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CEC Workshop on V2B for resilient backup power

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V2G World Overview: Markets developing

• Interest in bi-directional EVs around the world
  • EV markets
  • High DER penetration
  • Islands

• UK, France, Denmark, Japan, California:
  • UK: Demand response and rate optimization
  • Japan: Reactive power and demand response
  • Denmark: Frequency regulation
  • France: Wholesale and retail optimization
  • California: Experimenting with solar optimization, demand charge management

• Policy ricochets across the world, building on previous progress
  • Inverter standards
  • Baselining
  • Market structures
Example School Bus Projects

Franklin-McKinley SD

Torrance Unified SD

Con Edison V2G Pilot

Time of Use

Demand Charge Management

Demand Response

Charge off-peak

Charge at night

Discharge at peak

Discharge with utility signal

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Nuvve Commercial V2G Bus offer

• Standard V2G School Buses are available

• Certified UL1741 SA V2G chargers are available

• Nuvve is proposing complete offers for V2G installations today that include:
  • Installation
  • Chargers
  • Buses
  • Financing
California Interconnection

Is there an inverter present? 23a, 23b

Yes

Is the inverter configured for 1-way or 2-way use? 23d, 23e

2-way

Where is the inverter located?

In EV

No

1-way

Connect under Rules 2, 15, 16

In EVSE

Rule 21! (23c) Can we streamline this? 23f, 23h (Nonconsensus)

In vehicle: How do we allow interconnection? 23g, 23i (Nonconsensus)
Where are we now

• Regulatory structure for interconnection is being set
  • Yay!
  • CAUTION: We cannot ignore the practical questions once we have technical approval

• Pilots in a variety of use cases
  • DANGER: Death by pilot
    • How do we spread experience without starting from zero every time

• Commercialization requires contextualization
  • See next slide…
Where are we now continued...

• Business case is complex because systems and business structures are still designed around centralized generation and largely uncontrolled loads
• TOU rates, transportation electrification programs, net metering, demand response programs
  • Not designed to account for or exploit this type of device/capability
• Transmission level: FERC 2222
  • FERC cannot complete the job without PUCs doing their part
  • Wholesale design can be perfect, retail disincentives can still prevent access
• Solar optimization
  • INVENT is showing that the value to the customer does not reflect the value to the system
  • Example of lack of incentive to engage in V2G activities
V2H:

- Not really an on-ramp
- Interconnection:
  - “Can we hide behind the house load?”
    - No: If it’s not interconnected, you can’t use it as a charger, or optimize anything
  - “If it is interconnected, can we then switch the grid-forming for back-up?
    - Utility questions around changing from grid-integrated to grid-forming mode?
    - How to island in an orderly manner
  - Goldilocks scenario: Use as a charger when grid is up, don’t do grid study for interconnection because EV will only be bi-directional for back-up power
    - The switch from uni-directional to bi-directional can’t currently be done in this way
    - Even with UL PCS CRD 2019, firmware change require to change modes (van roll)?
- Emergency back-up
  - Logical? Yes
  - Best fit? Not necessarily
  - CAUTION: This should not be the marquee application for this technology
    - The place of Evs and V2G in the energy ecosystem is much larger than this one application
Thank You

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