Shine and Drive: The Symbiotic Relationship Between Renewables, Electric Vehicles, and the Grid

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Increasing Renewables to Reduce Electricity GHGs

- California law requires a 40% reduction in GHGs below 1990 levels by 2030.
- Renewable power needs to be approximately 60% of electricity supply to meet this target.
- Most promising renewables are intermittent.
  - In 2014, wind was 36% of renewable supply.
  - Solar PV's share of the Renewable Portfolio Standard is projected to increase to 40% by 2020.
  - CA has nearly 3,000 MW of distributed solar with approximately 1,000 MW installed in 2015.

The Challenges of Intermittency

- Renewable power is produced only at certain times of the day and is not always matched to consumer loads.
- Current challenges:
  - Excess power needs to be curtailed since power in to the system must equal power used.
  - Generation is steeply ramping up and down as lots of solar comes on the grid in the morning and off the grid in the evening.
- We will need flexible resources on the supply and demand side that can absorb the excess renewable power and provide the ancillary services needed to manage diurnal generation ramps and fluctuations.

Electric Vehicles Can Help Reduce Transportation GHGs and Air Pollution

- Transportation responsible for 38% of CA GHGs.
- Four in ten Californians live close to a freeway or busy road; nearly twice as many Californians die from the health impacts of vehicular pollution as from motor vehicle accidents.
- California investing in electric vehicles – Governor's Goal of 1.5 million Zero-emission vehicles by 2025, ZEV action plan, ZEV mandate, SB1275 target of 1 million ZEVs by 2023.
- EVs carbon intensity decreasing as the electricity supply gets greener.

Electric Vehicles Help the Grid Manage Higher Levels of Renewable Energy

- EVs provide load that can be scheduled to occur when there is excess supply – daytime charging to absorb solar, nighttime charging to absorb wind.
- EVs can provide demand response, storage, and wholesale ancillary services such as voltage and VAR support.

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- Vehicle Grid Integration technology, smart communications protocol, and pricing signals enable EVs to integrate with the grid and provide needed services.

Vehicle Grid Integration

- The VGI vision is that vehicle charging creates a reciprocal relationship between battery powered cars and the power grid in a way that produces mutual benefits.
- VGI Roadmap, a joint report from the CAISO, CPUC, and CEC, maps a way to develop solutions that enable EVs to provide grid services while still meeting consumer driving needs.
- Four key regulatory considerations with respect to VGI:
  - What is the vehicle grid integration resource location?
  - Who is the appropriate aggregator of vehicle resources?
    - How do we capture the distribution benefits?
  - How do we determine primacy among grid benefits?
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VGI Pilots Are Underway

- Pacific Gas and Electric (PG&E) pilot using second life batteries and EVs as demand response.
- PG&E, in partnership with Honda and IBM, cloud-based PEV Communications Pilot.
- Southern California Edison (SCE) and Dept. of Defense are testing how the LA Air Force Base PEV fleet can provide bi-directional power flow as ancillary services to the CAISO markets.
- San Diego Gas and Electric's (SDG&E) smart grid development project developed communication protocols to control EVSE charging power based on demand response signals and the integration of EVs with Home Energy Management systems.
- SCE and SDG&E EV charging investments in workplaces and multi-family dwellings with demand response capabilities and VGI friendly rates.

Thank You!

For further information related to these proceedings

Please see:

http://www.cpuc.ca.gov/

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