

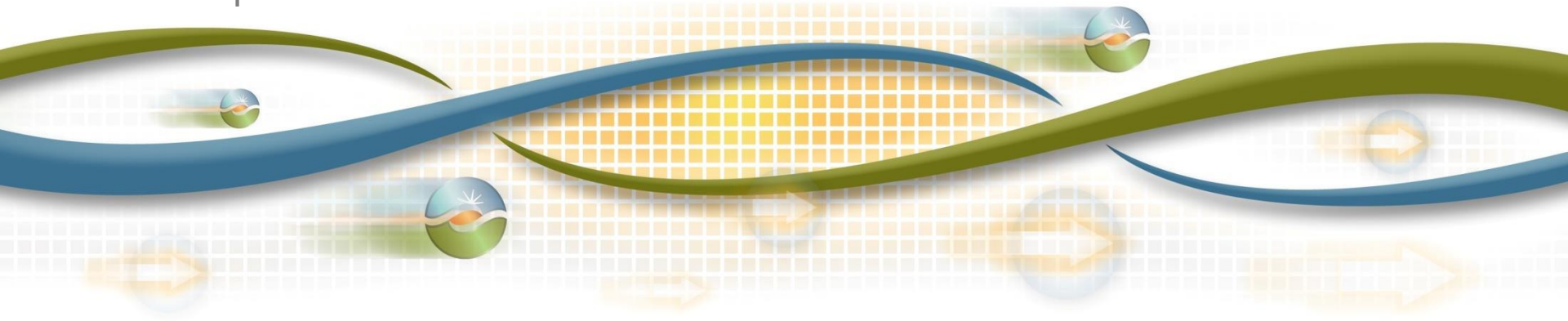
# EVs and Renewable Energy

– *Driving to transform our society*

DOE EAC Panel: Grid Impacts of EV Penetration

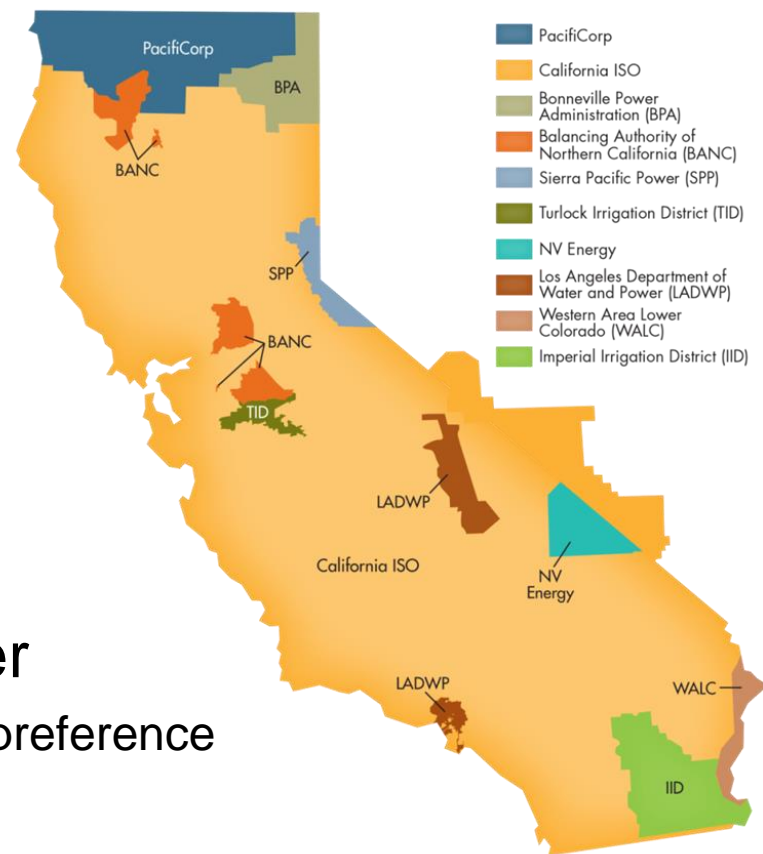
Tom Doughty  
Vice President, Customer and State Affairs

September 2016



# Big changes underway in CA ...driven by:

- State Renewables Objectives
  - 20% by 2010
  - 33% by 2020
  - 50% by 2030
- Rooftop solar, hydro and nuclear don't count
- Growth in consumer-owned power
  - Rooftop solar; driven by rates and green preference
- Potential for consumers to aggregate and participate
- CA home to 200,000 EVs; 7,600 charging stations



# The State of the State of Renewables

## California Today:

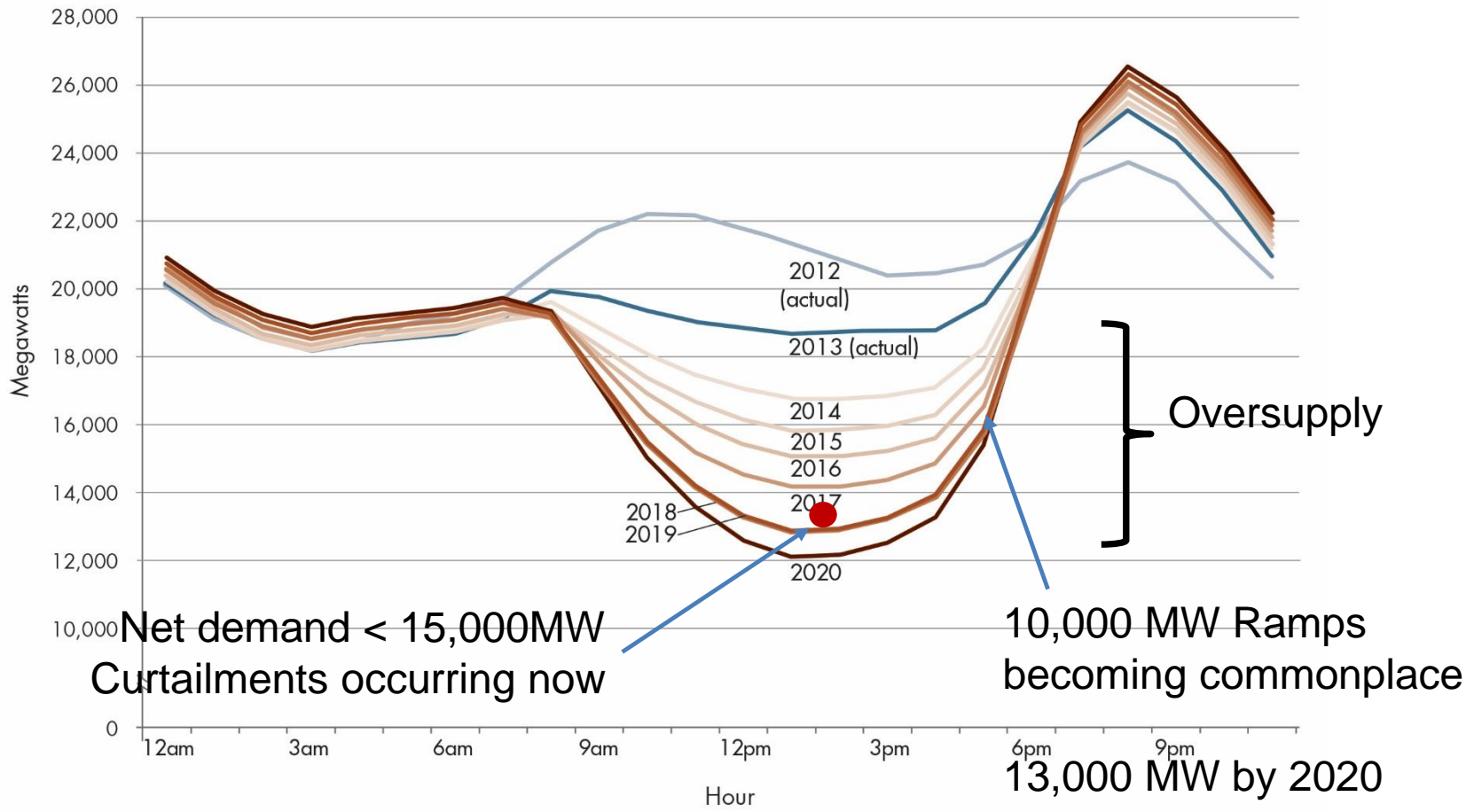
- 65,000 MW of total capacity
  - 30,000 +/- in spring and fall
- 19,000 MW utility renewables
  - Solar peak 8,000 MW – doubled in 2 years
- 5,000 MW of consumer rooftop solar
  - 11,000 new per month; adding 50-70 MW / mo.
- Another 5,000 - 10,000 MW renewables expected



# Clean, plentiful renewables...what's the problem?

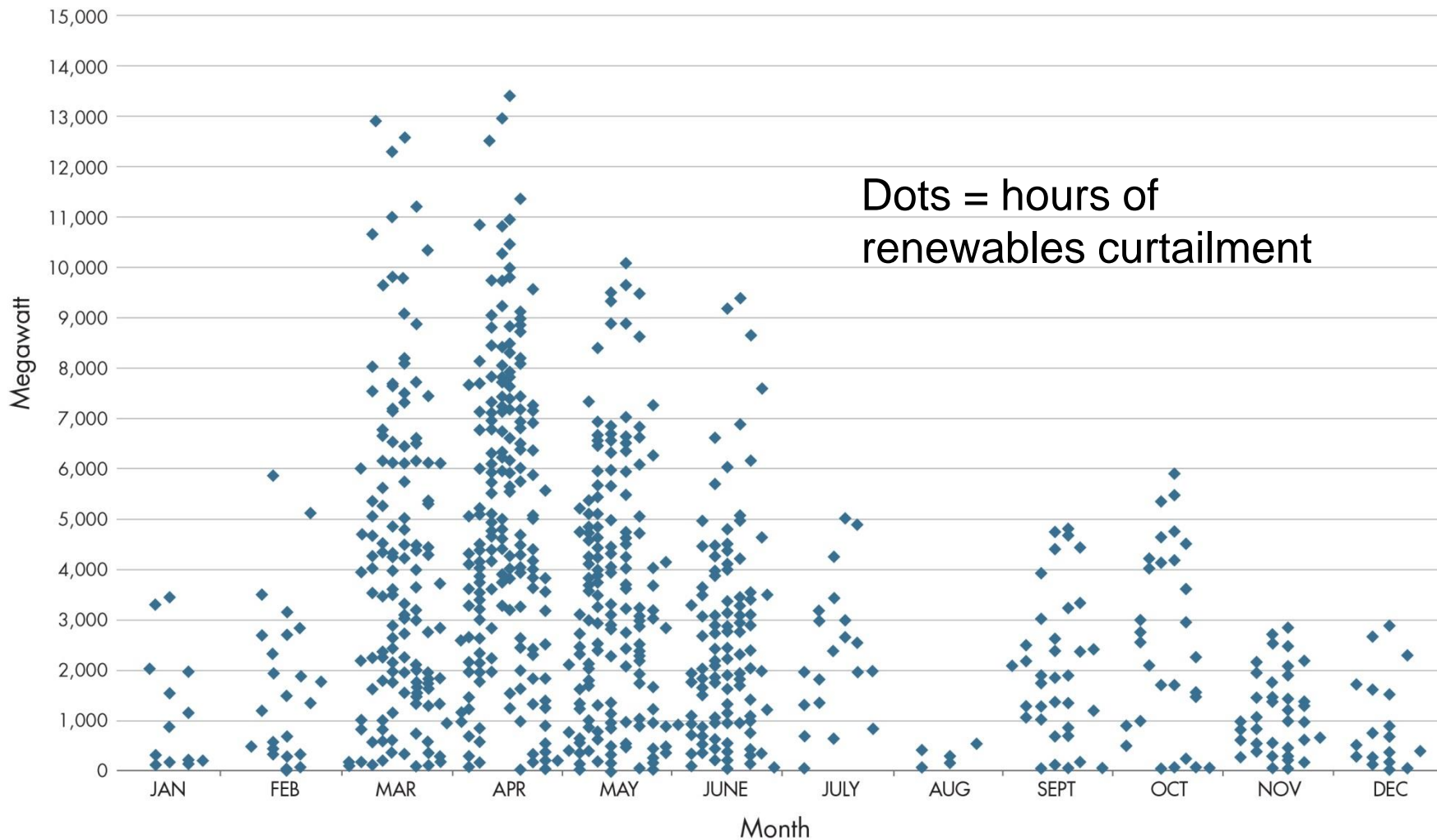
## - *Oversupply and Ramping*

Net load - March 31



# Surplus power... today, requires curtailment

40% RPS in 2024



# Synergies between EVs and Renewable Integration

Solution for Grid Challenges	EV Synergy
Energy storage	✓
Demand response	✓
System Frequency Response	✓
Consumer control: Align TOU rates w/ system conditions	✓
Electrify transportation and fuels	✓
Deepen regional coordination	Maybe
Targeted energy efficiency	
Enable economic dispatch of renewables	
Retrofit existing power plants – Lower Pmin; more flexibility	

# ISO supports EV research, pilots, and demos

- V2G Roadmap
- Utilities and EVSE Developers, EV Service Providers
  - EVs participating in ISO Wholesale Demand Response
  - EV fleet aggregations
  - Geographically disbursed DER aggregations
- Clinton Global Initiative Electric School Bus
- County's Clean Vehicles Program
- Regulatory proceedings and pilots
- Technical Advisor to state agencies, University, and National Laboratory researchers

# Empowering EV grid resources to participate

Technology

Market Design  
& Rates

Ease of Use

## Energy Storage & Distributed Energy Resources (ESDER)

- Enable transmission-connected storage and distribution-connected resources to participate in ISO market (2016)

## Distributed Energy Resources Providers (DERP)

- Pathway for DER resources to bundle, meet 500kW threshold

## Frequency Response

- Enable dynamic response to frequency changes during initial seconds of a system disturbance