

LADWP Power Strategic Long-Term Resource Plan (SLTRP)

Advisory Group (AG): Meeting #7

Friday, December 17, 2021

10:00 am – 12:00 pm

Zoom Platform (Virtual)

Meeting Summary (Draft)¹

Attendees:

Advisory Group Members/Observers:

1. California Energy Storage Alliance (CESA), Jin Noh
2. California State University, Northridge (CSUN), Loraine Lundquist
3. Center for Energy Efficiency and Renewable Technologies (CEERT), Jose Carmona
4. City of Los Angeles - Climate Emergency Mobilization Office, Rebekah Guerra
5. City of Los Angeles - Council District 02, Councilmember Paul Krekorian, Aaron Ordower
6. City of Los Angeles - Council District 03, Councilmember Bob Blumenfield, Jeff Jacobberger
7. City of Los Angeles – Council District 04, Councilmember Nithya Raman, Joshua Nuni
8. City of Los Angeles - Office of the City Administrative Officer (CAO), Sarai Bhaga
9. City of Los Angeles - Office of the City Attorney, Jean-Claude Bertet
10. City of Los Angeles – Office of the City Attorney, Priscila Kasha
11. City of Los Angeles - Office of the Mayor, Paul Lee
12. City of Los Angeles – Office of Public Accountability (OPA), Camden Collins
13. City of Los Angeles - Office of Public Accountability (OPA), Frederick Pickel
14. Food and Water Watch – Andrea Vega
15. Green Hydrogen Coalition (GHC), Nick Connell
16. LADWP Advocacy Committee, Jack Humphreville
17. LADWP Board of Commissioners, Mia Lehrer
18. LADWP Memorandum of Understanding Oversight Committee, Tony Wilkinson
19. Los Angeles Business Council (LABC), Adam Lane
20. Los Angeles Business Council (LABC), Arielle Lopez
21. Los Angeles Unified School District (LAUSD), Christos Chrysiliou
22. Neighborhood Council Sustainability Alliance (NCSA), Dan Kegel
23. Pacoima Beautiful, Veronica Padilla
24. Port of Los Angeles (POLA), Carlos Baldenegro
25. Port of Los Angeles (POLA), Dac Hoang
26. Sierra Club, Francis Yang
27. Sierra Club, Katie Ramsey
28. University of California, Los Angeles (UCLA), Bonny Bentzin
29. Water and Power Associates, Bill Engels
30. Water and Power Associates, William Barlak

¹ This summary, prepared to the best ability of the notetakers, is provided as synopsis of the meeting for review of topics covered, and is not intended to represent an official record or transcript of all matters presented or discussed.

LADWP Staff

1. Stephanie Spicer
2. Dawn Cotterell
3. James Barner
4. Glenn Barry
5. Daniel Beese
6. Michael Buck
7. Kai Choi
8. Pjoy Chua
9. Eric Montag
10. Paul Habib
11. Hassan Motallebi
12. Carlos Jimenez
13. Jimmy Lin
14. John Levy
15. David Rahimian
16. Jay Lim
17. Haik Movsesian
18. Ashkan Nassiri
19. Douglas Tripp
20. Linda Novoa
21. Jason Rondou
22. Nermina Rucic
23. Armen Saiyan
24. Ann Santilli
25. Faranak Sarbaz
26. Steve Ruiz
27. Louis Ting
28. Carol Tucker
29. Kodi Uzomah
30. Jeremiah Valera
31. Julie Van Wagner
32. Jesse Vismonte
33. Lisa Yin
34. Lister Yu
35. Simon Zewdu
36. Luis Martinez

Project Team

1. Joan Isaacson, Kearns & West (Facilitator)
2. Alyson Scurlock, Kearns & West (Polling)
3. Brady Cowiestoll, National Renewable Energy Laboratory (NREL)
4. Megan Day, National Renewable Energy Laboratory (NREL)
5. Brandon Mauch, Ascend Analytics
6. Zach Brode, Ascend Analytics

Note: The meeting presentation slides are posted at ladwp.com/sltrp.

1. Welcome and Introductions

- Joan Isaacson, meeting facilitator from Kearns & West, welcomed the Advisory Group (AG) to AG Meeting #7.

2. Meeting Purpose and Agenda Overview

- Jay Lim, LADWP Manager of Resource Planning, gave an update on the progress achieved to date, including drafting of the scenario matrix for modeling. Preliminary results for capacity expansion modeling (first level of analysis) are expected in February 2022.

3. LA100 Equity Strategies

- Simon Zewdu, LADWP Director of Power Transmission Planning, Regulatory, and Innovation (PTPRI) Division, and Pjoy Chua, Assistant Director of PTPRI Division and Contract Manager of LA100 Equity Strategies, were introduced to provide an overview on LA100 Equity Strategies.
- Zewdu recapped important findings from the LA100 Study, such that 100% renewable energy is achievable amidst significant new investments costing between ~\$50 billion to ~\$80 billion, that there will likely be a significant increase in building and transportation electrification, and that there is the potential of significant job creation and customer-facing programs.
- Zewdu furthermore explained that at the conclusion of the LA100 Study, two rounds of community outreach meetings were held, and there were many questions on equity and environmental justice. LADWP was asked what considerations were made to ensure the path to 100% reduced the burden on low-income rate payers, took renters into account, and ensured equity and environmental justice along the way, thus LA100 Equity Strategies was commissioned by the LADWP Board of Commissioners President.
- In LA100 Equity Strategies, LADWP will continue to work with NREL to leverage data sets from the LA100 Study, as well as bringing UCLA on board to leverage their capabilities for modeling local communities.
- Zewdu explained that LA100 Equity Strategies is designed to be community-driven. Almost 50% of City of L.A. is designated as a disadvantaged community (DAC), and the idea is to ensure benefits, costs, and investments are modeled as equitable as possible. Historically, equity targets have not been prevalent as it has been discussed more as a concept and idea, but Zewdu explained that there should be a development of targets and plans that are measurable in order to gauge success.
- LA100 Equity Strategies is organized around three tenets of justice – Procedural, Recognition, and Distributional Justice, further described as follows:
 - Procedural Justice: Allows community stakeholders to be involved in the framing and addressing of problems, before finding all solutions.
 - Recognition Justice: Acknowledges historical inequities that may have occurred, and can help develop meaningful solutions for the future.

- Distributional Justice: Develops an equitable distribution of both benefits and burdens. Furthermore, focus was placed on how in order to achieve the goal of all communities sharing in the benefits of the clean energy transition, improving equity in participation and outcomes would require intentionally designed policies and programs.
- Zewdu explained that LA100 Equity Strategies has two important and complimentary committees, Steering Committee and Advisory Committee, further described as follows:
 - Role of the Steering Committee: Provide strategic guidance; primarily composed of community-based organizations whom primarily have lacked power and access to be part of the conversation in the past
 - Role of the Advisory Committee: Much larger group that explores how the findings of the LA100 Study can be expanded throughout the City, including other City Departments and entities.
- Zewdu finished the presentation by providing an update that two Steering Committee meetings and one Advisory Committee meeting had been held to date. Furthermore, it was announced that the planned conclusion for LA100 Equity Strategies was mid-2023, with implementation planned over the next 10-15 years in alignment with the SLTRP.
- Major Themes from Advisory Group Member Discussion and Questions
 - Is this study going to evaluate equity through different technology scenarios?
 - *A: Yes, we'll look at everything. There is a wealth of information and pathways defined in the LA100 Study and our intent is to look at each pathway and see the impact on equity.*
 - Comments on energy unfairness often times being discussed in terms of shorter-term topics like access to rooftop solar and community solar, but given LADWP will soon be providing 100% renewable energy, community solar is in essence a subsidy.
 - Comments on environmental justice bringing up a lot of concerns with air pollution, but the air pollution not coming primarily from power generation. In the Valley, the air pollution is coming from other places and sometimes people blame LADWP just because they see the smoke stacks.
 - How will LA100 Equity Strategies have input into the investments determined by the SLTRP and other metrics?
 - *A: The SLTRP will determine how to get to 100% renewable energy, and when the LA100 Equity Strategy results are ready in 2023, they will be implemented into the SLTRP. The team is looking for ways to better evaluate equity in the near term and with the current SLTRP effort, whether it be enhanced engagement or otherwise, and is certainly looking for feedback.*
 - Will there be any discussion about job access? Particularly opportunities for folks in the community where some of these power plants are currently located?
 - *A: One of the main pillars is analyzing what jobs will be created, required, and expanded city-wide and regionally as well, including job classifications, workforce changes, work with labor unions, among others.*
 - Comments on the need for metrics in the procedural and recognition justice areas and additional facts for distributional justice.
 - Comments on whether LA100 Equity Strategies will address cost shifting, as well as the impact on employers who represent over 60% of power system revenues.

- Comments on how minimal impact to ratepayers in the face of demand for an accelerated schedule for 100% renewable energy is wishful thinking, and how reality needs to be introduced in the planning process, such as via the SLTRP.

4. 2022 SLTRP: Advisory Group Meeting #6 Discussion Review

- Lim presented AG feedback in the form of a “word cloud” visual from AG#6, indicating which topics were more frequently brought up by the AG, and many of the comments were identified to be in relation to long-duration energy storage (LDES).
- Lim further explained that as part of the SLTRP process, there were considerations for an expansion in scope to incorporate an active technology innovation process in order to formulate a process to actively evaluate emerging technologies.
- Lim also explained that the “What-If” sensitivities were updated to ensure they meet the 100% carbon-free by 2035 target, per AG feedback, and are actively seeking ways to evaluate sensitivities on implementation challenges, including the cost of electrification and fuel switching to the customer, via analysis, qualitative assessments, and narrative.
- Regarding LDES, Lim explained that energy storage plays a critical role in all scenarios of the LA100 Study and showcased various related LADWP efforts over the past few years including:
 - Past and Ongoing Planning Efforts
 - 2019-20: Boulder Canyon Pumped Storage Technical and Economic Feasibility Study
 - *Although the project was not cost-effective, LADWP continues to evaluate different pumped storage projects as the system expands. One influential factor was the existing pumped storage asset in Castaic Power Plant (1,200 MW), which impacts the value of future energy storage placed on the system.*
 - March 2021: Completion of the LA100 Study, with all scenarios including over 2,600 MW of energy storage by 2045
 - May 2021: Clean Grid LA Update presented to the LADWP Board, including over 1,000 MW of energy storage by 2030
 - Past Efforts and Ongoing Procurement Efforts
 - 2018: Stand-alone compressed air energy storage (CAES) request for proposal (RFP) issued
 - *Unfortunately negotiations did not work out but LADWP still has an active RFP*
 - 2019: Distributed energy resources (DER) and renewables request for information (RFI) released, which included components of LDES
 - 2020: LADWP issued an energy storage rolling RFP that resulted in active negotiations of LDES projects, over 50 MW each for CAES and LAES (liquid air energy storage)
 - Ongoing: Energy storage rolling RFP through the Southern California Public Power Authority (SCPPA)

5. Energy Storage Update Presentation

- Ashkan Nassiri, LADWP Manager of Distributed Energy Resource Planning, delivered an energy storage update to the AG, detailing energy storage plans for LADWP as a result of the LA100 Study, emerging technologies and use cases being considered for energy storage, as well as details on energy storage efforts to date.
- Plans for utility-scale energy storage were described to be expected at or near most in-basin generating stations, in addition to expansion of Beacon energy storage, co-locating storage with all future utility-scale solar projects, and increasing the use of Castaic Power Plant (a pumped hydro facility).
- Potential use cases for energy storage were described as enabling a greater deployment of renewable and low-carbon energy to customers, provide reliability and grid stability via multiple output and duration options, as well as support scaled deployment in response to the ongoing energy transformation.
- Different durations were discussed such as short, medium, and long-duration energy storage, in addition to different technology categories such as electro-chemical, chemical, mechanical, and thermal. Pumped hydro energy storage (mechanical) and lithium-ion batteries (electro-chemical) were described to be the most prevalent forms of energy storage today, comprising approximately ~93% and 7% respectively, of energy storage installations. The durations for pumped hydro energy storage and lithium-ion batteries were described to be from 8-12 hours, and from 1-6 hours, respectively.
- In addition to describing various studies that have impacted LADWP's energy storage deployment strategy, Nassiri went on to discuss the ongoing partnership with the Electric Power Research Institute (EPRI), an independent, nonprofit organization conducting environmental and energy research for public interest, in relation to energy storage. EPRI is currently conducting several studies that investigate energy storage as distributed generation, energy storage technology readiness, and the environmental as well as safety aspects in relation to energy storage in general.
- In particular on technology readiness, Nassiri described a metric known as Technology Readiness Level (TRL) that EPRI uses in assessing the readiness of different energy storage technologies for commercial use and widespread deployment.
- In particular, LADWP has been selected as a project site host for MALTA, a pumped-heat thermal energy storage that uses liquid salt as a medium and has a TRL of 4. A demonstration pilot of approximately up to 100 MW, 10-hour duration is planned as part of a collaboration with EPRI, MALTA, and other industry partners.
- Other technologies were also described such as liquid air energy storage (LAES), which has no locational or geological constraints and allows modular increase in capacity and duration but needs thermal management and has capital cost constraints. Adiabatic compressed air energy storage (CAES) was also described as an emerging technology that proposes to use rock caverns for long duration energy storage.
- In conclusion, Nassiri explained how less expensive solutions with potentially different operating characteristics will ultimately be needed, with long duration energy storage likely to

be mechanical or chemical. Nassiri further explained that some LADWP negotiations to date have unfortunately fallen through as it is very challenging for small and new developers to have the necessary capital, among other factors, however LADWP continues to advertise and readvertise the role of stand-alone energy storage in its rolling request for proposal through the Southern California Public Power Authority. Lastly, Nassiri closed by reiterating that energy storage will be a key part of the transition to a clean energy future as the LA100 Study identified approximately 2,600 MW of seasonal energy storage (via dispatchable renewably fueled combustion turbines that have over a 300-hour duration), in addition to 2,600 MW of regular energy storage, to maintain system reliability and achieve targets.

○ Major Themes from Advisory Group Member Discussion and Questions

- The inability to raise capital implies that the projects are not economic.
 - *A: Most of the time these are emerging technologies, with no prototypes, and it really depends on the appetite for banks and investors to take on risks. This may not imply something is not efficient or feasible. The Department of Energy is offering many loans to hopefully alleviate the burden.*
- Comments on combustion generation, including hydrogen, being a stop-gap to assure reliability until technologies mature and a better alternative comes along.
- Comments on recyclability of utility-scale solar panels and the problem of solar panel and wind blade disposal.
- Comments on how the demand for an earlier 100% carbon-free target conflicts with the possibilities for optimal technology solutions.
- Comment on how overbuilding solar and wind resources may reduce the need for seasonal storage: <https://pv-magazine-usa.com/2020/05/14/overbuilding-solar-at-up-to-4-times-peak-load-yields-a-least-cost-all-renewables-grid/>
- How much of the energy storage longer than 4-hours in duration, is planned for in-basin?
 - *A: Studies had 300 MW of long-duration energy storage as a placeholder, but that will be reevaluated in light of the updated goals.*
- Curiosity about more details regarding the Malta technology.
- Are there long-term energy storage options that LADWP is monitoring that could replace an existing power plant at the plant site?
 - *A: With the help of EPRI there are many contenders, but none are ready for commercial use. We are hopeful with some of the technologies seen in RFP and due to modularity, hope to expand to 8-10+ hours of storage. Implementation of the SLTRP will take decades, so we can continue to update the SLTRP roadmap as technologies mature.*
- Is there a threshold Technology Readiness Level (TRL) that would give LADWP comfort to procure and contract for? Also, what is the TRL for green hydrogen?
 - *A: Technology Readiness Levels are 1-9, with 9 meaning actual operation. We would like to see technologies beyond level 7, for more confidence in feasibility. Green hydrogen is level 7*
- Comments on unfamiliarity with the technical aspects of energy storage, however it appears nothing is moving forward at the moment as there are many unknowns regarding energy storage, and wondering whether there is something tangible that can be shared with the community as to the energy storage update from today?
 - *A: In summary, different energy storage technologies were discussed as options such as electro-chemical, chemical, mechanical, and thermal, and the need was*

discussed for both short-duration technologies and long-duration technologies. With the help of EPRI and manufacturers, various of these technologies are currently being tested and explored for the potential to use them in larger scale applications.

- Comments that there is hope for ultimate solutions, except the challenge is allowing time for technologies to mature, hence the problems with a 2035 goal vs a 2045 goal.
- Questions on whether there are ways to enhance the flexibility of Western hydro generation basins such as BC's northern hydro and the Colorado River basin, to gain benefits for LADWP.
- Request that LADWP put together a one-pager summary of the energy storage update presentation, so AG members can share it with the community.
- Comments that Valley Generating Station is probably less of an environmental hazard than an office building-sized pile of lithium-ion batteries.
- Comments that some may be pressured to not express opinions that fail to match audience preferences.

6. 2022 SLTRP: What-If Sensitivities Discussion

- Lim reviewed the SLTRP modeling process, explaining the details and transitions between Phase I and Phase II.
- Afterwards, SLTRP staff presented updates to the “What-If” sensitivities including aligning the zero-carbon turbines with the City Council motion for 100% carbon-free energy by 2035, exploring a no-combustion sensitivity with hydrogen fuel cells instead of hydrogen combustion turbines, and removing the energy efficiency sensitivity due to already assuming maximum levels in the core scenarios shown in the Scenario Matrix.
- SLTRP staff further explained the challenges and risks with the sensitivities posed, including differences between hydrogen turbines and hydrogen fuel cells, demand response deployment, potential impacts of delays to required in-basin transmission upgrades, and the risk factors associated with load uncertainty
- Major Themes from Advisory Group Member Discussion and Questions
 - Desire to see sensitivity analyses check high carbon prices greater than \$100/metric ton.
 - A: *The high carbon prices will be part of our price sensitivity analyses. We are relying on data from the California Air Resources Board, but can discuss with our Environmental team to gauge whether cap and trade prices could exceed \$100/metric ton.*
 - Desire to see short and intermediate term rate impacts as a result of modeling. Further comment that some AG members are more interested in seeing bills or change to percent of customers experiencing energy insecurity, more so than rates.
 - Comments that the SB 100 reference case will reveal increases in costs and rates, in comparison to the scenarios for 100% carbon-free by 2045.
 - Comments that in the short-intermediate term, it is realistic to include natural gas generation that is covered by renewable energy credits, as there will be challenges in remaining consistent with the City Council motion when the cost and reliability limits of current technologies are exceeded.
 - Desire to see more information about NOx mitigation plans, from the hydrogen turbine manufacturers.

- Comments that an interesting source for environmental, social, and governance (ESG) products is www.xpansiv.com, with carbon price information shown here: <https://xpansiv.com/cbl/>
- Questions on the difference between analyzing green hydrogen and long-duration energy storage options including whether they face the same constraints, whether green hydrogen is being transported from offsite, produced and stored in gas infrastructure, or being produced on site. Additional questions on how transmission upgrades relate to the use of seasonal energy storage that charges off the grid.
- Concerns that the low load sensitivity is not low enough if it is not considering a decline in retail electric sales.
- Is LADWP risking system reliability with emerging technologies?
 - *A: No, the intent is mitigate reliability risks in planning by going through the proper modeling process.*
- Comments on how the California Energy Commission is over-enthusiastic on conservation.
- Comments on how the capital costs that come from the SLTRP will give a good idea on the rate impact percentage growth.

7. Wrap Up and Next Steps

- In conclusion, Lim and the Project team thanked the AG for their valuable contribution to date and expressed appreciation at the ongoing collaboration. Lim explained that the SLTRP team was going to proceed with modeling with high level results expected between the February and May timeframes.

Next Meeting: February 2022 (tentative; to be confirmed)