VGI Policy Recommendations

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The purpose of this white paper is to provide a recommended regulatory, business, and technical roadmap to integrate and coordinate Electric Vehicle Supply Equipment (EVSEs) within distribution areas and across a balancing area to provide grid services.

Proposed Business and Regulatory Context

Right scaling new approaches

In a free market economy careful consideration must always be given not only to technical solutions but also to commercial and political considerations. A one-size-fits all set of mandates and technical requirements may add unnecessary cost, complexity and inconvenience to Managed EV charging and hamper widespread market adoption. With these considerations in mind, we recommend a tiered approach to integrating EVSEs into grid operations by differentiating technical requirements based on their impact, or load class.

A small load is represented by a residential cluster of EVSEs that may be on the same transformer with a nameplate capacity of 50 kVA or less. A medium load is represented by a small to medium charging station with a minimum nameplate capacity of 50 kVA but less than 500 kVA. A high load represents an EV fleet charging facility with > 500 kVA nameplate capacity.

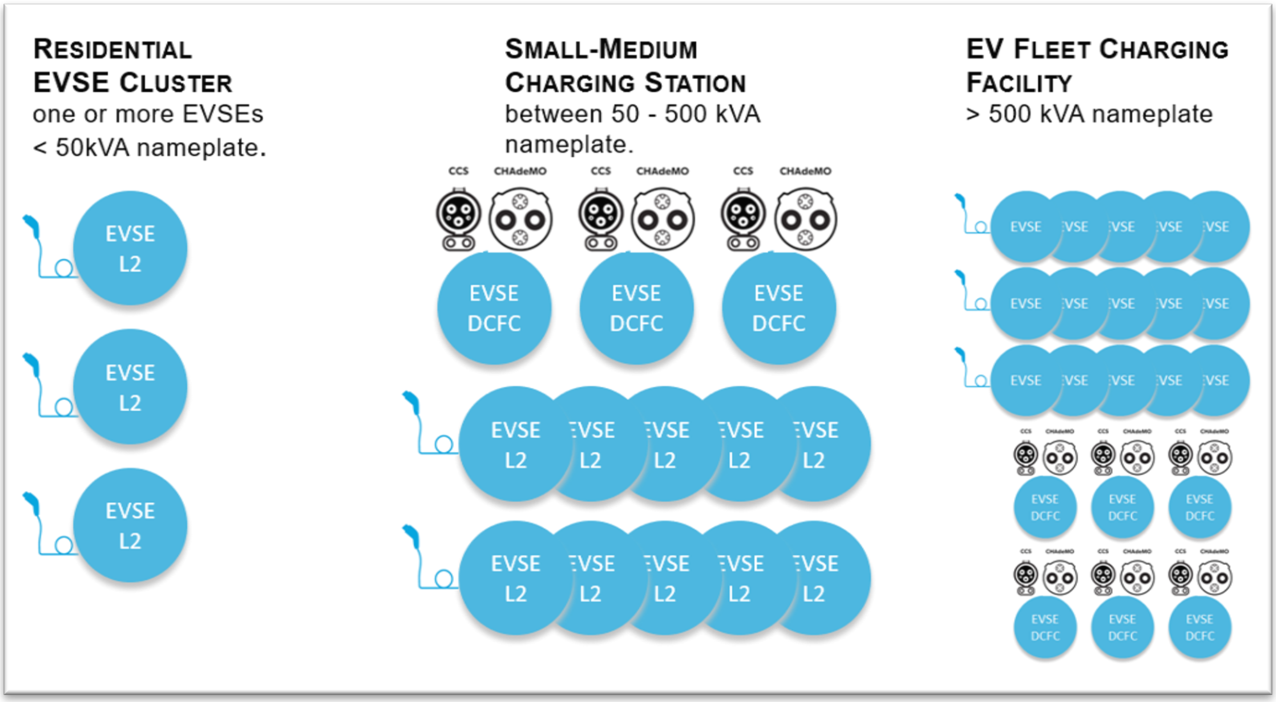
The assumption would be that small and medium loads may be managed as a portfolio. The portfolio may be managed by Charge Network Operators, traditional Energy Services Providers, i.e. aggregators, or directly by a grid operator. A HL Charging Station Operator may more likely directly interact with the local distribution operator or Independent System Operator.

The business and regulatory requirements would vary by Load Class.

Policy Recommendation 1: Any Level 2 EVSE sold within the next 2 years must be capable to provide energy services, i.e. can respond to an external data source to delay, reduce or initiate charging at a specific time for a specified duration based on an event or price signal and user-defined criteria. In order to meet this requirement, the EVSE must be able to support, directly or through a remote (cloud) service, OCPP, OpenADR, or IEEE 2030.5.

Policy Recommendation 2: A ML EVSE or Charging Station must be capable to provide energy services and may provide regulation services (volt/VAR, frequency, pf). The EVSE or Charge Station Management System must support OCPP or an equivalent standard that supports an external energy management system that supports grid interactions.

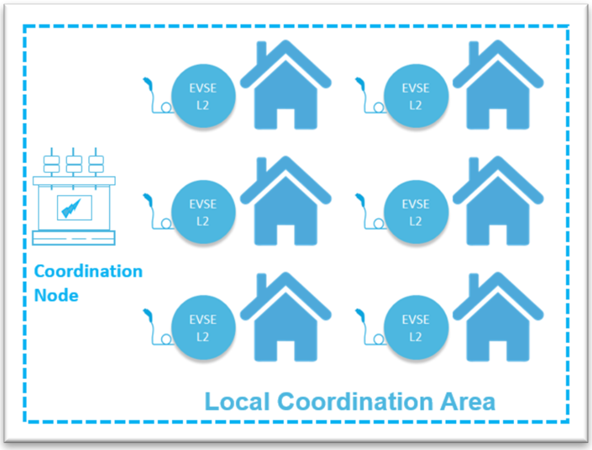
Policy Recommendation 3: A HL Charging Station (>500 kVA) must provide energy services and must be capable to provide regulation services (VVO, frequency response).



Use Cases as Business Drivers

We have identified three Use Cases for explaining the next VGI policy recommendations – Local Congestion Management, Abundant Renewable Supply, and Virtual Genset.

Local Congestion Management



The distribution system has dynamic needs that can occur within a day, month or season. Currently, output of most BTM DER (PV, batteries, EVs, smart t-stats. etc.) is not coordinated with dynamic grid conditions. Significant distribution needs are local. There may be an undersized transformer or a deficiency on a certain section of a distribution feeder. These needs are dynamic and can occur at various times within a day, month or season and may change over time. One distribution feeder may be overloaded for a few hours in the evening during hot summer months, while another feeder may exhibit high loading in early afternoon. Within a Local Distribution Area there may be a significant penetration of potentially dispatchable EVSE resources that can provide valuable services to distribution operators - relieving temporarily congested feeders, supporting non-wires alternatives, correcting phase imbalances, volt-var optimization, etc. Currently there are no standardized mechanisms for system operators to leverage the capabilities, capacities and availability of DER resources in concert with local challenges that may be occurring at a specific substation, feeder, or circuit.

Since the emergence of electric vehicles over the last 10 years, researchers have noted the clustering of EVs within local distribution areas. [1] The local impact of clustered EVs on transformers is quite dependent on the distribution design, equipment age and capacity, coincidence with other loads, and the charging overlap. These impacts can be mitigated with Managed Charging. [2]

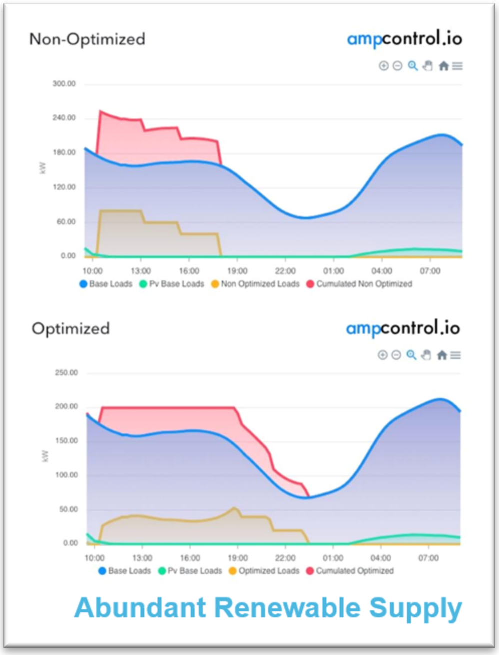
To be clear, as electric vehicle adoption rates accelerate, congestion management may happen at multiple scales – a local transformer, a feeder, or at a LV/MV substation.

Policy Recommendation 4: Develop a demonstration pilot that defines a means, based on existing open standards, that allows Aggregators, EV Network Providers and Charge Station Operators to dynamically map the capacity and availability of EVSE resources to local coordination areas – from transformer to feeder to substation.

Absorb Abundant Renewable Supply

As the total share of wind + solar generation continues to grow, curtailment of renewable energy sources is expected to intensify. Charging when these renewable resources are abundant relative to demand can provide tangible economic and environmental value to EV owners, plant and system operators, and to the whole system.

Time-of-use rates, while valuable most of the time, lack the flexibility to accommodate the dynamism of real-world conditions, like rapid changes in cloud cover or wind conditions. During the spring, when demand is low, solar irradiance is at peak, and some conventional plants are off-line, a utility may have an unplanned outage. A portfolio of real-time, responsive resources can provide the necessary cushion to enhance reliability and resilience.



Policy Recommendation 5: Develop a rate design and a standard implementation guide for utilities to provide real-time price and event (control) signals to EVSEs, CSMSs and EV drivers.

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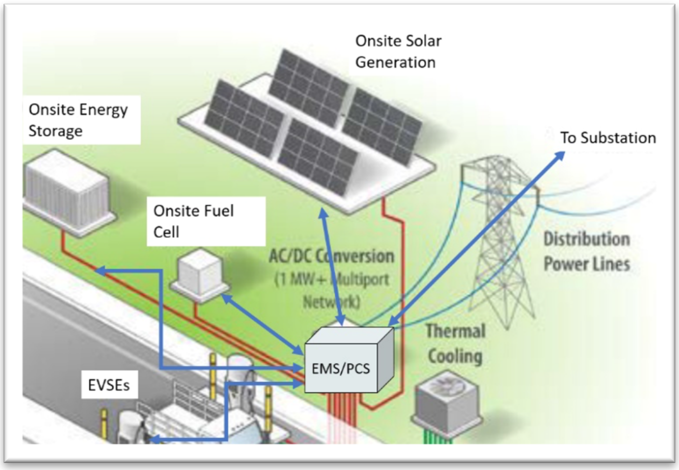
[1] The EV Project, 2013, What Clustering Effects have been seen by The EV Project? accessed Feb 11,2020, https://avt.inl.gov/sites/default/files/pdf/EVProj/126876-663065.clustering.pdf

[2] SEPA, April 2017, Utilities and Electric Vehicles: The Case for Managed Charging and SEPA, Black & Veatch, and the Sacramento Municipal Utility District, May 2017, Beyond the Meter: Planning the Distributed Energy Future, Volume II: A Case Study of Integrated DER Planning by Sacramento Municipal Utility District.

Virtual Genset



EV Fleet Charging Facilities are likely to be concentrated at seaports, airports, and other retail and wholesale transportation distribution centers. Existing substations, transformers and conductors may or may not be able to accommodate an unplanned increase in demand particularly depending on the time-of-day charging occurs. Charging may occur after normal business hours which may represent a new peak as solar represents a more significant portion of the generation portfolio. Yet advanced communications and the solid-state power conversion electronics of EV chargers can not only mitigate the potential impact of new loads but also provide valuable grid services. Larger facilities may also install solar PV, energy storage systems, and on-site generators. At the Point-of-Common Coupling (PCC), these facilities can readily simulate a virtual generator to provide a full-suite of energy and ancillary services including volt/VAR optimization and spinning and standby reserves. In short, EV Fleet Charging Facilities, operated as a virtual generator, can perform better, faster and cheaper than standby generators.

Policy Recommendation 6: Develop a Virtual Genset model and reference implementation pilot.