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on NEVI Deployment Plan Development

Additional submitted attachment is included below.

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Siemens Comments on CEC Docket No. 22-EVI-03, NEVI Deployment Plan Development

Siemens is pleased to provide comments and suggestions to Caltrans and the CEC (the "Agencies"), to inform development of the National Electric Vehicle Infrastructure Deployment Plan Development, 2022-26. Our focus in these comments include consideration of light-, medium-, and heavy-duty electric vehicles, the consumer experience, and interoperability.

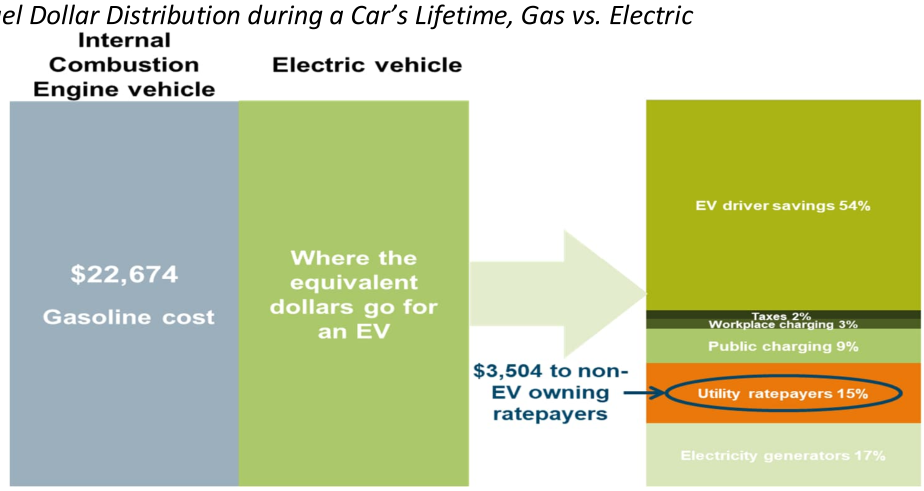
About Siemens eMobility

Siemens is the first corporation of its size to commit to being net-zero carbon by 2030 including a full transition to clean transportation. We are motivated by the goal of driving socio-economic benefits that stem from reducing GHG emissions and adoption of clean energy. Siemens provides over 40,000 well-paying jobs at hundreds of facilities across the U.S., generating tens of billions of dollars of economic activity. With the intent of generating business efficiencies for our customers at workplaces, transit, government, utilities, fleet and other segments, Siemens manufactures/assembles many of its EV chargers and EVSE electrical components in the U.S. Siemens's eMobility product portfolio encompasses hardware, software and services that are currently deployed across America and in 35 countries globally. Our solutions are geared to maximize the abilities of electric vehicles to act as Distributed Energy Resources as well as their use in effective harnessing of renewable resources.

Economic Benefits of EVs

While the focus of California's Deployment Plan for the National Electric Vehicle Infrastructure Program (the "Plan") is the development of the state's plan for EV charging infrastructure, an important context for this activity is the scope of economic benefits of EVs themselves. The health and environmental benefits provided by EVs through reductions in emissions and improving air quality is common knowledge. EVs provide direct economic benefits to their owners in the form of fuel and maintenance cost savings. More importantly, beyond the tremendous fuel savings to EV drivers, every light-duty EV purchased in America will deliver, over its lifetime, an estimated $3,500 in savings to non-EV drivers as a result of the added throughput through the electric grid – **provided that most of the charging is conducted during off-peak times such that grid reinforcement is minimized**. And that $3,500 is for grid fees only. The additional money paid for power to charge EVs also benefits electricity generators.

Figure 1: Fuel Dollar Distribution during a Car's Lifetime, Gas vs. Electric



Sources: Energy Information Administration, Union of Concerned Scientists, Siemens

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Grid Benefits and Smart Charging

Beyond these economic benefits, EVs have important advantages for the electricity grid, power supply costs, integration of renewables, and resiliency. EVs and their "second-life" batteries can act as a non-wires alternative to sometimes expensive traditional grid reinforcement and provide back-up power during outages resulting from natural disasters. The EVs and their used batteries can provide peaking capacity and ancillary services to reduce wholesale electricity costs, with those benefits flowing to all ratepayers.

Through what is known as "smart or managed" charging, EVs become grid assets that can soak up excess wind and solar production while avoiding charging during times of peak demand. Smart charging is the management of the intensity and timing of charging to take advantage of the low off-peak prices while avoiding high on-peak costs. It also includes the ability to reduce or turn off charging during system emergencies when reserve margins are very low (i.e., load management). Smart charging utilizes remote communications and control with the charger to enable these capabilities.

General Observations

The following comments and suggestions relate to the Plan generally:

- **Optimize the consumer (driver) experience**. A critical aspect of California's EV charging infrastructure deployment strategy should be a focus on the consumer, whose positive experience is central for the ICE-electric transition to occur. Charging a vehicle should be as easy and convenient as filling at a gas pump. This builds on the primary purpose of the national EV Charging Program, which is to promote and support EV adoption.

- **Define "access" to include ability to locate charging stations, connect to chargers, and pay for charging**. These three elements are, by definition, required for EV drivers to be able charge their vehicles. Effectively enabling EV drivers to locate charging stations requires that charging station owners freely and openly publish the locations and characteristics of their chargers (e.g., charging speed in kW and pricing, be it per kWh, per minute, or some combination; and whether the charger is operational and whether it is currently occupied), via an API to which app developers can connect. The FHWA guidelines include mention of this API, and the Plan should require that grant applicants describe how they will implement this requirement. The connectors used by the chargers must be open standard (e.g., CCS for DC fast chargers) so any vehicle using the open standard can connect to the charger. Finally, anyone attempting to use a public charger funded by the Plan should have the ability to use a physical credit card or to use an RFID card that is accepted universally (see further details on Open Payment below).

- **Interoperability**. The BIL specifically requires that EV chargers funded by NEVI be interoperable. Interoperability, by preventing vendor lock-in, increases consumer choice, minimizes the risk of stranded assets, and promotes competition, thereby reducing costs. In addition, California should require that charging equipment funded through these public funds be certified that it supports specific technical standards (such as OCPP, ISO 15118) by a certification body such as OCA.

- **Equity**. We encourage California to consider and incorporate the needs of historically underserved communities and those with the greatest barriers to charging – including accessibility as discussed above – to ensure that access to charging does not create a barrier to clean affordable electric mobility.

- **Flexibility and future-proofing.** The guidelines should reflect that technology is evolving quickly, such as EV range, charging speeds, etc., and that there are many site-specific needs for factors such as utility interconnection size and time, need for resiliency and reliability. Accordingly, the Plan should be flexible enough to allow for these site-specific needs and broaden the definition of charging infrastructure beyond the traditional utility make-ready equipment to include DERs such as on-site storage and other Advanced Load Management (ALM) technologies as eligible uses of Federal funding. In addition, the guidelines should allow for future technology evolution. For example, California should mandate open technical standards but only as a base, so that companies can adopt future versions of standards without the need for state oversight. Another example would be allowing for, and encouraging, oversizing of certain make-ready equipment (e.g., conduits, transformers, switchgear, etc.) to allow for increasing charging levels from 150 kW to 350 kW or adding additional chargers at each site.

Grid Interconnection

Regarding connections to the electric grid, Siemens suggests California support two principles. First, existing utility policies for funding interconnections should be the starting point. These policies usually have the utility pay for the interconnection if the subsequent energy sales over a period of several years meets a particular threshold or other decision criteria. Such utility funding should be leveraged for EV infrastructure investment. Only if such utility funding is insufficient should funding from NEVI be available.

Second, interconnection policies should explicitly allow for on-site energy management. Some utilities require that the interconnection support the maximum theoretical load possible; others allow for the use of on-site distributed energy resources (DER) and/or active load management to reduce the interconnection size requirement. For example, ten 150 kW chargers would have a theoretical maximum load of 1500 kW (1.5 MW). The size of the interconnection can be reduced significantly through the installation of DERs such as on-site generation, energy storage and/or ALM technologies – with appropriate protection devices. In our example, we could add a 500 kW battery and active load management (throttling chargers to 100 kW or sequencing the charging) to ensure that the total load drawn from the grid is only 500 kW. This 500 kW interconnection would be only one-third the size of the theoretical maximum of 1500 kW, thereby costing significantly less. More importantly, in many locations the flexible approach could result in avoiding a major grid upgrade, such as running new conductors for several miles or installing a new transformer. Another use case is where only single phase power is available, such as some rural locations. The battery could utilize that for being recharged while still providing DC power to the EV chargers.

Following this reasoning and regarding the Plan's definition of site capacity, we urge the Agencies to add further flexibility. Page 30 of the Plan states that NEVI-qualifying sites must have "site power capacity of not less than 600 kW." More specifically, the NEVI guidelines specify that four chargers much be able to charge simultaneously. This requirement can be achieved with a site interconnection of less than 600 kW, provided storage is available on site. Siemens has designed sites that can provide 600 kW of charging capacity with an interconnection of as little as 250 kW. This is particularly valuable for rural and disadvantaged communities, where utility grid capacity is less robust, and can provide substantial cost savings on the interconnection both in front of and behind the meter. Accordingly, we recommend that the Plan be modified to allow BESS to be included in the definition of "site capacity."

DCFC Sites Leveraging Existing Amenities

Highway travel centers have added many amenities to the sale of gasoline to accommodate consumer needs. Going beyond restrooms, most have added convenience stores with food and beverages, and other amenities. In addition, many of these locations have grown to have a number of eating establishments beyond the individual gas stations. These amenities take on more importance where EV charging occurs, because charging takes longer than filling a gas tank – taking up to an hour for a full charge with current DCFCs/EVs compared to five minutes for gas. Users of Plugshare frequently share information about amenities on the app, and many drivers use this information in selecting a location to charge.

Significantly, EV charging station developers will not be in a position to pay for providing significant – if any – amenities. It is critical that the stations leverage existing amenities (most frequently fast-food restaurants, coffee shops/kiosks or convenience stores) wherever possible, in order to maximize the driver experience. California should provide incentives to encourage locations with amenities.

The Need for EV Charging Infrastructure in Rural and Underserved or Disadvantaged Communities

The fundamental purpose of a nationwide charging network is to instill confidence in drivers that Americans can travel anywhere they need to go in their electric cars. This is very similar to the purpose of the interstate highway system itself. The purpose of the network is not to maximize short term utilization or profitability.

California's goal of providing universal charging access requires that sufficient infrastructure also be built in places where it will not be used very often, till EVs reach critical mass, and where it will be a long time - if ever - before it can collect enough revenue to pay for itself. Given that the most profitable sites already have charging stations and that private capital is already investing in additional sites based on a profitability criterion, Federal funds should be targeted at filling out the gaps in the infrastructure where there is less private sector interest. These gaps exist where charging is less profitable, which tend to be the most rural areas, as well as areas that are disadvantaged economically or otherwise.

Long-term Operation and Maintenance

Two things are essential to avoiding stranded assets and protecting the investment of public funds, which can be seen as ensuring that the charging stations continue to operate, to do so reliably, and to be accessible. First, interoperability in all elements (see our General Observations) is essential in achieving these goals, but especially in the communications protocol between the chargers and the back-end software system in the cloud. While this may seem to be a detail, it is actually the linchpin for ensuring that a new charging operator can take over existing installed chargers should the initial charging operator exit the business for any reason. This is not a theoretical problem; it happened for a major operator in 2020 in Australia.

Second, sufficient funding must be available to maintain the chargers. Insufficient funding is a more common problem for charging stations in some rural and currently underserved areas, precisely because they are less profitable or losing money. One solution is to include long-term (10-year) maintenance contracts in the funds provided by the program. Another is to work with local entities that have a long-term commitment to the location, especially electric utilities in rural areas, to support such sites.

Achieving 97% Charging Reliability

A recent Berkeley study[1] of public charging found that about a quarter of public DCFC did not work, meaning the researchers were not able to charge a vehicle. In the vast majority of failure situations, the charger itself was working (see table).

Table 1: EV Charging Reliability Issues

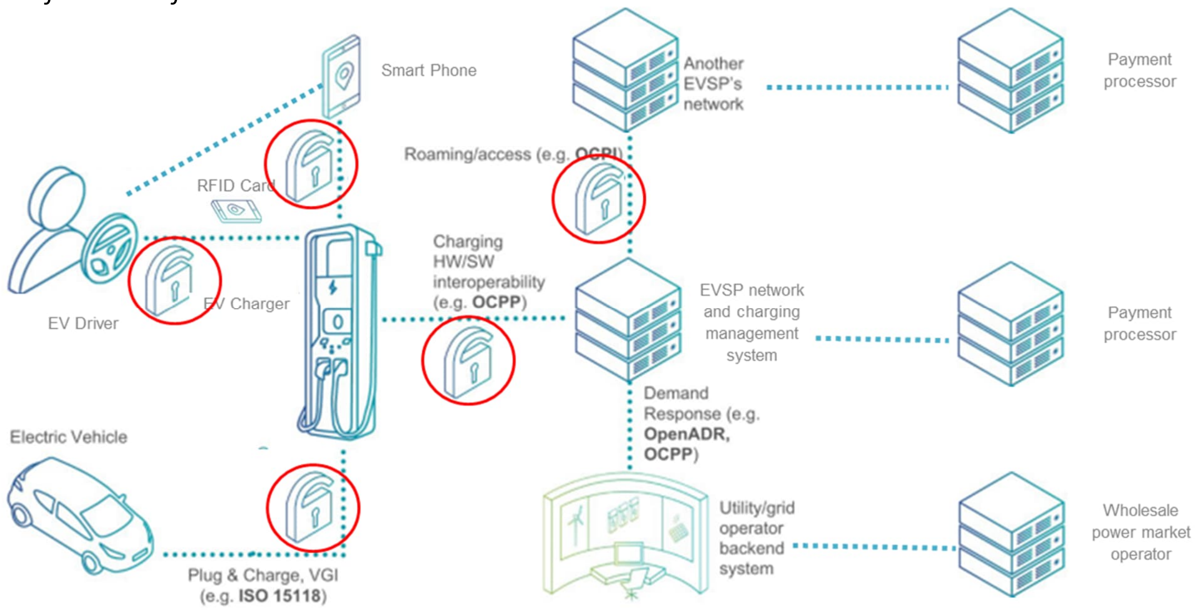
	N	%
Functioning		
Charged for 2 minutes	375	57.1%
Occupied by EV and charging	101	15.4%
Total	476	72.5%
Not Functioning		
Connector broken	6	0.9%
Blank or non-responsive screen	23	3.5%
Error message on screen[1]	24	3.7%
Connection error[2]	7	1.1%
Payment system failure[3]	47	7.2%
Charge initiation failure[4]	42	6.4%
Total	149	22.7%
Station Design Failure		
Cable would not reach[5]	32	4.9%

[1] Charger error, unavailable, under maintenance, etc.
[2] Connection, network, communication error, etc.
[3] 12 of these were evaluated with 2 credit cards but not an app or membership card
[4] Short session failure
[5] At 3 EVSEs the space was too small to safely back into

Instead, the inability to charge resulted from a failure in the charging ecosystem that needs to work from end to end for charging to function (see figure). These failures are primarily in communications between different elements of the ecosystem – due largely to a lack of well-defined and implemented interoperability between the system elements. **Siemens's global experience is that 97% reliability cannot be achieved without such well-defined and implemented interoperability.**

[1] David Rempel et al., "Reliability of Open Public Electric Vehicle Direct Current Fast Chargers," April 7, 2022.

Figure 2: EV Charging and Payment Interoperability Ecosystem. Red circles indicate where proprietary interfaces are often used.



Charger Power Levels

Drivers want something comparable to a "gas station" experience when they are fast charging on long trips. This has led to automakers increasing the speed with which vehicles charge. It is more common today for EVs to accept charging speeds of 150 kW, with some vehicles going as high as 350 kW. Even at 350 kW, charging will take longer than gas fueling, so pressure will continue to increase the speed of charging. (Such high charging speeds are less essential in other use cases, such as multi-family dwellings where the chargers are located nearby; 50 kW may be sufficient for those.) The Plan should allow for future growth in capacity through funding oversized make-ready equipment (e.g., conduit, transformers, switchgear, etc.) and allowing for DERs to provide resiliency. A charger without power does not serve any stakeholder.

Open Payment

Chargers funded via the Plan should accept physical credit and debit cards, which are the most universal and secure form of payment. They protect privacy, minimize fraud, and are available even to unbanked persons (who can purchase gift cards using cash). A second-best option is a universal RFID card that can be used at all public charging stations. The card can be issued by a third-party (as in Norway) or all EV service providers ("EVSPs") can agree to accept one another's RFID cards via "roaming" agreements. In this way, drivers can join a single EVSP network – of their own choice – but still charge everywhere. Many roaming agreements already exist.[2] It would be a small step to make roaming agreements a requirement for receiving Plan funding and would require minimal government regulation or oversight.

[2] https://electricautonomy.ca/2021/07/16/ev-charging-networks-roaming-agreement/

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Open Chargers

While less directly visible to EV drivers, having an open protocol interface between chargers and back-end cloud software is essential to preserving customer choice, minimizing the possibility of stranded assets, and increasing competition, thereby driving down costs. By requiring an open protocol, the Plan can prevent vendor lock-in and ensure that charging station owners can mix and match the best chargers with the best back-end software, and that the mix can change and evolve over time.

The best analogy is probably TCP/IP, which allows a huge variety of end devices to communicate with a huge variety of back-end software over the Internet. The equivalent for chargers is the Open Charge Point Protocol, OCPP, which is already used by virtually all EVSPs to connect their chargers to back-end software. It was developed by an open standards group, the Open Charge Alliance, and certification testing is available to ensure that both chargers and back ends speak the protocol properly.

To be very specific, the Plan should require that an open protocol be used between chargers and the back-end systems for any chargers and maintenance software funded with NEVI funds, and that the hardware and software pass certification testing. The Plan need not specify OCPP *per se* (though that may be preferable, and a few states have done so), because the industry has already largely – but not universally – adopted OCPP.

On the commercial side, the Plan requirement should also be that vendors agree to interoperate, i.e., that they agree to connect their hardware or software to other vendors' hardware or software using the open protocol when NEVI funding is involved and requests are made by site owners. Such connections must be done on a commercially reasonable basis, otherwise the interoperability requirement is meaningless.

Conclusion

Siemens appreciates the opportunity to submit these comments.

Sincerely,

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