PATHWAY TO 100% CLEAN ENERGY
MAINTAINING RELIABILITY AND RESILIENCE

UCI CALPLUG WORKSHOP
NOVEMBER 10, 2022

Louis Ting
Customers – 1.55 Million
LA Population – 4 Million
Staffing – 11,000+
Budget - $4.9 Billion
   Power & Fuel Purchase, O&M, Capital Projects
Demand – 20,936 Gigawatt-Hours – 8,101 MW Capacity
   Commercial/Industrial/Residential
Transmission System
   4,175 Miles Overhead and Underground
   15,452 Towers
Distribution System
   177 Distribution Substation
   11,067 Miles of OH & UG Lines & Cables
   130,703 Distribution Transformers
   300,884 Distribution Poles
LA 100 STUDY

THE LA CITY COUNCIL DIRECTED LADWP TO EVALUATE:

- What are the pathways and costs to achieve a 100% renewable electricity supply while electrifying key end uses and maintaining the current high degree of reliability?
- What are the potential benefits to the environment and health?
- How might local jobs and the economy change?
- How can communities shape these changes to prioritize environmental justice?
LA100 Advisory Group

American Wind Energy Association Committee Earth Justice
Cal State LA Environment California Research and Policy Center
Cal State Northridge Environmental Defense Fund
Center for Energy Efficiency and Food and Water Watch
Renewable Technologies IBEW Local 18
California Energy Storage Alliance Los Angeles Business Council
California Solar Energy Industry Los Angeles Chamber of Commerce
Association Los Angeles Unified School District
Association Los Angeles World Airports
Center for Sustainable Energy Metropolitan Transportation
Central City Association Agency
Chief Legislative Analyst Natural Resource Defense Fund
City Attorney Neighborhood Council
Communities for a Better Sustainability Alliance
Environment Office of the Mayor
Council Districts
DWP Advocacy Committee
DWP-NC MOU Oversight

Office of Public Accountability
Port of Los Angeles
RePower LA
Sierra Club
South Coast Air Quality
Management District
Southern California Gas
Southern California Public Power Authority (SCPPA)
University of California, Los Angeles
University of Southern California
Valero Wilmington Refinery
Valley Industry Commerce
Association
LA100 STUDY – BULK ELECTRIC SYSTEM
ACROSS ALL LA100 SCENARIOS

March 24, 2021 - Mayor announced 100% target by 2035
City Council Motion followed Mayor's announcement targeting 100% by 2035
2022 Strategic Long Term Resource Plan

2022 SLTRP CORE CASES

SB100
Reference Case pursuant to SB100 – 100% Clean Energy by 2045

CASE 1
Transmission | Mid
DERs | High
Natural Gas | 2035
Hydrogen | Backup

CASE 2
Transmission | Highest
DERs | High
Natural Gas | 2035
Hydrogen | Backup

CASE 3
Transmission | High
DERs | Highest
Natural Gas | 2035
Hydrogen | Limited
2022 Strategic Long Term Resource Plan

KEY FINDINGS: RATE IMPACTS

2022 SLTRP Customer Rates (Nominal $)

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>SB100</td>
<td>30 (in 2030) 38 (in 2035)</td>
<td>4.8%</td>
<td>3.3%</td>
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<tr>
<td>Case 1</td>
<td>38 (in 2030) 54 (in 2035)</td>
<td>7.7%</td>
<td>5.2%</td>
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<tr>
<td>Case 2</td>
<td>38 (in 2030) 54 (in 2035)</td>
<td>7.7%</td>
<td>5.2%</td>
</tr>
<tr>
<td>Case 3</td>
<td>42 (in 2030) 58 (in 2035)</td>
<td>8.4%</td>
<td>5.6%</td>
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</table>
# 2022 Strategic Long Term Resource Plan

## Key Findings: Monthly Bill Impacts

<table>
<thead>
<tr>
<th>2022 SLTRP Scenario</th>
<th>Average Customer Bill in 2035 (Apartment)</th>
<th>Average Customer Bill in 2035 (Single Family)</th>
<th>% Increase from 2022</th>
</tr>
</thead>
<tbody>
<tr>
<td>SB100</td>
<td>$112</td>
<td>$262</td>
<td>84%</td>
</tr>
<tr>
<td>Case 1</td>
<td>$160</td>
<td>$373</td>
<td>161%</td>
</tr>
<tr>
<td>Case 2</td>
<td>$160</td>
<td>$373</td>
<td>161%</td>
</tr>
<tr>
<td>Case 3</td>
<td>$174</td>
<td>$405</td>
<td>184%</td>
</tr>
</tbody>
</table>

Note: Average monthly bill in 2022 is $81.66 per month for apartment and $143.86 per month for single-family home.
WHERE ARE WE TODAY?
LADWP INFRASTRUCTURE - PATHWAY TO DECRABONIZE

**Energy Efficiency** – 15% Per Decade

**EV Adoptions** – 60% increase in 2 years 97,000 registered

**EV Chargers** – 93% increase in 2 years 19,500 L2 and L3

**NEM Solar** – 36% increase in 2 years 513 MW Total

25% of all NEM Solar adoption within last 2 years, inception - 1999

**Wind** – 1,328 MW

**Solar** – 2,020 MW

**Geothermal** – 331 MW

**Small Hydro** – 257 MW

**Construction** – 522 MW

**Customer** – 31.7 MW 3,877 BTM installations

**Li-ion** – 20 MW/10 MWh 400 MW/1,200 MWh (Under Construction)

**Pump Hydro** – 1,265 MW

2021 Power Content Label – 35.2% RPS
HOW RESILIENT IS LA’S POWER GRID?
PATHWAY TO 100% RENEWABLE – MAINTAINING RELIABLE & RESILIENT GRID

• Northridge Earthquake - 1994
  • Saddle Ridge Fire - 2019
  • Route Fire - 2022
• Past Summer Heat Waves 2020 & 2022
  • COVID - 19

CAVEAT – PAST PERFORMANCE DOES NOT GUARANTEE FUTURE RESULTS
LADWP Power System

1994 Northridge Earthquake

Magnitude 6.7 – Epicenter Reseda – 11.31 miles deep
1.8g acceleration – highest recorded urban area
Power System Damage – 10 mile radius - $150 Million
Entire Power System was de-energized – no service
Electricity demand was low – 1,900 MW
Within 24 hours – 93% of customers restored
14 days to return system to “Normal”

January 17
4:30 AM
Monday
LADWP Power System

1994 Northridge Earthquake

January 17
4:30 AM
Monday

Distribution Station Hazard Mitigation Plan – Seismic upgrade of 40 substations completed in 2005

Receiving Station Hazard Mitigation Plan – Replacement of equipment with seismic qualified disconnects, transformers, circuit breakers, and other related equipment completed in 2009

Creation of Institute of Electrical and Electronic Engineers, or IEEE, document, “Recommended Practice for Seismic Design of Substations” with help of LADWP Structural Engineers

IEEE 693 – document recommends design criteria for various voltage classes and testing criteria or equipment
• Brushfire near Sylmar area
• 8800 acres were burned, 16 power poles destroyed
• Mobilized 45 Crews
• 17,244 Customers lost service
• 100% of Customers restored within 24 hours
• Activated Emergency Operation Center
• 40 poles replaced
• 4000 feet of overhead conductor replaced
• 150 feet of underground conductor replaced
Saddle Ridge Fire
October 10, 2019
IN-BASIN RESILIENCY

WHEN THERE IS A TRANSMISSION OUTAGE,
WE WOULD RELY ON GREEN HYDROGEN TO KEEP CRITICAL POWER FLOWING

LA100 Study – Key Takeaway
In-basin capacity must be maintained for reliability and resiliency, even in a decarbonized future Power System.

All 2022 SLTRP cases have been developed to maintain reliability and resiliency

Example:
The 2019 Saddle Ridge Fire impacted the Pacific DC Intertie for **22 hours**, Barren Ridge corridor for **10 hours**, and VIC-LA path for **5 hours**.
Route Fire

- Occurred on August 31, 2022
- Started adjacent to the Interstate 5 near Castaic which is located northwest of Santa Clarita
- Burned a total of 5,208 acres
- Now 100% contained

Transmission lines connecting to Castaic Power Plant \textit{relayed}, effectively causing the complete loss of Castaic generation.
Route Fire Causes Complete Isolation of Castaic Power Plant
Pictures Taken From Castaic Power Plant
Route Fire Eliminated LADWP’s to Use Castaic Power Plant

- Occurred on a high-load day
- Castaic Power Plant is capable of generating up to 1265 MW
- Demonstrates the importance of system resilience

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<tbody>
<tr>
<td>Import</td>
<td>3232 MW</td>
</tr>
<tr>
<td>In-Basin Generation</td>
<td>2206 MW</td>
</tr>
</tbody>
</table>

Net Capacity = 5438 MW
Total Load = 5438 MW
2022 & 2020 Heat Wave Comparisons

2022 Heat Wave
- August 31 – September 12
  - ETS Response Level: 1 -> 2
  - Peak Temp: 112°F
  - Major Event Day (MED): None

2020 Heat Waves
- September 5 – September 9
  - ETS Response Level: 3
  - Peak Temp: 118°F
  - Major Event Day (MED): Sep 5-6
- August 14 – August 22
  - ETS Response Level: 1
  - Peak Temp: 112°F
  - Major Event Day (MED): None
Outage Breakdown by Code Group

- **67% (~304)** of outages were impacted by weather (extreme heat)
  - Transformers
  - Fuses
  - Cutouts
  - Jumpers

- Averaged **~195 outages/month** from Sept ‘21 – Aug ‘22

- **~150% increase** in outages due to extreme heat
Power System Daily SAIDI

- **System Average Interruption Duration Index**
  - Average outage duration (minutes) a customer experiences per year

- **SAIDI total during heat wave: 21**
  - 87% of SAIDI from **8/31-9/30**
  - 17% of rolling annual SAIDI (121.02)

- **5 of the 10 worst outages** during the heat wave occurred on **September 9**
2020 & 2022 HEAT WAVES

• In comparison, the **Sep 5 – 9, 2020 heat wave impacted more customers in a smaller period of time** than the 2022 heat wave
• The 2022 heat wave outages **were localized outages** affecting a smaller subset of customers for short durations of time
• Fuses, transformers, cutouts, and jumpers were the majority of the equipment failures during the 2022 heat wave
  • 72% of overhead transformer failures were 25KVA or less

RESILIENCE – LADWP STAFF, INFRASTRUCTURE, TECHNOLOGY, ADEQUACY
Questions?