Smart Electric Power Alliance

# Grid Responsive Charging Networks

National Governors Association
Electric Vehicle Grid Integration Summit
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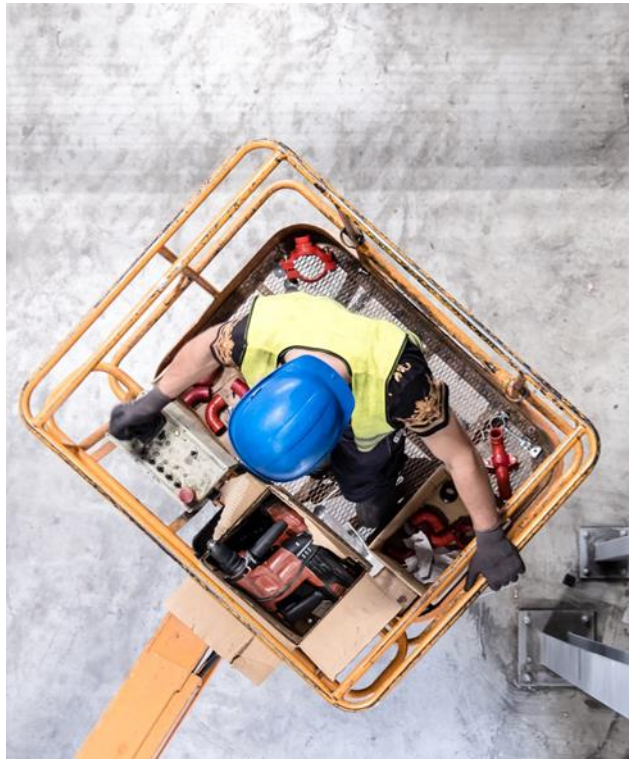
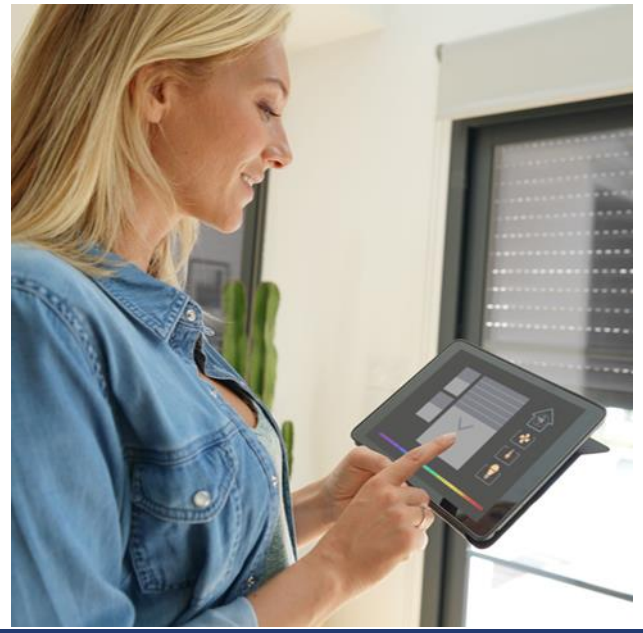
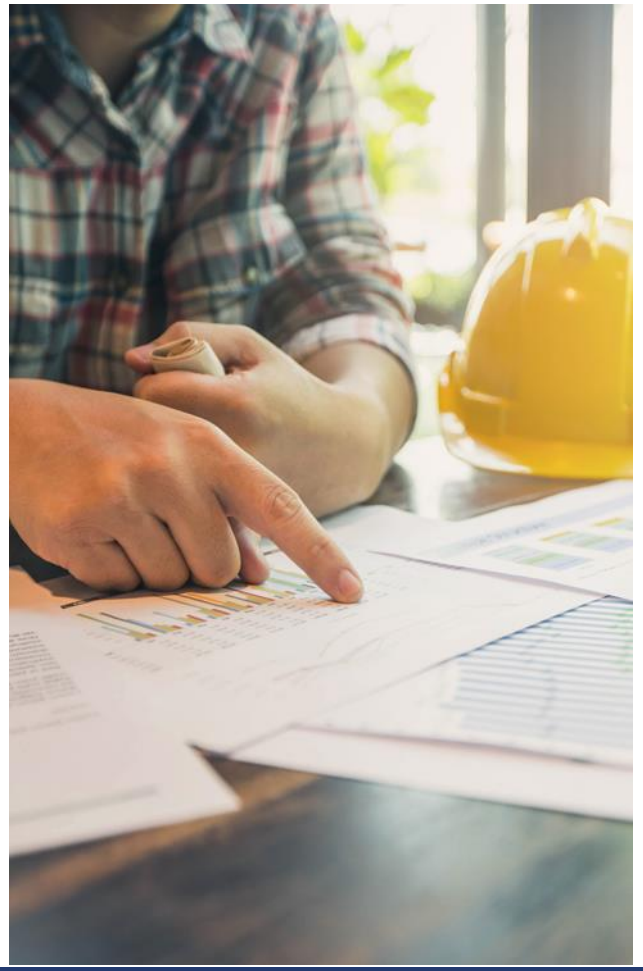
## Clean + Modern Grid

Utility Business Models | Regulatory Innovation | Grid Integration | Transportation Electrification







# Who Are We?

Smart Electric Power Alliance

Smart Electric Power Alliance

A membership organization

Founded in 1992

Staff of ~50
Budget of ~$10M

Research, Education, Collaboration & Standards

Based in Washington, D.C.

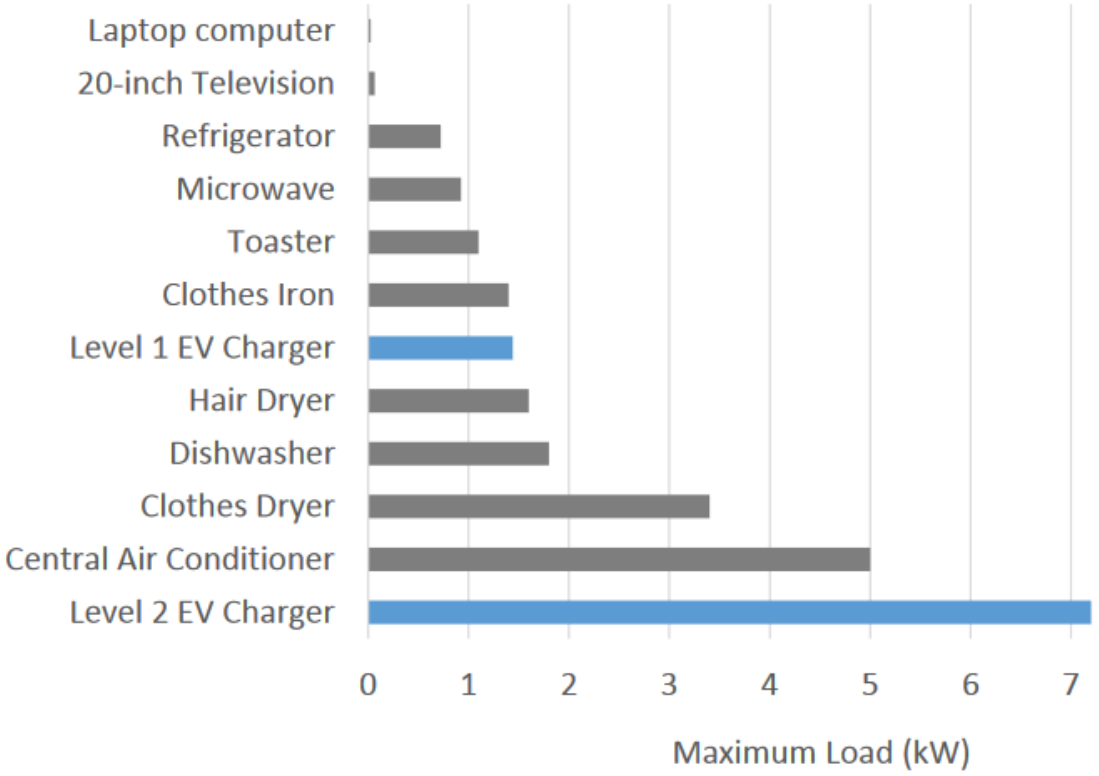
Unbiased

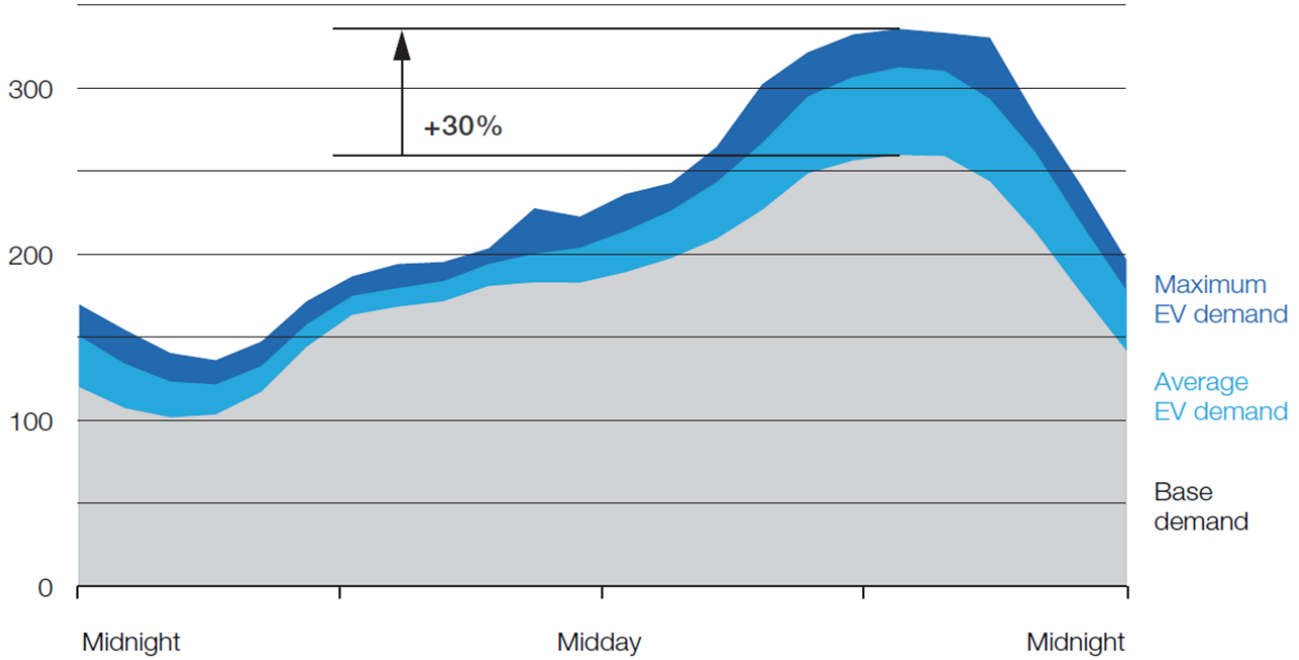
No Advocacy – 501c3

Technology Agnostic

# Impact of residential EV charging

The next generation of EV charging could have significant impacts on peak demand.

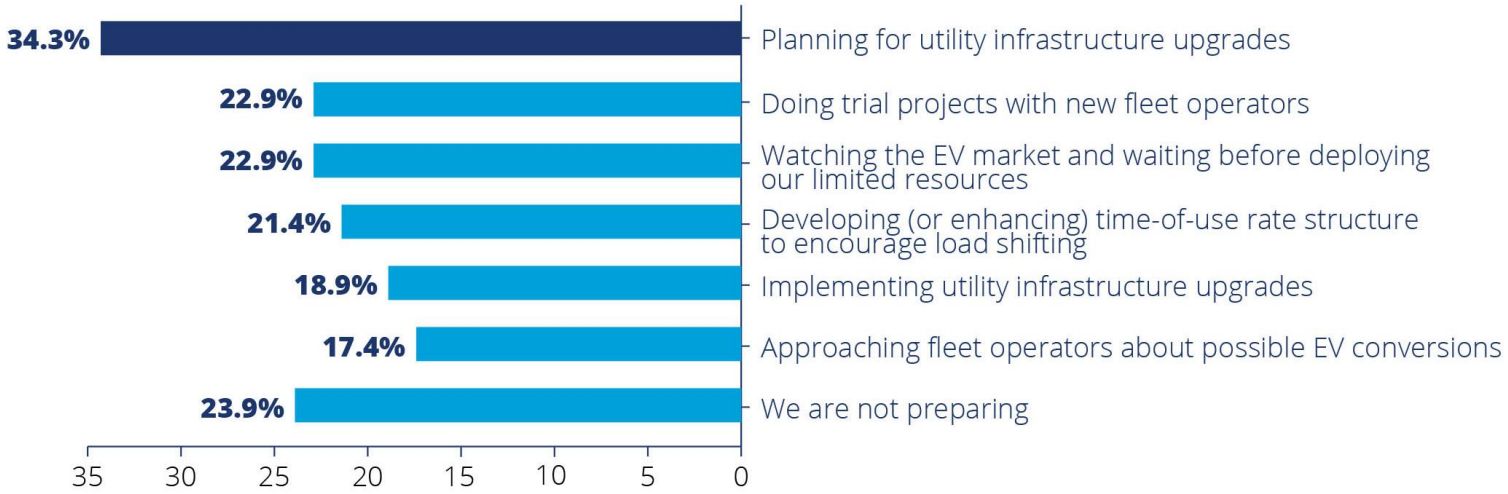



Source: Synapse Energy, 2019.

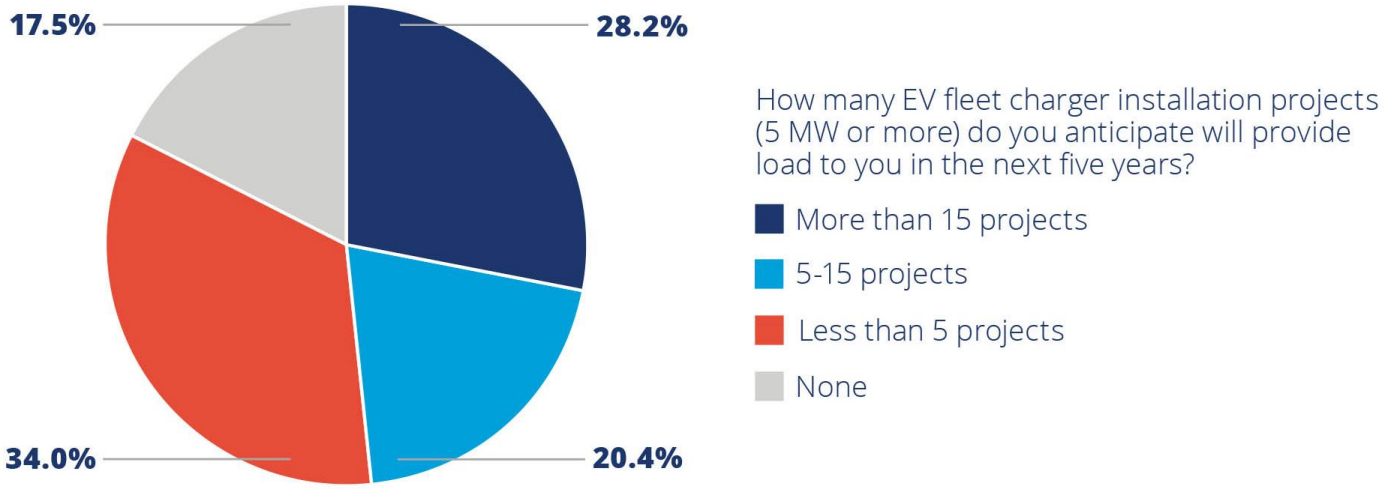
# Impact of fleet electrification

Most utilities are not adequately preparing…




Source: Black & Veatch, Strategic Directions: Electric Survey Results 2019. N=892.[12]

…even though ¾ of utilities expect >5 EV fleet projects of 5 MW+




Source: Black & Veatch, Strategic Directions: Electric Survey Results 2019.[22]

# Vehicle-Grid Integration Overview

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## Passive

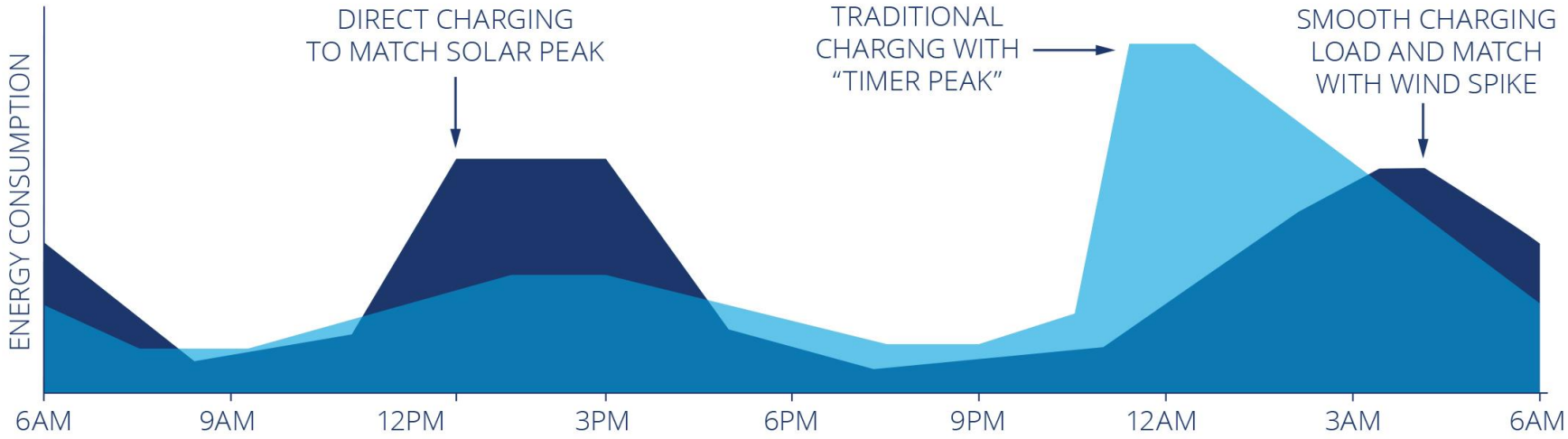
### Behavioral Load Control

- Choice
- User experience
- Timing is key
- Grid Operator Considerations

## Active

### Direct Load Control

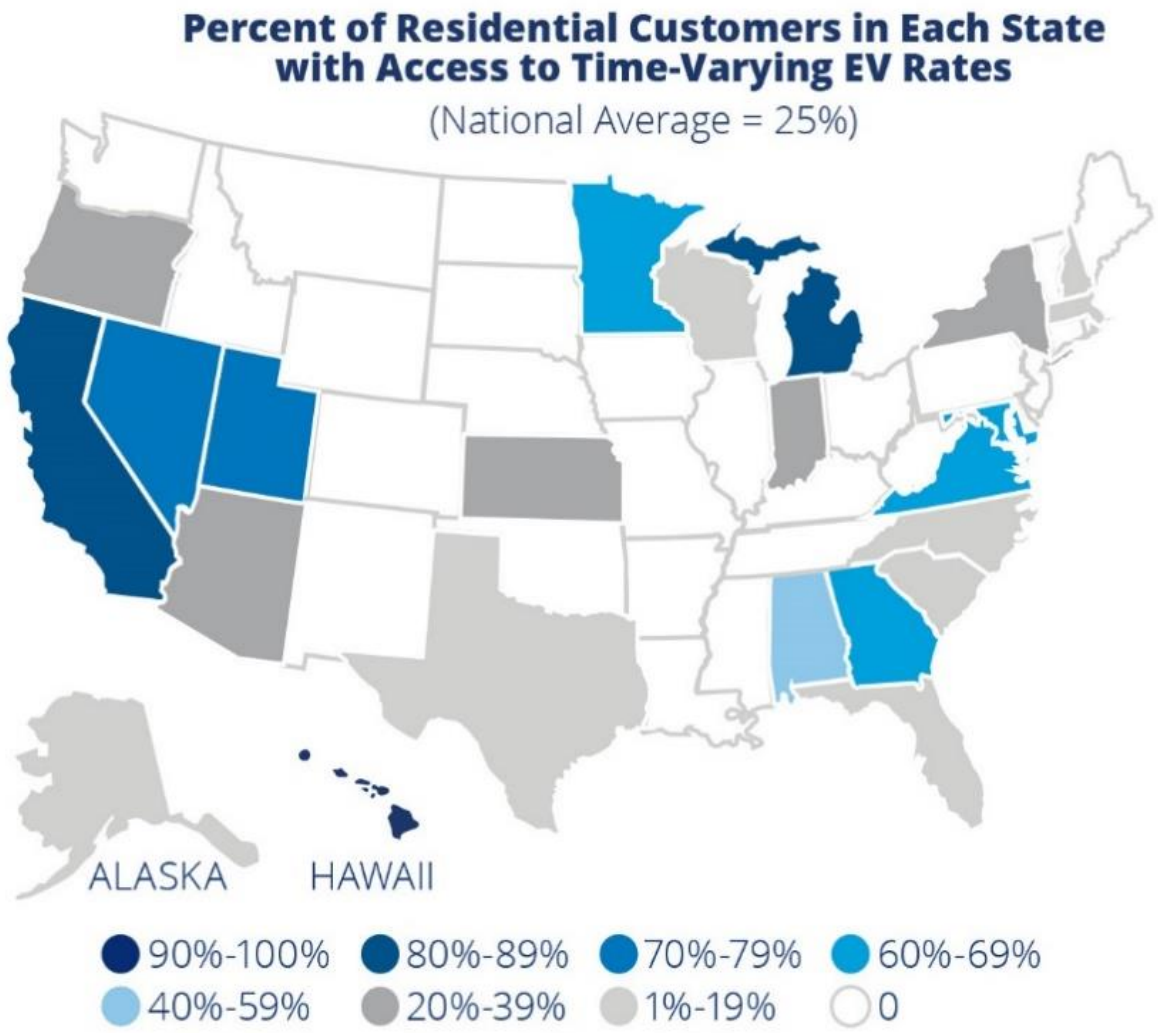
- User experience
- Transport Layer
- Messaging Protocol/ Standard
- Grid Operator Considerations




Source: BMW of North America, 2016 with edits by Smart Electric Power Alliance, 2017

Note: The light blue area illustrates the impacts of a hypothetical TOU residential charging rate with the lowest rate period beginning at 11 pm. The dark blue area shows how managed charging could distribute charging loads with peaks in renewable energy generation.

# Passive Load Management




Source: Smart Electric Power Alliance & The Brattle Group, 2019.

| | |
|---|---|
| **28** investor-owned utilities,<br>**12** municipal utilities, and<br>**10** electric cooperatives | **18** pilot programs,<br>**46** fully implemented residential rates |

Of the 64 EV rates, **58** were TOU rates, **1** was a subscription rate with an on-peak adder, and **5** were off-peak credit programs.

How the rate applies to the home load:

- **35** rates apply to the **total household energy consumption**, including the EV charging load.
- **21** rates **apply strictly to EV charging**. These rates typically require the installation of a second meter or submeter, and two rates are metered from a submeter in the EV charger itself.
- **8** rates allowed customers to **choose between whole home or EV-only options**.

# Active Load Management

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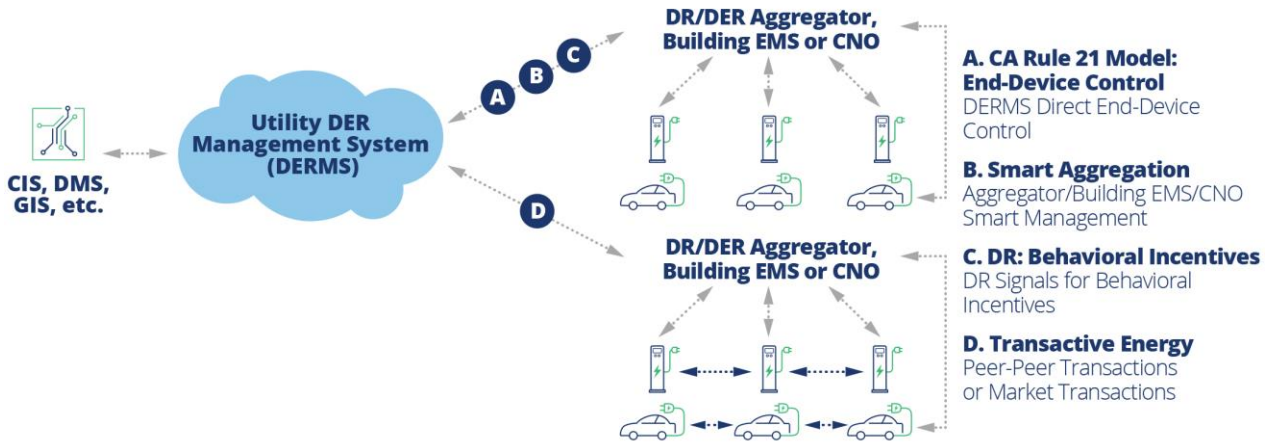
## How a State Could Support

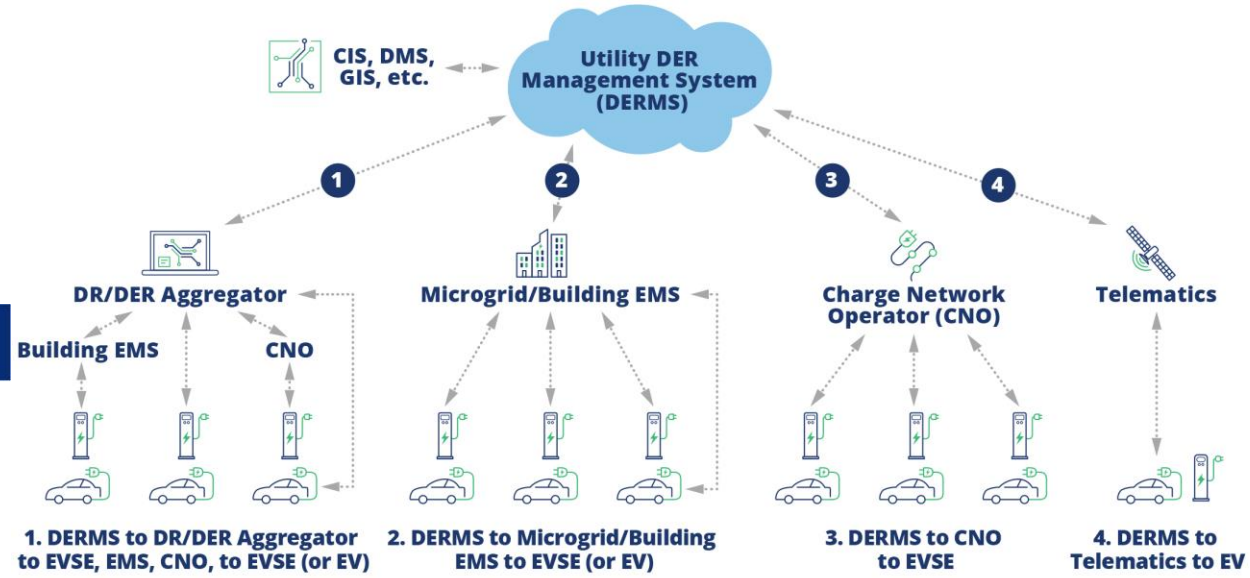
- Define value of managed charging
- Initiating a task force to discuss and define:
  - Communications protocols and standards
  - Pilots/demonstration projects that supports proof of concept for aggregation strategies
  - State goals for managed charging

**Figure 4: Grid-EV Communications Architectures: Where Decisions Are Made**




Source: Smart Electric Power Alliance, 2020.

**Figure 3: Grid to EV Communications Architectures**




- **Distribution Utility:** determines grid requirements; specific device or Group DER settings; communicates to DER
- **DER/DER Aggregator:** receives grid requirements; specific device or Group DER settings; communicates to DER; monitors and reports to DERMS
- **Building EMS:** receives grid requirements; determines how to implement; reports results to DERMS
- **Charge Network Operator:** receives grid requirements; determines how to implement; reports results to DERMS
- **EV:** with off-board, on-board or spilt inverter, uni- or bi-directions, AC or DC
- **EVSE:** with off-board, on-board or split inverter, uni- or bi-directional, AC or DC
- **Telematics:** Vehicle Telematics System—receives grid requirements; determines how to use EVs to meet grid needs

Source: Smart Electric Power Alliance, 2020.

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