Welcome

EV SWG Chair
Commissioner Katherine Peretick, Michigan Public Service Commission

EV SWG Vice-Chair
Chair Jason Stanek, Maryland Public Service Commission

NARUC Staff
• Danielle Sass Byrnett, Robert Bennett
<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>3:00 PM</td>
<td>Welcome and Announcements – Commissioner Katherine Peretick (5 minutes)</td>
</tr>
<tr>
<td></td>
<td>• Agenda review</td>
</tr>
<tr>
<td></td>
<td>• Announcements</td>
</tr>
<tr>
<td>3:05 PM</td>
<td>Setting the Stage- Chris Irwin, Program Manager for Transactive Energy, Communications and Interoperability in Smart Grid, DOE OE (3-5 minutes)</td>
</tr>
<tr>
<td>3:10 PM</td>
<td>Presentation: Muffi Ghadiali, Head of Ford Pro Charging (15 minutes)</td>
</tr>
<tr>
<td></td>
<td>• Vehicle 2 Grid (V2G) Impacts</td>
</tr>
<tr>
<td>3:25 PM</td>
<td>Presentation: Steve Letendre, PhD, VP, Policy and Regulatory Affairs, Nuvve Holding Corporation (15 minutes)</td>
</tr>
<tr>
<td></td>
<td>• Smart Charging (V1G) impacts</td>
</tr>
<tr>
<td>3:40 PM</td>
<td>Q&amp;A (20 minutes)</td>
</tr>
<tr>
<td></td>
<td>• Speakers will take questions from working group members</td>
</tr>
<tr>
<td>4:00 PM</td>
<td>Closed Door Discussion &amp; Peer Sharing (20 minutes)</td>
</tr>
<tr>
<td></td>
<td>• Introductions: name, state, role,</td>
</tr>
<tr>
<td></td>
<td>• Working group members will discuss their own views and the actions their states have taken to date.</td>
</tr>
<tr>
<td>4:30 PM</td>
<td>Adjourn</td>
</tr>
</tbody>
</table>

Feel free to enter questions into chat at any time
Federal Updates

Please see the email from March 20th, for more info on:

- The U.S. Department of Transportation’s (DOT) Federal Highway Administration (FHWA) recently announced the Notice of Funding Opportunity for the Charging and Fueling Infrastructure (CFI) Discretionary Grant Program. This round of funding makes up to $700 million from Fiscal Years 2022 and 2023 funding available to strategically deploy EV charging and other alternative vehicle-fueling infrastructure projects in publicly accessible locations in urban and rural communities, as well as along designated Alternative Fuel Corridors.

- Consider signing up for the DOE Joint Office of Energy and Transportation email list to receive important updates including information about past and upcoming Joint Office Webinars. [https://driveelectric.gov/](https://driveelectric.gov/)

- The White House announced a new initiative, the EV Call to Action Challenge. This is a call for stakeholders to make independent commitments to support the transition to EVs across four categories: (1) tools and resources, (2) consumer education and support, (3) EV fleet expansion, (4) community charging. The White House will be highlighting commitments on a rolling basis starting with submissions received by Friday, March 24, 2023.
Welcome

Moderator: Commissioner Katherine Peretick, Michigan Public Service Commission

Panelists
• Chris Irwin, DOE OE
• Muffi Ghadiali, Ford Pro Charging
• Steve Letendre, Nuvve Holding Corporation
Mitigating Impacts and Extracting Value

Range of Options

March 28, 2023

Christopher Irwin, U. S. DOE Office of Electricity
Transportation Electrification is Imminent

• Millions of vehicles will be connecting the grid in coming years
• It's important to understand our destination now to chart the best paths
  • To harness the value for consumers and utilities
• There is a span of approaches, and we will probably use all of them
No guarantees, but enormous potential

- EPRI staff made a “back of the napkin” estimate of the aggregate battery capacity of future EV populations.
- IF those EV’s are V2G capable, they can export to the grid as much as they can draw from the grid.
- Even with discounts in the assumptions, it’s a very large LOAD OR RESOURCE.
Approaches Span a Range of Options

- Vehicle Grid Integration CAN and WILL start simply
- Higher penetrations make more complex integrations worth the effort
  - (Grid appetite for control services grows)
- Complexity will be invisible to most participants, but especially the consumer
- Customer-owned EV’s won’t work for free
A note about grid services...
To Contact EVGrid Assist:
EVGrid@hq.doe.gov

THANK YOU
Commercial Electrification Perspectives

Muffi Ghadiali
General Manager
Ford Pro Charging
Mainstream Commercial Vehicles Are Now Electrified
Electric Vehicles and Charging cannot be separated.
Charging is Complicated

Utility Company Coordination + Infrastructure Changes + Construction + Charger Installation + Cloud Connection + Vehicle Delivery

~ 60% of Fleet Managers Say Transitioning to EVs is a Headache
Customers face Cost and Operational Challenges

"We’re not going 100% electric instantly, need a transition plan. We need to start now"

Operations Director
Utility Fleet

"We need integration across vehicles, chargers and how our fleet operates"

Director of Transportation
School District

"If we cannot control demand charges, electricity is more expensive than diesel"

Fleet Operations Manager
Transit Bus Operator

Operational risks and energy costs are the new roadblocks to fleet electrification
Providing a Complete Solution

Operations

Vehicles

Software

Design + Build

Hardware

Financing
Opportunities, and help needed

• Enable a seamless transition for customers with holistic vehicle-grid solutions

• Focused regulatory and technical policies that leverage V2G, V2X, Demand Response etc. and mitigate grid impact

• Incentives and new value streams that are designed for commercial and fleet customers
Mitigating Adverse Grid Impacts and Extracting Value:
NARUC Electric Vehicle State Working Group
A GLOBAL FOOTPRINT

• Headquartered in San Diego, CA
• Offices in Newark (Delaware), London, UK, and Copenhagen, Denmark
• 50+ employees
• 25+ years of V2G R&D
• 6+ years of continuous V2G commercial operations in Denmark
• US focus on electric school bus market
Renewable Grid Needs Storage

- NREL’s Storage Future Series estimates that 6.0 TWh of energy storage needed for zero carbon grid.

- Over 90% of lithium-ion batteries will be in EVs.
From Drain to Gain: Mitigating the Impacts of EV adoption on the grid

Managed Charging
V1G & Grid Services
V2G & Grid Services
Vehicle-to-Grid V2G

Nuvve controls power flow in and out of EV chargers and creates a Virtual Power Plant or VPP out of many small EV batteries to deliver energy services.
### V2G-AC vs. V2G-DC

#### V2G-AC (2 – 3 years)

**Description**
Power conversion on-board the vehicle

**Advantages**
Simple: cheaper, smaller, lighter, and easier to install

**Disadvantages**
Utility interconnection process is more complicated due inverter on vehicle

#### V2G-DC (today)

**Description**
Power conversion off-board the vehicle

**Advantages**
Interconnection process is straight forward as inverter is off-board

**Disadvantages**
Station and installation is more expensive than AC charging stations
The Importance of Bi-directional Charging

- Reduce the overall cost of ownership by unlocking the value that EVs provide as grid resources.
- Supporting the integration of variable sources of generation including wind and solar.
- Displace the need for stationary storage resources and the associated raw materials needed for their manufacture.
- Enhance grid flexibility through V2G dispatch during periods of extreme grid strain avoiding regional power outages.
- Providing resilience using EV with V2G during grid outages meeting essential loads at critical facilities.
NUVVE’S COMMERCIAL V2G WITH SCHOOL BUSES

- Standard V2G School Buses are available with CCS plugs

- Certified UL1741-SA V2G chargers are available
- Nuvve through our JV, Levo Mobility, offers a complete V2G fleet solution:
  - Buses
  - Chargers
  - Installation
  - Financing
Deployments Under Construction / Planned

- Cajon Valley
  - SDG&E territory
  - 6 DCFC & 6 Lion Electric buses
  - Participated in summer 2022 ELRP

- Ramona USD
  - SDG&E territory
  - 8 DCFCs & 8 Blue Bird buses
  - Recently gained PTO and will enroll in 2023 ELRP.

- San Diego USD
  - SDG&E territory
  - 3 DCFCs, 13 L2 and 3 Blue Bird buses, 10 IC buses

- Suffolk Transportation Services
  - PSEG LI territory
  - 11 DCFCs and 11 Blue Bird buses
  - Waiting on final construction and PTO
Policy Priorities

✓ Create incentives for V2G deployments and compensation mechanisms that represent the full stack of values that TE and V2G offers.
✓ Streamline interconnection standards and processes for V2G.
✓ Include V2G in grid impact studies and resource planning activities.
✓ Help “future proof” policies to incorporate bi-directional capabilities into infrastructure planning processes and funding.
✓ Expedite the development and implementation of V2G-related specifications and technical standards.
THANK YOU

Contact:
Steve Letendre, PhD
sletendre@nuvve.com
802-779-3580

V2G charging solutions: https://nuvve.com/contact/
Questions?

Raise your hand to ask a question or type a question into the question box
Please share your name, role, time at the commission, time on the working group

- Arizona
- California
- Colorado
- Connecticut
- District of Columbia
- Delaware
- Florida
- Georgia
- Hawaii
- Idaho
- Illinois
- Indiana
- Kentucky
- Louisiana
- Massachusetts
- Maryland
- Maine
- Michigan
- Minnesota
- Missouri
- New Mexico
- New York
- North Carolina
- Nevada
- Ohio
- Oregon
- Oklahoma
- Pennsylvania
- Puerto Rico
- Rhode Island
- South Carolina
- Texas
- Utah
- Vermont
- Washington
- Wisconsin

Please send any feedback or inquiries to rbennett@naruc.org
Next EV SWG meeting: Tues, April 25th, at 3pm ET

WWW.NARUC.ORG/CPI-1/ENERGY-INFRASTRUCTURE-MODERNIZATION/ELECTRIC-VEHICLES/
DOE’s EV Grid Assist webinar series (June – November) recordings are posted at: www.energy.gov/eere/evgrid-assist-accelerating-transition

Presentations and recordings of past EVSWG events are available on the NARUC website: www.naruc.org/cpi-1/energy-infrastructure-modernization/electric-vehicles/

EVSWG Listserv: NARUC-EVSWG@lists.naruc.org

ICYMI – 4 NARUC EV publications released late 2022:
- Models for Incorporating Equity in Transportation Electrification
- Electric Vehicle Interoperability: Considerations for Public Utility Regulators
- Considering Interoperability for Electric Vehicle Charging: A Commission Case Study
- Transportation Electrification: State Level Roles and Collaboration among Public Utility Commissions, State Energy Offices, and Departments of Transportation