# The Center for Community Energy Strongly Endorses SB59

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Our organization has made extensive study of the Vehicle-to-Grid (V2G) issue, and we have several technical comments to make about the feasibility of immediate adoption of V2G.

**V2B (Vehicle-to-Building) energy transfer via a DC charger is a mature technology**: A bidirectional vehicle can send energy back to the charger either as AC or DC. Currently sending AC via an internal converter is not permitted in CA. The CPUC is studying the requirements that would have to be met if a vehicle were to connect its AC output directly to building wiring.

On the other hand, if the charger is a DC charger (even a relatively low power L2 home charger) then bidirectional power transfer where the vehicle sends DC to the charger and the charger makes it into AC is currently permitted and chargers for this application are coming onto the market in CA.

Further, the marginal parts cost in the car to allow bidirectional DC charging is negligible. Only minor software changes to the vehicle and charger are necessary. Rich Scholer, Chairman of the SAE Hybrid Communication and Interoperability Task Force, has shown how this can be done in a presentation to the CEC in May of 2024 ISO 15118 Workshop - SAE J28472 Bidirectional Presentation.

We are aware there is a reluctance on the part of automakers to implement V2G because the communication standard between the car and the charger required to initiate V2G is still not complete. The standard ISO15118-20 already has an Addendum 1 under consideration and there is uncertainty in the industry about the degree of cybersecurity required to carry out the financial side of a V2G transaction.

However, this does not have to prevent the early adoption of V2B. As Scholer pointed out in his CEC presentation, the ISO standard provides for multiple protocols. The addition to the simpler ISO15118-2 standard that Scholer recommends would allow V2B between a car and a private charger behind the owner's meter. In this use case there is no need to exchange financial information with the utility, and the advanced protocol to allow V2G from a public charger could be added later as a software upgrade.

Since the base standard allows for multiple protocols and provides a mechanism for a car and charger to agree on a protocol at the time of connection, supporting both a simple protocol for V2B and later loading a more sophisticated one for V2G will not create any incompatibility going forward.

**We recommend that the simple protocol to allow V2B be required as soon as possible, since that would allow home use which is the most common requirement.** If some fraction of bidirectionally capable vehicles just sent enough energy into homes to cover the load from 5pm to 9pm it would significantly reduce the evening load on the grid. This degree of interaction does not require messaging between the car and the utility. Rate design alone would encourage the desired behavior.

**There is no reason to believe V2X will require an increase in battery size:**
Multiple Manufacturers are making bidirectional vehicles and many more have announced that future models will be bidirectional. None has suggested that a larger battery is required to meet the CARB standard if a vehicle is bidirectional. There is an obsolete idea that using a car battery for V2G will reduce the cycle life. This was a concern earlier, but academic studies have shown that the usage anticipated by V2G would not shorten battery life. In fact, some studies show that the controlled cycling in V2G usage can extend battery life. [1] [2] [3]

We now know that the primary contributor to battery decay is rapid discharge or deep discharge. In V2G plans the battery would never be deeply discharged and the discharge rate would not exceed the charge rate of a low power level 2 charger. The studies cited above show that the lighter usage contemplated in V2G schemes can actually refresh the battery.

**Bidirectional Charging does not require added electrical capacity in buildings:**
A new EV charger may require electrical upgrades, but this depends on the capacity of the charger, not whether it is bidirectional. A one-way charger of a given capacity will require the same amount of upgrade, so this is not an argument against bidirectionality.

**V2G control schemes can be designed to avoid discharging the battery too far**:
Concerns about leaving a vehicle discharged misunderstand the intended use of V2G. In all the designs and pilots for V2G, the system has been designed to never draw the vehicle battery below a certain level. To get into a situation where V2G discharged the battery the user would have to override the normal settings of a V2G system.

[1] Kotub Uddin et. al. On the possibility of extending the lifetime of lithium-ion batteries through optimal V2G facilitated by an integrated vehicle and smart-grid system, *Energy* Volume 133, 15 August 2017, Pages 710-722

[2] Wei, Y; et al. A Comprehensive Study of Degradation Characteristics and Mechanisms of Commercial Li(NiMnCo)O2 EV Batteries under Vehicle-To-Grid (V2G) Services. Batteries2022,8,188. https:// doi.org/10.3390/batteries8100188

[3] EV-elocity Project Final Report https://www.cenex.co.uk/app/uploads/2022/06/EV-elocity-Final-Report_published.pdf