LA100

ACHIEVING 100% RENEWABLE ENERGY IN LOS ANGELES

LA DWP

Scattergood Modernization Project

Responses to Questions from Energy & Environment Committee

February 3, 2023

LA DWP Los Angeles Department of Water & Power

Scattergood Modernization Project: Presentation Overview

- **Background**

- **Energy & Environment Committee Questions**

1. Project Overview
2. Project Alternatives
3. Health and Safety
4. Public Engagement
5. Hydrogen's Role in 100% Carbon Free
6. Technology Readiness
7. Water Needs

Common Investments Across All LA100 Scenarios

Electrification
Efficiency
Flexible Load

Customer
Rooftop Solar

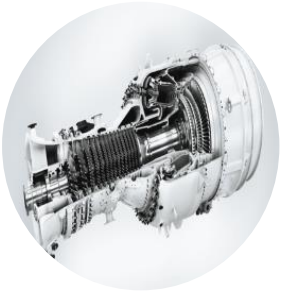
Renewable
Energy

Solar: + >5,700 MW
Wind: + >4,300 MW

Storage

+ >2,600 MW

Transmission,
Distribution



Renewably Fueled
Dispatchable
Turbines

+>2,600 MW
(in basin)

Much More

Natural Gas → Biofuel/ Hydrogen	
Today: Daily	**Future:** Infrequently

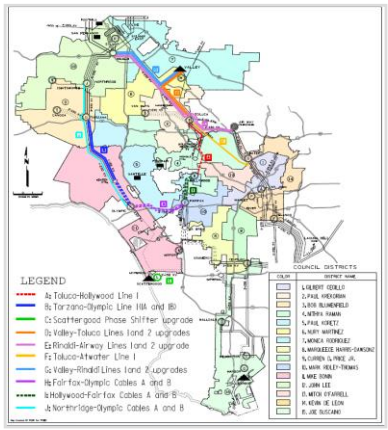
LA100 Next Steps – Progress to Date

80% Renewable by 2030

Red Cloud Wind: 331 MW in-service Dec 2021
Eland Solar + Storage: 2023 commercial operation
Local Solar: 602 MW in-service to date

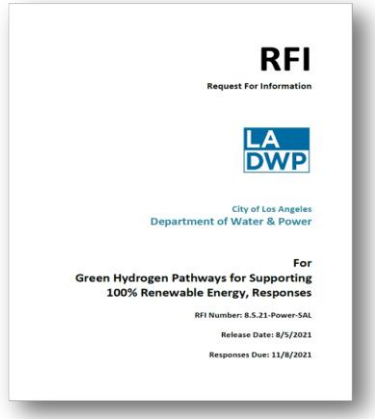
Transmission

Toluca to Hollywood Line 1 permitting in process
Tarzana to Olympic Line 1 permitting in process
Biweekly Implementation Meetings



Local Generation

Green hydrogen Request for Information (RFI) issued
Scattergood hydrogen capacity and **Haynes recycled water**
Seeking external funding opportunities for green hydrogen



Energy Storage

Installed or contracted **333 MW of energy storage for 2023**
Maximize use of solar + storage **Investment Tax Credits**
Scattergood energy storage conceptual plans

Equitable DERs

LA100 Equity Strategies Study on-going through 2023
Expanded **Feed-in Tariff** from 150 MW to 450 MW, advertised **DER RFP**, launched thermostat **demand response** program

Energy & Environment Committee Questions

1. Project Overview
2. Project Alternatives
3. Health and Safety
4. Public Engagement
5. Hydrogen's Role in 100% Carbon Free
6. Technology Readiness
7. Water Needs

1. Project Overview

"An overview of the Scattergood Generating Station Green Hydrogen project"

- Scattergood Generating Station (SGS) is one of four in-basin power plants owned and operated by LADWP
- SGS is located just south of LAX and Hyperion Water Reclamation Plant
- LADWP's existing in-basin power plant capacity totals 3,600 MW
- Of that 3,600 MW, SGS accounts for 876 MW of in-basin natural gas capacity
- LADWP must decommission SGS Units 1 & 2 in 2024
- SGS capacity is the most immediate need
- **LA100 identified a need renewably-fueled long duration capacity at or near all of LADWP's existing power plants**

1. Project Overview

"An overview of the Scattergood Generating Station Green Hydrogen project"

- **Proposed ordinance pending before Council is for the approval of the contractual methodology, enabling the LADWP Board of Water & Power Commissioners to proceed with a Request for Proposals**
- **Engineering, Procurement, and Construction contract structure is proposed**

Future Scattergood Modernization Project Overview

- Combined Cycle and Balance-of-Plant Equipment
- 346 megawatts (MW) capacity
- Hydrogen Ready
- Estimated Cost: $800M
- In-Service Date: 12/30/2029

2. Project Alternatives

"Potential alternatives to the project including fuel cells, multi-day demand response programs, long-duration energy storage, and others"

- LADWP operates 4 in-basin power plants
  - Totaling 3,600 MW of natural gas fueled capacity

- LA100 Study: LADWP must have in-basin capacity and could be achieved with:
  - Natural gas with renewable offsets
  - Biofuels
  - Green Hydrogen

- LA100 attempted to envision a 100% carbon free future without in-basin capacity

2. Project Alternatives

“No combustion” modeled by NREL and by LADWP

- LA100 Study: significant implementation feasibility challenges, not resilient, more expensive
- Strategic Long-Term Resource Plan: fuel cell scenario without local combustion

Fuel cells

- Significantly more expensive, requires significantly more space, not been demonstrated at utility scale
- May be a viable option at other locations
- Will continue to be a candidate resource for future power plans

Long Duration Energy Storage

- LADWP launched RFP in 2021 and is currently evaluating proposals
- Duration, space constraints, and technology maturity are potential challenges

Multi-day Demand Response

- LA100: “has not been deployed and tested at scale” and must be concentrated near existing power plants
- A potential resource for LADWP in the future

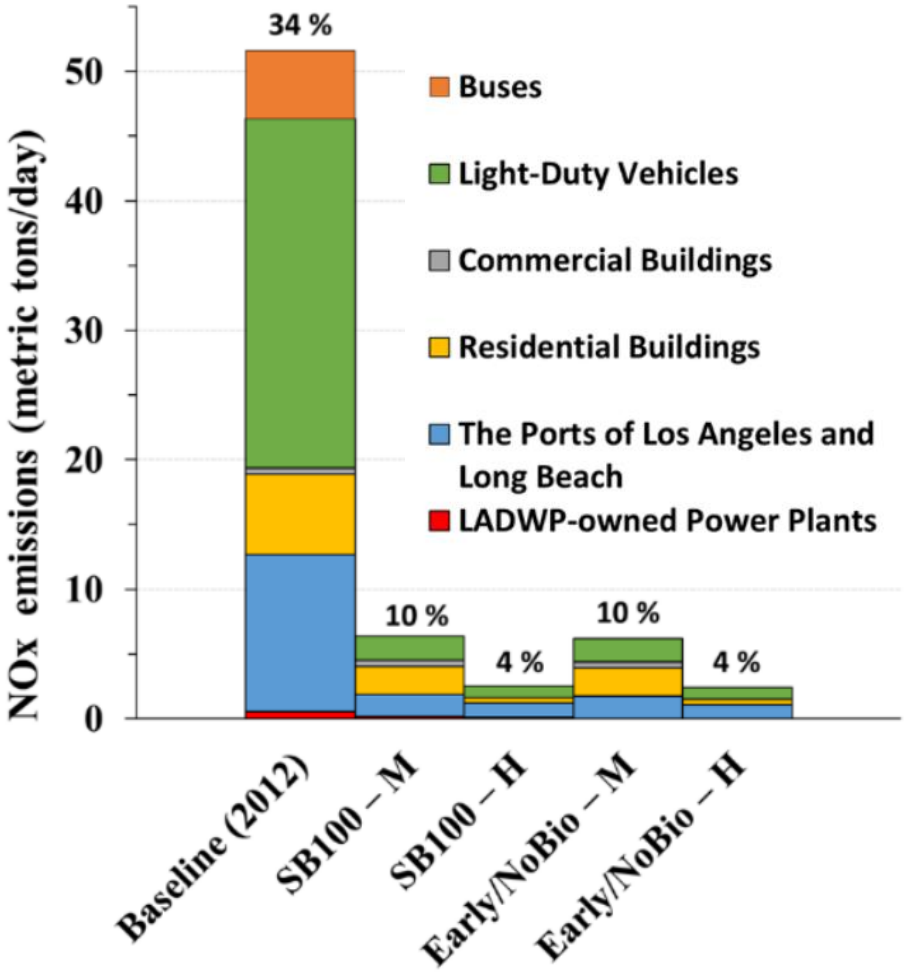
Distributed Energy Resources: continued significant investment and deployment are required for LADWP’s carbon free future.

3. Health and Safety

"The public health and safety impacts or risks of producing, transporting, storing, and combusting green hydrogen, including emissions of NOx and other pollutants"

- LADWP will prioritize safety of staff, community, and assets
- Commitment to safety throughout all phases, including procurement, design, implementation, and operation
- Compliance with Federal, State, and Local codes and standards, including:
  - National Fire Protection Association (NFPA) 2 – Hydrogen Technologies Code
  - American Society of Mechanical Engineers (ASME) 31.12 – Hydrogen Piping & Pipelines

LA100 Scenario NOx Emissions Reductions



- LA100 Study 2012 Baseline: LADWP's in-basin plants contributed 0.4% of NOx emissions citywide
- Contribution of LA100-influenced sectors to **annual average emissions** in Los Angeles based on 2012 Baseline
- LA100 scenarios could lead to **citywide reductions** in major air pollutant emissions including oxides of nitrogen (NOx)
- Significant NOx reductions modeled by LA100 and by Strategic Long-Term Resource Plan

4. Public Engagement

"The public engagement process for the project conducted to date and the planned public engagement process in the future, including with Neighborhood Councils"

LA100's Advisory Group

- Extensive three-year engagement process: 2017 – 2021
- 47 Advisory Group Member Organizations
- Public Community Outreach

Annual Strategic Long-Term Resource Plan (SLTRP)

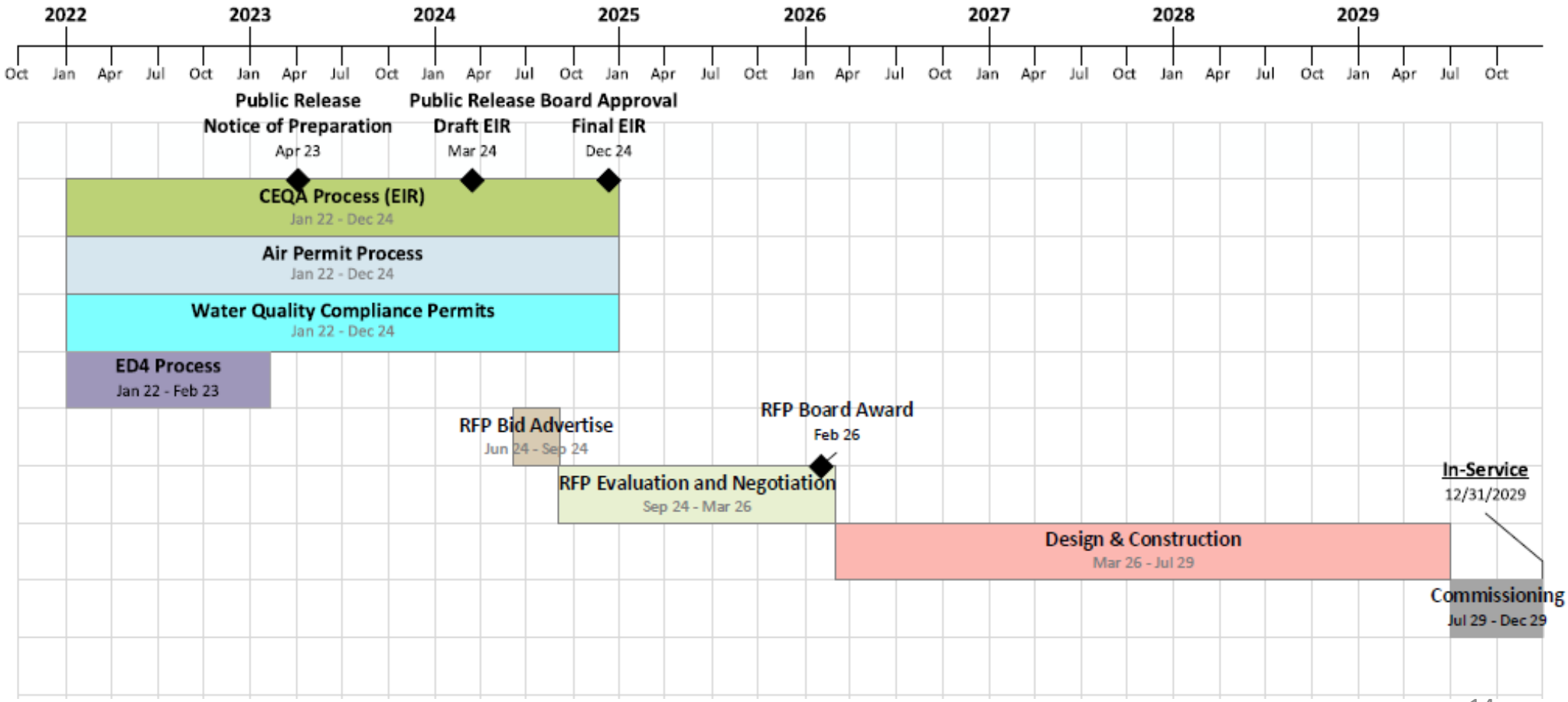
- 2022: 11 Total AG Meetings and 3 Public Meetings

Early Stakeholder Engagement on Scattergood

CEQA & Public Involvement

● Opportunities for public input

CEQA & Public Involvement

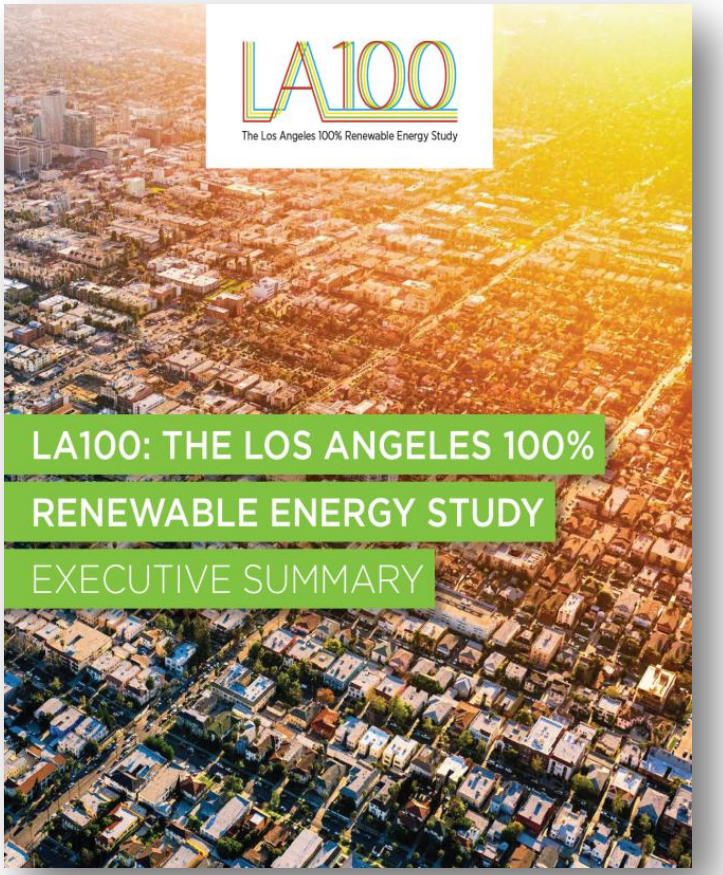


5. Hydrogen's Role in 100% Carbon Free

"The role of green hydrogen at large in the City's transition to 100% renewable energy"

Why Invest in Renewably Fueled Turbines if Infrequently Used in the Future?

- **"The challenge of addressing the seasonal mismatch of supply and demand.** Demand peaks in August and September, but wind and solar generation peaks earlier in the year."
- "The risks associated with relying on transmission lines to bring wind and solar energy to the city. **Fires and earthquakes could affect these transmission lines, so LA needs to have energy that can be stored locally that can produce electricity for extended periods of time when needed**."
- "The limitation of the city's local transmission network— it is difficult and expensive to upgrade transmission infrastructure that could help import renewable energy through the north side of the LA system to other locations in the city."
- LA100 Study report, Executive Summary, pg. 29

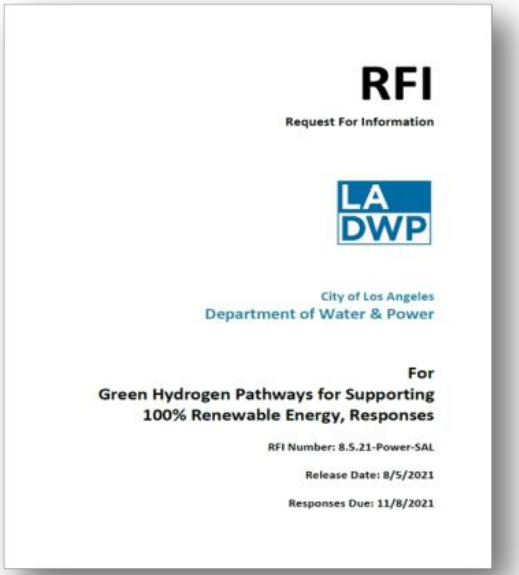


6. Technology Readiness

"An assessment of the commercial readiness of technology to produce, store, and transport green hydrogen at scale"

- Green Hydrogen RFI
- HyDeal LA
- Bipartisan Infrastructure Law's H2 Hub opportunity
- Ongoing partnership with the Electric Power Research Institute
- Intermountain Power Project Green H2
- New York Power Authority successfully demonstrated up to 44% H2 capability

EPRI ELECTRIC POWER RESEARCH INSTITUTE


RFI

Request For Information

LA DWP

City of Los Angeles
Department of Water & Power

For
Green Hydrogen Pathways for Supporting
100% Renewable Energy, Responses

RFI Number: 8.S.21-Power-SAL

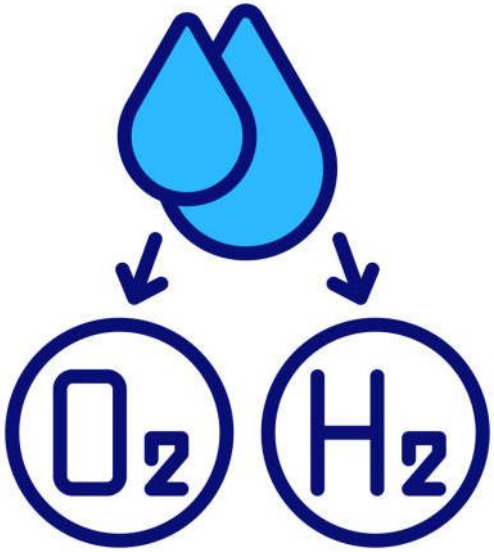
Release Date: 8/5/2021

Responses Due: 11/8/2021

7. Water Needs

"The water needs of producing green hydrogen and the sources for that water, including timing of that water supply"

- LADWP does not currently plan to produce hydrogen but it recognizes the importance of the full lifecycle implications of hydrogen production
- LADWP will prioritize disciplined and minimized water usage
- Preferred sources of water supply:
  - Recycled and Reclaimed water
- Timing of water needs:
  - Hydrogen producers may determine production based on available excess renewable generation
  - Scattergood hydrogen readiness upon commissioning and plans to transition to 100% H2 capability by 2035



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Thank you

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LA City Council motions 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: How can LADWP reach 100 carbon free?

Each Scenario Evaluated Under Different Customer Demand Projections (different levels of energy efficiency, electrification, and demand response)

- Moderate
- High
- Stress

SB100

Evaluated under Moderate, High, and Stress Load Electrification

- 100% clean energy by **2045**
- Only scenario with a target based on retail sales, not generation
- Only scenario that allows up to 10% of the target to be natural gas offset by renewable electricity credits
- Allows existing nuclear and upgrades to transmission

Early & No Biofuels

Evaluated under Moderate and High Load Electrification

- 100% clean energy by **2035**, 10 years sooner than other scenarios
- No natural gas generation or biofuels
- Allows existing nuclear and upgrades to transmission

Limited New Transmission

Evaluated under Moderate and High Load Electrification

- 100% clean energy by **2045**
- Only scenario that does not allow upgrades to transmission beyond currently planned projects
- No natural gas or nuclear generation

Transmission Focus

Evaluated under Moderate and High Load Electrification

- 100% clean energy by **2045**
- Only scenario that builds new transmission corridors
- No natural gas or nuclear generation

6. Technology Readiness

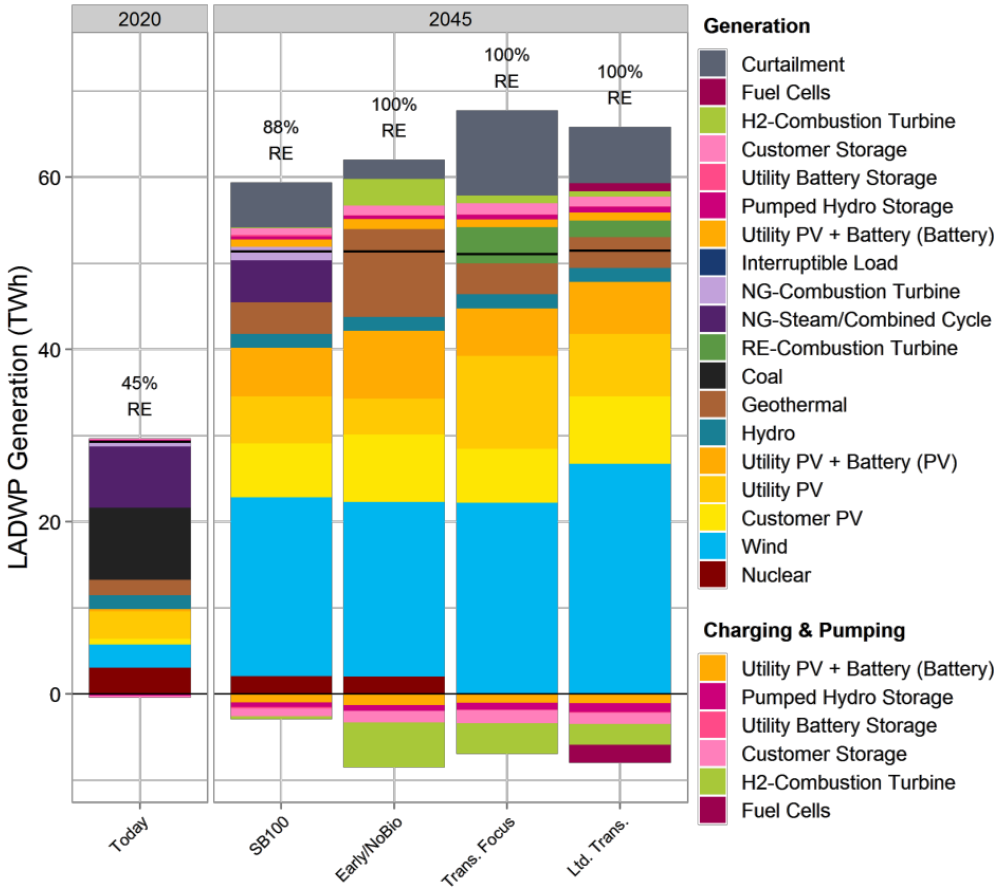
"An assessment of the commercial readiness of technology to produce, store, and transport green hydrogen at scale"

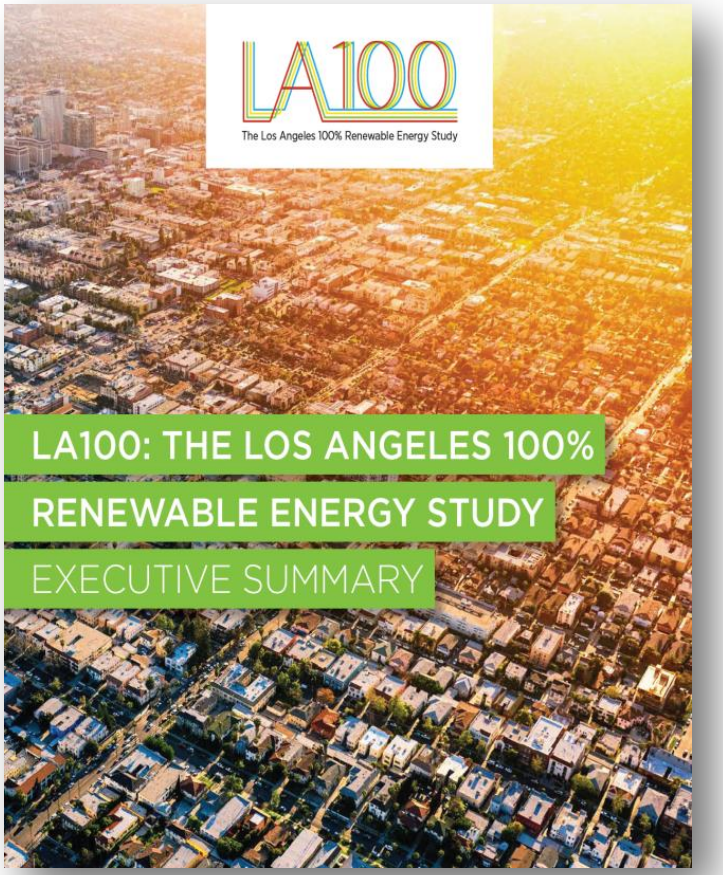
Type	Medium	TRL	Type	Medium	TRL
Thermal	Silicon	5	Thermal	Gravel	3
Mechanical	Compressed Air	9	Chemical	Hydrogen	7
Electrochemical	Lead	8	Mechanical	Air	2
Mechanical	Gravitational	6	Mechanical	Compressed Air	4
Thermal	Ceramic	2	Electrochemical	Lithium Ion	9
Thermal	Ceramic	5	Electrochemical	Lithium Ion	9
Mechanical	Flywheel	7	Electrochemical	Lithium Ion	9
Electrochemical	Liquid Metal	4	Electrochemical	Lithium Ion	4
Thermal	Carbon	3	Thermal	Liquid Salt	4
Mechanical	Compressed Air	7	Thermal	Silicon	3
Mechanical	Flywheel	9	Thermal	Liquid Salt	9
Thermal	Aluminum Phase Change	3	Thermal	Liquid Salt	2
Thermal	Rock	5	Mechanical	Water	6
Thermal	Concrete	4	Mechanical	Steel	3
Electrochemical	Lithium Ion	6	Thermal	Sand	5
Mechanical	Compressed Air	9	Electrochemical	Sodium Ion	9
Thermal	Heat Transfer Fluid	3	Electrochemical	Sodium Sulfur	8
Thermal	Sulfur	4	Electrochemical	Lithium Ion	6
Thermal	Concrete	6	Electrochemical	Lithium Ion	8
Mechanical	Concrete	4	Chemical	Thermochemical Redox	4
Mechanical	Compressed Air	4	Mechanical	Compressed Air	8
Mechanical	Gravitational	3	Mechanical	Steel	9
Mechanical	Flywheel	4	Chemical	Metal Hydride	6
Mechanical	Liquid Air	7	Electrochemical	Flow Battery	8
Chemical	Hydrogen	7	Electrochemical	Metal Air	8
Mechanical	Compressed Air	6	Electrochemical	Flow Battery	8

Source: EPRI

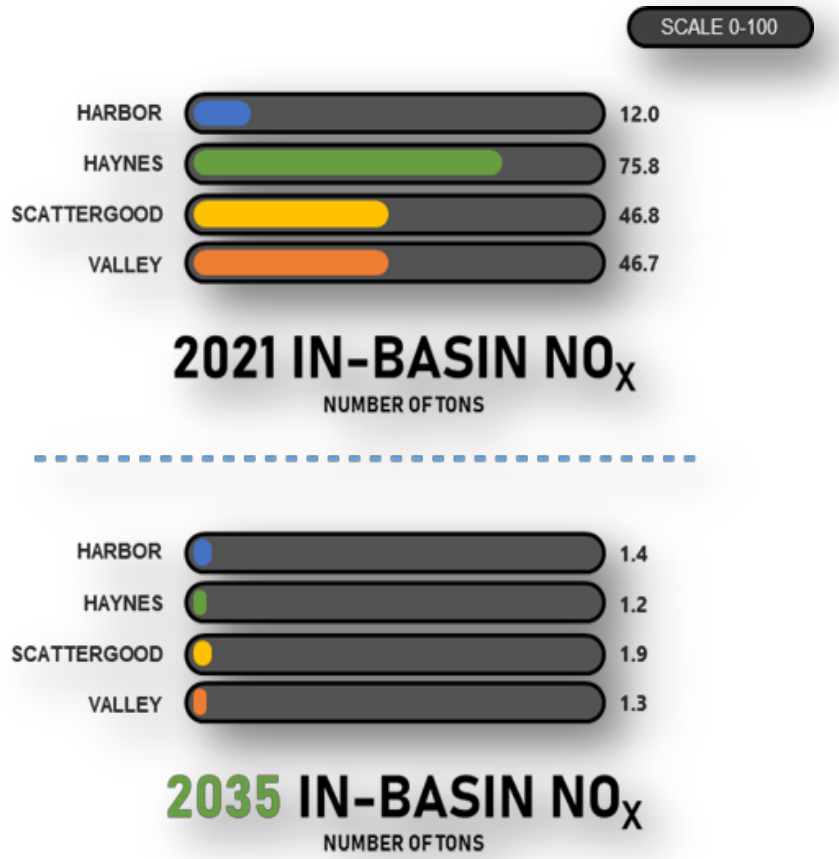
5. Hydrogen's Role in 100% Carbon Free

"The role of green hydrogen at large in the City's transition to 100% renewable energy"





In-Basin Power Plant NOx Emissions Reductions



- Contribution of LA100-influenced sectors to **annual average emissions** in Los Angeles based on 2012 Baseline
- LA100 scenarios could lead to **citywide reductions** in major air pollutant emissions including oxides of nitrogen (NOx) and fine particulate matter (PM2.5)
- Emission reductions in SB100 scenarios are due to increased **electrification**.

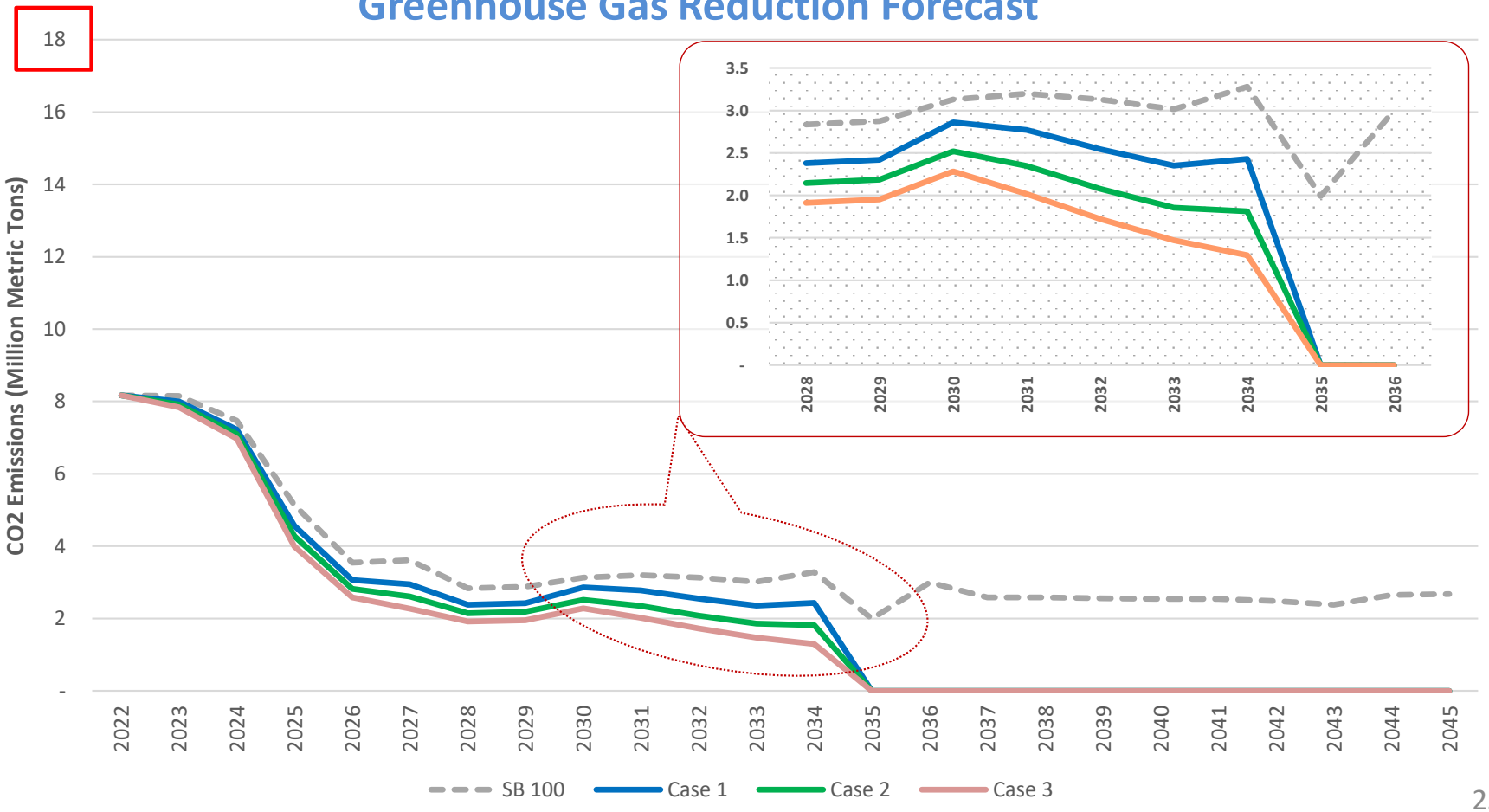
LA100 Next Steps – Investments Began in 2021

Accelerate to **80% Renewable 97% GHG-Free by 2030**	**Increase to 80% renewable energy by 2030** to achieve 97% GHG free by adding **3,000 MW of new renewables**.
Accelerate **Transmission**	Complete **10 critical transmission projects over 10 years** to maintain grid reliability and meet growing EV, building electrification, LAX, and Port of LA electricity demand
Transform **Local Generation**	**Green hydrogen Request for Information** (RFI) for all in-basin generating stations. Construct **hydrogen capacity at Scattergood**. Retrofit **Haynes to recycled water cooling**.
Accelerate **Energy Storage**	Build over **1,000 MW of energy storage by 2030** to support capacity needs.
Accelerate **Distributed Energy Resources Equitably**	Deploy **1,000 MW of local solar, 500 MW of demand response**, doubling energy efficiency, and support 580,000 electric vehicles by 2030. Adopt goal of **50% of DER investment reaching disadvantaged communities**.

2022 Power Plan Core Cases

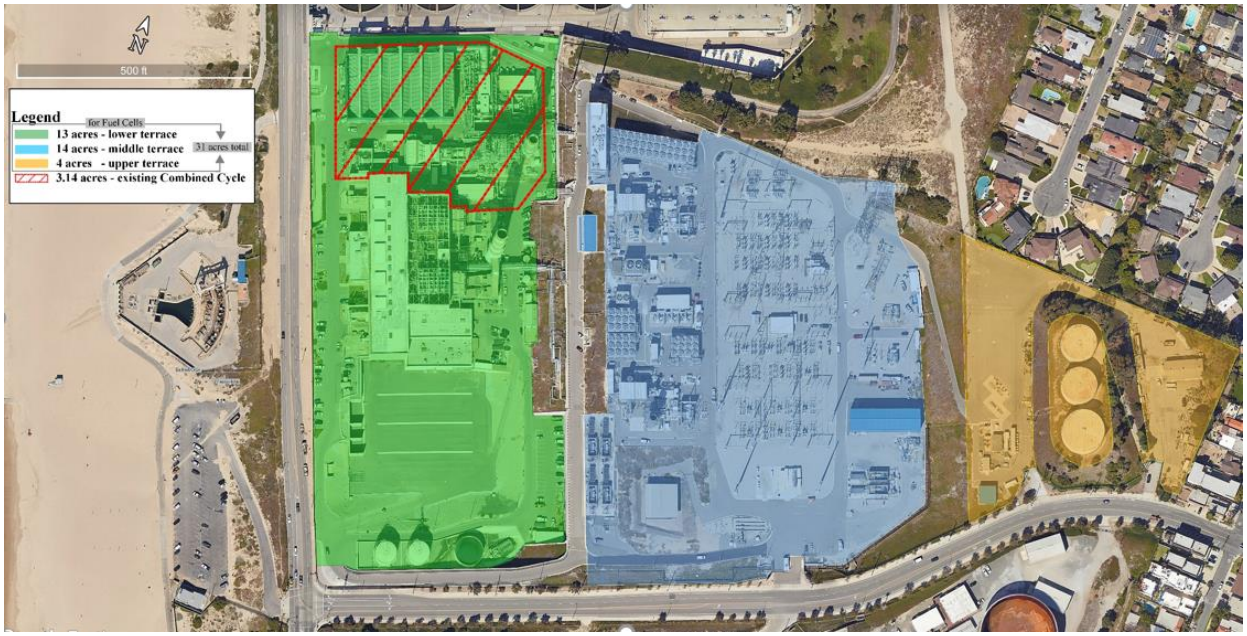
Greenhouse Gas Reduction Forecast

1990 baseline levels = 17.9 MMT



2. Project Alternatives: Fuel Cells

- Fuel Cells were evaluated as a non-combustion alternative through LADWP's Strategic Long-Term Resource Plan (SLTRP)
- Significantly more expensive
- Requires more space; not feasible at SGS
- Technology less mature than combined cycle
- Utility-scale fuel cells have never been demonstrated



2. Project Alternatives: LA100 on No Combustion

- Through the LA100 process, NREL attempted to model a scenario without in-basin combustion
- This scenario resulted in the following outcomes
  - Increased out-of-basin combustion by approximately 1,600 MW (i.e. new power plants)
  - Required 14 square miles of ground mounted solar (in addition to needed rooftop solar)
  - New in-basin transmission; 5 new in-basin transmission lines
- This no-in basin combustion scenario resulted in the inability to serve load (i.e. maintain reliability) during low frequency, high impact events such as wildfires, earthquakes, and heat storms
- These findings were communicated through the LA100 Advisory Group process as well as through LADWP's most recent Strategic Long-Term Resource Plan (SLTRP) Advisory Group process

2. Project Alternatives: Multi-day Demand Response

- Demand Response (DR) is a valuable resource providing up to 4 hours of load reduction during heat storms and other emergencies
- LADWP continues to invest significantly in DR and other local resources
- LA100 noted multi-day DR could be a resource to help meet long duration capacity needs
- LA100: multi-day DR “has not been deployed and tested at scale”
- Resources must be located adjacent to existing power plants

Recent Significant Efforts on DERs

Local Solar

- **Expanded FiT** from 150 MW to 450 MW; additional 50 MW request to Board under development
- **Record Rooftop Solar Adoption**: In the last 18 months, ~23% of the total installed NEM capacity; total local solar: ***602 MW***
- **Green Access Program** for commercial renewable access (UCLA & USC)

Community Solar & Energy Efficiency

- **Utility-installed Solar Rooftops Program**
- **Shared Solar Low Income program expansion**
- **Launched VNEM Pilot Program**
- **Community Resiliency Program** under way
- **LA100 Equity Strategies** launched
- **Comprehensive Affordable Multifamily Retrofits (CAMR)** launched

Energy Storage & Demand Response

- **Launched FiT+** allowing energy storage; pilot expansion under way
- **Expanded Power Savers** (residential DR program); increased from 25 MW to 35 MW with ~40k customers; 2023 expansion underway
- **Commercial Energy Storage to Grid** under development

2. Project Alternatives: Long Duration Energy Storage

- Long Duration Energy Storage (LDES) is a critical element of LADWP's present and future power system
- Advertised Energy Storage RFP in 2021, requesting proposals in-basin and for long duration technologies and collaborated with industry to improve for LDES
- Actively seeking state and federal funding for LDES
- Technology Innovation Partnership with Electric Power Research Institute (EPRI) to assess long duration energy storage deployment strategies, technology readiness level, technical performance, and economic benefits
- Negotiated long duration project contract for 2 years, developer withdrew due to inability to deliver

Emphasis on Reducing Use of Valley Generating Station

- LADWP to dramatically reduce utilization of Valley Generating Station:
  - Today Valley is utilized 30% of the time
  - The combination of **80% renewables** by 2030, **Haynes recycled water cooling,** and **Scattergood capacity** reduces Valley usage
  - Valley usage to be reduced from 30% to 5% thereby reducing adverse impacts on the local community

- Utilize significant space at Valley Generating Station for future clean energy projects