Hydrogen Energy Storage For Grid and Transportation Services

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May 14, 2014

Purpose

- Introduction
- Energy Policy
- Energy Storage - Challenges and Opportunities
- Alternative and Renewable Fuel and Vehicle Technology Investment in Hydrogen Fueling Stations & EPIC Program
- Questions

- The California Energy Commission is the state's primary energy policy and planning agency.
- The R&D Division manages investments that advance energy science and technology in the areas:
  - Energy Efficiency
  - Renewable and Advanced Clean Generation
  - Energy Transmission and Distribution
  - Energy-related Environmental Protection
  - Transportation
- FTD funds the development and deployment of alternative and renewable fuels and advanced transportation technologies.

Policy Drivers

- AB 2514 – 1.325 GW Energy Storage
- SB X1-2 – Signed into law by Governor Jerry Brown requiring 33% of retail electricity sales per year as renewable resources by December 31, 2020.
- AB 32- Reduce GHG to 1990 Level by 2020.
- California Governor's Goal – 20,000 MW Renewables by 2020; 12,000 MW Distributed Generation
- ZEV Action Plan – 1.5 million zero emission vehicles by 2025

AB 2514 – Energy Storage Systems

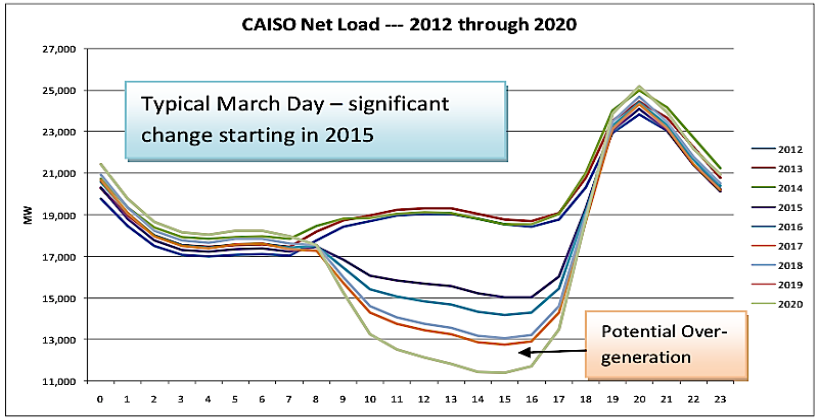
Requires CPUC to convene proceedings to evaluate energy storage procurement targets considering:

- Technology and Application neutral – but must be cost-effective
- Utility owned, customer owned, and third party owned are eligible
- CPUC to consider information from CAISO and integration of storage with other programs, including demand side management

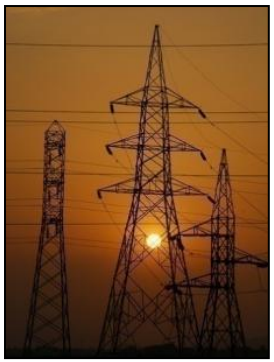
Key Drivers of Growth for Grid Storage

Renewables Integration

CAISO Duck Curve



Transmission Constraints



Energy Storage has many key applications for renewable integration…

1. Cleaner, more effective alternative for frequency regulation
2. Storing renewable over-generation and avoiding curtailments
3. Renewable generation smoothing and or shaping
4. Generation shifting (to increase T&D capacity and or value of generation)

Energy Storage Technologies

- Pumped Hydro
- Compressed Air Energy Storage (CAES)
- Flywheels
- Batteries (Na-S, Li-Ion, Redox Flow, etc.)
- Super-Capacitors (SuperCaps)
- Superconducting Magnetics
- Thermal Storage (Molten Salt and Ice)
- Hydrogen Storage

California's Involvement in Energy Storage Research has 10+ years history of advancing Energy Storage Technologies.

Energy Commission's Alternative and Renewable Fuel and Vehicle Technology Program

Nearly $50 Million to Hydrogen Fueling Stations – to promote a consumer market for fuel cell vehicles.

Press Release

http://www.energy.ca.gov/releases/2014_releases/2014-05-01_hydrogen_refueling_stations_funding_awards_nr.html

Energy Commission's EPIC Program

http://www.energy.ca.gov/research/upcoming_funding.html

Questions?

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