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## Comments for EPIC-5 regarding AC V2G

*Additional submitted attachment is included below.*

## Comments for EPIC-5 regarding AC V2G

Submitted by: Climate Action California
Focus Areas: Transportation Electrification / DER Integration

CAC recommends that EPIC-5 fund research into bidirectional Alternating Current Vehicle-to-Grid (AC V2G). In the US, nearly all V2G is currently DC which is expensive to implement on the network side. AC V2G can enable large amounts of vehicle distributed storage to economically support the grid. Research should be consistent with existing charging and connection standards and should take advantage of AC V2G already implemented in Europe and CA.

AC three-phase V2G is already being developed in Europe. SAE J3068 is the North American counterpart to IEC 62196 Type 2 (the Mennekes connector), which the EU adopted as its official EV charging standard in 2013 and which provides native support for three-phase AC. Europe's bidirectional charging efforts are already being built on this AC pathway.
The strongest example is in Utrecht, Holland, where Renault and partners have moved from earlier AC V2G trials to an operational bidirectional AC deployment. Renault Group describes the program as Europe's first large-scale V2G car-sharing service and a world premiere in bidirectional AC charging. The service launched with 50 Renault 5 E-Tech electric cars and is based on 500 Renault electric vehicles equipped with Mobilize V2G technology. We Drive Solar provides the bidirectional public AC chargers and aggregation technology. Renault states that the 500-vehicle fleet can provide approximately 10% of the storage flexibility needed in the Utrecht region to make solar and wind generation more reliable. Another example of AC V2G implementation is a system based on ISO 15118-20 by Amina.

On the other hand, the US market has mostly adopted DC-centric V2G. In California, Tesla's Cybertruck just became the first AC-based vehicle approved for PG&E's residential V2X pilot program . Ford's F-150 Lightning and GM's Ultium vehicles use DC systems. PG&E approved the Cybertruck, the F-150 Lightning, and five GM Ultium vehicles (Silverado EV, Equinox EV, Blazer EV, Lyriq, Sierra EV) for its pilot program.

From the utility's perspective, they're all just distributed battery assets. AC or DC architecture is an implementation detail. What matters to the grid operator is dispatchability…can they call on your vehicle when they need it, and will it respond reliably and will there be a large enough ownership base to impact peak grid needs?

The EPIC-5 Plan should not treat AC as an unproven or marginal option.For example, at the high power end, bench data shows that light-duty AC-V2G at 133–160 kW is comparable  with today's typical unidirectional 150 kW DC fast charging  power interface.

Future demonstrations should compare AC and DC V2G on cost, efficiency, interoperability, installation requirements, achievable power, and grid-service performance to determine which approaches provide the greatest ratepayer benefit.

Submitted by,

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