California Regulation Landscape for BEV after 2020 Rolling Blackouts

International Conference on Mobility Challenges
December 2020
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Who is Nuvve?

• Our founders invented the concept of V2G at the University of Delaware in 1996

• Nuvve Corp. has been in operation for 10 years, HQ in San Diego

• V2G Projects and Operations in multiple countries

• Longest V2G operation: 4 years of operation in Denmark

• Corporate investors
  o EDF Renewable Energy
  o Toyota Tsusho

• Joint Venture

Awards:
How does V2G/VGI create value?

1. **Revenues** from Energy Markets (Ancillary, Spot, Demand Resp. etc.) *These markets require qualifications and aggregation for access.*

2. **Savings** from optimizing energy flow to buildings and EVs. *Savings depend on local site setup and metering*
California background and context

• 2014: VGI Roadmap established
• 2015: SB 350 State law including $ for EV infrastructure
• 2017: Small generation rules revision includes EVs
• 2017: EV sub-metering pilot begins
• 2018: New rulemaking on EV rates and infrastructure
• 2018: New build solar mandate
• 2019: SB 676: State law requiring VGI for all new transportation electrification. Establish strategies by Dec 31, 2020
• 2019: Microgrid rulemaking includes EVs
• 2020: Extreme weather rulemaking
V2G in focus starting in 2017

• Small generation rule revision:
  • DC V2G (stationary inverter) is analogous to battery storage for interconnection purposes
    • Existing rules and procedures are sufficient as currently written
  • AC V2G (mobile inverter) subgroup established
    • Gap analysis of existing technical standards
    • UL and SAE collaborating on standards updates
    • Group will reconvene when updates are complete
    • Pilots being allowed while updates continue

• Microgrid rulemaking considers V2G
• Energy commission funds development of V2G school buses
• Millions in funding for V2G demonstrations
• VGI Working Group explores short term policy actions for all possible use cases
Related crises: Wildfire PSPS

• Dry, hot, windy weather: Wildfire risk from July-November
  • In windy conditions where trees are near electrical infrastructure, utility lines can actually start fires
  • Example: PG&E’s bankruptcy is partly due to liability for 2019 wildfires caused by poorly maintained power lines

• TEMPORARY SOLUTION: Public Safety Power Shutoffs (PSPS)
  • Utilities identify sections of their transmission and distribution grids at risk and shut off power to those lines to prevent potential fires
  • PSPS can affect hundreds of thousands of customers and last several days

• Microgrid rulemaking adds RESILIENCY as a focus
Related Crises: Heatwave blackouts

- Historic heat waves in Western US: Energy demand exceeds supply
  - August 14-19 temperatures 10-20 degrees above average
  - 50.5 GW peak load (Today forecast: 37 GW)
  - Conventional generation was less efficient: planned and unplanned outages
  - Solar resources under-performed due to unusual cloud cover
  - Demand was under-scheduled by market participants
  - Transmission constraints limited interstate power transfers
  - Demand response prices spiked to market cap
  - “Flex Alerts”: California System Operator (CAISO) requests voluntary demand response from every customer

- TEMPORARY SOLUTION: Rolling blackouts to prevent system crash
  - 1-hour long power cuts to decrease demand, alternating circuits
Power shutoffs and EVs (and V2G)

• PSPS: Potential for EVs as backup power
  • Microgrids
  • Islanding individual houses and emergency shelters
  • EVs need advance warning to charge prior to shutoff

• Rolling blackouts: EVs as potentially significant demand response resource
  • Better if EVs can help prevent the blackout ever happening
  • Demand response, metering, price signals
Building on existing efforts

• Urgency of climate change growing with these incidents
• PSPS, rolling blackouts, climate targets, and EV goals require reconsideration of EVs as part of the energy ecosystem
  • Short-term: Getting through next summer with the lights on
  • Long-term: Making 6 million EVs part of the solution in 2030
• Acceleration and expansion of existing/planned efforts
  • Grant funding expanded and extended
  • Markets access
  • Rulemakings added and include adjusted scopes
• Consideration of previous policy proposals that had not been prioritized
• CAISO exploring role of EVs at system level
Need action before Summer 2021

• Microgrid rulemaking is too complex for a short-term fix
  • Diesel generators as default plans
  • How do microgrids and the EVs inside them help the grid when it goes down?
  • Pilot for V2G backup using smart meter disconnect for summer

• Address SB 676 VGI strategies using previous VGI working group results
  • Automated Load Management
    • Distribution upgrade deferral
    • Optimizing with other resources (solar, batteries, loads)
  • Rate design with real-time dynamic rates
  • Credit for V2G export
  • Working toward wholesale market participation

• Post-Incident study found Demand Response resources not fully utilized
  • Resulted in Extreme Weather Rulemaking
Extreme Weather Rulemaking

• Proposed short-term programs:
  • Emergency load reduction Program
    • Measure load reduction without baselines
    • Compensate for export (current Demand response does not)
  • Add new Demand Response capacity auctions specifically for the summer
  • Compensate demand response capacity programs at real-time market prices
  • Expand EV participation in existing Demand Response programs
  • Other market adjustments

• EVs already incentivized to delay charging by TOU
  • V2G is relevant here

• Nuvve and others would prefer these mechanisms be permanent
Thank You

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