also benefit from the project.

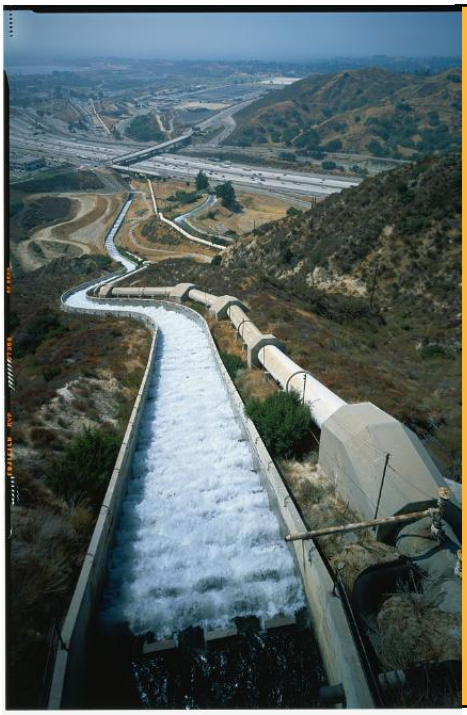
Because of its relatively small carbon footprint on a national and worldwide scale, DWP's impact on climate change is best achieved by demonstrating a successful transition to renewable energy that maintains the reliability and affordability of electric power. Studies have shown that in-basin on-call generation is needed to maintain the reliability to which ratepayers are accustomed. However, there are now some questions as to the availability of $100 million of federal funding that was previously earmarked for the Scattergood hydrogen conversion project. Without the federal funding, DWP would bear additional costs and accept a higher risk.

A feedback loop is built into monthly reports to the Board of Commissioners and frequent presentations to the City Council regarding progress on the transition to clean and renewable energy. Thus, the concerns that W&PA has expressed about the viability and cost of achieving the transition by 2035 will become apparent as progress toward the goal is made and especially if timelines begin to slip.

The need for in-basin generation to sustain the reliability of a power system based on intermittent renewable sources is extremely important, but difficult to explain to the public. The Scattergood conversion to gas and hydrogen fuel has undergone extensive study more than any other project in DWP history and its need is unquestioned among DWP staff. Yet skeptics continue to question DWP's motivation in spending large amounts of money on a fossil-fueled project. Furthermore, the conversion of Scattergood to 100% green hydrogen fuel cannot be guaranteed because the technology isn't fully tested on a large scale, and the infrastructure for production and delivery of green hydrogen fuel does not yet exist. The challenge is to keep educating the Board, City Council, and other decision-makers who seem to understand the project's complexities so far.

Intermountain Power Project (IPP)

IPP is a major component of the transition to renewable energy and will incorporate an abundance of new and innovative technology. Despite the challenges of that technology, the project is progressing on schedule. The electrolysis plant that will produce the green hydrogen fuel for the plant will be completed next year. Some Utah politicians have expressed interest in keeping the coal-fired portion of the plant in order to provide energy for AI data centers now expected to be built soon. DWP is amenable to that proposal as long as the state of Utah is willing to take responsibility for its operation. Other state leaders have requested a feasibility study for the construction of a nuclear power plant at the IPP site. That study is now ongoing.



Mystery History Answers

1. B – To meet rising demand and secure L.A.'s rights to Owens Valley and Mono Basin water
2. C – 1970
3. C – Haiwee Reservoir
4. B – Private contractors under LADWP
5. C – Penstock delivering high-pressure water to hydroelectric turbines
6. C – It increased the city's water import capacity by approximately 50%
7. D – Water delivery and hydroelectric power generation
8. D – When the hydroelectric power plants are offline or cannot handle the full flow

For additional information click:

https://waterandpower.org/museum/A_Second_Aqueduct.html

SAVE THE DATE

2025 CALENDAR

GUEST OF THE MONTH

Meetings in Person Room 1471, JFB and Via Zoom, Check your WPA Emails for the Zoom Link

TO BE ANNOUNCED SOON	JULY 9, 2025
TIM O'CONNER LADWP Rate Payer Advocate	AUGUST 13, 2025 Welcome New RPA
MWD Guest, Tentative	SEPTEMBER 10, 2025 MWD Water Supply Issues
TO BE DETERMINED	OCTOBER 8, 2025
TO BE DETERMINED	NOVERMBER 12, 2025 Urban Water Mgt Plan

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