

NREL H2@Scale

Marino Monardi
Corporate Strategy

PG&E Corporation

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PG&E is focused on providing safe, reliable, affordable and clean energy to nearly 16 million Californians



more than
23,000
employees

5.3 million
electric
customers

4.4 million
gas distribution
customers

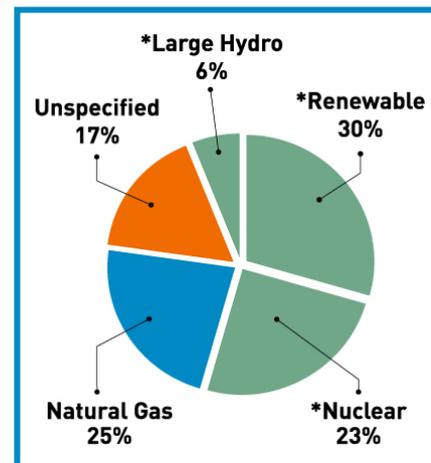
70,000
square mile
service area

260,000
customer-
owned solar
installations

70,000
GWh of electric
sales annually

900
BCF of natural
gas annual
throughput

7,300
MW renewable
capacity in
portfolio



PG&E 2015 Power Mix

Why is PG&E interested in hydrogen?

1

HELPS MEET CLEAN ENERGY GOALS



Meet State GHG Goals



Clean Fuel for Transportation

2

GAS & ELECTRICITY PRODUCE HYDROGEN



Steam Methane Reformation



Electrolysis

3

POTENTIAL TO AID IN GRID OPERATIONS



Potential for Storing Energy

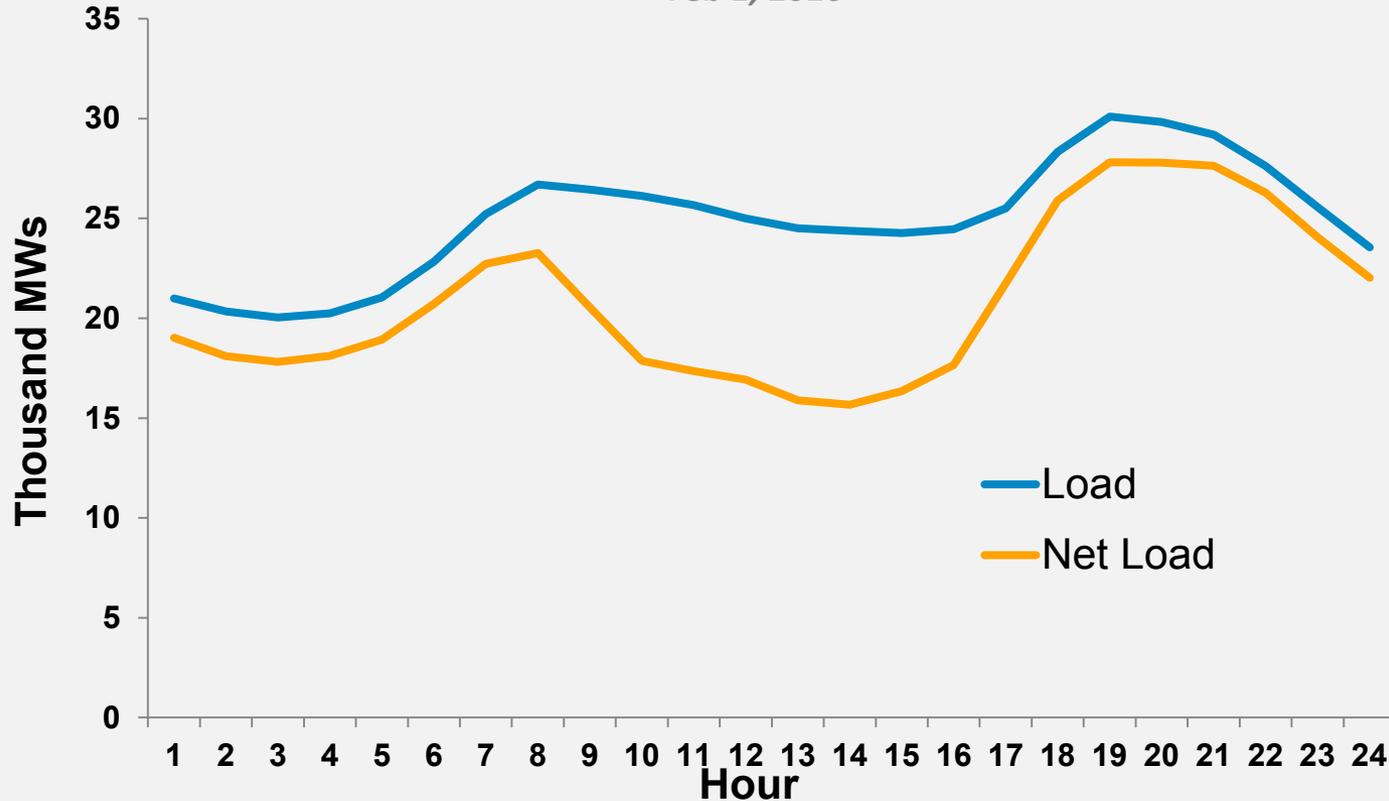


Assist in Grid Balancing

The Need for Controllable Storage

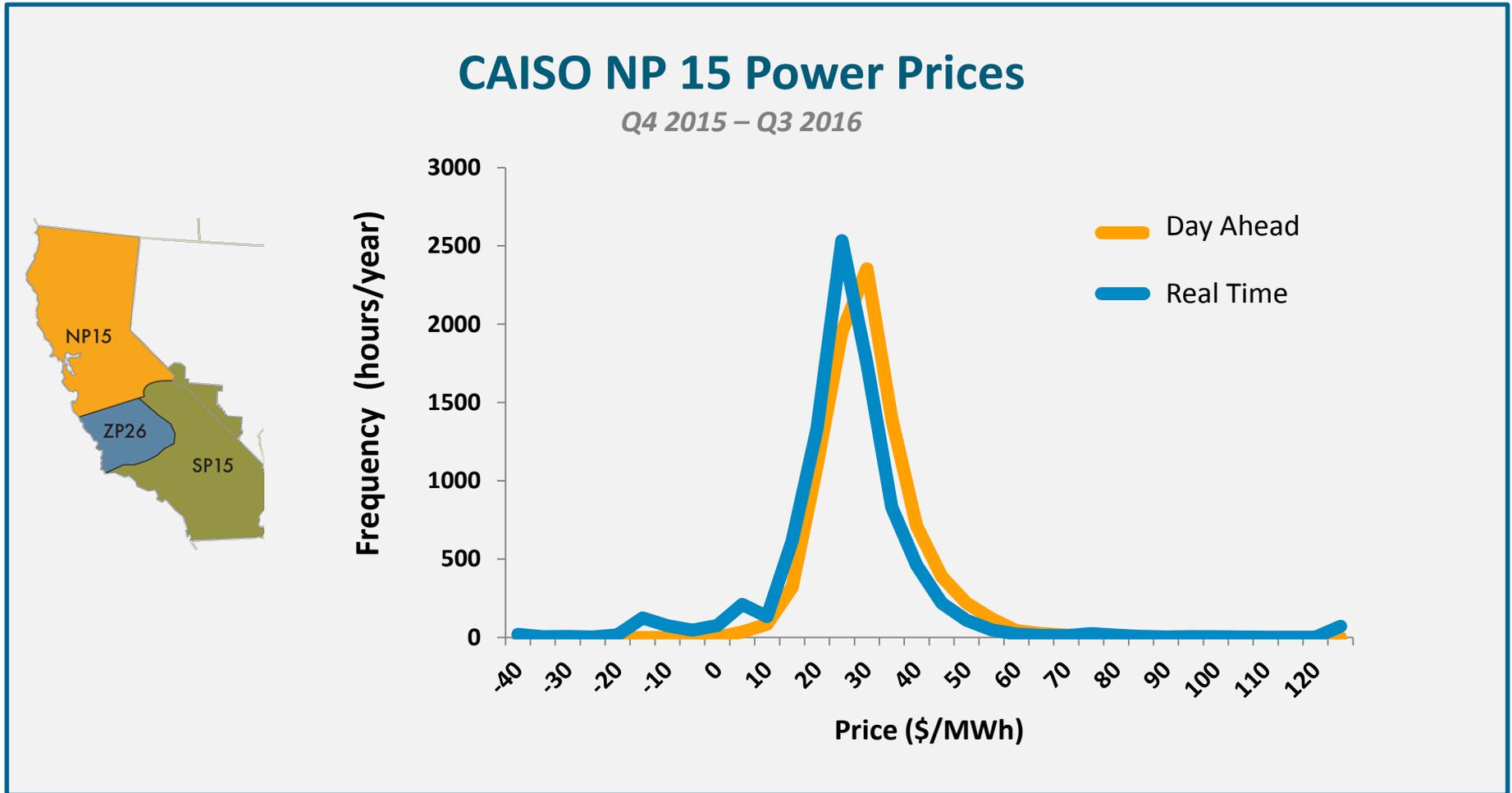
CAISO* Load Net of Solar and Wind

Feb 1, 2016



*California Independent System Operator

- Solar and Wind combined to reduce load by over 8,000 MWs during mid-day.
- Late afternoon/evening net load three hour ramp was over 10,000 MWs.



- Recent Day Ahead market prices were below \$25/MWh about 40% of the year
- In the Real Time Market, prices were below \$0/MWh about 5% of the time



Low cost wholesale power

- CAISO expansion
- Investments in electric storage
- Increase in renewables
- Commitments to flexible generation
- Retirements of baseload generation
- Future load growth
- Conversion efficiency/fixed costs



Access to wholesale power

- Wholesale or retail
- Electric Storage-like regulatory treatment
- Direct connect to renewables

- **Safety ALWAYS comes first**
 - Ensure customer and employee safety

- **Affordability is an important consideration**
 - Demand stagnation and increased system investments for reliability can increase costs to our customers

- **Utility investments need to satisfy stakeholders' concerns**
 - Balance policy objectives for both Gas and Electric businesses



Thank you!

Questions?



PG&E Corporation.
