DOCKETED	
Docket Number:	18-MISC-04
Project Title:	Vehicle Grid Integration Roadmap Update
TN #:	225714
Document Title:	Presentation - VGI Roadmap Update Workshop - Policy Panel
Description:	Presentation filed by Eli Harland (CEC) for Honda.
Filer:	Eli Harland
Organization:	American Honda Motors Co., Inc.
Submitter Role:	Public
Submission Date:	10/31/2018 3:53:19 PM
Docketed Date:	10/31/2018

VGI Roadmap Update Workshop – Policy Panel

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October 29, 2018

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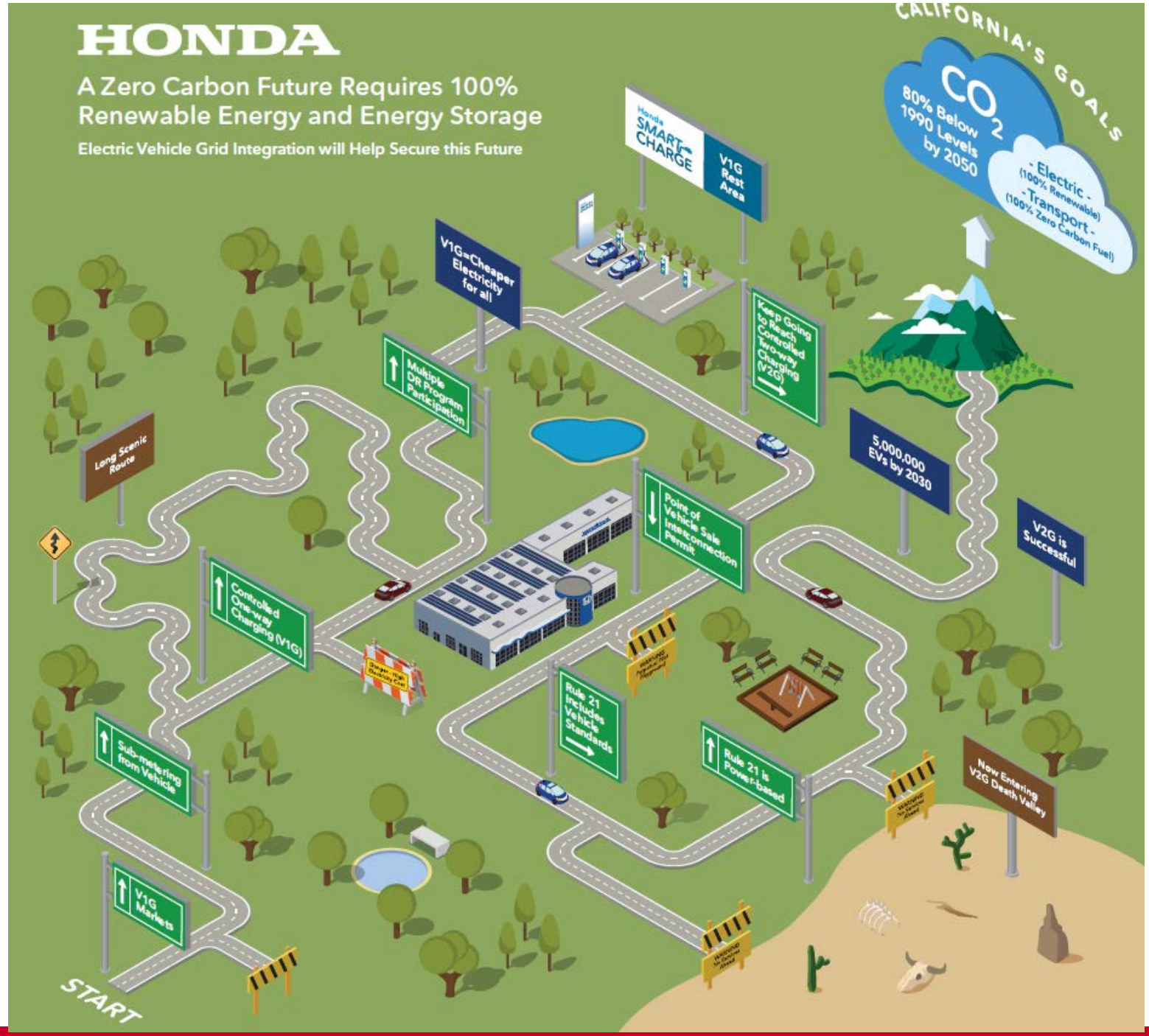
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A Zero Carbon Future Requires 100% Renewable Energy and Energy Storage
Electric Vehicle Grid Integration will Help Secure this Future
CALIFORNIA'S GOALS
CO2
80% Below 1990 Levels by 2050
- Electric - (100% Renewable)
- Transport - (100% Zero Carbon Fuel)
Honda SMART CHARGE
V1G Rest Area
V1G=Cheaper Electricity for all
Multiple DR Program Participation
Keep Going to Reach Controlled Two-way Charging (V2G)
Long Scenic Route
5,000,000 EVs by 2030
V2G is Successful
Point of Vehicle Sale Interconnection Permit
Controlled One-way Charging (V1G)
Rule 21 Includes Vehicle Standards
Rule 21 is Power-based
Sub-metering from Vehicle
New Entering V2G Death Valley
V1G Markets
START

V1G Markets

- Currently, neither electricity markets nor utility demand response programs reward the flexibility that controlled EV charging (V1G) or bidirectional EV charging (V2G) can provide.
- Electric vehicle charging is flexible because cars often sit for hours fully charged – their predictable load and long dwell times can become a fast acting resource.
- Changing the electricity market rules to recognize the value of EV charging flexibility could enhance vehicle sales and broaden electricity markets with new entrants.

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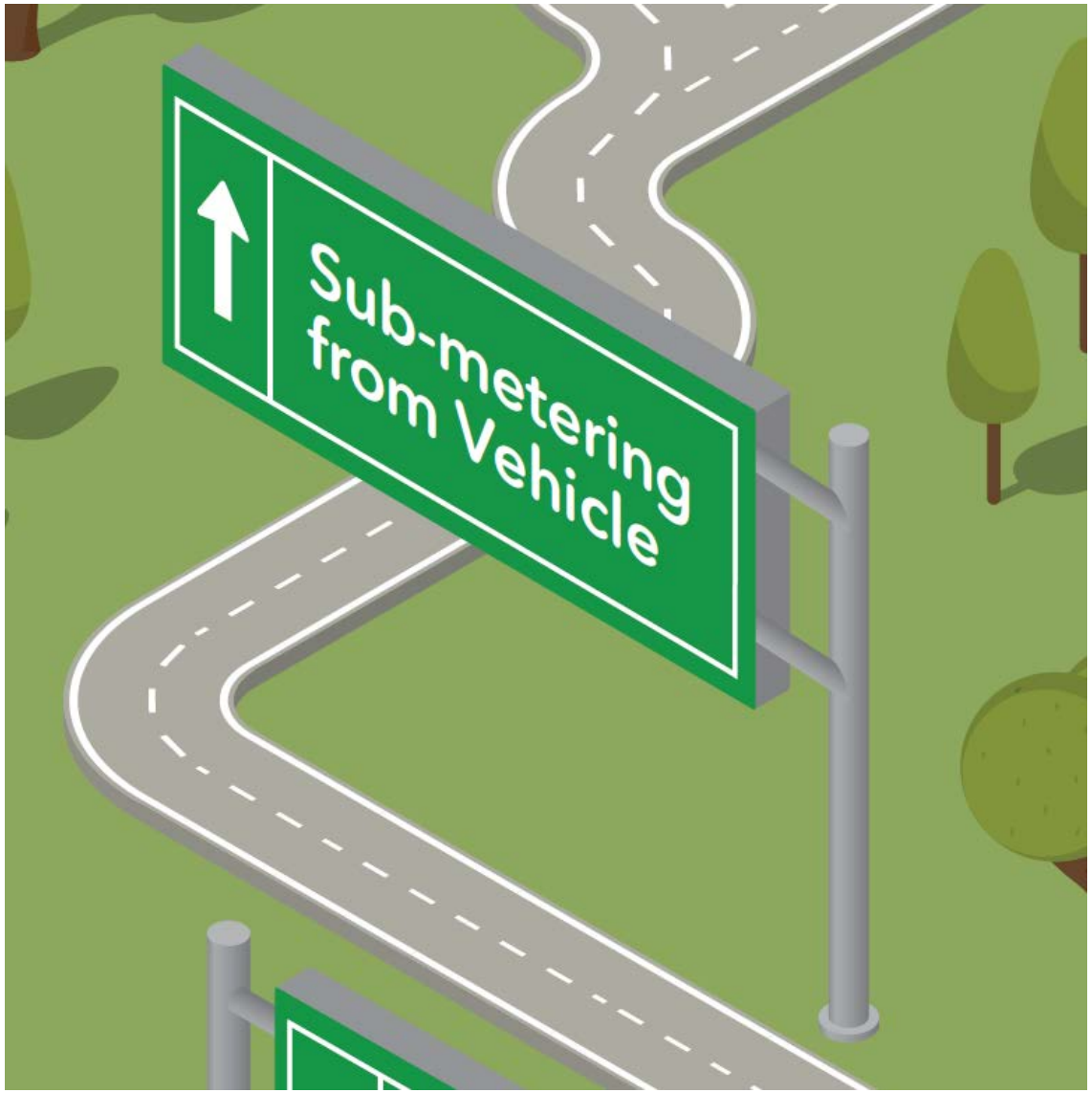
Sub-metering from the Vehicle



- Currently, demand response requires utilizing a whole house or site revenue-grade meter to prove demand response.
- Linking the vehicle's action to other generation and site load is imprecise and creates operational difficulty.
- Instead, using vehicle charging data or sub-meters to prove response would improve the accuracy of reconciling vehicle response.

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Controlled One-way Charging (V1G)

- Currently, V1G, or “smart charging”, is not recognized as a grid resource the way that stationary battery storage is.
- V1G includes slowing, stopping, or delaying EV charging based upon grid signals. This makes the vehicle a flexible scheduled load.
- V1G offers the potential to be lower cost than storage, as no major capital investment is required. Only a control signal to the vehicle or charging station to start and stop charging is needed.
- Because of its flexibility and low cost, V1G should be recognized as a grid resource for storage.

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Multiple DR Program Participation

- Currently, utility and ISO rules prevent enrollment in multiple DR programs at a time.
- Many EV customers are already enrolled in traditional DR programs, and are therefore ineligible to participate in vehicle-based DR programs.
- Customers should be able to participate in both traditional DR and vehicle-based DR programs at the same time.

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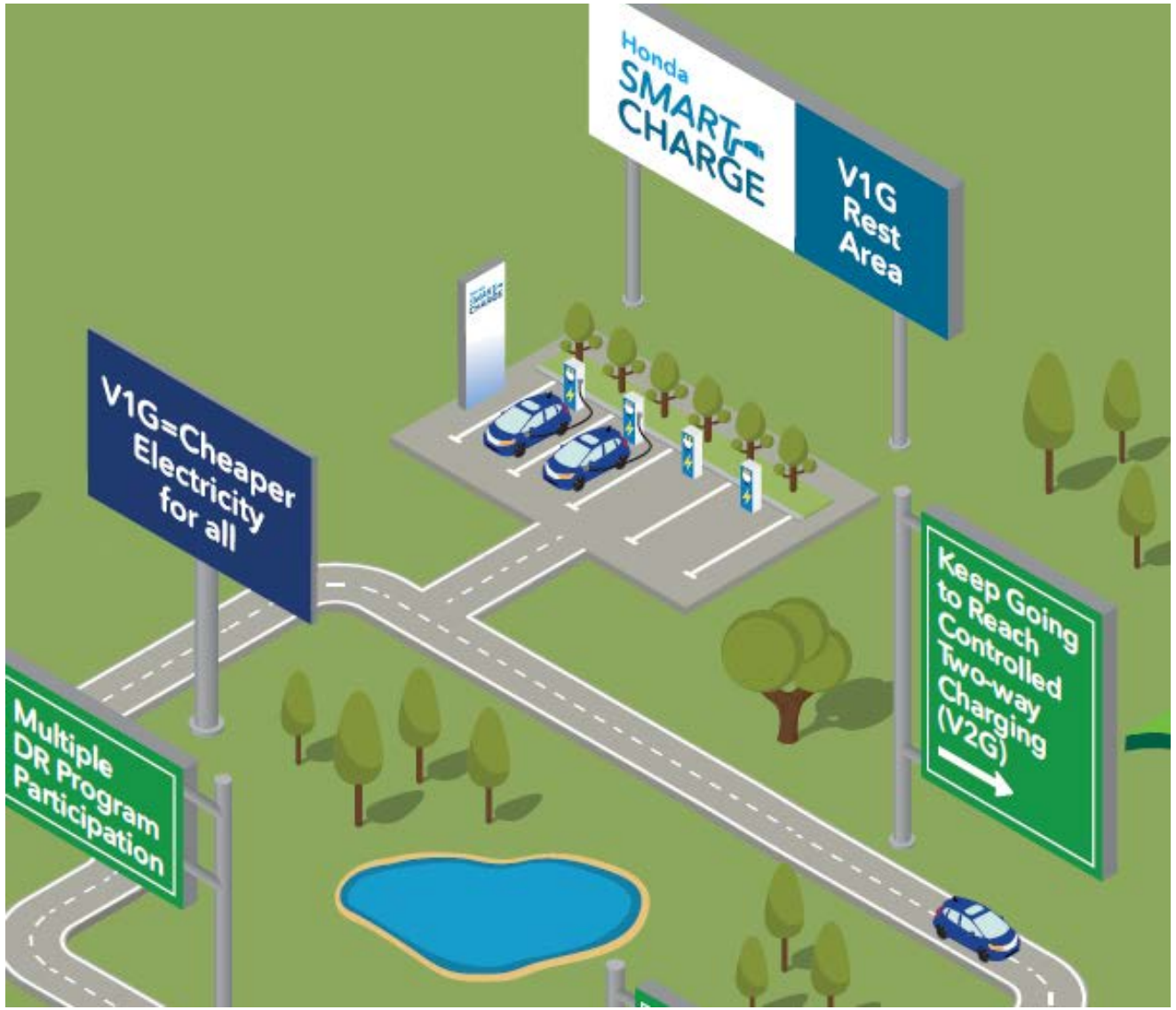
Onward to V2G!



Moving on to V2G…

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Point of Vehicle Sale Interconnection Permit

- Currently, the interconnection process for generation can take a long time.
- Customers need a simple, barrier-free pathway to participate in bidirectional (V2G) programs.
- Delays in getting an interconnection permit for a vehicle could be a barrier to widespread adoption.
- A type-certification based interconnection process should be established for V2G.

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Rule 21 Includes Vehicle Standards

- Currently, Rule 21 specifically lists UL1741 standards for inverters; however, UL does not apply to automobiles.
- The Society of Automotive Engineers (SAE) creates vehicle standards, including those covering grid connections for EVs.
- SAE J3072, a standard for bi-directional charge/discharge of vehicles, includes the same safety testing and performance standard (IEEE 1547) as UL1741.
- Rule 21 should also list SAE J3072 as an acceptable safety performance standard or specify IEEE 1547 as the standard for all inverters.

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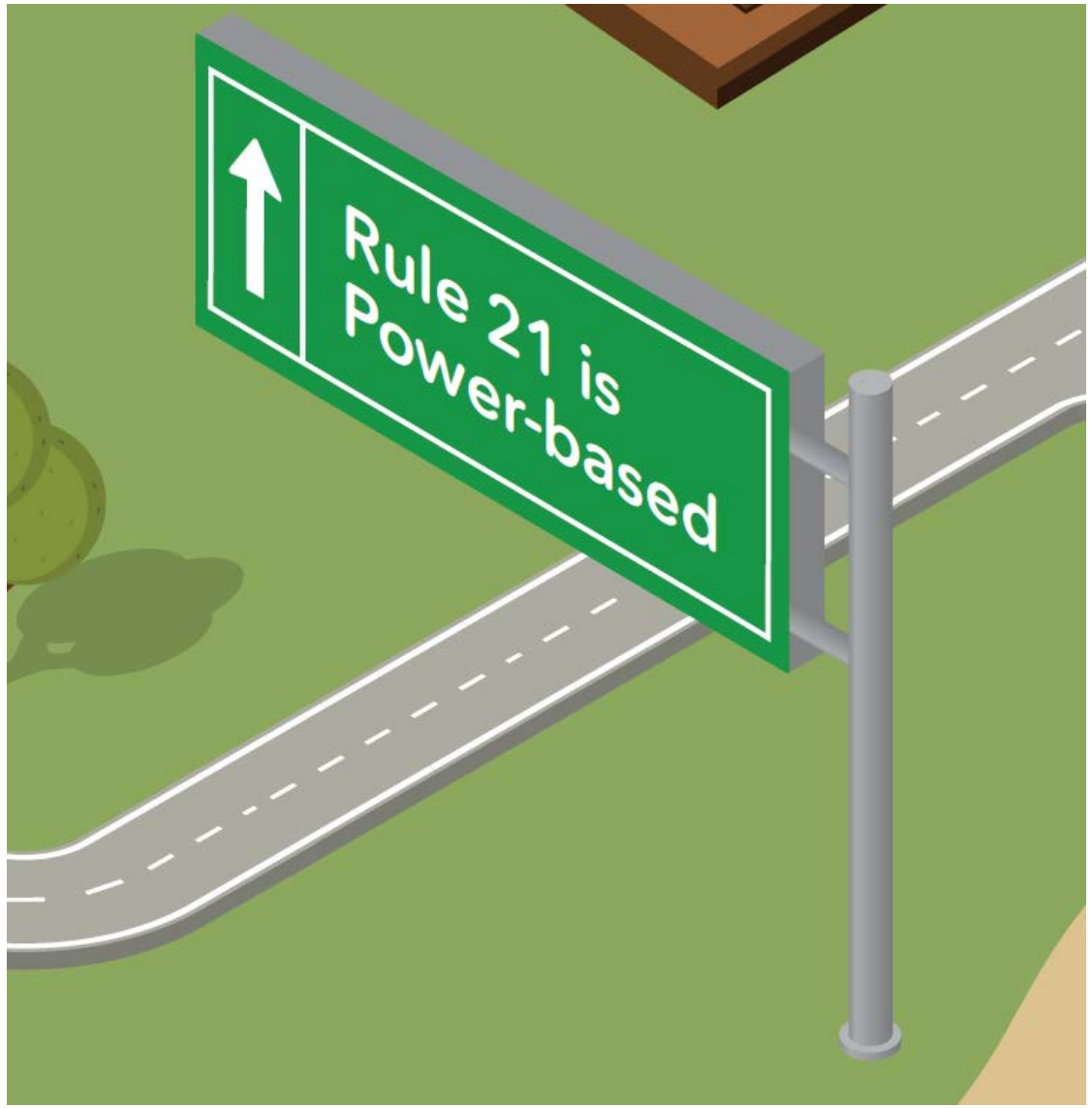
Rule 21 is Power-based



- Current regulations for interconnection dictate the type of inverter and generation source.
- Interconnection permits should be based on power and response, and not the specific model of the inverter, thus allowing for multiple types of equipment.

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Conclusions and Final Comments

- Honda believes the auto industry is technically prepared and ready to commit to deploying Vehicle-to-Grid technologies in California at scale in 4-5 years.
  - However, the business case for OEMs to do so is very uncertain today.
- CEC and other state agencies can solidify the business case and ensure V2G deployment is successful by providing:
  - **Vehicle Incentives:** Until sufficient market based value can be generated, provide vehicle-level incentives to reduce the risk to OEMs installing the hardware onboard the vehicles.
    - Estimate $1,000 per vehicle sold in CA could support a business decision to bring tech to market.
  - **EVSE Development:** Provide support to develop SAE J3072-based EVSE necessary for AC V2G.
    - Estimate $500 per EVSE deployed as well as direct development funding
  - **V1G and V2G Market Development**: Develop markets and utility tariffs that value and compensate vehicle resources.
  - **Interconnection Support:** Amend Rule 21 to enable V2G with onboard inverters
- Need full support to remove these barriers - lots of work to do!

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Thank You!

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