Vision for 100% Clean Energy

A Path Forward

Board of Water and Power Commissioners

August 16, 2016

Integrated Resource Plan (20-Year Look Ahead)

IRP Key Strategic Initiatives

- Renewables
  50% RPS in 2030
- Electric Vehicles Expansion
- Energy Efficiency (EE)
- Local Solar / Energy Storage
- Eliminate Coal

Senate Bill 350

Clean Energy & Pollution Reduction Act

- **50% Renewable Energy by 2030**
- **50% increase in Energy Efficiency**

City Council Action

- **Expected in September 2016**

- **LADWP to initiate and implement a research partnership with:**
  - Region's Universities;
  - Members of the Southern California Public Power Authority (SCPPA);
  - California Independent System Operator (CAISO);
  - Neighboring Utilities; and
  - Other Stakeholders

  To determine what investments should be made to achieve 100% renewable energy portfolio.

- **The research partnership to utilize the resources of the U.S. DOE and its support of "Mission Innovation" and the "Breakthrough Energy Coalition."**

Pathways to 100% Clean Energy

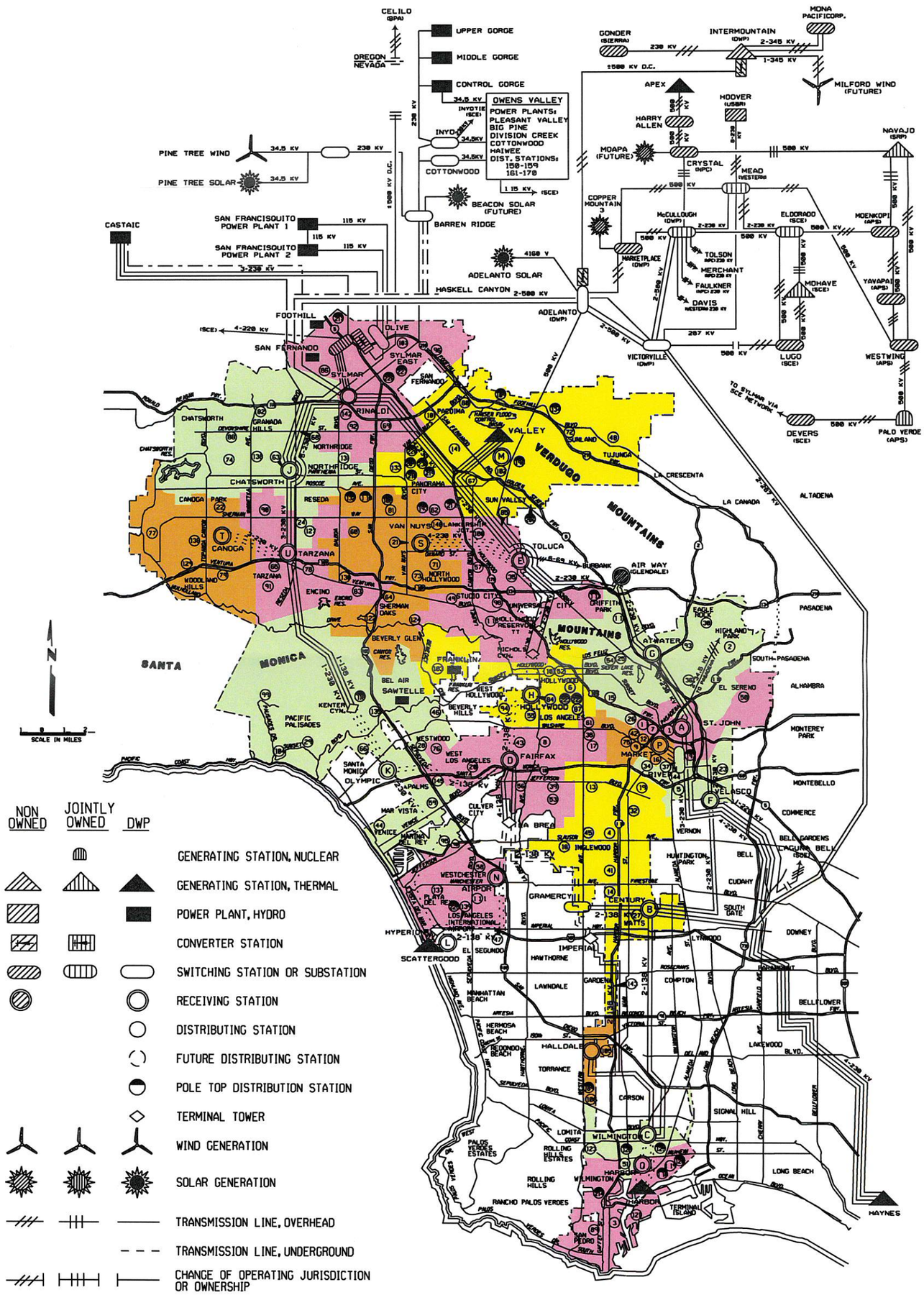
Scenarios	Methodology
100% Fossil-free	• Sources other than Coal, Natural Gas, and Oil • Retire natural gas fired IPP and In-basin plants • Mix of Solar, Wind, Hydro, Geothermal, Nuclear, Hydrogen Turbines, Fuel Cell, Ocean Wave energy, and future emerging fossil-free technologies • Build sufficient capacity to deliver 100% of Customer Peak Demand • Electrification of Transportation
100% GHG Neutral	Achieve "net zero" GHG emissions by offsetting the amount of GHG released into the air through: • Equivalent over-generation of non-GHG emitting energy resources; or • Purchase of GHG credits

What are the Significant Issues?

- **Reliability-Must-Run (RMR) requirement**
- **Renewable Generation Resources (Location and Capacity)**
- **Transmission**
- **Energy Storage Capability**

Extensive Planning, Studies, and R&D will be Required

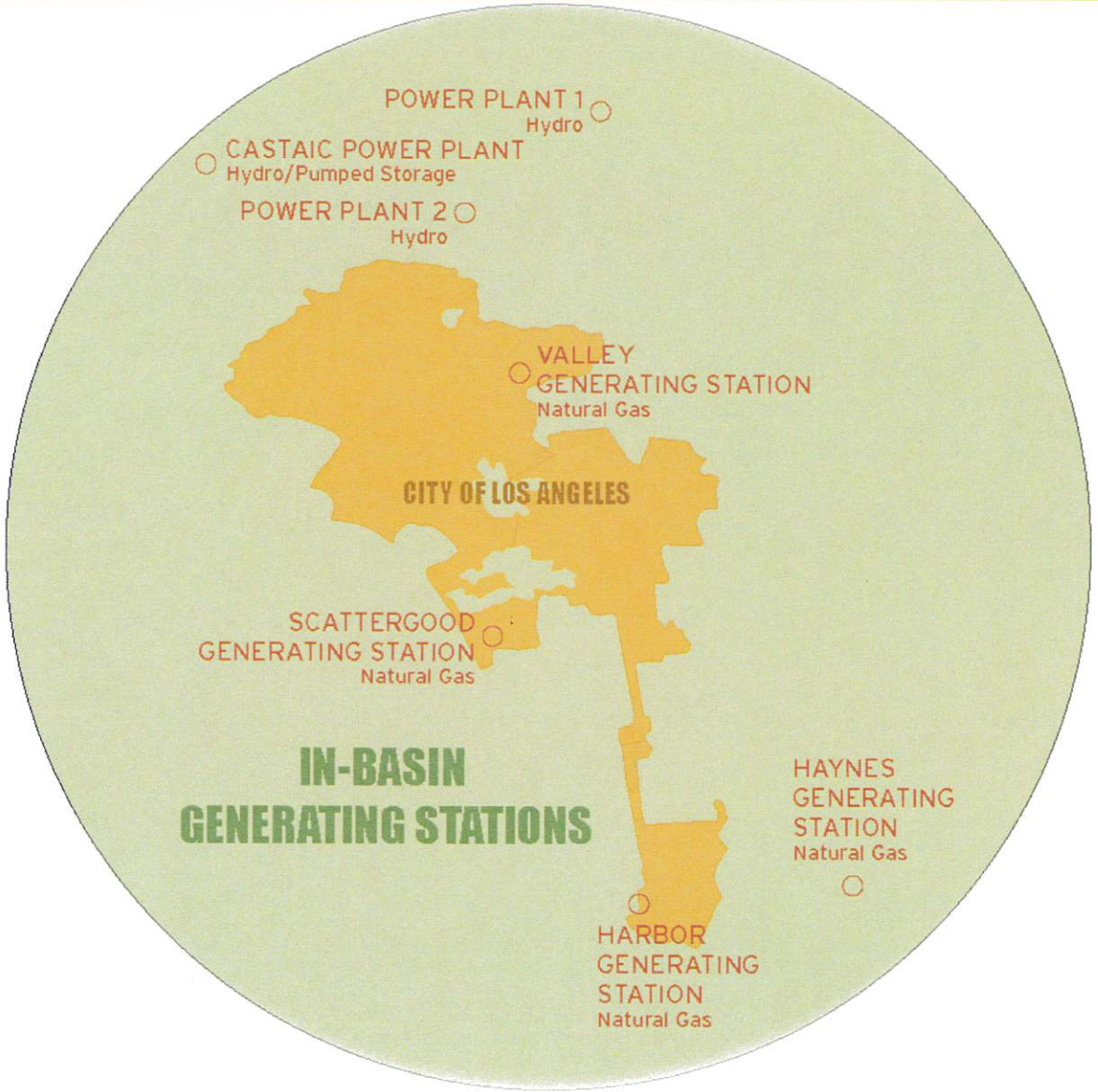
POWER SYSTEM DIAGRAM



POWER SYSTEM PLANNING AND DEVELOPMENT
TRANSMISSION PLANNING GROUP

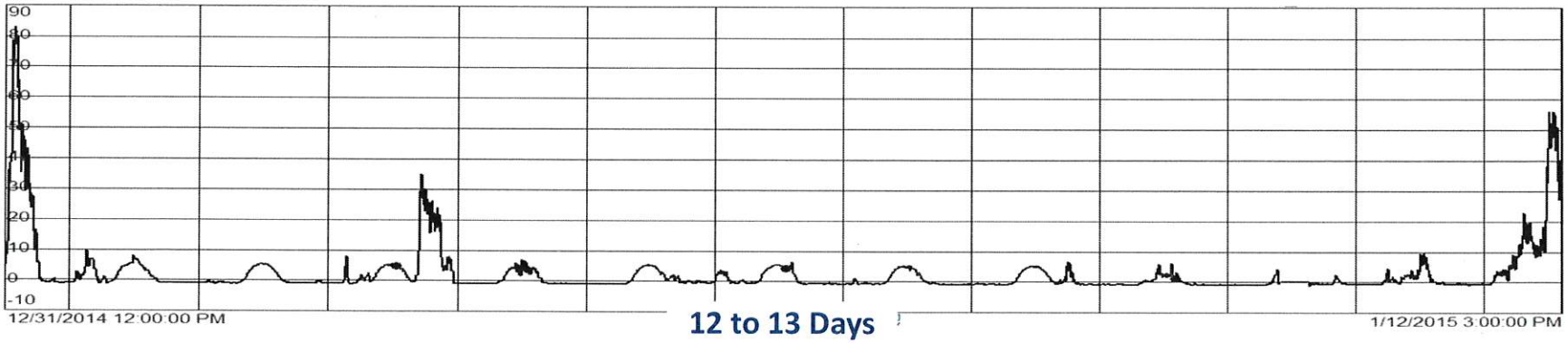
PSD.dgn
MARCH 2015
REV. 20

In-Basin Resources



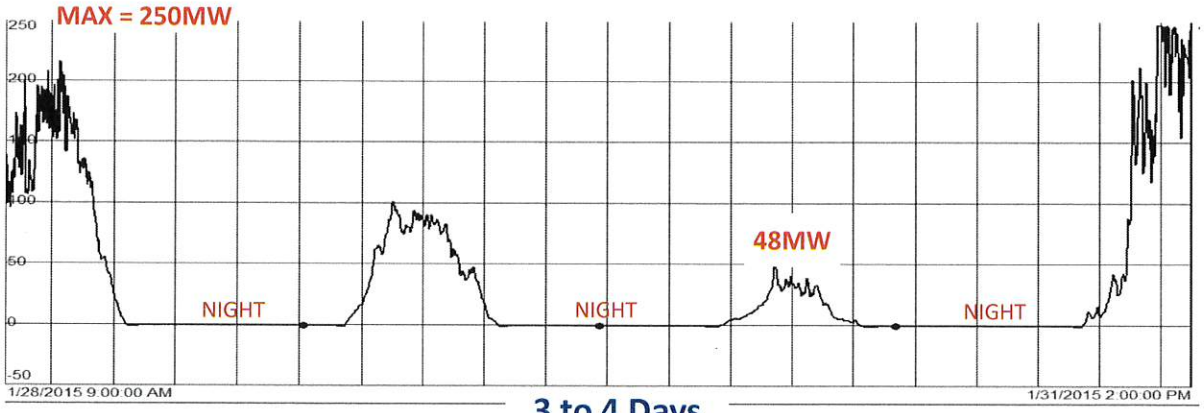
Wind/Solar Performance Examples

Wind Generation



12 to 13 Days

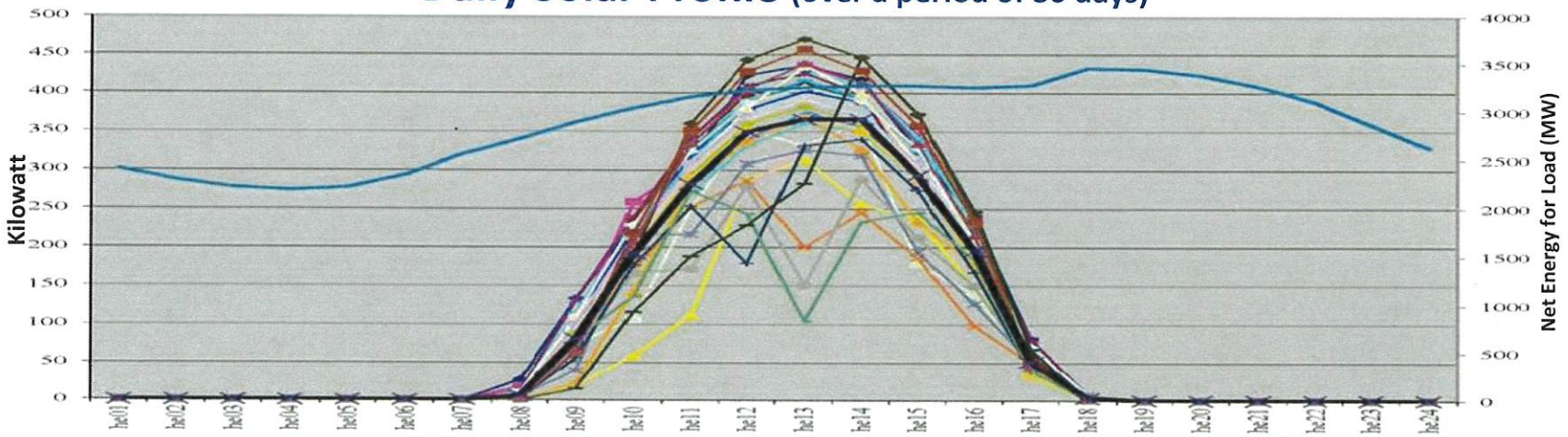
Solar Generation



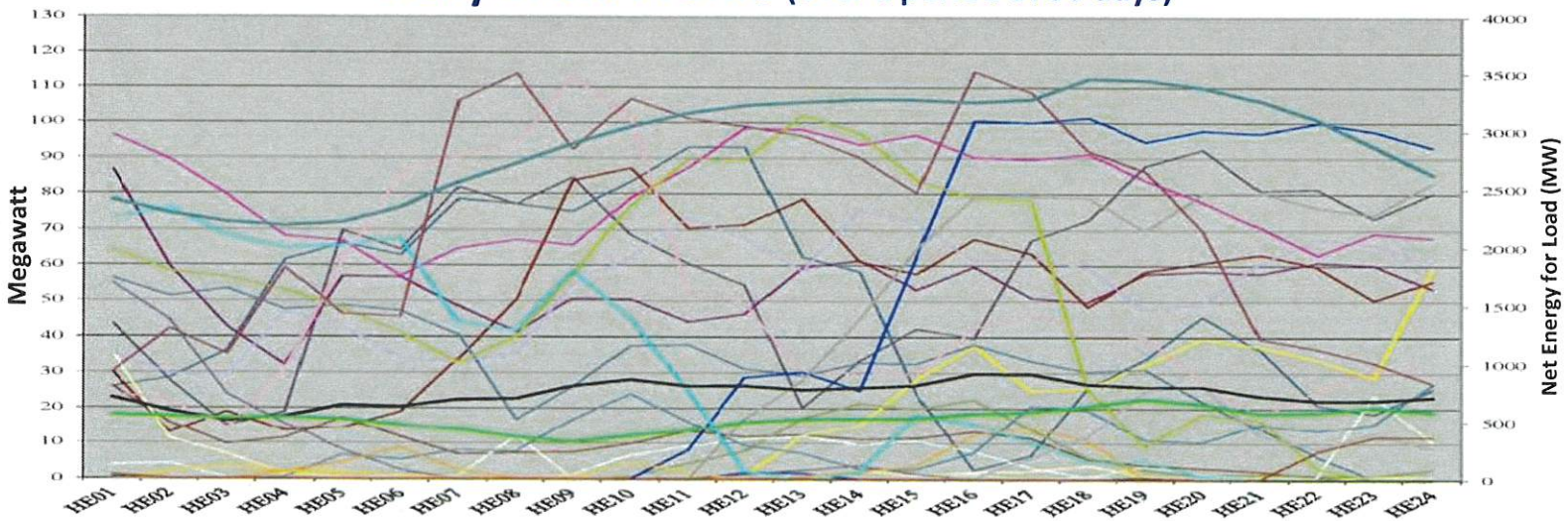
3 to 4 Days

Renewable Integration/Volatility

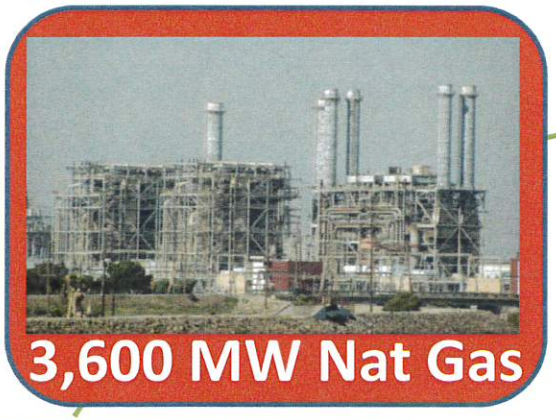
Daily Solar Profile (over a period of 30 days)



Daily Wind Profile (over a period of 30 days)

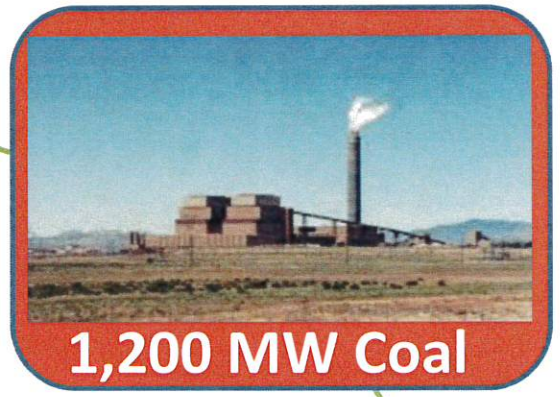


LADWP's Current Resource Portfolio

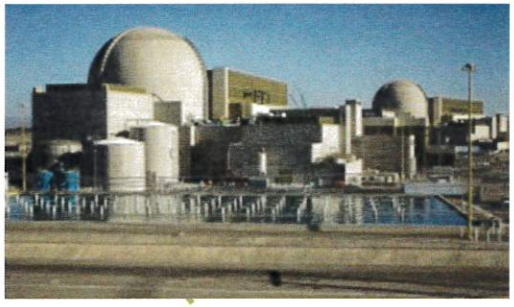


3,600 MW Nat Gas

2,000 MW Hydro



1,200 MW Coal

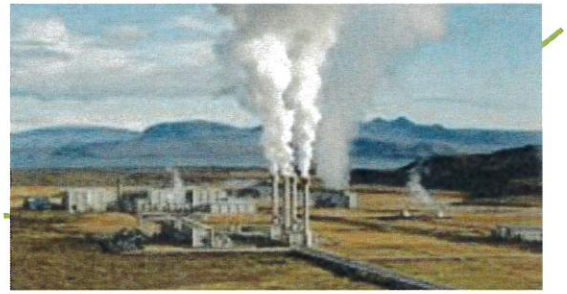


380 MW Nuclear

Total Capacity
8,820 MW

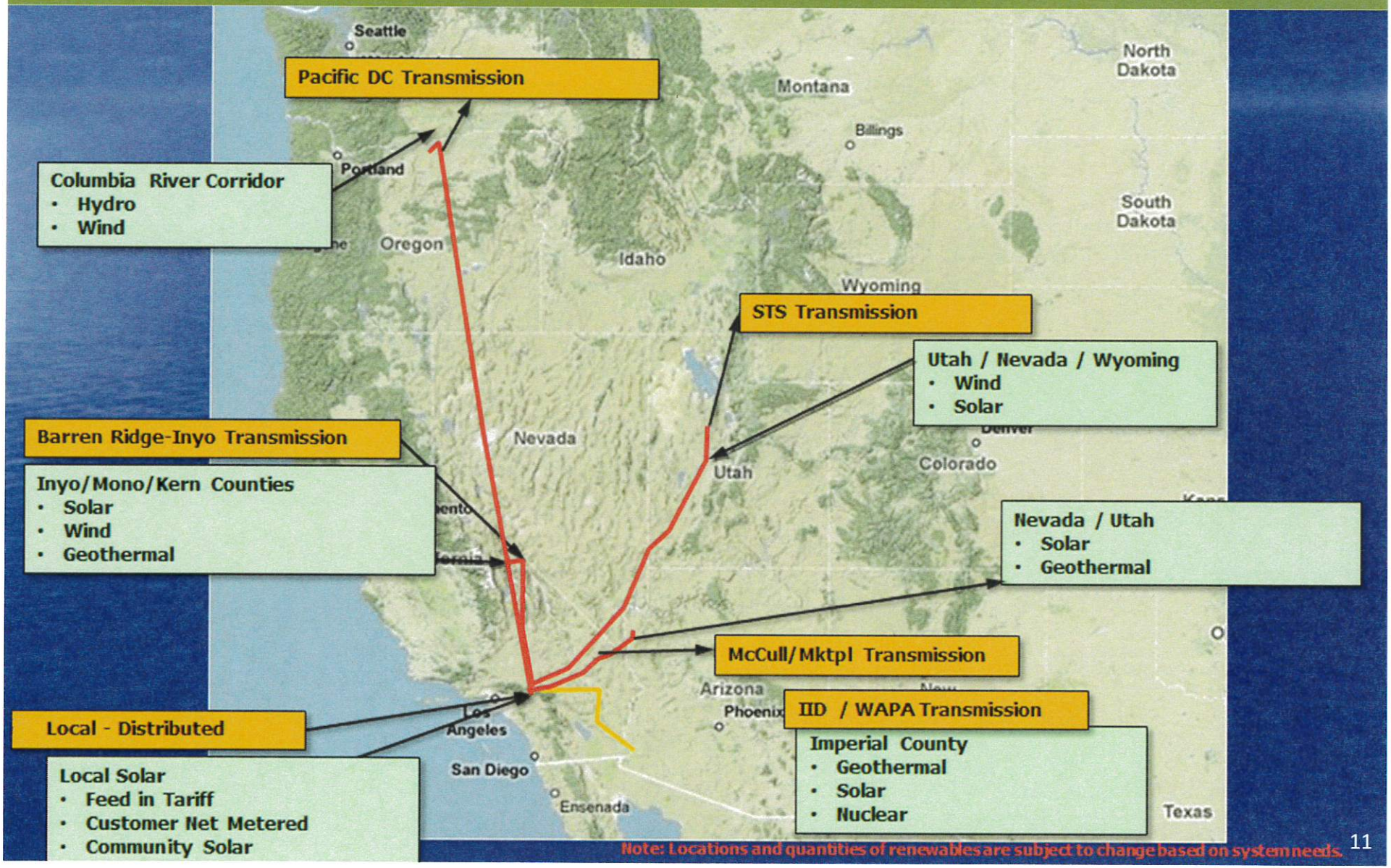
1,000 MW Wind

520 MW Solar



120 MW Geothermal

Renewable Energy Resource Map



LADWP Initiatives/Research Partnerships

- **Power System formed a Vision Team**
- **Independent Consultant**
  - Third Party Analysis
  - Targeted Research
  - Targeted Studies
  - Validation of Assumptions
  - Determination of Investments
- **Research Partnerships**
  (Universities, SCPPA, CAISO, Utilities, and DOE)
- **Flexible Planning to facilitate Innovation**
- **Forward Thinking to Achieve a Clean Energy Future**

Clean Energy Building Blocks

1. What does the Generation Portfolio include?
2. Location of Fossil-free Resources
3. Major Upgrade of Transmission Assets and New Transmission Lines
4. Rebuilding of In-basin Distribution System
5. Install Energy Storage Capacity
6. Reduce or Eliminate Reliability-Must-Run (RMR) Requirement
7. Expand Demand Response, Energy Efficiency, and EV Programs

Research and Development

Planning Studies
Feasibility, Cost-effectiveness, Risk, Reliability, and Integration

Next Steps

- **Vision Team**
- **Investigation of Risks, Benefits, & Investments**
- **R&D and Maximize Joint Partnerships**
  - Build on Past R&D Partnerships (UCLA, USC, Cal-Tech, and EPRI)
- **What are the Prospects? Is it Possible?**
- **Flexible Planning**
- **Report Progress and Results to the Board**
- **Ultimate Goal – Provide Clean and Reliable Energy**