



# Los Angeles: A Path to Net Zero Carbon



The background image is a composite of three distinct scenes related to renewable energy. On the left, a large array of solar panels is tilted towards the sun. In the center, several wind turbines are visible against a hazy, sunset-colored sky. On the right, a large, white, rectangular energy storage container sits on a gravel path. The container has a blue and white geometric logo and the words 'ENERGY STORAGE' printed on its side. The foreground is filled with tall, golden-brown grass, and the overall lighting is warm and atmospheric, suggesting the 'golden hour' of sunset or sunrise.

# LADWP AND HYDEAL LA OVERVIEW

# LADWP Overview

Balancing Authority

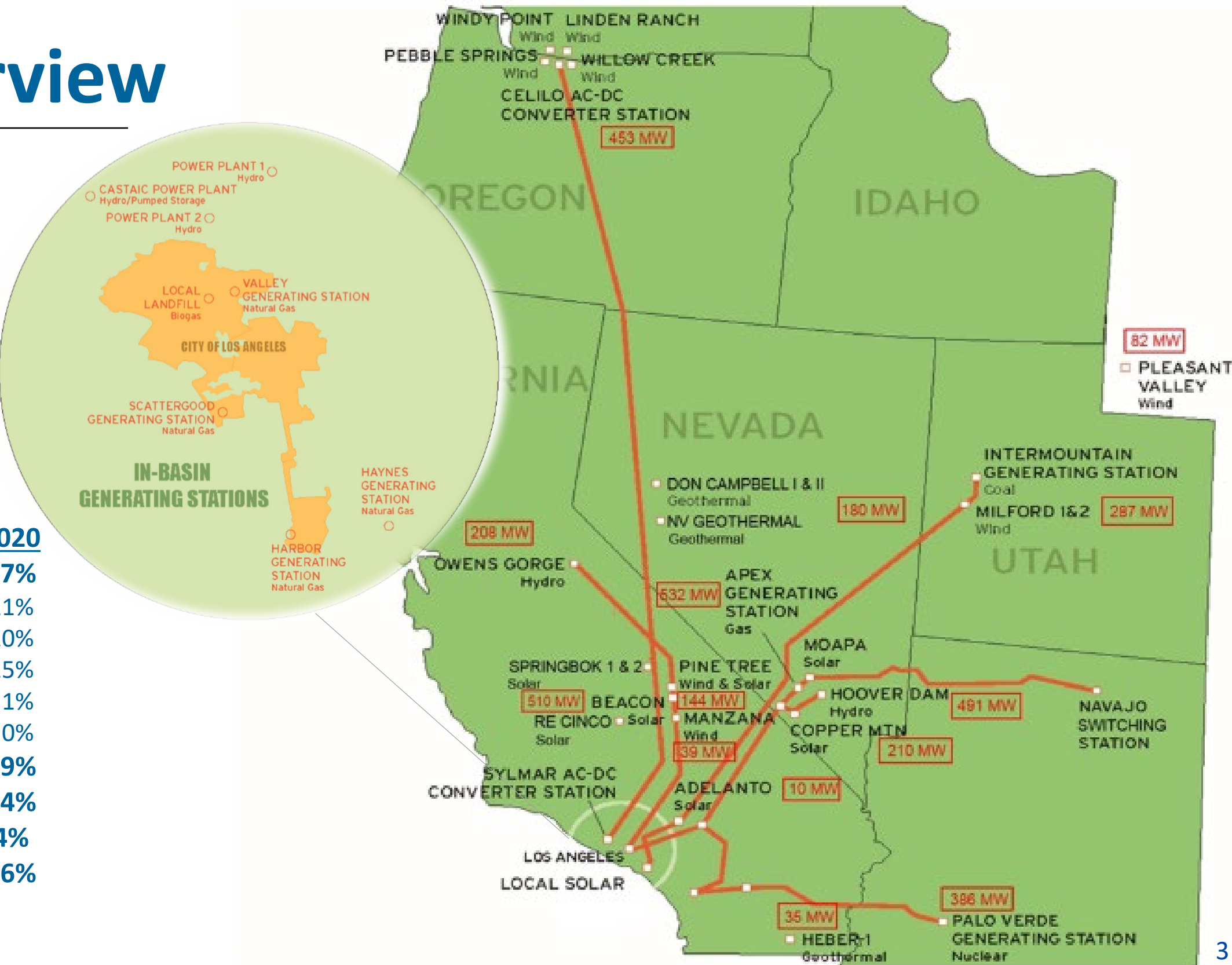
Largest Publicly Owned Utility

1.5 Million Electric Customers

\$4.7 Billion Annual Power Budget

Peak Demand of 6,502 MW (8/31/17)

	2019	2020
Renewable Energy	34%	37%
Wind	10%	11%
Geothermal	9%	10%
Solar	12%	15%
Eligible hydroelectric	3%	1%
Biomass & Biowaste	0%	0%
Natural Gas	27%	29%
Nuclear	14%	14%
Large hydro	4%	4%
Coal	21%	16%





# Clean Grid LA & LA100

## LA100

Determine investments needed achieve  
100% Renewables

## TARGETS

100% CLEAN ENERGY BY 2035

## CLEAN GRID LA

Replace 1660 MW by 2030

# HyDeal LA Vision: Become North America's first green hydrogen industrial hub at scale

LA will be the first in North America to...



Achieve 100% renewable electricity affordably and reliably



Decarbonize fuel refining and move to renewable fuels



Provide green hydrogen and its derivatives for shipping/aviation fuel and fertilizer



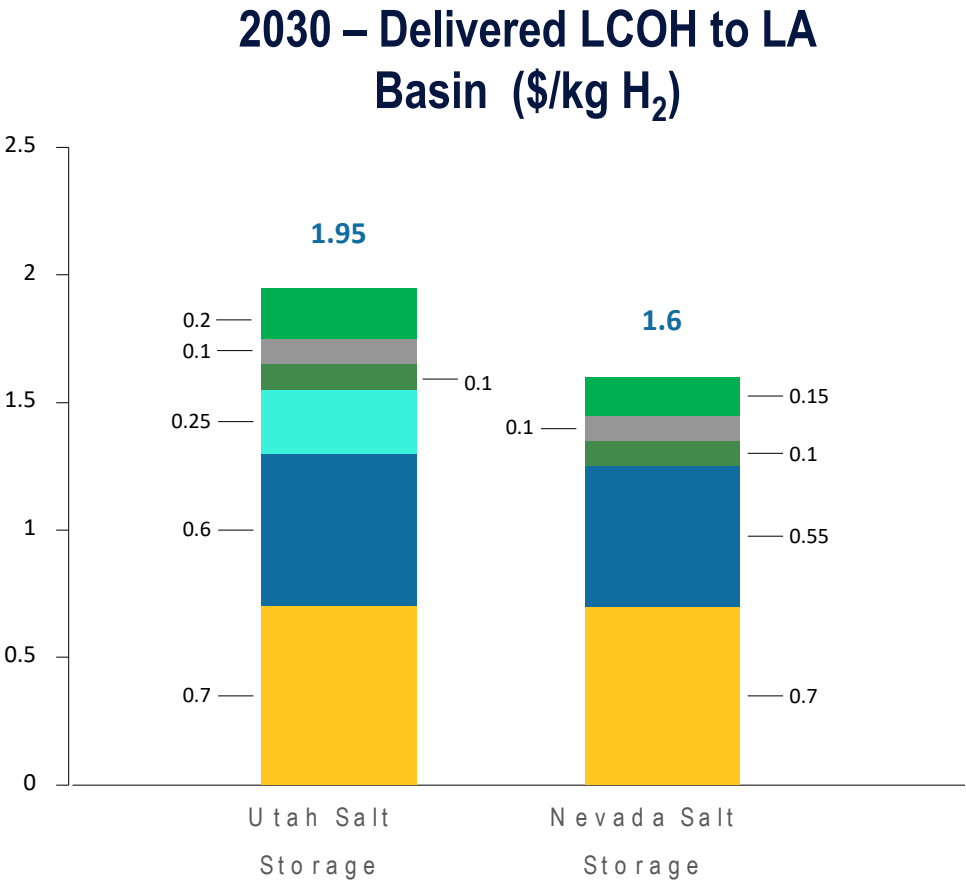
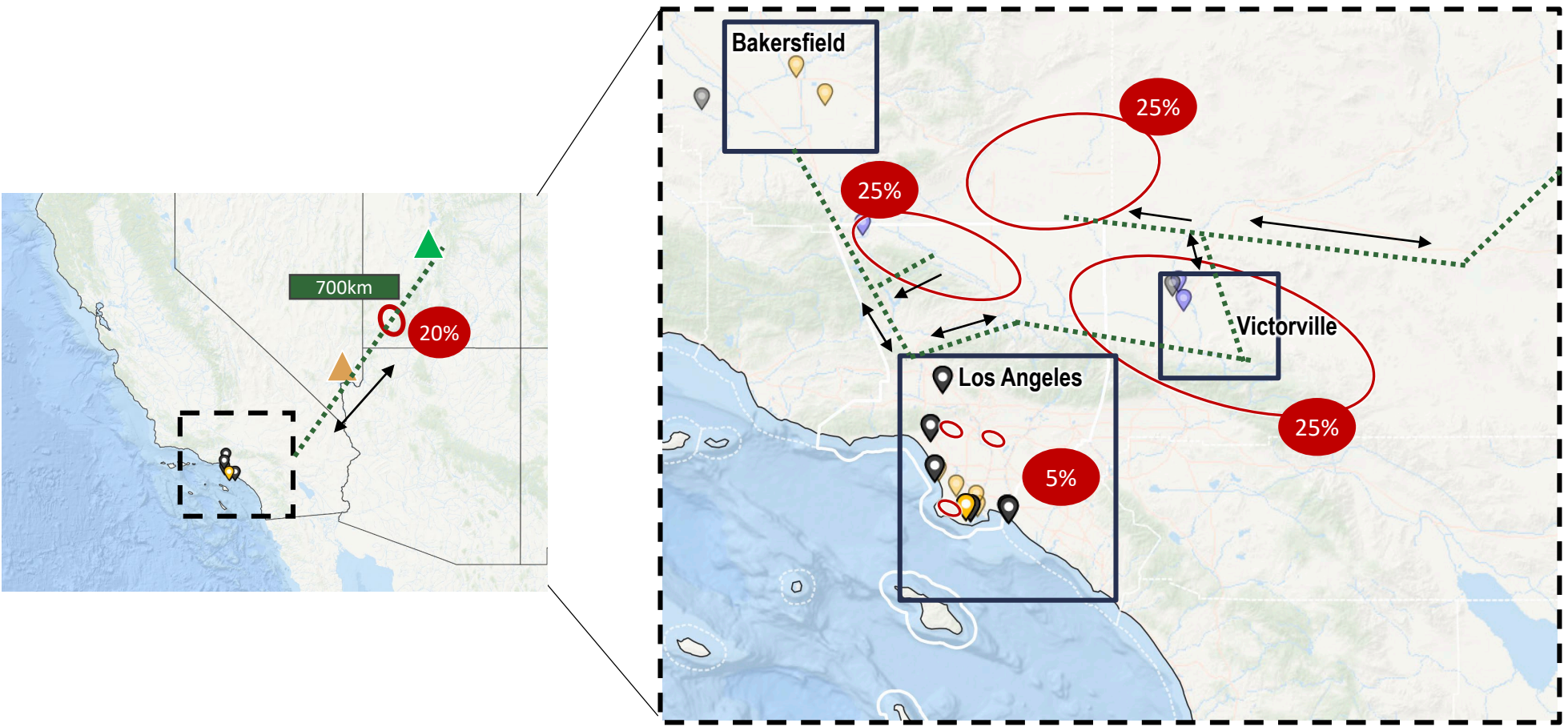
Demonstrate green hydrogen fuel cell passenger flight (e.g. Long Beach Airport to Sacramento)



Export low-cost green hydrogen at scale



# Sub \$2/kg mass-scale green hydrogen delivered to the LA Basin is feasible by 2030



- H2 off-takers area
- Qualified power plant
- Known storage sites – Salt Cavity
- TSOs potential routes (greenfield) – High-level design
- Area to produce and inject H2 into the H2 pipeline / x% total prod.
- Qualified and not-qualified refineries
- Possible storage sites
- Flow direction need
- Not-qualified cement plants
- Not-qualified power plants

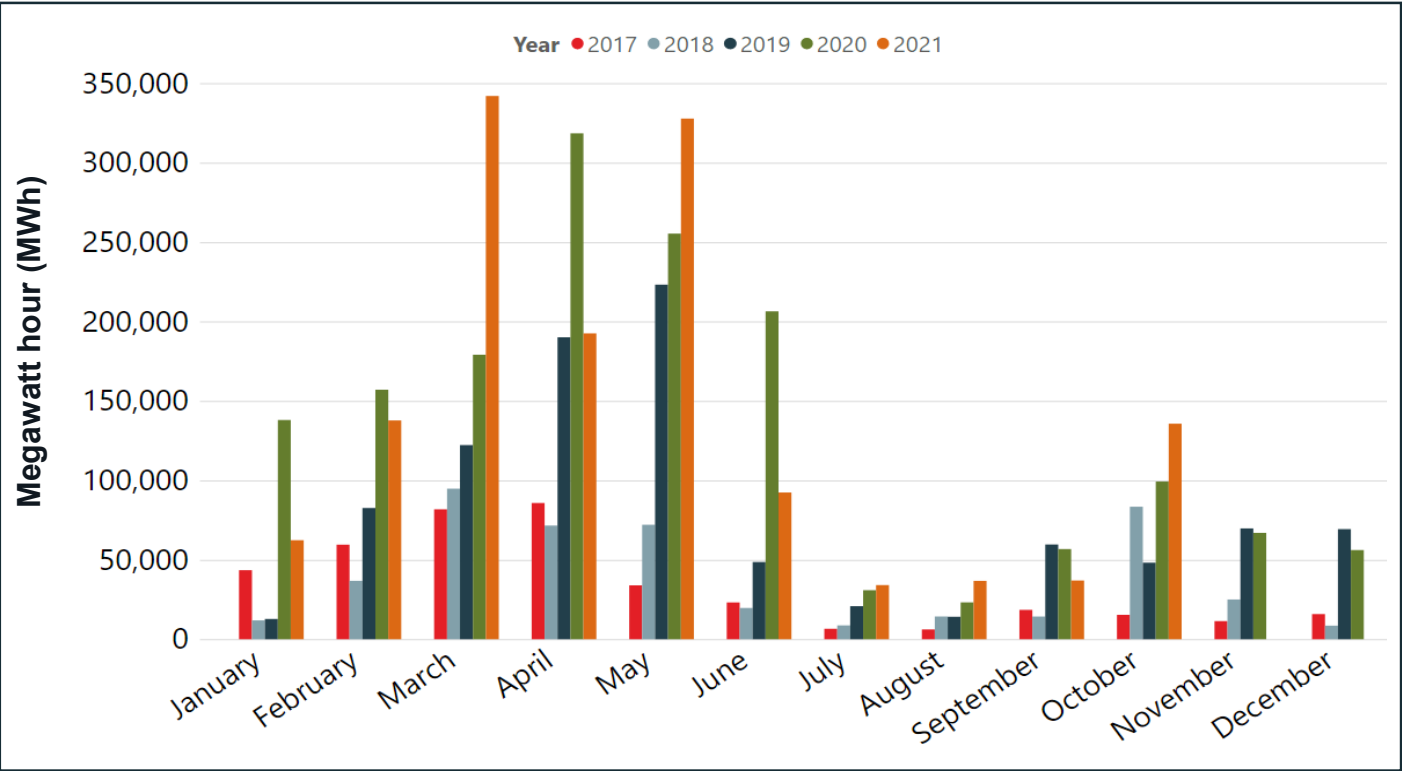
- Transport
- H2 Compression ad hoc
- Storage
- H2 Compression
- H2 Production
- PV



A composite image showing a landscape with solar panels in the foreground, several wind turbines in the middle ground, and an industrial facility in the background. In the right foreground, there is a large blue energy storage container with the words 'ENERGY STORAGE' and a logo on its side. The scene is set during sunset or sunrise, with a warm, hazy glow. The foreground is filled with tall, dark grass.

# MARKET NEED AND SUPPORTING TECHNOLOGY

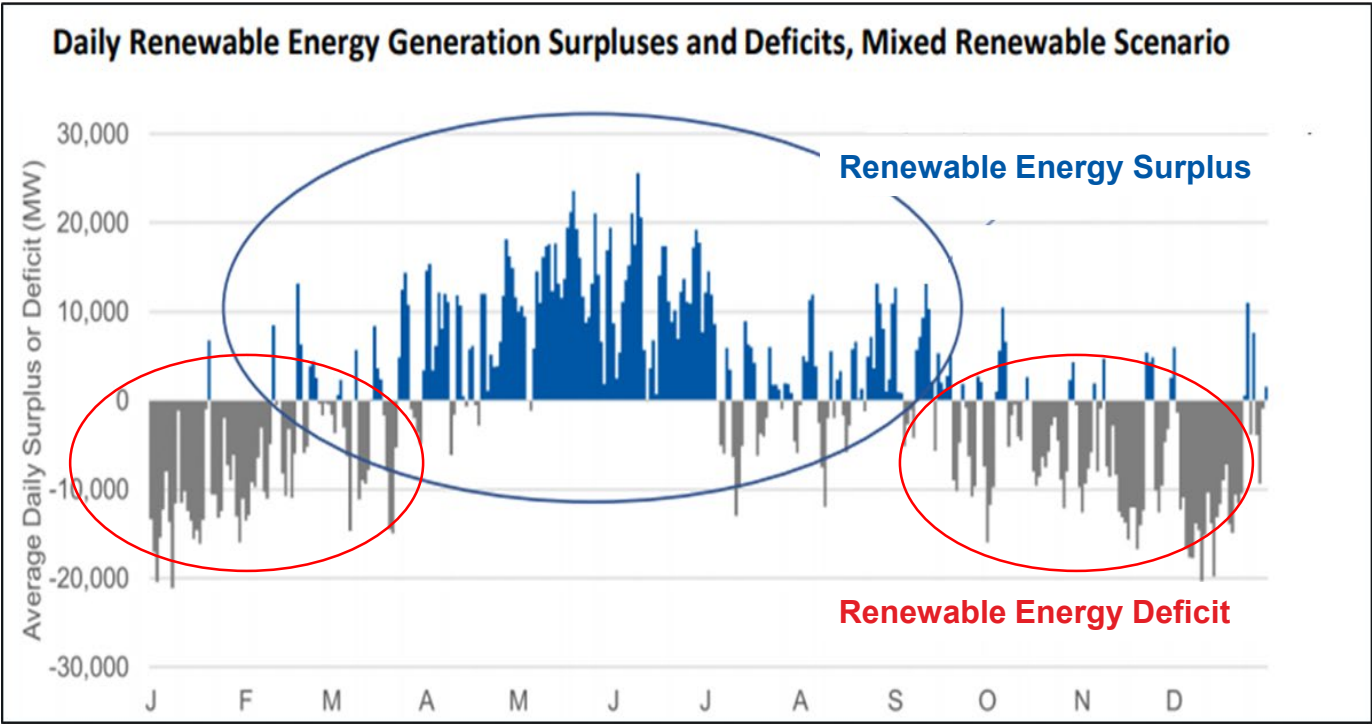
## CALIFORNIA WIND AND SOLAR CURTAILMENTS HIT RECORD HIGH IN MARCH 2021



Source: CAISO  
Data compiled Dec 2021  
<http://www.caiso.com/informed/Pages/ManagingOversupply.aspx>

At just 30% renewable integration, peak monthly curtailment exceeds 300,000 MWh

## CALIFORNIA SURPLUS AND DEFICIT PATTERNS UNDER A 100% RENEWABLE ENERGY SCENARIO



Seasonal surplus and deficits signal need for long-duration energy storage “beyond the duck curve”





**Lithium Ion**  
(<4 hours)



**Flow**  
(4-12 hours)



**Renewable Hydrogen**  
(>24 hours)

Commercial &  
Industrial

500 kW – 3 MW's

Renewables +  
Batteries

> 5 MW's

Utility Scale  
Energy Storage

> 5 MW's

Microgrids  
Fuel Cell + Solar Storage + ...

> 500 kW's

Gas Turbines +  
Batteries/H<sub>2</sub>

> 20 MW's

100% Hydrogen =  
**Zero CO<sub>2</sub> Emissions**

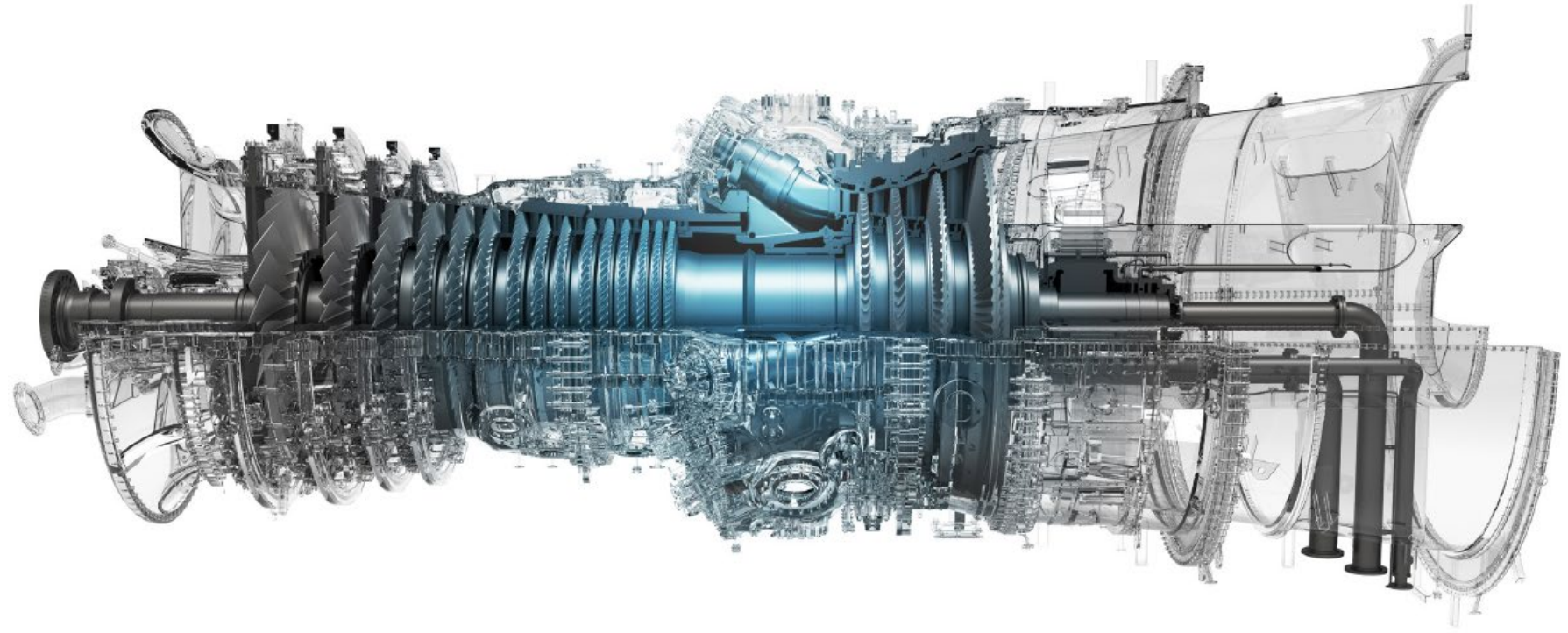
**BASED ON PROVEN AND COMMERCIALY  
DEPLOYED TECHNOLOGIES**

Over  
**3.5 MILLION**  
hours of H<sub>2</sub> turbine operation

First H<sub>2</sub> pipelines  
**1930's**

Large-scale  
electrolysis systems since  
**1940's**

First H<sub>2</sub> storage in salt caverns  
**1980's**

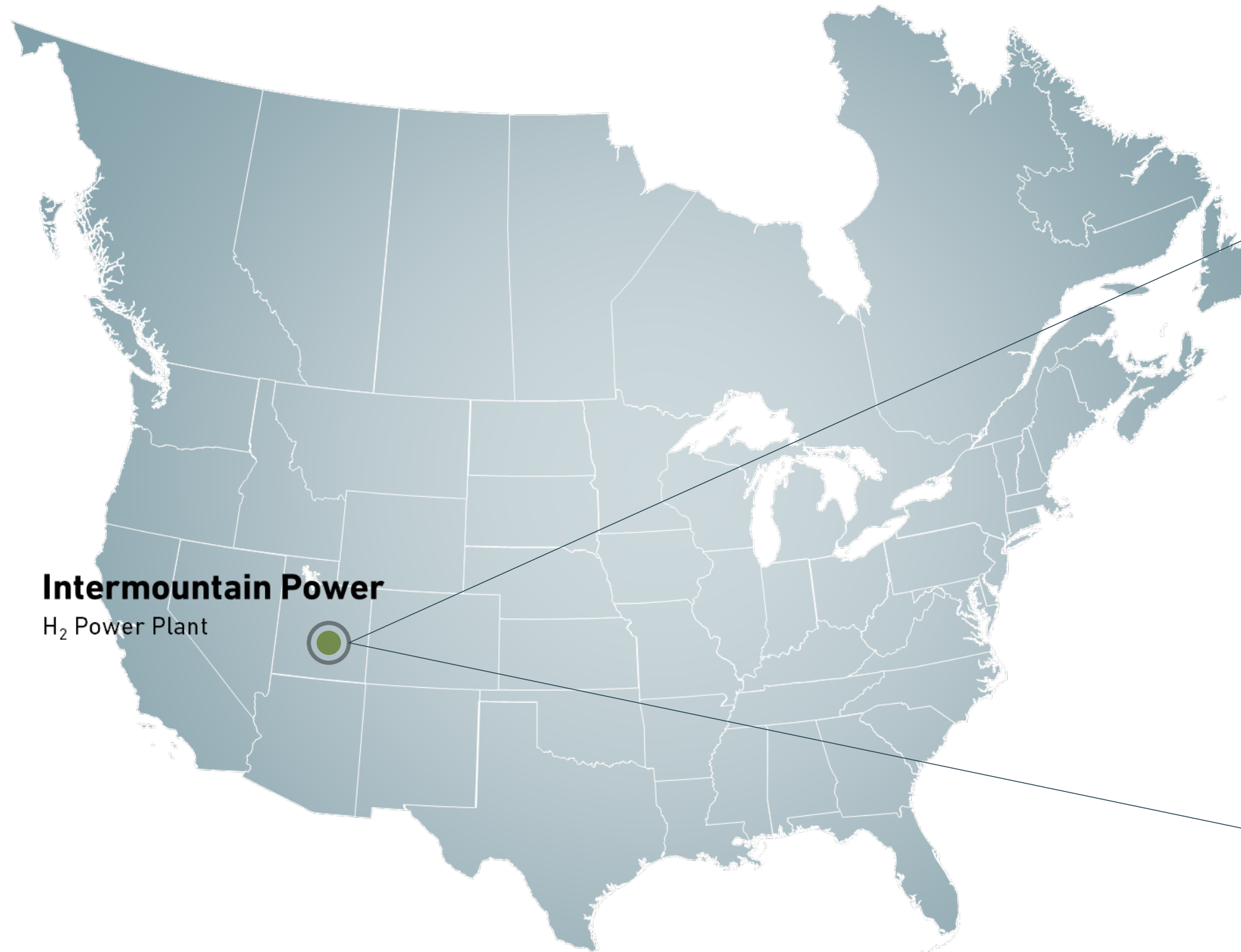






# MITSUBISHI POWER PROJECTS



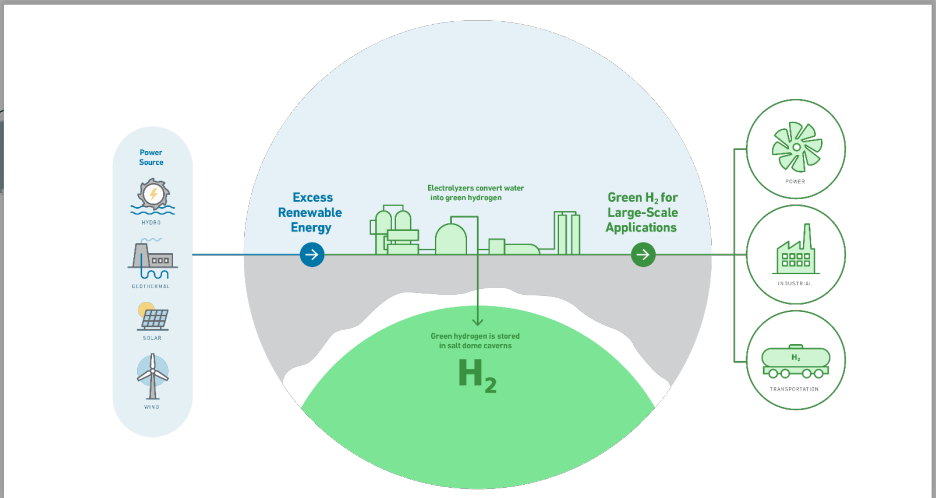


- \$1.9B Investment with FNTF
- 840 MW of reliable power
- 30% green hydrogen in 2025
- 100% green hydrogen no later than 2035





**Advanced Clean  
Energy Storage**  
Green H2 Production & Storage



- 150,000 MWh of clean energy storage
- Green Hydrogen Production, Storage, and Transportation

