



2022 Power Strategic Long-Term Resource Plan (SLTRP)

Roadmap to 100% Carbon Free by 2035

**SLTRP Advisory Group Meeting #5
Phase II (Scenario Development)
November 10, 2021**

Meeting Agenda

Joan Isaacson, Kearns & West

- Welcome & Introductions
- Meeting Purpose and Agenda Overview
- LA100 No In-Basin Combustion Scenario
- 2022 SLTRP Assumptions and Evaluation Metrics
- 2022 SLTRP: Draft Scenario Matrix Refinements
- Wrap Up

Website: www.ladwp.com/SLTRP

Email: powerSLTRP@ladwp.com

Guides for Productive Virtual Meetings



Use Chat for input OR Raise Hand to join the conversation

Help to make sure everyone gets equal time to give input

Keep input concise so others have time to participate

Actively listen to others, seek to understand perspectives

Offer ideas to address questions and concerns raised by others

Advisory Group Role in 2022 SLTRP

The Advisory Group will provide input and feedback based on their expertise, knowledge, and resources of the organizations, institutions, and constituent groups represented by Advisory Group members.

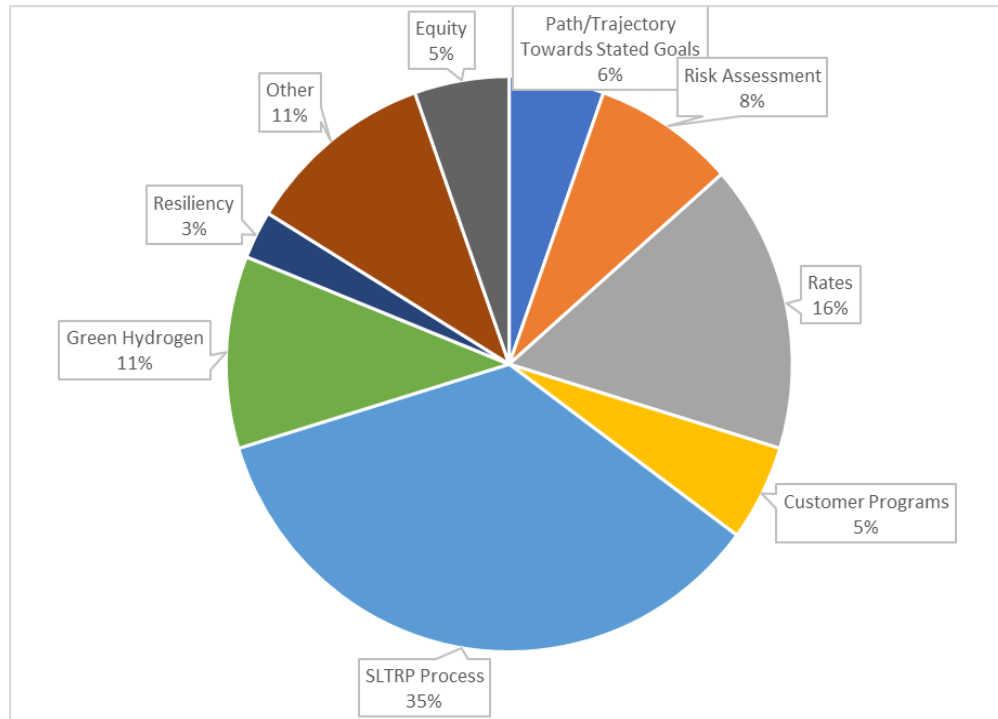
Advisory Group Meeting Plan

| Phase 1 Q3 2021 Launch & Laying Foundation | Phase 2 Q3 2021 Scenario Development | Phase 3 Q4 2021 Modeling | Phase 4 Q1 2022 Results | Phase 5 Q2-3 2022 Outreach |
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| <p>#1 September 23</p> <ul style="list-style-type: none"> Advisory Group Launch LADWP Overview LA100 (Achieving 100% Renewable Energy) 2022 SLTRP Orientation Advisory Group Protocols & Operating Principles | <p>#4 October 22</p> <ul style="list-style-type: none"> Customer Focused Programs <ul style="list-style-type: none"> Energy Efficiency & Building - Electrification Transportation Electrification Demand Response Draft Scenario Matrix | <p>November-January</p> <ul style="list-style-type: none"> Internal Modeling Analysis of Scenarios | <p>#7 February TBD Preliminary Results</p> | <p>#8 July TBD Public Outreach Results</p> |
| <p>#2 September 30</p> <ul style="list-style-type: none"> <i>LA100 Study Review (NREL) at 9 am</i> LA100 Rates Analysis (OPA) at 10 am LA100 Next Steps (LADWP) LA100 Assumptions (PSRP) Consider Topics for October 22 Consideration of Scenario Definition | <p>#5 November 10</p> <ul style="list-style-type: none"> LA100 “No Combustion” Scenario 2022 SLTRP Assumptions Metrics & Evaluation Process Scenario Considerations Refine Scenario Matrix | <p>Modeling Underway</p> | <p>March – April TBD Potential field</p> | <p>August Review Draft 2022 SLTRP</p> |
| <p>#3 October 08</p> <ul style="list-style-type: none"> SLTRP Deep Dive SB100 Review (LADWP) 100% Carbon-Free by 2035 Requirements (NREL) Green Hydrogen in LA (LADWP) 2022 SLTRP Key Considerations and Potential Scenarios | <p>#6 November 19</p> <ul style="list-style-type: none"> Distribution Automation LA100 Equity Strategies Overview Develop Scenarios Final Scenario Matrix | <p>Modeling Underway</p> | <p>May – June TBD Community Outreach Meetings</p> | <p>September Submit Final 2022 SLTRP for approval</p> |

LA100 Study: No In-Basin Combustion Scenario

- Some Advisory Group members suggested that the 2022 SLTRP include a “no-combustion” scenario
- Multi-year LA100 Study evaluated “no in-basin combustion” in two separate instances through the course of the Study
 - Initial Modeling
 - Sensitivity
- **Overall results indicated that in a decarbonized future, more reliance is placed on the transmission system, which presents reliability issues under stressed conditions without in-basin combustion**

Areas of feedback from Advisory Group



LA100 No In-Basin Combustion Scenario

Dr. Brady Cowiestoll, National Renewable Energy Laboratory



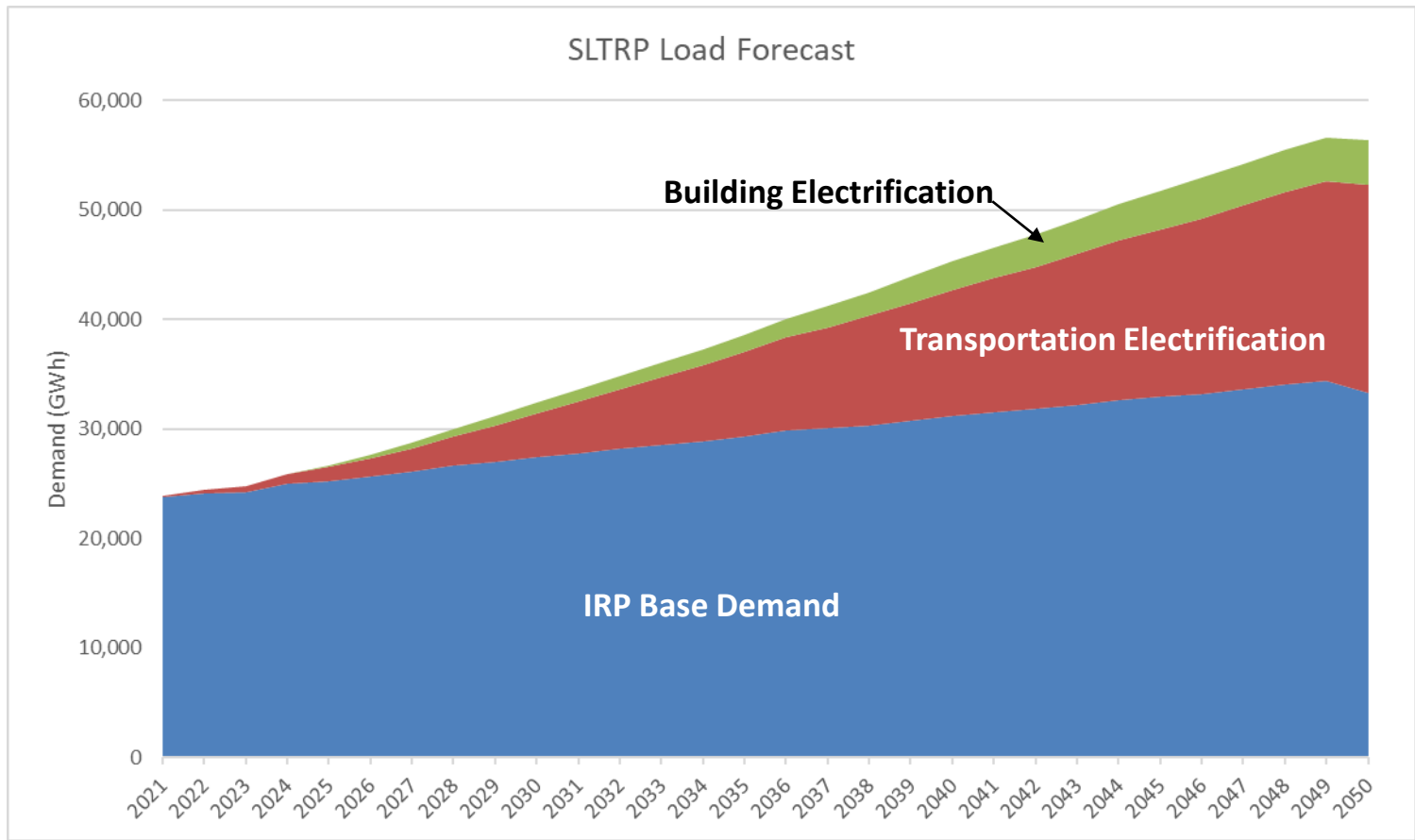
Discussion and Q&A



2022 SLTRP Assumptions and Evaluation Process

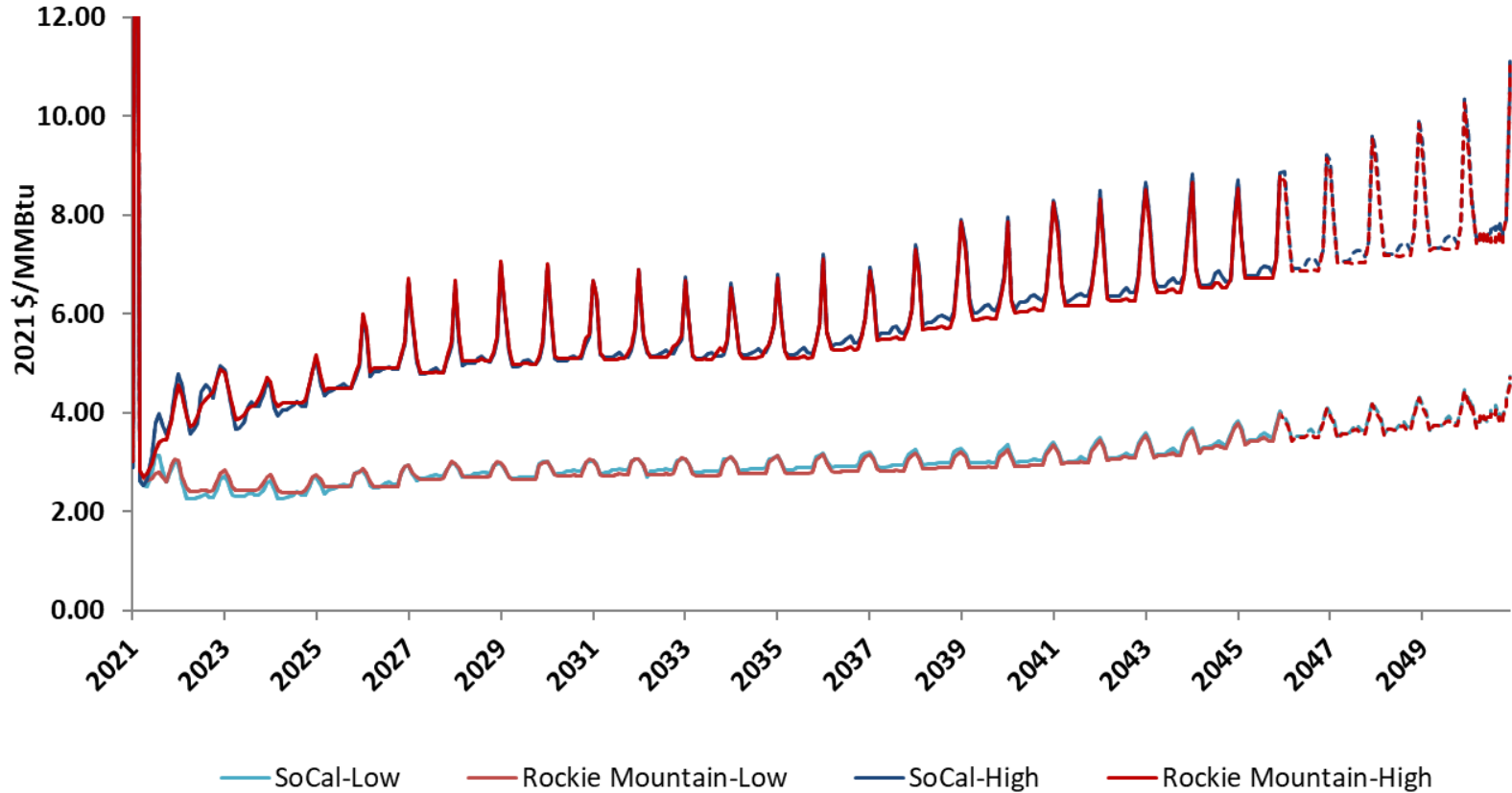
Robert Hodel, LADWP Supervisor of Integrated Resource Planning



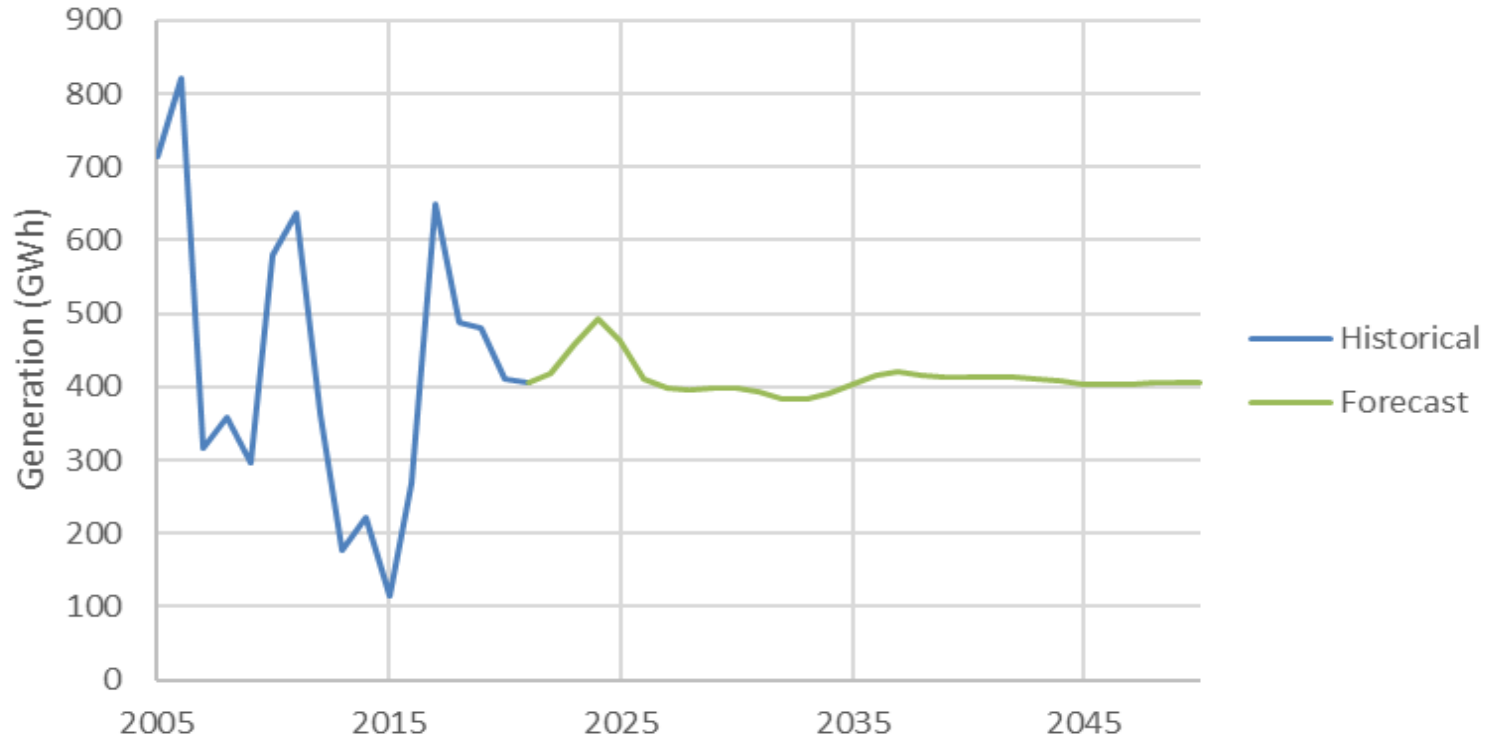


Source: LADWP Load Forecasting Group, 2020 Energy Efficiency Potential Study, Electric Power Research Institute (EPRI) Assessment

Gas Prices: High vs Low (Spring 2021)

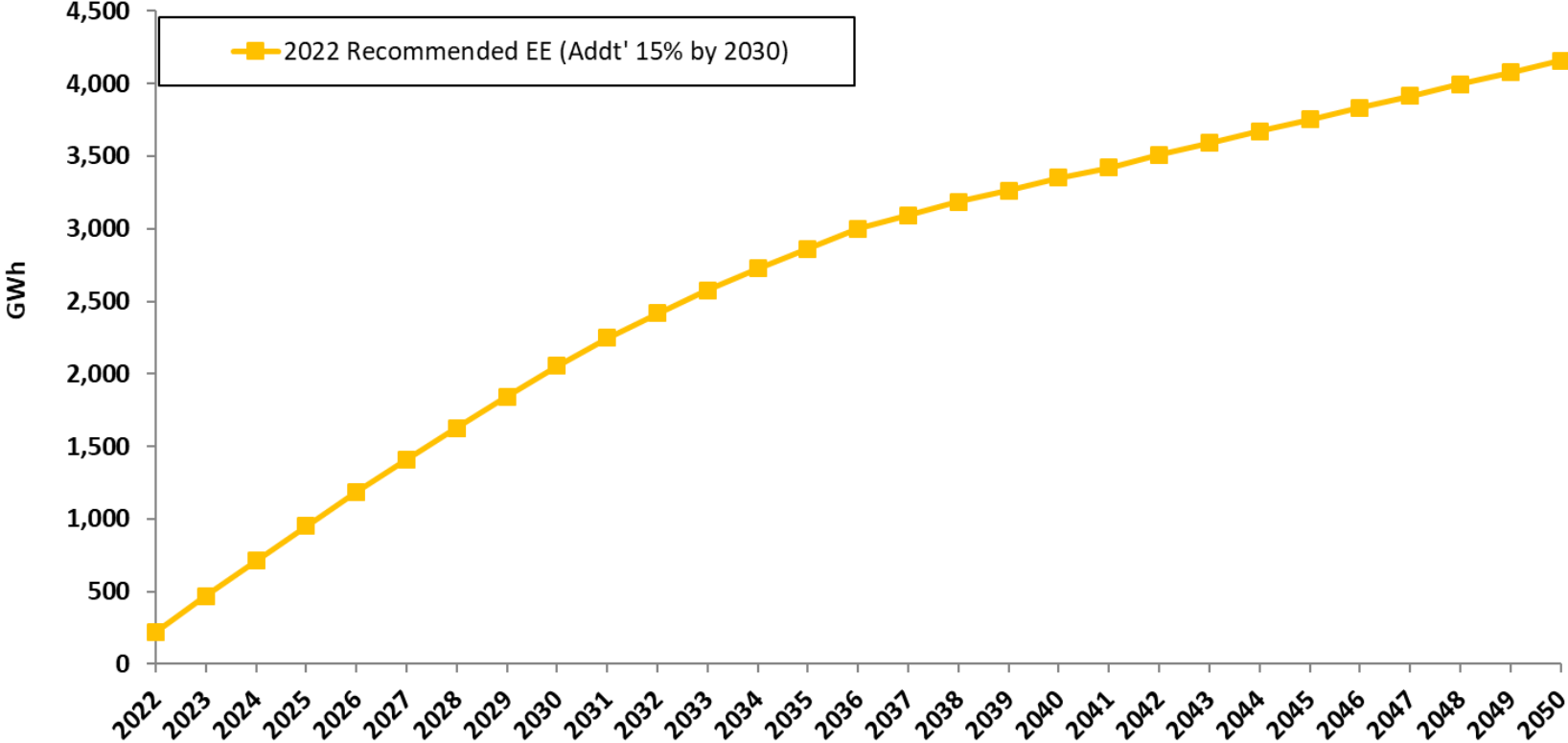


Hoover and Small Hydro Generation



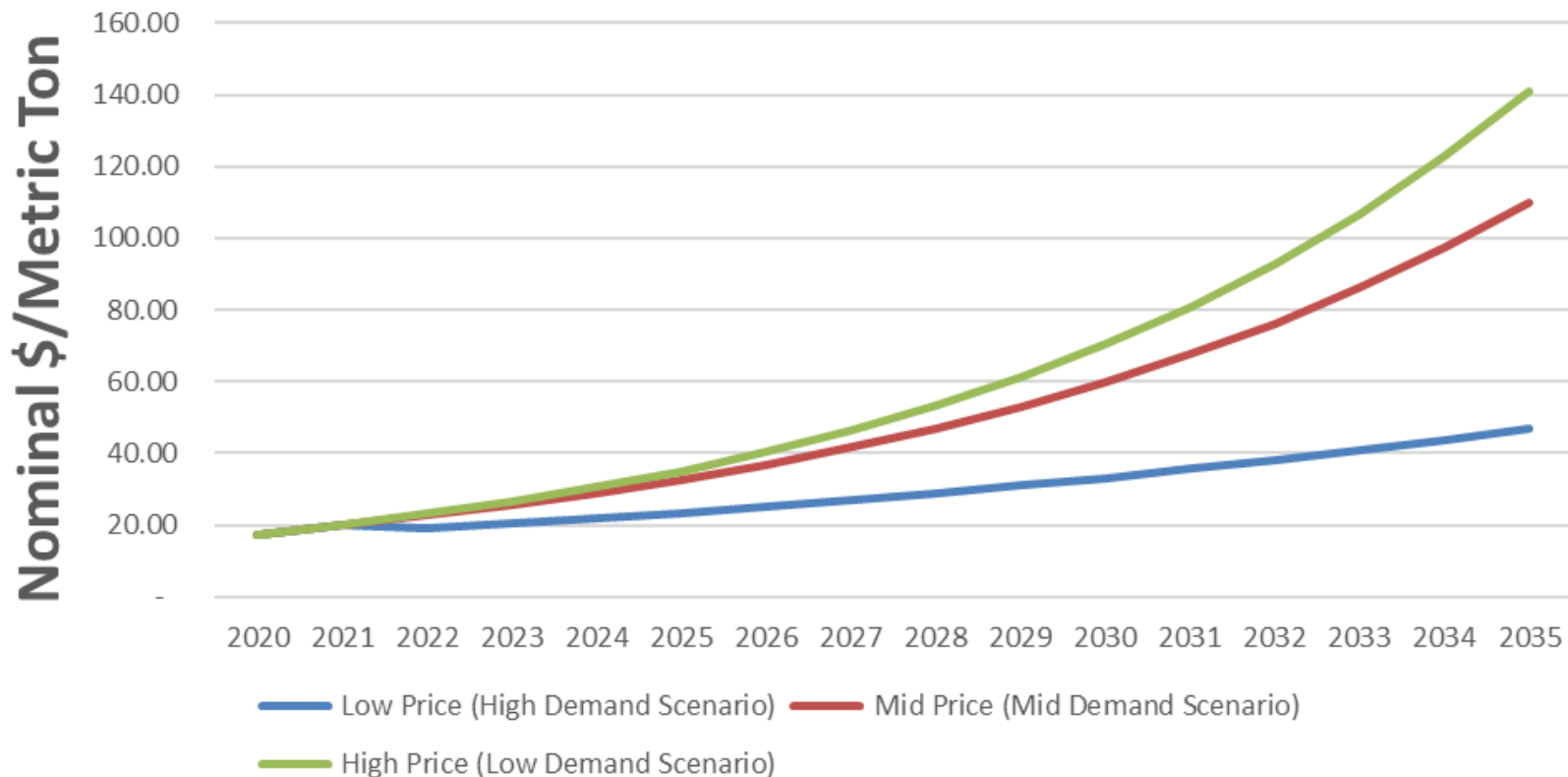
Source: Bureau of Reclamation – Operation Plan for Colorado River System Reservoirs for Hoover Dam, Eastern Sierra runoff data

Energy Efficiency Program Cumulative Savings



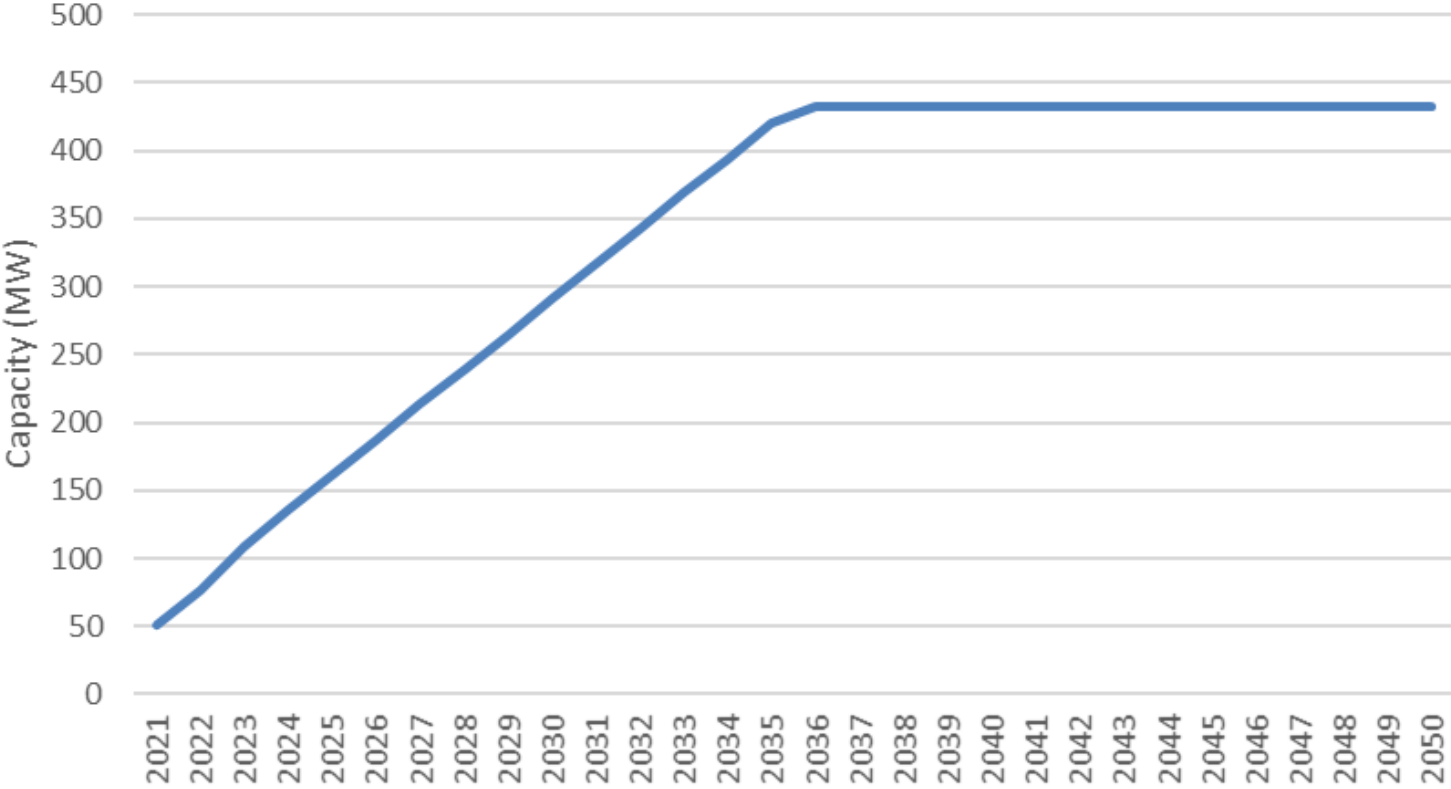
Note: Savings reflected reflected on this chart are for Programs only, and do not include Codes & Standards.

Assumed GHG Emissions Allowance Prices (\$/ton)



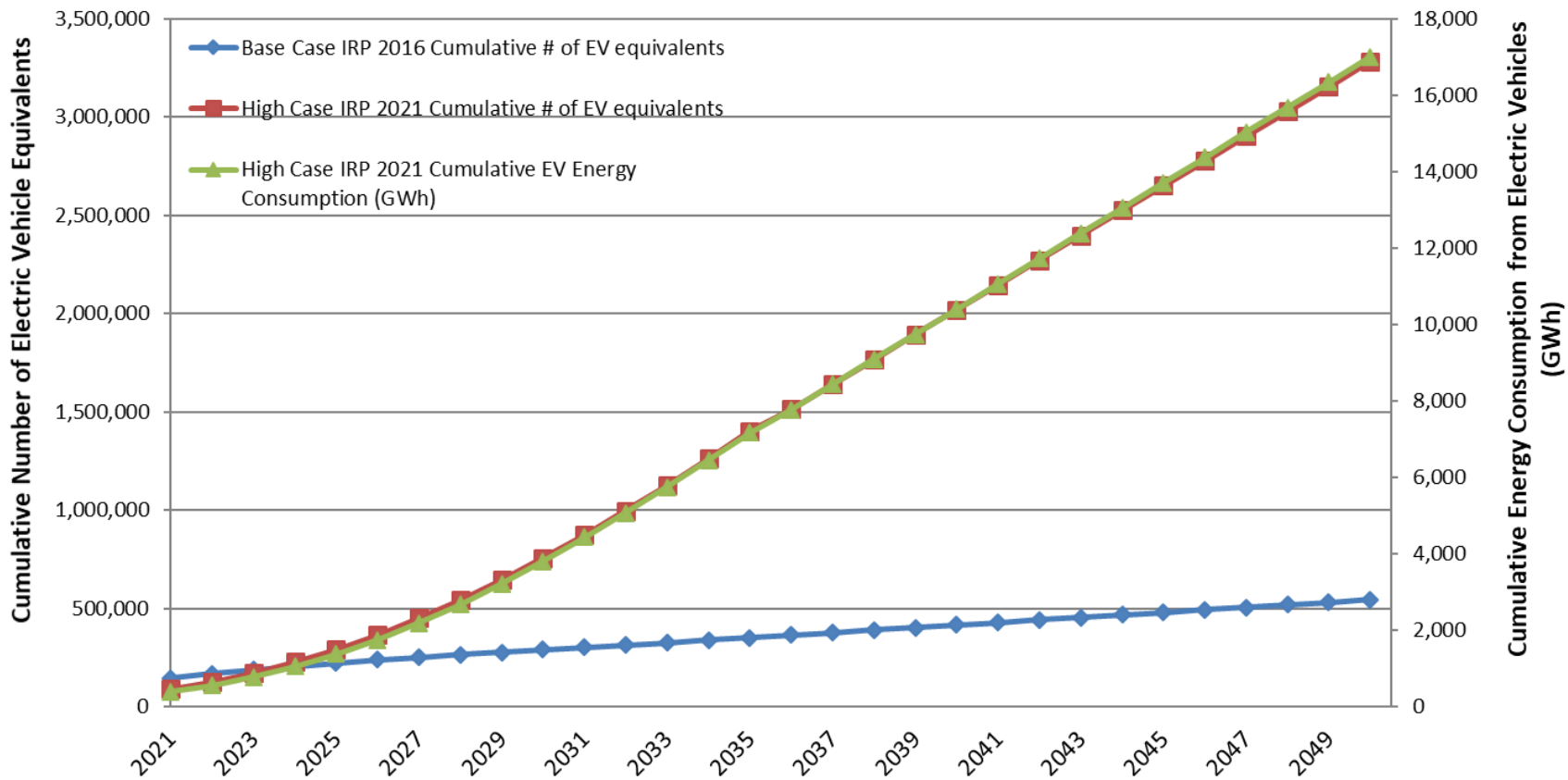
Source: California Energy Commission

Demand Response Deployment



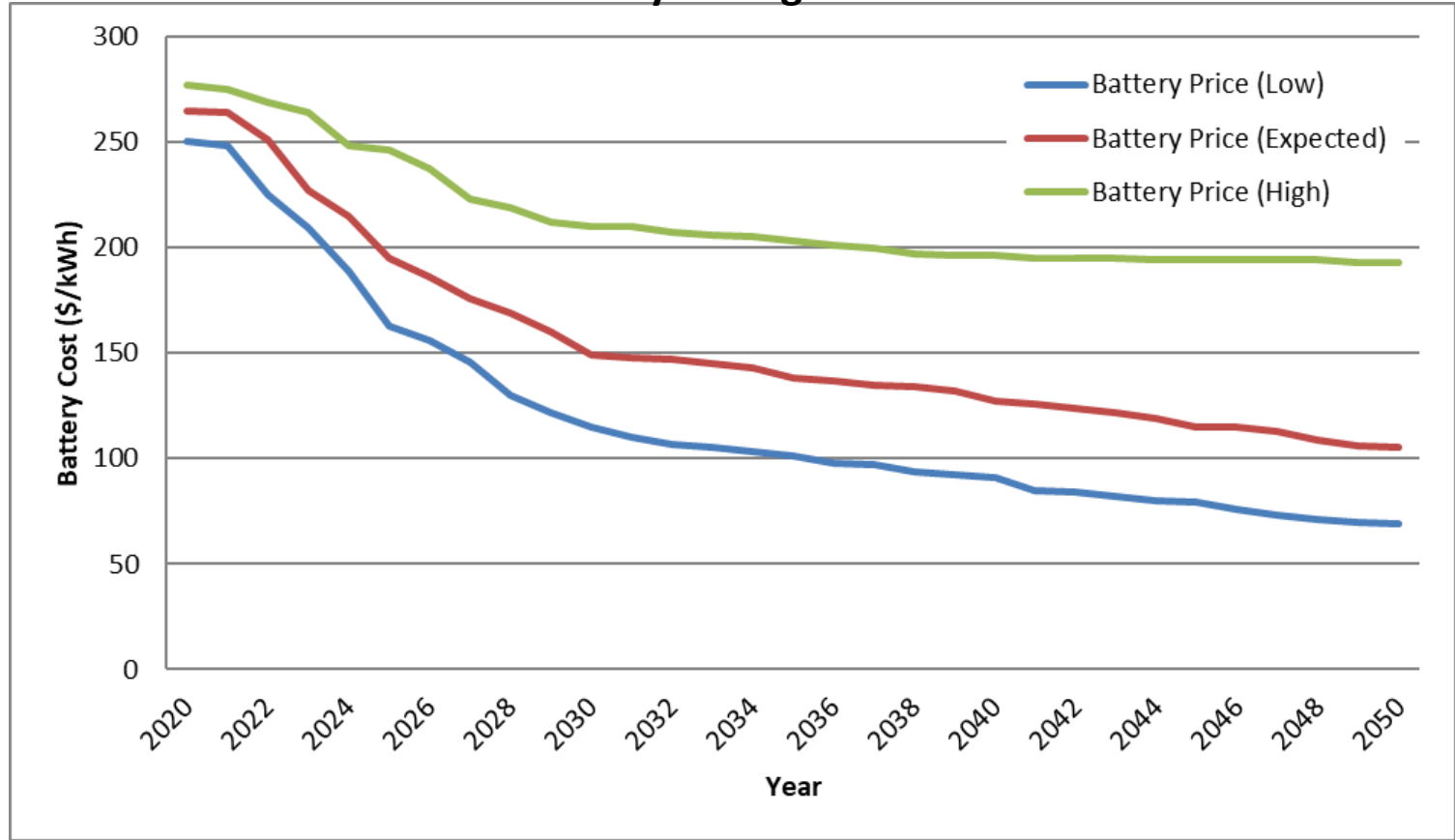
Source: LADWP Demand Response Group

Cumulative Transportation Electrification



Source: LADWP Financial Services Office

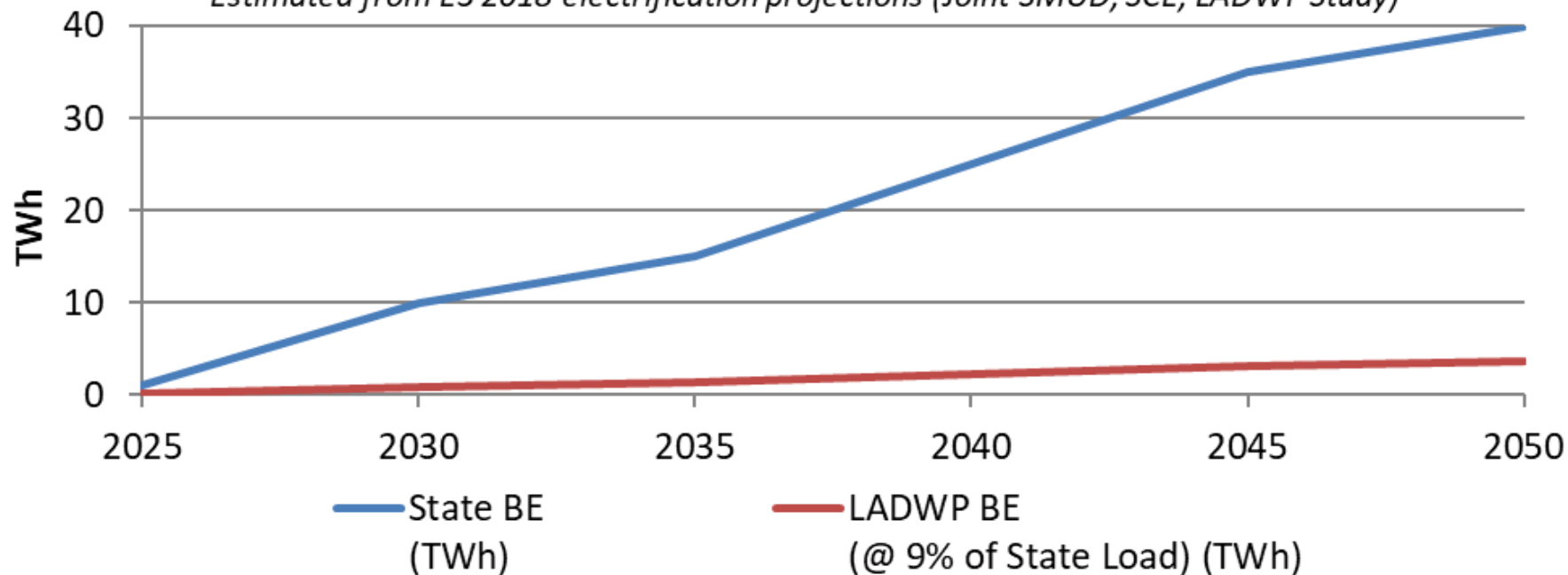
Battery Storage Costs



Source: NREL Annual Technology Baseline, Bloomberg

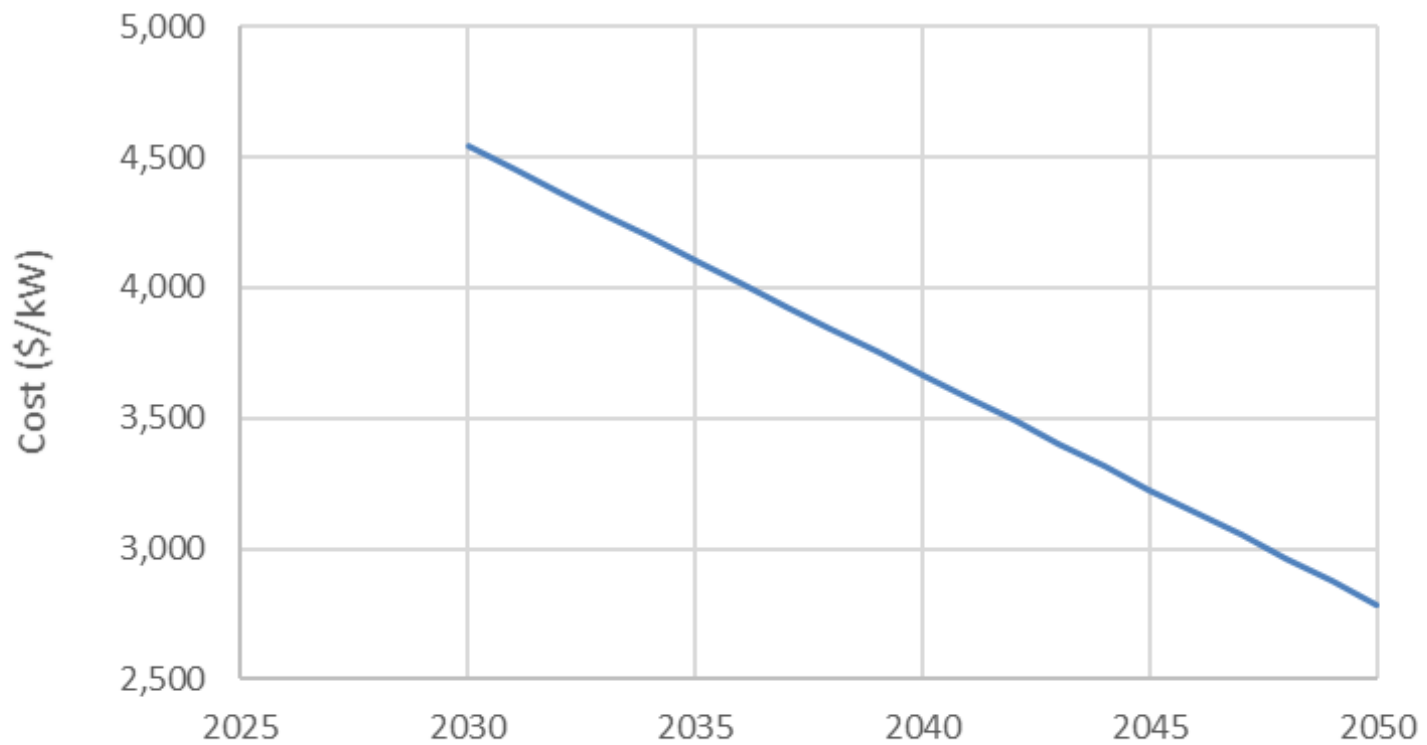
Building Electrification (BE) Forecast Estimates

Estimated from E3 2018 electrification projections (Joint SMUD, SCE, LADWP Study)



Source: Electric Power Research Institute (EPRI)

Hydrogen Turbine Cost



Source: NREL

Metrics to Be Considered

- GHG Emissions
- Reliability
 - Resource Adequacy
 - Resiliency
- Financial
 - Overall Cost
 - Rate Impacts

Discussion and Q&A



2022 SLTRP: AG#4 Feedback

Joan Isaacson, Kearns & West

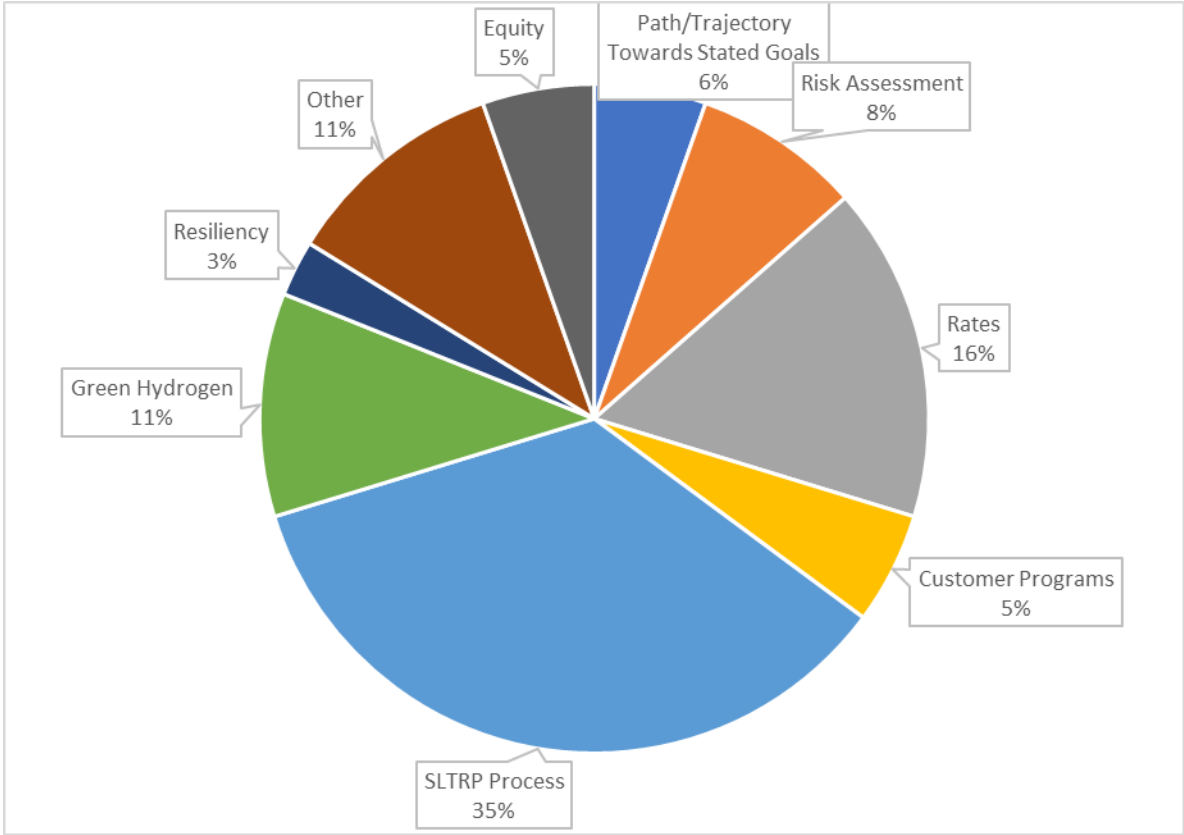
Jay Lim, LADWP Manager of Resource Planning



Advisory Group Meeting 4 Raw Feedback

| | | | | |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Additional scenarios might include aggressive expansion of demand response, no green hydrogen in-basin, more storage, higher levels of energy efficiency. | What is the rationale and application for hydrogen in-basin? | Hydrogen maybe should be described as fossil-free fuel. | How will we model different "high-low" sensitivities. | What are the capital expenditures for Department and third party providers with PPAs? We will be on the hook for those capital expenditures. We haven't gotten any decent information on the last 10% and impact on reliability. |
| Really disappointed there are only two more meetings for this SLTRP. The timeframe for the meetings was too short. | What are the impacts on low income ratepayers. If people need to purchase new vehicles and appliances, imposing costs on people, how is this taken into account. | I'm curious about hydrogen costs. Has it been discussed, transitioning and infrastructure costs? | We want to see impact on customer bills and affect of various measures on their bills such as increased EE and DR. | This is a con job. Once you start mentioning rates, if you talk about costs, then everyone puts their thumbs down. |
| The scenarios seem pre-determined without meaningful public dialogue. | What is technically feasible for significant needs and upgrades to the distribution system. | When will building and implementation begin (such as EV, DR, lcoal solar)? Next five years? | Is the DAC and EJ equity component factored into any of the assumptions? | Disagree about this being a con job. Not a lot of conversation about health impacts. |
| There should be opportunity for public buy-in to the objectives set by the Council motion. | We have all these different pathways and charts that present too much information but don't tell you anything. | I would like to see a plan or breakdown of a timeline for the projects that are part of the SLTRP. | Evaluation criteria that considers equity and EJ issues, whether quantitative or qualitative, should be included in the final report. | We need to look more at resilience. |
| From an outside perspective, it appears that the SLTRP objective is being driven by political aspirations by elected officials who seek or want grassroots support. | What will the rates be, impact to individual ratepayers especially with rooftop solar, DRR, updating the distribution system. | The Balanced Decarb scenario doesn't meet the City Council motion and shouldn't be included, and that all the scenarios should meet the City Council motion. LADWP seems to have an inaccurate interpretation of the City Council motion. | Why are the environmental advocates all assigned together to a single breakout group rather than being dispersed across all of the groups. | Will biofuels be included in all scenarios? |
| We need more interim reports. | Suggest also using the 2017 IRP as another base case. | Keeping the SB100 scenario as a base case made sense to the group. | There should be more scenarios so that tradeoffs could be explored and understood. | Hydrogen is not understood in communities and more discussion needs to be focused on it. |
| Are fuel cells considered in the DER portion per the City Council motion? | | | | |

Advisory Group Meeting 4 Feedback Categories



Advisory Group Meeting Summary of Top Three Feedback Categories

- SLTRP Process
 - Additional scenarios may be appropriate.
 - Higher EE, DR, etc.
 - Scenarios should meet the requirements of the City Council Motion.
 - SB100 should be the reference case.
 - There should be more meetings to allow stakeholders additional opportunities for feedback and buy in.
- Rates
 - Capital expenditures should be clearly reported.
 - How will various programs (e.g., EE and DR) affect individual customer bills?
- Green Hydrogen
 - Will hydrogen fuel cells be considered for in-basin use?
 - What is the cost of transitioning to hydrogen?
 - Hydrogen is not understood in many communities and more discussion needs to focus on it.

Discussion and Q&A



2022 SLTRP: Draft Scenario Matrix Refinements

Jay Lim, LADWP Manager of Resource Planning
Joan Isaacson, Kearns & West, Facilitator



September 2021 City Council Motion

- **21-0352: LA100 / SLTRP / 2035 100% Carbon-Free Energy / LADWP**
 - Instruct LADWP to prepare an SLTRP that achieves 100% carbon-free energy by 2035, in a way that is equitable and has minimal adverse impact on ratepayers
 - Prioritize equity for EJ communities defined as at or above the 75th percentile on CalEnviroScreen. Ensure emissions do not increase for any period of time in EJ communities.
 - Report on “no-regrets” projects common to all LA100 paths, and “shovel-ready” projects to act on Federal and State funding opportunities
 - Report every six months to ECCEJR Committee an update via one-page report card, including necessary ingredients to achieving a clean grid by 2035, as well as barriers and challenges such as streamlining transmission upgrades

2022 SLTRP Modeling Process

Phase I

SLTRP Core Cases (100% Carbon Free by 2035)

- SB 100 (Reference Case)*
100% Carbon Free by 2035
1. 80% RPS by 2030
 2. ~90% RPS by 2030
 3. ~90% RPS by 2030 (High DERs)

Modeling Components:

- Capacity Expansion
- Production Cost Modeling
- Resource Adequacy
- Resiliency Assessment

SLTRP Price Sensitivities

Price Sensitivities Applied to all 100% Carbon Free by 2035 Scenarios

- Low/High Natural Gas
- Low/High GHG prices
- Low/High Energy Storage

Match low, high commodity prices to establish bookends

Phase II

SLTRP Implementation Sensitivities (What-ifs)

TBD based on feedback from Advisory Group

Identify risk factors, resource constraints, and potential outcomes of "what-if" scenarios

Tentative Draft Recommended Case

Draft Recommended Case

Public Outreach

2022 SLTRP Core Scenarios

| | | 2022 SLTRP Core Scenarios | | | |
|-------------------------------------------------|-------------------------------------------------------------|---------------------------|--------------------------|-----------------------------------|---------------------------------------|
| | | 100% Clean Energy by 2045 | 100% Carbon Free by 2035 | | |
| | | SB 100 (Reference Case) | 80% RPS by 2030 | Aggressive Interim | Aggressive Interim and High DERs |
| 2030 RPS Target | | 60% by sales | 80% by sales | 80% by generation (~90% by sales) | 80% by generation (~90% by sales) |
| Compliance Year for 100% zero carbon | | 2045 by sales | 2035 by generation | 2035 by generation | 2035 by generation |
| Eligible Technologies | Renewables (Wind, Solar, Geo, Small Hydro) <i>(primary)</i> | Yes* | Yes* | Yes* | Yes* |
| | Energy Storage <i>(primary)</i> | Yes* | Yes* | Yes* | Yes* |
| | Solid Biomass | No | No | No | No |
| | Biogas/Biofuels | Yes* | No | No | No |
| | Fuel Cells | Yes* | Yes*, hydrogen only | Yes*, hydrogen only | Yes*, hydrogen only |
| | Hydro - Existing | Yes* | Yes* | Yes* | Yes* |
| | Hydro - New | No | No | No | No |
| | Hydro - Upgrades | Yes* | Yes* | Yes* | Yes* |
| | Natural Gas | Yes* | Yes*, until 2035 | Yes*, until 2035 | Yes*, until 2035, Limited (More DERs) |
| | Zero Carbon H2 Turbines <i>(secondary)</i> | Yes* | Yes* | Yes* | Limited (More DERs) |
| | Nuclear - Existing | Yes* | Yes* | Yes* | Yes* |
| Nuclear - New | No | No | No | No | |
| Transform existing gas capacity (non-OTC units) | | | | | |
| | Haynes, Scattergood, Harbor, Valley | No | Yes | Yes | Yes |
| DERs | Local Solar | Reference | High | High | Highest (Max DERs) |
| | Local Energy Storage | Reference | High | High | Highest (Max DERs) |
| | Energy Efficiency | Reference | High | High | High |
| | Demand Response | Reference | Moderate | Moderate | High |
| RECS | Financial Mechanisms (RECs/Allowances) | Yes | No | No | No |
| Transmission | | | | | |
| | New or Upgraded Transmission | Moderate | High | High (possible new corridors) | High |

*Note: Optimal portfolio will be determined through the capacity expansion model

Note: Zero carbon includes RPS + nuclear + large hydro + green hydrogen

2022 SLTRP Price Sensitivities

| | | Sensitivity Scenarios Applied to 100% carbon free by 2035 Scenarios |
|------------------|-----------------------|---------------------------------------------------------------------|
| Fuel Prices** | Natural Gas, H2, etc. | High/low sensitivities |
| GHG Prices** | GHG Allowance Prices | High/low sensitivities |
| Storage Prices** | Li-Ion, flow, etc. | High/low sensitivities |

**Note: Optimal portfolio will be determined through the capacity expansion model*

***Note: Applied to all scenarios*

Note: Zero carbon includes RPS + nuclear + large hydro + green hydrogen

2022 SLTRP Implementation Sensitivities – “What-ifs”

- *Input from the 2022 SLTRP Advisory Group*

Discussion and Feedback

Which of the following reflects your view about the following statement?

The draft scenarios presented by LADWP today capture the range of the Advisory Group's interests and priorities for the SLTRP process.

- Strongly agree
- Agree
- Good enough
- Not yet

Discussion and Feedback

2022 SLTRP Price Sensitivities

| | | Sensitivity Scenarios Applied to 100% carbon free by 2035 Scenarios |
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| Fuel Prices** | Natural Gas, H2, etc. | High/low sensitivities |
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**Note: Optimal portfolio will be determined through the capacity expansion model*

***Note: Applied to all scenarios*

Note: Zero carbon includes RPS + nuclear + large hydro + green hydrogen

2022 SLTRP Implementation Sensitivities – “What-ifs”

- *Input from the 2022 SLTRP Advisory Group*

What elements would you like to see analyzed as part of the “what-if” scenarios for the 2022 SLTRP?

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Wrap Up & Next Meeting

Next Meeting:

November 19, 2021 (10 am to 12 pm)

Future Meeting:

February 2022

Website: www.ladwp.com/SLTRP

Email: powerSLTRP@ladwp.com



September 2021 City Council Motion

- **16-0243-S2: Hiring and Workforce Plan / LADWP / LA100 Study/ Clean Energy Grid Goals**
 - Instruct LADWP with assistance of Personnel Department, CAO, CLA, and labor partners, to create a long term hiring and workforce plan that coincides with a pathway identified in the LA100 Study, which focuses on ensuring project labor agreements, prevailing wage and targeted hiring requirements, and increases hiring from city neighborhoods in environmentally and economically disadvantaged communities. Include LADWP and contract workforce that builds and maintains solar, wind, storage, transmission, and all other aspects needed to accomplish the LA100 clean energy grid goals.