



CUSTOMERS FIRST

L.A.'s Clean Energy Transition: 100% Renewable Energy Study

By LADWP General Manager David H. Wright

Power System Key Priorities



Safe & Reliable
Electric Service



Cost
Competitive
Rates



Environmental
Stewardship

LADWP's Power Grid

Local and out-of-basin
power generation and
transmission provide
reliable electricity for L.A.



Power Supply Transition

LADWP is transitioning to a clean energy supply for Los Angeles through major investments in:

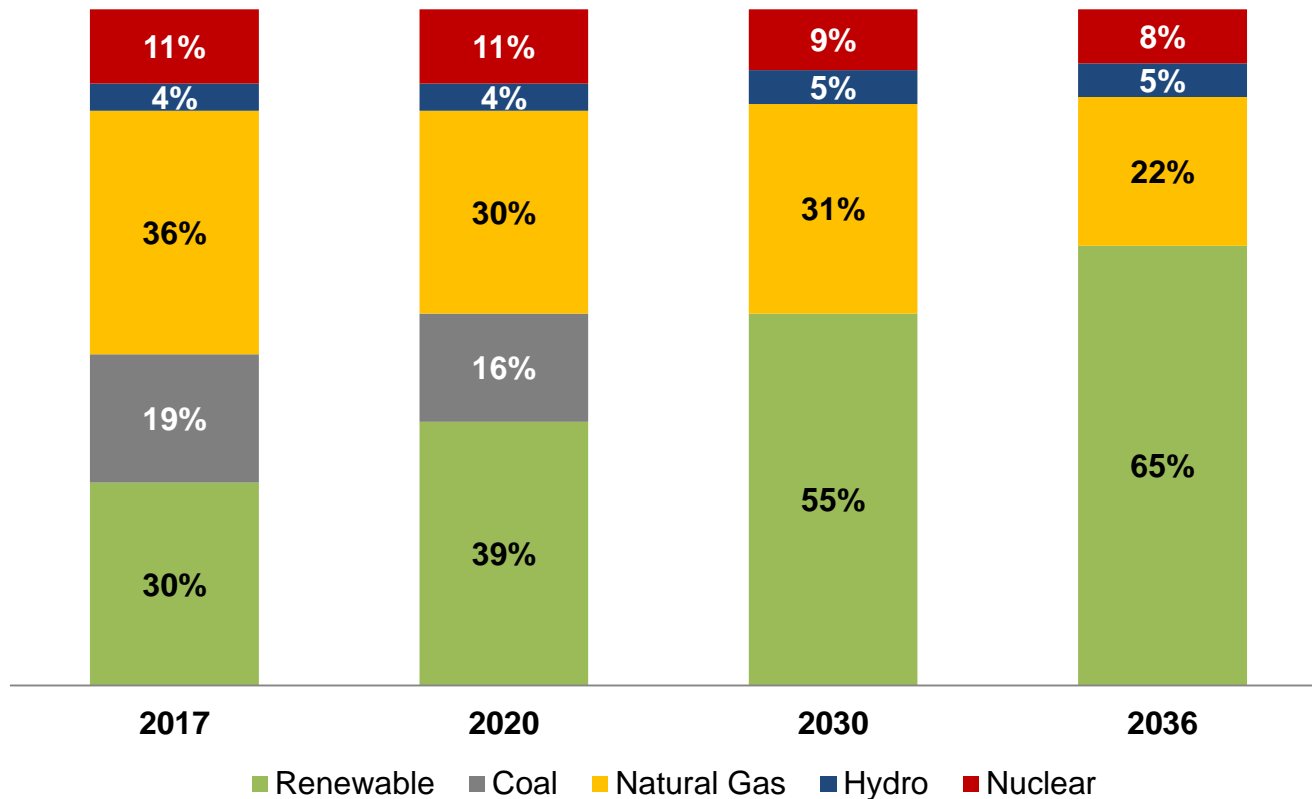
- Power Reliability
- Coal Transition
- Renewable Energy
- Energy Efficiency
- Electric Transportation
- Energy Storage
- Distributed Energy Resources (DER)



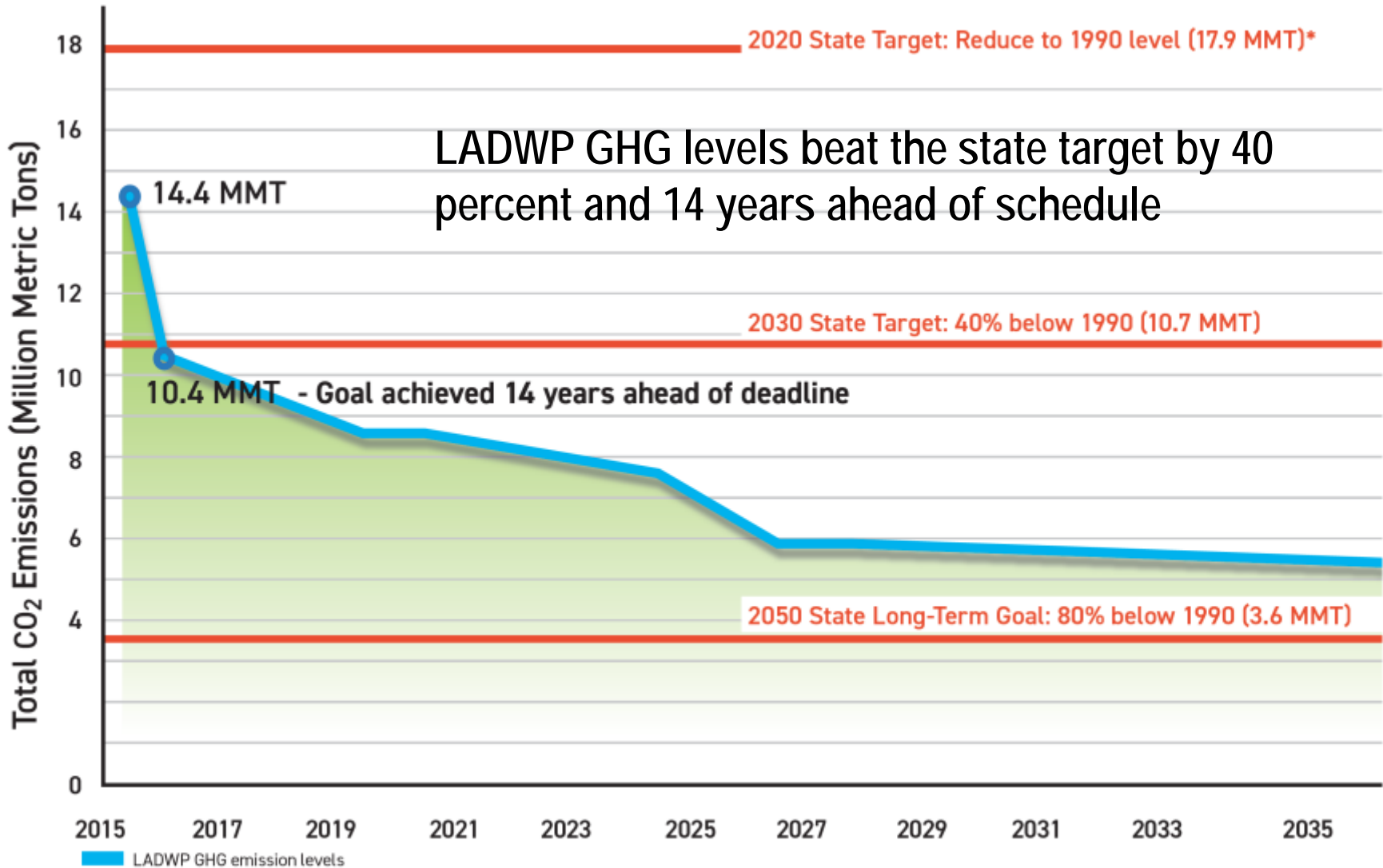
Clean Energy Successes

Achieved 30% Renewables in 2017—up from 6% in 2006

LA's Future Power Supply Is Coal-Free



Clean Energy Successes



*LADWP emissions have been below the 1990 level since 2002 (16.4 MMT), 18 years ahead of 2020 state target.

In 2025, LADWP will have reduced CO₂ emissions by 9.8 million metric tons, compared to the 1990 baseline level, equivalent to removing 2.1 million cars from the highway.

Clean Energy Successes in 2017-18



- Reduced GHG emissions to 47% below 1990 level
- 30% renewables for CY 2017
- 1,100 MW of large-scale solar
- >321 MW customer local solar (No. 1 Solar City in U.S. in 2017)
- 1,318 MW wind and geothermal power
- Commissioned Beacon 250 MW solar + 20MW lithium battery
- Moved forward with eliminating IPP coal by 2025
- 1,400+ EV chargers installed in L.A.
- Launching new Community Solar, Jan 2019

Clean Energy Transition Goals



- Invest in power grid reliability
 - \$800 million/year (Power System Reliability Plan)
- Eliminate coal by 2025 (early replacement of IPP)
- Achieve 33% RPS by 2020 (State RPS)
- Increase long-term RPS goals by 5% (70% by 2036);
- Achieve 900 MW local solar by 2025
- Achieve 15% energy efficiency by 2020; another 15% by 2027
- Implement 404 MW of energy storage by 2025
- Accelerate EV expansion (10,000 chargers in L.A.)

100% Renewable Energy Study



Los Angeles City Council Motion

Approved on September 16, 2016

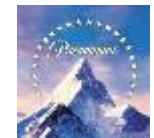
REQUEST the LADWP to report with a program to develop and implement a research partnership, utilizing relationships with the region's universities, members of the Southern California Public Power Authority, the California Independent System Operator, neighboring utilities and other stakeholders, with the objective of determining what investments should be made to achieve a 100 percent renewable energy portfolio for the LADWP.

100% Renewable Advisory Group

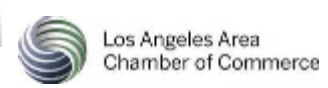
Provides necessary leadership and strategic guidance to working teams. The Advisory Group is comprised of two individuals from each represented organization, one primary member and one alternate member. The Advisory Group meets at least quarterly.



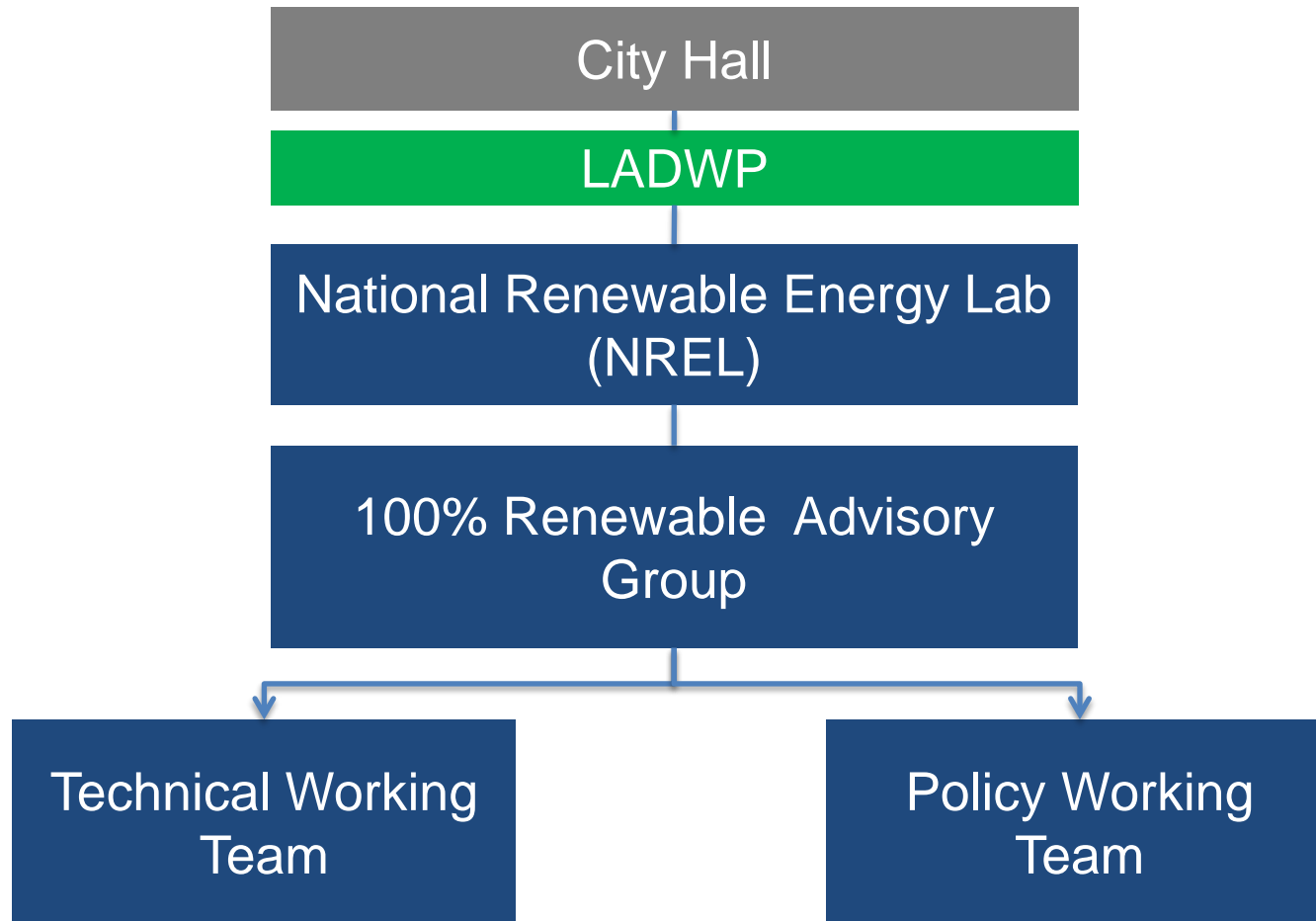
Advisory Group Participants



ladwp.com



Study Organization



100% Renewable Energy Study Steps

- ✓ Develop Approach
- ✓ Data Collection
- ✓ Develop Models & Scenarios
- ✓ Develop Recommendation
- ✓ Prepare Report
- ✓ Create Visualization
- ✓ Present Finding

Key Study Considerations

- Maintaining system reliability
- Types/availability of clean energy resources
- Role of energy storage, energy efficiency, demand response, and Energy Imbalance Market (EIM)
- Developing technologies
- Necessary infrastructure upgrades
- Optimization of costs
- Impact to local economy
- Impact to ratepayers



100% Renewable Energy Challenges

- Maintaining power reliability while increasing renewables
- Meeting all regulatory requirements
- Developing adequate energy storage and other advanced technologies
- Keeping rates competitive



Status

- Conducted seven quarterly AG meetings.
- NREL, in consultation with the AG, proposed seven scenarios to achieve a 100% renewable energy portfolio. All proposed scenarios will achieve 100% net renewable energy by 2030.
- AG provided their feedback/ comments on items such as the forms of renewable energy, proposed scenarios and sensitivities to achieve a 100% renewable energy portfolio.

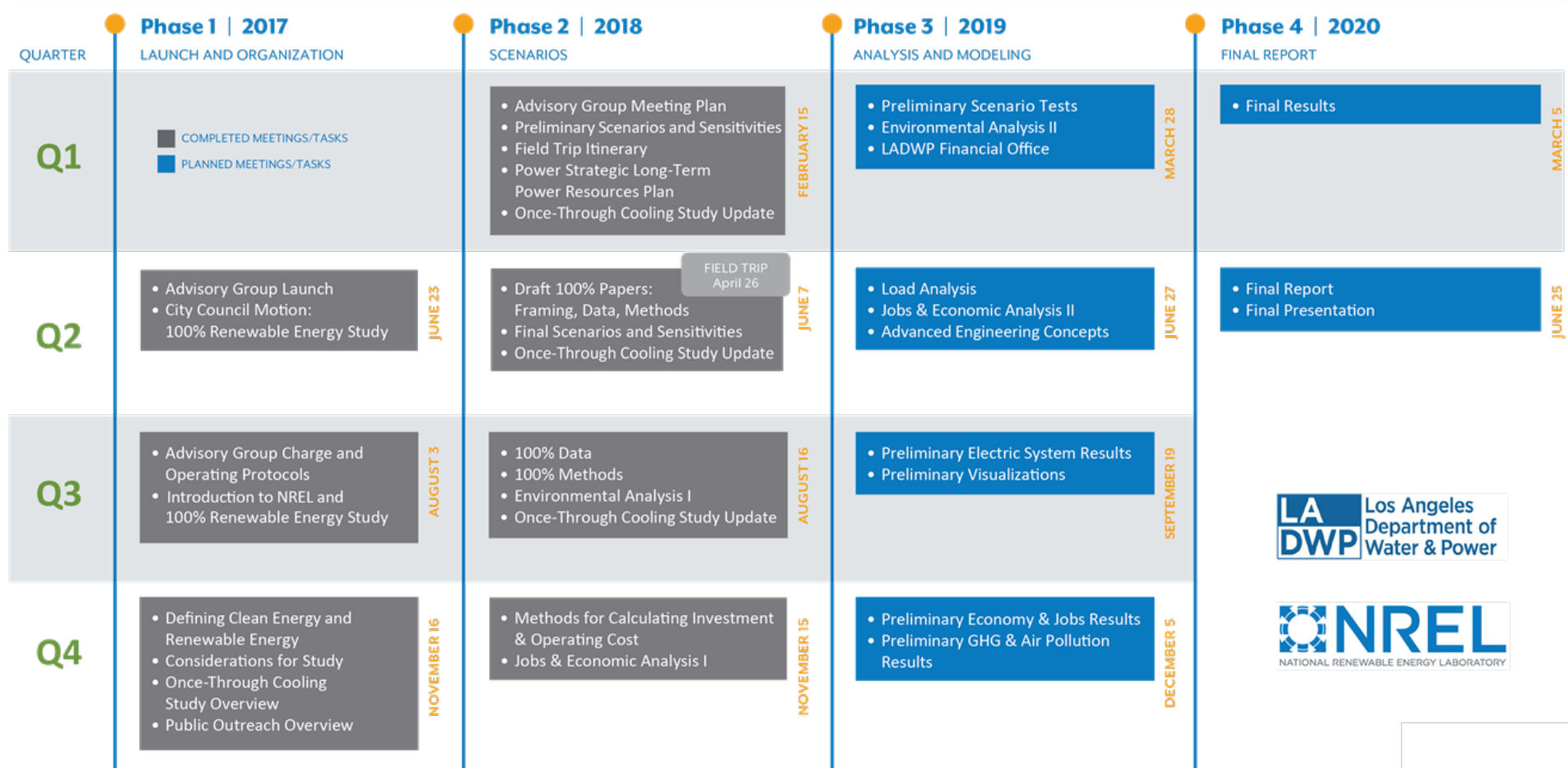


Status

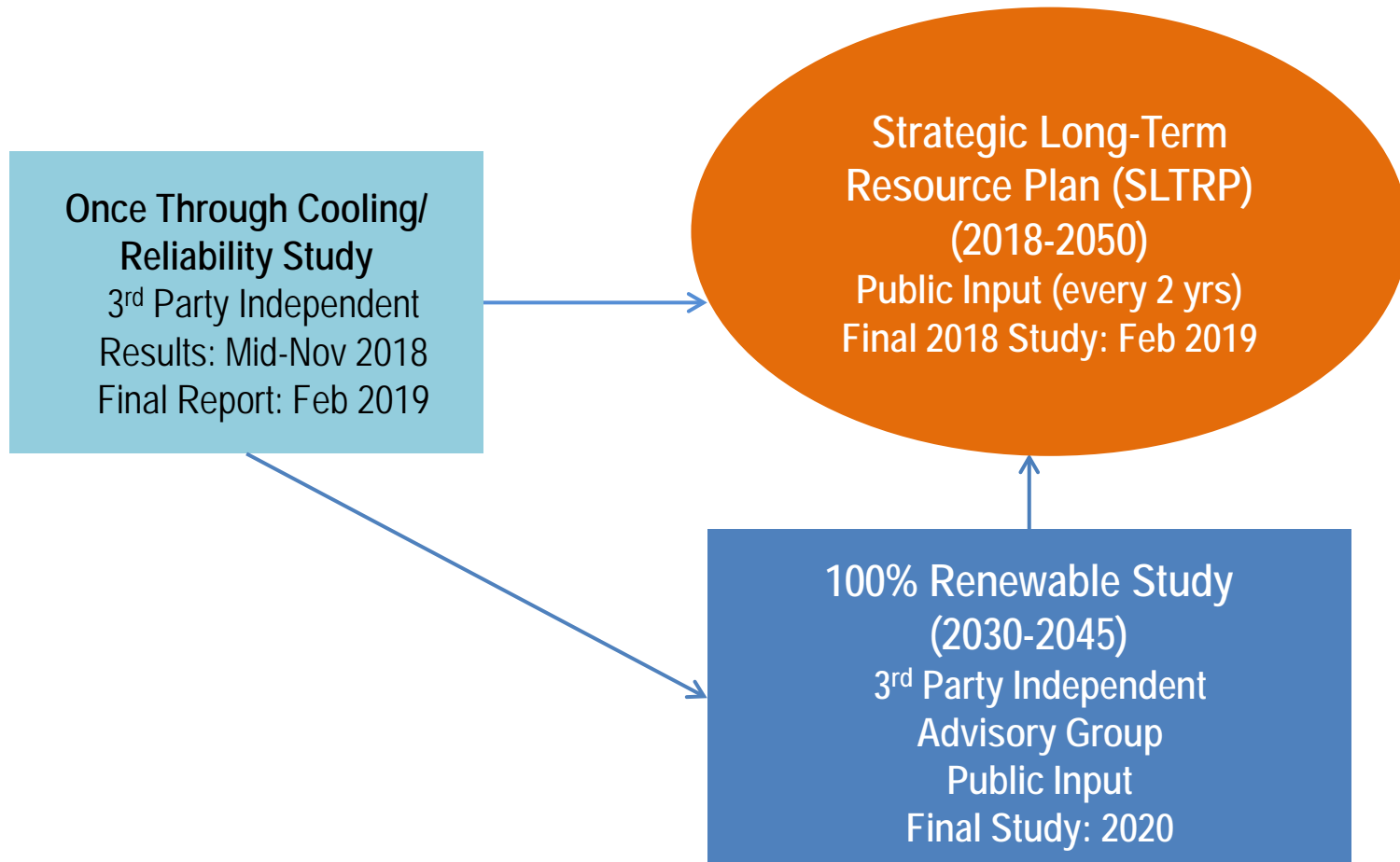
- In September 2018, California Gov. Brown signed The 100 Percent Clean Energy Act of 2018, also known as SB 100, into law. Subsequently, NREL proposed changes to the scenarios to ensure they all exceed LADWP's requirements under this new law.
- In April 2018, LADWP conducted a site tour for the AG and project team. The tour stopped at Barren Ridge Switching Station, Beacon Solar and Battery Energy Storage, and Pine Tree Wind Generating Station.
- NREL has requested data and is currently analyzing available data to build a model of the entire LADWP Power System through 2045.
- NREL and LADWP subject matter experts meet regularly to discuss/clarify/coordinate the data gathering/analyzing phase.



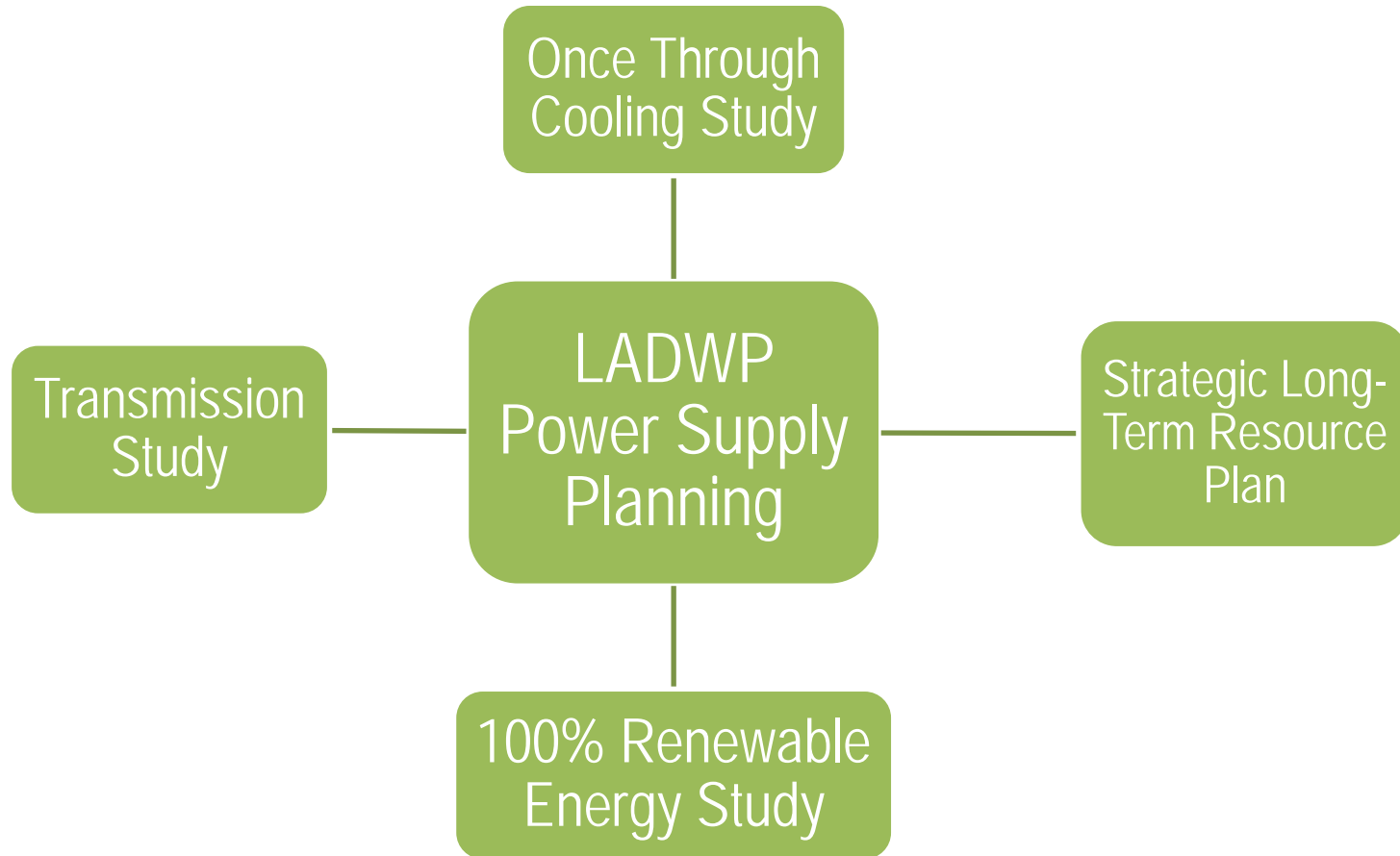
Timetable



Clean Energy Planning Process



2018 Power System Resource Planning for “L.A.’s Clean Energy Future”



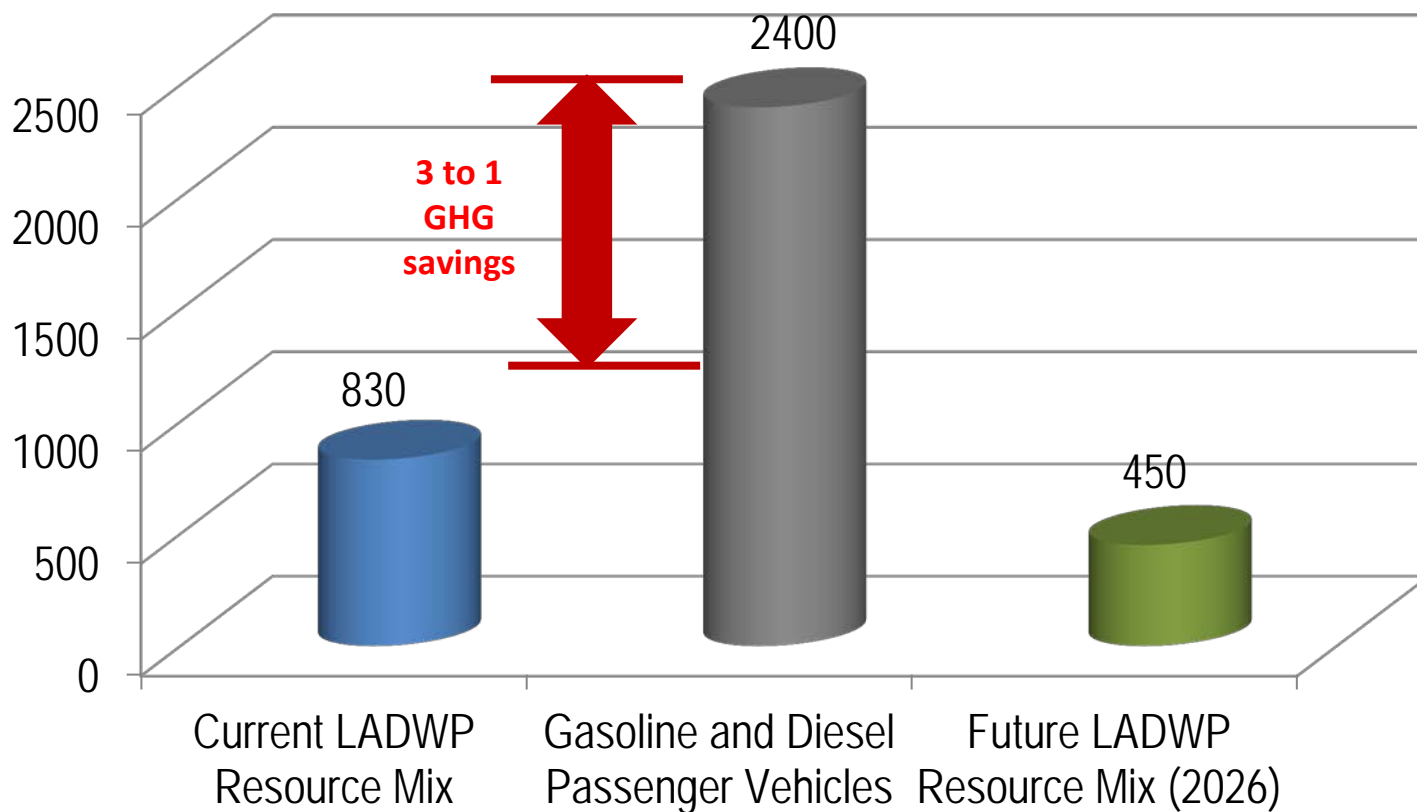
Electrification of the Transportation

- More EVs with more chargers in LA
- GHG reduction credits for each charging station (Sacramento)
- Improve local infrastructure to support higher load to support EV charging



Electrification of the Transportation

Carbon Intensity of Electricity vs. Petroleum
(lbs CO₂/MWh)



Recommended Study Evolution

- Electrification of Transportation will increase energy load by 50% to 100%
- California's regulation and legislation has been based on low penetration of electric transportation
- Switching to electric transportation faster will significantly reduce GHG emissions sooner
- California has the ability to influence the automotive industry
- Let's look at studying a faster transition to transportation electrification and increased load growth
- Goal: How do we reduce GHG emissions the most quickly



LADWP.com/CleanEnergyFuture

