LA100 EQUITY STRATEGIES

Los Angeles 100% Renewable Energy Equity Strategies

Steering Committee Meeting #17
March 29, 2023
Summary[1]

Schedule and Location

Wednesday, March 29, 2023, 10:00 a.m. to 12:00 p.m.
Conducted virtually

Virtual Meeting #17 Attendees

Steering Committee Members

Climate Emergency Mobilization Office (CEMO), Marta Segura
Climate Emergency Mobilization Office (CEMO), Rebekah Guerra (alternate)
Climate Resolve, Jonathan Parfrey
DWP-NC MOU Oversight Committee, Tony Wilkinson
DWP-NC MOU Oversight Committee, Jack Humphreville (alternate)
Move LA, Denny Zane
Pacific Asian Consortium in Employment (PACE), Susan Apeles (alternate)
Pacoima Beautiful, Veronica Padilla
Pacoima Beautiful, Annakaren Ramirez (alternate)
RePower LA, Roselyn Tovar
RePower LA, Olivia Walker (alternate)
South Los Angeles Alliance of Neighborhood Councils, Thryeris Mason
Strategic Concepts in Organizing and Policy Education (SCOPE), Agustín Cabrera
Strategic Concepts in Organizing and Policy Education (SCOPE), Tiffany Wong (alternate)

LADWP Board of Commissioners

Cynthia McClain-Hill, Board President

LADWP Staff

Amanda Ly
Anton Sy
Ashkan Nassiri
Bernardo Perez

[1] This summary is provided as an overview of the meeting and is not meant as an official record or transcript of everything presented or discussed. The summary was prepared to the best of the ability of the notetakers.

Carol Tucker
David Castro
David Rahimian
Dawn Cotterell
Denis Obiang
Iris Castillo
Jay Lim
Jorge Centeno
Mudia Aimiuwu
Mukund Nair
Pjoy Chua
Ramon Gamez
Richard Trujeque
Sean Lim
Simon Zewdu
Stephanie Spicer
Steve Baule

Project Team

Ashok Sekar, National Renewable Energy Laboratory (NREL)
Ashreeta Prasanna, NREL
Eda Giray, NREL
Garvin Heath, NREL
Kate Anderson, NREL
Nicole Rosner, NREL
Patricia Romero-Lankao, NREL
Sonja Berdahl, NREL
Vikram Ravi, NREL
Yun Li, NREL
Eric Fournier, UCLA
Stephanie Pincetl, UCLA
Yifang Zhu, UCLA
Brisa Aviles, Kearns & West
Christian Mendez, Kearns & West
Jasmine King, Kearns & West
Joan Isaacson, Kearns & West
Robin Gilliam, Kearns & West

Welcome Remarks

Joan Isaacson, facilitator from Kearns & West, welcomed members to the seventeenth Los Angeles 100% Renewable Energy Equity Strategies (LA100 Equity Strategies) Steering Committee meeting. She introduced Simon Zewdu, Director of the Transmission Planning, Regulatory, and Innovation Division, to provide opening remarks. Simon Zewdu welcomed Steering Committee members and thanked them for attending, noting that LADWP is reviewing preliminary results from the analyses done by NREL and UCLA. He expressed gratitude to the Steering Community, NREL, and UCLA for their continuous support as the findings from the LA100 Equity Strategies are presented.

Meeting Purpose and Agenda Overview

Joan Isaacson reviewed the meeting agenda (see slide 3 in Appendix). She noted that both UCLA and NREL would present preliminary results and equity strategies for air quality and health, and NREL would present on local solar and storage. UCLA would also present its residential panel upgrades analysis. Joan Isaacson emphasized that although much of the meeting time would be spent on presentations due to the importance of the results, time was reserved for discussion and another follow-up questionnaire would provide for providing additional input after the meeting. She reminded members of the Steering Committee about the guide for productive meetings, the protocol of one member per organization participating in the meetings, and the recommendation to keep input concise.

Joan Isaacson previewed the April and May Steering Committee meetings, stating that in April, the focus would be on affordability and rates, access to cooling, grid reliability and resilience, and jobs. The May meeting would include the LA100 Equity Strategies Summary and presentations on next steps and stakeholder involvement from LADWP.

Air Quality and Health: Preliminary Results and Strategies (UCLA)

Yifang Zhu, Professor of Environmental Health Science at the UCLA School of Public Health, introduced preliminary results on air quality and health. She overviewed the UCLA analysis of potential environmental and public health benefits of zero-emission vehicle adoption, especially in disadvantaged communities. Yifang Zhu stated that UCLA modeled three scenarios in addition to the 2017 base scenario. These included a 2035 Disparity scenario where zero-emission vehicle adoptions are not equally distributed in Los Angeles, a 2035 Equity scenario where zero-emission vehicle adoptions are equally distributed in Los Angeles, and a 2035 Mobile Source Strategy scenario where more emission reductions occur in trucks and off-road equipment.

Yifang Zhu presented a graph showing that non-disadvantaged communities are adopting zero-emission vehicles at a much higher rate than disadvantaged communities (see slide 9 in Appendix), which raises concerns about the equitable benefit of zero-emission vehicle adoption. She emphasized that all communities should benefit from the adoption of zero-emission vehicles. Yifang Zhu explained that the UCLA research team used vehicle registration data and assumed zero-emission vehicle adoption rates would follow an exponential trend. The modeling, as indicated on the map, shows that adoption rates will significantly increase by 2035 as compared to 2017 and also indicates disparities as the coastal areas in non-disadvantaged communities in Los Angeles have higher zero-emission vehicle adoption rates than disadvantaged communities.

To assess regional air quality benefits, an integrated transportation model was developed by the UCLA Mobility Lab, which simulates the movement of vehicles by transportation mode across Los Angeles, Yifang Zhu stated. She shared that the UCLA Mobility Lab estimated the number of electric vehicle miles traveled per census tract by 2035 and compared vehicle ownership to miles traveled as shown in two maps (see slide 12 in Appendix). The differences between disadvantaged communities and non-disadvantaged communities are much lower for electric vehicle miles traveled than zero-emission vehicle ownership (see slide 13 in Appendix). These results show that users of zero-emission vehicles reduce emissions in all communities as they travel across Los Angeles.

To examine equity, Yifang Zhu stated that the three modeled equity scenarios were the 2035 Disparity scenario, the 2035 Equity scenario, and the 2035 Mobile Source Strategy scenario (see slide 14 in Appendix). She shared that the 2035 Los Angeles County emission inventory change to 100% clean energy is shown in the table (see slide 15 in Appendix). Yifang Zhu noted that increases in emissions can increase with population and industrial growth.

To predict air quality improvement by 2035, projected emissions changes were applied to an atmospheric model. In the analysis, UCLA researchers found that fine particulate matter (PM2.5) would reduce by 7.4% between 2017 and 2035 (see slide 16 in Appendix). Minor changes were observed between the 2035 Equity scenario and the 2035 Disparity scenario, but more medium- and heavy-duty vehicle electrification and off-road emission reductions in the 2035 Mobile Source Strategy scenario were found to further reduce PM2.5 by 2035.Additionally, nitrogen oxide (NOx) would be reduced, which would cause an increase in ozone by 12% due to temporary the non-linear relationship between ozone constituents as Los Angeles transitions to 100% clean energy. Yifang Zhu further explained that volatile organic compounds would also need to be reduced to lower the ozone levels in Los Angeles. She stated that further reductions in NOx would ultimately reduce ozone levels.

Yifang Zhu shared that ozone changes are similar between the 2035 Equity scenario and the 2035 Disparity scenario, with minimal reductions. Ozone increases by 6% with more NOx reductions in the 2035 Mobile Source Strategy scenario. Again, she emphasized that continued reductions in NOx will eventually lead to decreases in ozone.

Avoided mortality was analyzed by racial and ethnic groups for each of the modeled scenarios, Yifang Zhu stated (see slide 19 in Appendix). She reviewed results, stating that Hispanic communities saw the greatest reductions in mortality under the 2035 Disparity scenario, followed by White, African American, and “other” groups. Avoided mortalities were fewer under the Mobile Source Strategy scenario. Across each scenario, Yifang Zhu shared the importance of considering ethnicity and race in the health assessments.

The UCLA team also analyzed total avoided deaths across the 2035 Disparity scenario and the 2035 Mobile Source Strategy scenario. The results show a total of 330 avoided deaths in both the Disparity and the Mobile Source Strategy scenarios, and that ozone increase is the main driver for areas with negative avoided death values (see slide 20 in Appendix). She stated that it is necessary to consider both PM2.5 and ozone when assessing the overall impact of zero-emission vehicle adoption strategies on public health.

In summary, Yifang Zhu explained that vehicle electrification reduces PM2.5, which can lead to improved health outcomes for both disadvantaged and non-disadvantaged communities, and that electrifying medium- and heavy-duty trucks will bring more health benefits than light-duty vehicles. She stated that the use of ethnic and racial-specific exposure-response functions can help reveal greater health benefits, particularly for the Hispanic population, than previously estimated. Lastly, to reduce ozone, it is crucial to further reduce NOx and volatile organic compounds in parallel with PM2.5 and NOx reductions.

Major Themes from Steering Committee Member Discussion

- The northwestern part of Los Angeles showed no change in mortality, whereas all other areas showed significant changes in mortality. Is this because pollution is so bad in disadvantaged communities that electric vehicle adoption will have a minimal impact on mortality? The concern is that the areas with poor health outcomes maintain poor outcomes.
    - Yifang Zhu: When comparing the Disparity scenario and base scenario, the less than zero avoided deaths result on orange areas of the maps is driven by temporary ozone increases. The Mobile Source Strategy scenario shows additional benefits. Overall, there are some benefits when electrifying medium- and heavy-duty vehicles. Given the projected light-duty electric vehicle adoption rate, NOx reductions will lead to ozone increases, especially in the orange areas on the map. That is the main reason why these areas aren't projected to experience immediate benefits in reduced mortality rates. As the City of Los Angeles undergoes its transition, these areas will eventually see ozone reductions.
- As someone who lives three blocks south of the I-10 freeway and 2 miles west of the I-110 freeway, where the air has also been adversely impacted by oil drilling, the proposed reduced long-term emissions outcomes are appreciated. It would be wonderful if the electric vehicle infrastructure is built out and heavy-duty vehicles are converted to electric vehicles.
- In the orange regions on the map, is mortality not decreasing because ozone is increasing?
    - Yifang Zhu: First, PM2.5 drives mortality benefits. There is still a lot of PM2.5 coming from other emissions. The secondary emissions come from NOx and ozone. The city needs to go through a transition period, which will eventually show reduced emissions overall.
- Can LADWP have UCLA look into the impacts of hydrogen released from energy investments? Is it true that hydrogen lengthens the timeframe of greenhouse gas emissions?
    - Simon Zewdu: Yes, LADWP and UCLA are looking at the footprint of hydrogen, how it will help in the energy transition, and what the emissions from hydrogen are. This discussion will continue in the future.
- These study results are showing that changes in ownership and use of light-duty vehicles are not the equity issue previously assumed, and the benefits for low-income communities are not as significant as originally estimated. This also reinforces the former emphasis on heavy[-duty]

vehicles and PM2.5 reductions in LA100 Equity Strategies. The health and economic benefits come from reducing heavy-duty vehicle emissions.

- What is the Mobile Source Strategy scenario? Does the Mobile Source Strategy scenario include the transition of heavy-duty vehicles to electric? Heavy-duty vehicles make up 70% of NOx emissions. Does this scenario include a reduction of 70% to 0% emissions? The heavy-duty vehicle aspect needs to be fleshed out.
    - Yifang Zhu: The Mobile Source Strategy scenario reduces heavy-duty NOx emissions to 22-30% as a result of projections. Garvin Heath's analysis will show how these reductions can be further expanded.

Air Quality and Health: Preliminary Results and Strategies (NREL)

Garvin Heath, Senior Environmental Scientist and Energy Analyst with NREL, stated that the UCLA and NREL analyses on air quality and health are complementary. He thanked the NREL air quality and health technical team, Vikram Ravi and Yun Li, for their work. Garvin Heath highlighted the community guidance that helped shape the analysis, noting recommendations to ensure investments occur in communities that have had the greatest pollution burden. Other guidance included reducing pollution from traffic and low-income delivery workers, incentivizing local goods movement to be cleaner and powered by green power, and working with companies to upgrade fleets to electric vehicles. Steering Committee members also recommended a focus on cleaning up pollution from the Port of Los Angeles (e.g., freight traffic), Los Angeles International Airport (LAX), South Los Angeles, and Pacoima and a focus on providing community access to air quality measurement tools (i.e., citizen science).

To frame the analysis, Garvin Heath shared background information on incentive programs that LADWP manages (see slide 26 in Appendix). He stated that commercial new charger incentives only apply to light-duty vehicles and were disproportionately distributed to non-disadvantaged, non-Hispanic, renter, and wealthier neighborhoods. Additionally, many incentives don't apply to medium- and heavy-duty vehicles.

Garvin Heath reviewed the methodology, stating that it is based in CalEnviroScreen to identify disadvantaged community tracts with acute traffic and air quality impacts. He shared that the red areas on the map (see slide 27 in Appendix) represent these key census tracts (i.e., traffic-affected disadvantaged communities). South Los Angeles will be added as an additional area for detailed analysis in the next round of modeling.

Key findings on truck electrification and its impact on NOx emissions were shared by Garvin Heath. He overviewed the different classes of trucks – heavy-duty, medium heavy-duty, and heavy heavy-duty vehicles (see slide 29 in Appendix). In terms of NOx emissions, heavy-duty trucks overall represented 5% of vehicles but generated 51% of on-road NOx. Heavy heavy-duty trucks represented 1% of vehicles yet generated 32% of on-road NOx emissions.

NREL modeled multiple truck electrification scenarios in 2035, Garvin Heath stated. Electrification levels were tested for each of the three classes of trucks, ranging from lower bound (15%) to medium (40%) to upper bound (65%). He noted that the Mobile Source Strategy scenario contains proposed regulation for an advanced clean fleet, the 2020 Mobile Source Strategy (California Air Resources Board). The model also included the 2035 Equity scenario and 2035 Equity Mobile Source Strategy scenario developed by UCLA (see slide 30 in Appendix).

Garvin Heath reviewed the results of truck electrification on air quality emissions. Focusing on direct PM2.5 and NOx emissions, he shared that today's NOx and PM2.5 emissions are directly impacted by heavy heavy-duty vehicles. PM2.5 brake and tire wear emissions are reduced under all scenarios but are not fully eliminated with electrification, while NOx is reduced more significantly. The greatest benefits are seen at each electrification level by the electrification of heavy heavy-duty vehicles (see slide 31 in Appendix).

The preliminary results of the impacts of truck electrification on air quality concentrations by disadvantaged community were then reviewed by Garvin Heath. Key findings show that NOx and PM2.5 concentrations decrease linearly as truck fleet electrification increases. Traffic-affected disadvantaged communities benefit slightly more from increased truck fleet electrification than traffic-affected non-disadvantaged communities. Electrification of heavy heavy-duty trucks shows the greatest benefit on NOx and PM2.5 concentration (see slide 32 in Appendix).

Garvin Heath then shared preliminary results showing where the greatest air quality improvements occur by census tract under a 65% truck electrification scenario. Maps shown by Garvin depict the distributions of direct PM2.5 concentrations (from tires, exhaust, and brakes) and NOx concentrations (see slide 33 in Appendix). The greatest reductions occur along highway corridors, particularly I-5, I-10, I-405, and US 101. Garvin Heath noted that regions such as LAX and the Port of Los Angeles do not see as large a reduction in concentrations of PM2.5 or NOx from truck electrification, likely due to the use of vehicles classified as "non-road" trucks, which are not included in NREL's modeling. He stated that LAX and the Port of Los Angeles are currently adopting emissions reductions plans to address air quality concerns.

Lastly, Garvin Heath presented on truck electrification equity strategies (see slide 35 in Appendix). He first reviewed where Los Angeles currently stands in terms of truck electrification equity. He noted that 58% of disadvantaged communities have percentile scores above 75 for "traffic impacts" or "diesel particulate matter" in CalEnviroScreen, and that trucks account for more than 50% of on-road transportation emissions. Community solutions guidance included electrifying trucks to reduce pollution and improve health benefits, setting up low-income communities for electric vehicle infrastructure, and focusing on cleaning up port pollution.

Garvin Heath highlighted four equity strategies. These include prioritizing incentives for charging infrastructure and for purchase of electric heavy-duty trucks, especially when replacing older models and/or higher emitting vehicles; and incentivizing and locating charging infrastructure by working with city/regional agencies to understand where heavy-duty trucks would ideally be charged, especially those servicing ports and LAX. Other strategies are to revisit the medium heavy-duty partial zero-emission vehicle goals of 4,000 by 2025 and 12,000 by 2035 and add associated medium heavy-duty charging infrastructure goals and to collaborate with city agencies to support a City of Los Angeles heavy heavy-duty vehicle fleet (e.g., fire trucks) electrification and charging infrastructure. Ultimately, focusing on truck electrification would benefit disadvantaged communities more.

Major Themes from Steering Committee Member Discussion

- So, tires, brakes, and roads all contribute to the emissions?
  - Garvin Heath: Tires move vehicles through friction, which propels the vehicle forward. Tire wear generates particulate matter, which enters the atmosphere. The same process applies to brakes. With electric vehicles, braking emissions improves, but tire wear emissions stay the same.
- Should the materials in the pavement be examined for emissions and stormwater contamination?
  - Garvin Heath: Roads are made largely from asphalt, which is a product of fossil fuels. Alternative road construction materials are not considered in this study, and the team is unfamiliar with differences in road degradation and particulate matter missions of asphalt roads vs. concrete or other road materials. This is an interesting question that could be investigated separately.
- Previously, fuel cell powered trucks have been included. Battery electric trucks have some issues that fuel cell powered trucks don't have.
  - Garvin Heath: This analysis is focused on electrified vehicles and is not accounting for the other kinds of differences that are seen in fuel cell vehicles. The read-ahead slides sent by Dawn Cotterell contain additional information on NREL's air quality analysis, including a a visualization of the benefits gained from truck electrification.

Local Solar and Storage: Preliminary Results and Strategies

Ashok Sekar, Solar and Storage Researcher at NREL, presented preliminary results on local solar and storage. He reviewed community guidance related to solar equity, stating that recommendations included addressing the cost of rooftop solar, fostering community solar access by addressing barriers and providing information on solar developers, and addressing mistrust and misunderstandings with solar developers by providing customized and accessible information (see slide 39 in Appendix). Ashok Sekar stated that some of this guidance is reflected in NREL's modeling.

Ashok Sekar reviewed the baseline solar equity analysis, noting that 65% of LADWP solar and storage investments went to households in non-disadvantaged communities. Additionally, $341 million in investments over 22 years disproportionately benefitted White, non-Hispanic, home-owning, and wealthier neighborhoods (see slide 41 in Appendix). In terms of solar installation programs, there was no statistically significant difference in the communities receiving benefits from feed-in tariff and rooftop lease agreement programs, but there was a statistically significant benefit for the net metering program for non-disadvantaged, mostly White, mostly non-Hispanic, home-owning, and above median-income communities (see slide 42 in Appendix). He then presented a map of which areas received solar incentives proportional to their population. Results showed that areas including South Los Angeles and the Harbor did not receive solar incentives proportional to their population (see slide 45 in Appendix).

Improved Access to Solar and Storage for Multi-family Residents and Renters

Ashok Sekar presented on improved access to solar and storage for multi-family residents and renters, explaining that NREL analyzed the technical potential of rooftop solar in Los Angeles (see slide 47 in Appendix). Using LiDAR data, NREL analyzed total photovoltaic developable roof area, finding that 430 million square feet of rooftops are available. He stated that the available rooftop area was analyzed by income, tenure, and building type. Low- and moderate-income households were found to have an aggregate of 47% of the total technical capacity, which is more than high- and middle-income homes. Renters were found to represent 40% of photovoltaic developable rooftop area, and multi-family households represent 32%. Ashok Sekar noted that these residents face split incentive[2] issues, but there is significant rooftop potential not being used.

The modeling team ran several analyses to assess the technical potential for rooftop solar adoption under baseline and multiple equity scenarios, Ashok Sekar stated. Equity scenarios were developed by varying split incentives assumptions, incentives, compensation mechanisms, and the future load profile (variation in demand/electrical load over a specific time). He explained that the equity scenarios assume load when there is high energy efficiency uptake in 2035 (see slide 48 in Appendix). Ashok Sekar reviewed the baseline solar adoption projections, where the figures show adoption by income, building type, and ownership type. Baseline solar adoption projections show approximately 1.45 GW of adoption by 2035. The higher-income residents show the greatest adoptions by 2035 in this scenario, but the modeling projects low battery adoption at 0.3 MW for all communities.

Ashok Sekar reviewed preliminary results on the modeling for solar adoption projections from the equity scenarios. The top chart shows the average increase in photovoltaic technical capacity from the baseline scenario for low- and moderate-income households, while the bottom chart shows the average increase for renters (see slide 49 in Appendix). He explained that the results show all equity scenarios leading to significant increases in solar adoption. Increases in solar adoption for low- and moderate-income households could vary between 27% and 85%, and an increase in adoption for renters could vary between 0% and 84%. Ashok Sekar stated that net energy metering may have some impacts for low- and moderate-income owners on their adoption rates due to reduced costs.

Ashok Sekar described first-year bill savings as savings when a consumer adopts solar or a battery system in a particular year. He shared several results on first-year bill savings where high- and middle-income residents are assumed to have the same level of adoption. Compared to the baseline, he stated, residents see maximum energy savings in the first year. On average, first-year bill savings as a percentage of the total bill are approximately 30% for high-income households and 27% for all other income categories. Ashok Sekar explained that net metering leads to additional increases in bill savings for low- and moderate-income consumers compared to the baseline scenario. When providing a system free of cost to low- and moderate-income households with net billing, increases in bill savings were 21%

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[2] Split incentives occur when those responsible for paying energy bills (the tenant) are not the same entity as those making the capital investment decisions (the landlord or building owner). Source

for moderate-income, 14% for low-income, and 23% for very low-income households (see slide 51 in Appendix).

Ashok Sekar reviewed two equity strategies: to design programs to benefit low- and moderate-income custmers – enabling 25% in bill savings – and to design solar programs to enable renters to benefit from rooftop solar, which will increase adoption substantially (see slide 53 in Appendix).

Major Themes from Steering Committee Member Discussion

- The discussion of subsidies going to the recipients of different race[s] and ethnicities confuses identity politics with economic analysis. Subsidies to people with significant electric needs and the means to invest in capital costs benefit everyone in the community in getting more green energy per dollar. The subsidies are not the only factor. The investments of the higher-income Angelenos also need to be considered in the benefits analysis. Solar on an older, smaller home can be risky with costly maintenance [and] will offer decreasing economic benefits as the excessively low connection charges in power bills rise to their proper levels.
    - Ashok Sekar: There are benefits across multiple factors. When writing the report, NREL will include those as caveats.
- What are the impacts of scenarios on expenditures and rates?
    - Ashreeta Prasanna (NREL): The analysis on LADWP revenues is a separate analysis, presented earlier by Thomas Bowen.
- All of these specialized equity programs need to be considered in light of how much they increase the cost of power. For low-income households, direct subsidies for power bills could be much more effective than rooftop solar installations, for example, especially since most low-income families are renters.
    - Ashreeta Prasanna: While NREL would have the total dollar costs required to provide these incentives, NREL is focused on solar and storage, not impact to LADWP revenues. Subsidizing electric bills is an alternative to subsidizing/providing no-cost solar systems. NREL can provide costs of these strategies for comparison and consideration by LADWP.
    - Ashok Sekar: The solar and storage group is working closely with the affordability group to understand what that means for the analysis and what will be the total cost of the programs.
- Cynthia McClain-Hill: It is critical that debt burden and debt transfer issues be addressed in connection with these strategies. The ratepayer is the concern.
- When will feedback for this presentation be due?
- If capital installations are being financed, LADWP incurs the risk of paying back borrowed money, perhaps at increased interest costs. Direct rate subsidies come out of current LADWP income.

Residential Panel Upgrade Analysis

Eric Fournier, Research Director at UCLA's California Center for Sustainable Communities, presented UCLA's residential panel upgrades analysis. He provided background on electric service panels and explained customer vs. utility-owned equipment (see slides 56-57 in Appendix). How much energy can be consumed is dependent on both customer- and utility-owned hardware, Eric Fournier noted. He stated that increases in power demand from electrification in homes will require infrastructure capacity upgrades. One example of utility-side infrastructure upgrades are below-ground system upgrades, which will be more expensive (see slide 58 in Appendix).

Eric Fournier reviewed the components of a typical electric panel (see slide 59 in Appendix). He noted that each branch circuit has a breaker that will cut off when the electrical load exceeds the capacity of the panel. Larger appliances will often require higher voltage service due to higher power demand. He explained that as electrification is being discussed, more physical space and capacity is needed in electrical panels. Multi-family buildings have additional complexities as the electric loads are both in-unit and in centralized locations in buildings. Eric Fournier stated that the UCLA analysis is focused only on individual unit panels due to uncertainty around community metering.

Electric Panel Capacity

Eric Fournier reviewed the analysis on the electric panel capacity needed to support different electric appliances. He shared that some electrification can be implemented without a panel upgrade, but full electrification requires more service capacity. Understanding how much power and panel capacity an appliance uses is determined by a combination of its voltage and amperage.

His slides include a chart showing the capacity needed for different appliances (see slide 62 in Appendix). For example, adding a high-power electric vehicle charger or heat pump typically requires additional panel updates, Eric Fournier stated. The three categories most likely to trigger panel upgrades are heat pump systems, electric water heaters, and level-2+ electric vehicle chargers (see slide 63-64 in Appendix).

Existing Capacity of Service Panel Hardware in Los Angeles' Housing Stock

Eric Fournier next described how UCLA estimated the existing capacity of service panel hardware in Los Angeles' housing stock. Panel size is usually determined at the time of building construction, which strongly correlates with building size and year of construction, Eric Fournier shared. UCLA developed a methodology to understand this landscape where they first estimated as-built service capacity and then identified historical permitted upgrades, inferred antecedent and unpermitted upgrades, and assigned existing service capacity.

First, Eric Fournier explained that the charts show a distribution of all buildings in Los Angeles' housing stock (see slide 67 in Appendix). The size of single- family homes spans four orders of magnitude (from 100 square feet to 100,000 square feet) and the average single-family home in Los Angeles was built in 1957. He noted that the majority of single-family homes are in non-disadvantaged communities. Multi-family properties are overrepresented in disadvantaged communities, were constructed on average in 1944, and have a much lower variation in the size of the homes. Eric Fournier shared that UCLA estimated as-built panel ratings for single and multi-family buildings (see slide 68 in Appendix). The single-family residential property panel sizes range from 0-1,200 amps in non-disadvantaged communities and 0-1,000 amps in disadvantaged communities. Multi-family property panel size ratings ranged from 0-150 amps in disadvantaged communities and from 0-150 in non-disadvantaged communities, while most units have 40-60 amp panels. Eric Fournier noted that newer buildings typically have more panel capacity due to upgrades in the electrical code.

Panel Upgrades

Eric Fournier reviewed panel upgrade permits for single-family and multi-family properties across non-disadvantaged and disadvantaged communities. He noted that for single-family properties, 10,000 permits are submitted per year for panel upgrades, and this number is not split evenly between disadvantaged and non-disadvantaged communities (see slide 69 in Appendix). On average, Eric Fournier noted that 4,000 panel upgrades are done per year in Los Angeles.

Eric Fournier shared that UCLA analyzed how long it takes before service panels are upgraded for single-family and multi-family properties across non-disadvantaged and disadvantaged communities (see slides 70-71 in Appendix). In disadvantaged communities, panels are left for 7 years longer before they are replaced when compared to non-disadvantaged communities. In terms of multi-family units, the buildings must reach nearly 75 years before there is 50% chance of receiving an upgrade.

Eric Fournier also reviewed the estimated panel ratings between single-family and multi-family homes, where 200 amps is a baseline sign of electrification readiness (see slide 72 in Appendix). He stated that twice as many single-family properties are electrification-ready in non-disadvantaged communities as compared to disadvantaged communities. For multi-family units, the difference in the number of electrification-ready properties was minimal between non-disadvantaged communities and disadvantaged communities. He also reviewed maps showing estimated existing panel ratings where the orange outlines indicate a much lower capacity as compared to the darker shaded areas (see slide 73 in Appendix).

The analysis on the number of necessary panel upgrades was reviewed by Eric Fournier (see slide 75 in Appendix). For single-family properties, if electrical panel capacity is currently less than 100 amps, an upgrade will likely be needed and half of single-family properties will likely need an upgrade, he stated. For single-family properties in non-disadvantaged communities, only about one-third of electric panels are estimated to need upgrades. For multi-family properties, the differences between non-disadvantaged communities and disadvantaged communities are minimal, but overall, these properties will need more upgrades than single-family homes (about 67-72%). In general, Eric Fournier stated that few census tracts are considered “electrification-ready” (see slide 76 in Appendix).

Eric Fournier then reviewed a summary of results, noting that load center capacities that can guarantee support of full electrification are greater than 200 amps for single-family homes and greater than 150 amps for multi-family homes (see slide 77 in Appendix). About 50% of single-family homes in disadvantaged communities and about 30% in non-disadvantaged communities will likely need panel upgrades. For multi-family properties, about 70% will likely need panel upgrades. He shared that the data from the panel upgrades technical program shows that the average cost of a service panel upgrade ranges from $200-$4,400, which does not include the costs of pulling the plugs of the older equipment or other components. Eric Fournier closed by stating that it is important to distribute costs equitably so customers are not unduly burdened with upgrade costs, and seismic upgrades can be an example of how to do this well.

Eric Fournier presented several questions for Steering Committee feedback:

- How to support customers whose buildings need panel upgrades?
- How to avoid panel upgrades that aren't necessary?
- How to take advantage of new smart panel hardware capabilities?

Major Themes from Steering Committee Member Discussion

- The analysis is premised on consumers being rational actors - are they?
  - Eric Fournier: When considering rationality in terms of different aspects of the decision, is it rational to upgrade the service panel beyond what is needed today? An element of uncertainty around consumer behavior is removed by requirements of the electrical code, which dictates panel capacity sizing for the given power demand in a home. If you want a given appliance, the electrical panel needs to be sized accordingly. The oversizing of panels on the distribution system should also be considered.
- Simon Zewdu: Is there federal funding for panel upgrades?
  - Eric Fournier: Income-qualified funding is available through the Inflation Reduction Act. A dollar amount is funded as a function of poverty rate in the area. This is dependent on an individual households' income, and about half to three-fourths of costs can be covered.
- What is the ability of the power grid to handle the upgraded loads? Currently, there are power outages due to the inclement weather.
  - Eric Fournier: The addition of electric vehicles will require a doubling of capacity, which is a huge issue. This is an important aspect to consider. Grid reliability is out of scope of this particular analysis, but the grid reliability research team is seeing similar concerns on the utility side. In this analysis, customers have to pay for panel upgraes out of pocket, and grid improvements will add costs distributed across all customers.
- Outages will become a major issue when all energy is electrified and the grid is fed by unreliable power. Low-income customers will be directly impacted by those outages.
  - Eric Fournier: If residents are currently using natural gas for heating, switching to electrification will produce more vulnerabilities to disruptions. But also, there is no possibility of producing natural gas at home. Solar coupled with batteries can add a measure of self-sufficiency. It is also important to consider distributed energy resource programs to address this.
- This is a good analysis on how impacts will be felt in the future. There are concerns about low-income communities and the widespread need for panel upgrades. Right now, there is still a lot of work needed to ensure these improvements can be made.
- It seems like there's an element of technical assistance needed, like a one-stop shop for resources, resources connected to existing energy audits or healthy home assessment programs, and financial assistance through Inflation Reduction Act funding or existing state and local incentive programs.

- Assistance programs for electric panel replacement for disadvantaged communities should occur at the local and federal level.
- Ensure there are protections for tenants, so landlords are not passing costs to tenants and making them more rent burdened.
- In terms of rethinking how panel upgrades are customer owned, can this be utility owned instead? What would that take?
    - Eric Fournier: There is an opportunity to do demand response at the customer level. Certain circuits could be turned off to alleviate strain on the grid. Analogies to seismic retrofits can be made here.
- As a landlord, if costs cannot be passed on to tenants, then how would there be incentivizes to install upgrades? Most mom-and-pop landlords are not LLCs or corporations, so they don't have the added tax breaks.
    - Eric Fournier: This is the number one reason why panel upgrade rates are lower for multi-family units. There is a need to think about sharing costs between property owners and tenants.
- It is important to consider costs to the population beyond simple power rates in the push for zero emissions. Many of these other costs (like panel upgrades) are not being considered by the elected officials. The social costs of 100% clean energy are huge.
    - Eric Fournier: Gas-combustion stoves use represents about 6% of a home's total gas use annually. There is a balance between greenhouse gas emissions benefits and electrification benefits. It is important to consider the top priorities. Generally, a slow creep towards partial electrification will be seen.
- Considering the increase in the price of gas, how will this play out in the future? What recommendations do you have for LADWP to accelerate the transition of panels?
    - Eric Fournier: Gas used to be five times more expensive, but the electrical appliances were more energy efficient. With increased gas costs, long-standing cost savings of electrifying can be conveyed to customers. Panel upgrades will be expensive, but gas costs may unexpectedly increase as well. Think about the long-term benefits of electrification.

Wrap Up and Next Steps

Joan Isaacson wrapped up by reminding members that the next Steering Committee meeting will take place on April 19, 2023, and will focus on rates and affordability, access to home cooling, and jobs. She invited Steering Committee members to provide additional feedback in the questionnaire to be sent out after the meeting.

Simon Zewdu concluded the meeting by thanking Steering Committee members for their participation. He thanked the NREL and UCLA researchers for their work and recommendations on LA100 Equity Strategies and noted that LADWP will share how they will carry the strategies out in the future. He also stated that the final results will be shaped by Steering Committee members' guidance and shared in the next meeting.

Appendix

Steering Committee Meeting #17
March 29, 2023
Presentation Slides