CESA
CALIFORNIA ENERGY STORAGE ALLIANCE

EV Charging

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1. Overview Section

A recent Pike Research report has indicated that nearly 1 in 4 vehicles sold in the years 2012-2020 in the US will be in California. As California becomes a leader in electric vehicle adoption, the state will also need to take a leadership role when it comes to the sustainable installation of electric vehicle supply equipment. Within the Governor's EV Action Plan, he highlights the importance of public access to charging stations.

Each public electric vehicle charging station, whether it is a Level 2 or a DC Quick Charger, places an added load on the host facility in addition to the local distribution grid. California prefers 24 hour access to public chargers, which means that the charging station host cannot control or predict when a customer charges their vehicle. The EV charging peaks can be costly in the form of demand and delivery charges and eventually discourage the adoption of a public infrastructure. This is where storage can prevent problems and complement another industry.

The support for EV customer-side of the meter electricity storage projects has already been demonstrated by the California Energy Commission. Energy storage tied to electric vehicle charging systems can only serve as a complement for other use cases such as energy storage for peak load reduction, energy storage for load management or demand response and energy storage for integration of renewable generation. This could utilize electric vehicles in a micro-grid demonstration and show the way to avoid demand charges in the rollout of high powered electric vehicle charging

2. Use Case Description

This use case describes energy storage associated with facilities with an interest in hosting electric vehicle charging infrastructure. The on-site storage in intended to support the charging that occurs on-peak daily, during demand response events or in response to emergency outages.

2.1 Objectives

Energy storage can play a role in mitigating expensive peaks caused by electric vehicle charging. To maximize the effectiveness of a public electric vehicle charging infrastructure, on-site energy storage can prevent those costly peaks and also help to avoid utility infrastructure upgrades associated with additional or excessive loads on-site.

2.2 Actors

Name	*Role description*
EV Charging Host Facility	Owner and possibly operator of chargers, responsible for the electric bill associated with the EV charging
Installer/Integrato r	Ties EVSEs to storage and possibly monitors and controls facility and EVSE power levels as well as battery charge and discharge
Supplier	Battery manufacturer
Utility	Administers demand response programming, administers demand delivery charges

2.3 Proceedings and Rules that Govern Procurement Policies and Markets for This Use

Agency	*Description*	*Applies to*
CPUC	Rule 21 Interconnection Tariff	Third Party Owner
FERC	Order No. 785 Pay for Performance	Third Party Owner

2.4 Location

In all cases the energy storage unit is places within close proximity to the EVSEs and the main electrical panel of the host site. The battery is placed on a concrete pad within an enclosure with accessibility to service providers, but generally out of the sight of general public or EV drivers charging their vehicles.

2.5 Operational Requirements

The site-specific pre-installation information is critical to maintain successful operations. Information such as the electrical capacity of the facility, the pre-install consumption profile, the number and type of EVSEs to be installed, anticipated charge frequency and time-of-day, and perhaps most importantly, the desired peak facility demand after EVSE and energy storage installation are all critical data points to right-size the system and achieve operation success.

Further, a system of monitoring, control and communication must be established. This involves software designed to monitor the system and make decisions in real-time to achieve the desired load balance. Responsiveness and immediate charge and discharge are the keys to operational effectiveness. Therefore software-based controls, either locally or remotely, and communication on real-time load conditions are essential.

2.6 Applicable Storage Technologies

Storage Type	*Storage capacity*	*Discharge Characteristics*
Li-ion Batteries	50-250kWh/50-100kW	Fast response, short to medium duration

2.7 Non-Storage Alternatives for Addressing this Objective

Alternatives include:

- Installing EVSEs and paying the associated demand charges that result, typically significantly more than the customer accepted rate for public EV charging
- Limit the times when a customer may charge his or her electric vehicle to the valleys of the facility's consumption pattern. Prohibit charging all other times
- Pay for upgrades to distribution system to allow for electrical capacity to host desired number of electric vehicle chargers

3. Cost/Benefit Analysis

3.1 Direct Benefits

End Use	***Primary/ Secondary***	***Benefits/Comments***
1. Frequency regulation	S	Aggregated Ancillary Services

2. Spin		
3. Ramp		
4. Black start		
5. Real-time energy balancing	P	
6. Energy arbitrage	S	
7. Resource Adequacy		
8. VER[1] / wind ramp/volt support,		
9. VER/ PV shifting, Voltage sag, rapid demand support		
10. Supply firming		
11. Peak shaving: load shift	P	
12. Transmission peak capacity support (deferral)		
13. Transmission operation (short duration performance, inertia, system reliability)		
14. Transmission congestion relief		
15. Distribution peak capacity support (deferral)	P	
16. Distribution operation (volt/VAR support)		
17. Outage mitigation: microgrid	S	
18. TOU energy mgt	P	
19. Power quality	S	Aggregated Ancillary Services
20. Back-up power	S	

[1] VER = Variable Energy Resource

3.2 Other Beneficial Attributes

- Modular construction/incremental build optional
- Attractive to small/medium sized businesses not familiar with peak load conditions
- Avoided peak demand charges
- Avoided electrical infrastructure upgrades
- Demand Response participation revenue
- Utility peak mitigation opportunity

3.3 Costs

Cost Type	*Description*
Installation	Variable depending on location and proximity to electrical box and EVSEs
O&M	Minimal, remote monitoring and wireless fee
Equipment (battery)	Variable on account of chemistry, supplier, quality and size.

3.4 Cost-effectiveness Considerations

Cost effectiveness is contingent on a number of factors:

- Host facility load patterns
- Frequency and duration of the EV charging
- Quantity of EVSEs
- Size of requirement of battery
- Presence of other on-site distributed generation

4. Barriers Analysis & Policy Options

4.1 Barrier Resolution

Barriers Identified	*Y/N*	Policy Options / Comments
System Need	Y	
Cohesive Regulatory Framework	N	

Evolving Markets	Y	
Resource Adequacy Value		
Cost Effectiveness Analysis		
Cost Transparency & Price Signals	N	
Commercial Operating Experience	Y	
Interconnection Processes	Y	
Financing Opportunities	N	Low interest loans for small/medium sized businesses looking to offer EV charging/energy storage systems
Other issues		
		Other comments

4.2 Other Considerations

5. Real World Example

5.1 Project Description

Green Charge Networks' GreenStation operating at a 7-Eleven location in Queens, NY

Location	*7-Eleven convenience store, Queens, NY*
Operational Status	Fully Operational
Ownership	Operator-owned
Primary Benefit Streams	Peak Demand Mitigation, Demand Charge Avoidance, Infrastructure Upgrades Avoided, Demand Response Revenue, Fast EV Charging Revenue
Secondary Benefits	Energy Arbitrage

Available Cost Information	DOE supported demonstration

5.2 Outstanding Issues

Description	*Source*
High Cost of Batteries	

5.3 Contact/Reference Materials

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6. Conclusion and Recommendations

Is ES commercially ready to meet this use?

Yes

Is ES operationally viable for this use?

Yes

What are the non-conventional benefits of storage in this use?

Supports the growth of a complementary industry

Can these benefits be monetized through existing mechanisms?

Yes, based upon electricity rates schedules, demand charges, and demand response program structures.

If not, how should they be valued?

Is ES cost-effective for this use?

Yes, on a case by case basis

What are the most important barriers preventing or slowing deployment of ES in this use?

The problem of demand charges associated with Quick Charging is not fully realized by the market. The solution is apparent, but not easily achieved, as site specific engineering and installation can be expensive and software and monitoring technology is only now being developed.

What policy options should be pursued to address the identified barriers?

Once this is identified as a solution and not simply an idea, then the demand for such systems will rise. However, the upfront costs of the hardware remain a hurdle. Loans or incentives to installed systems such as these would be optimal at least until the price and quality of batteries normalize.

Should procurement target or other policies to encourage ES deployment be considered for this use?