NARUC Electric Vehicles State Working Group

EV BATTERY AND CHARGING MYTH BUSTING & STATE ROUNDTABLE

JANUARY 30, 2024, 3:00 - 4:30 PM ET

Welcome

EV SWG Chair

Commissioner Katherine Peretick, Michigan Public Service Commission

EV SWG Vice Chair

Commissioner Milt Doumit, Washington Utilities and Transportation Commission

New! EV Commission Staff Leads

Ryan Cheney, North Carolina Utilities Commission and Steve Olea, Arizona Corporate Commission

NARUC Staff

Danielle Sass Byrnett and Robert Bennett

Agenda

Feel free to enter questions into chat at any time

3:00 PM	**Welcome and Announcements – Commissioner Milt Doumit (10 minutes)** • Agenda review • Announcements • DOE – NARUC EV Leadership and Support
3:10 PM	**Patrick Walsh, Vehicle Technology Office (20 minutes)** • EV Battery Facts and Myth busting • Q & A
3:30 PM	**Member Roundtable (55 minutes)** • Anticipated state EV decisions, developments, or actions in 2024
4:25 PM	**Prioritizing 2024 EV State Working Group topics (5 minutes)**
4:30 PM	**Adjourn**

Event Announcements (1 of 2)

- **Webinar: February 1, 2024, 3:00 pm ET: NASEO-NARUC Webinar on Demand Flexibility and Electrified Transportation - V2G/V2X**. This joint webinar of the NASEO-NARUC GEB and Microgrids State Working Groups will explore opportunities for electrified transportation integrated with other distributed energy resources (DERs) to provide grid services and support resilience through demand flexibility and vehicle-to-grid (V2G)/vehicle-to-everything (V2X) functionality. Please see this link to register.

- **NARUC Winter Policy Summit: February 25, 2024, 11:15 am- 12:15 pm: Staff Subcommittee on Energy Resources and the Environment session on electric vehicles.** The meeting will feature three presentations on emerging EV topics: NEVI, interoperability, and transportation equity. Please use this link to find the Conference registration and agenda.

NARUC Winter Summit Interactive Workshop: Medium-Heavy Duty Vehicle Charging Needs in 2024 and 2030

Tuesday, February 27, 2024

- **Part one (11:15 – 12:15)** will focus on Near-Term Challenges and promising Approaches.
- **Part two (1:45 – 2:45)** will discuss Longer Term Capacity Needs, Data, and planning.
- ***This Workshop is open to Commission Staff Only.*** **Please use this form to register in advance.**

Workshop Agenda

Part 1: Near-Term Challenges & Promising Approaches (11:15 am – 12:15 pm)

- **Workshop Overview**
  - Danielle Sass Byrnett, Senior Director, NARUC Center for Partnerships & Innovation
- **Medium-Heavy Duty Fleet Electrification Experiences** (*moderated presentation & questions*)
  - Moderator: Steve Olea, Arizona Corporation Commission
  - Featured Speaker: Mike Roeth, North American Council for Freight Efficiency: Run on Less Campaign
  - Q & A: All attendees
- **Options for Energizing Large Capacity Chargers** (*facilitated attendee roundtable*)
  - Lead Discussant/Facilitator: TBD, U.S. DOE / Joint Office of Energy and Transportation
  - Roundtable: All attendees

Part 2: Longer-Term Capacity Needs, Data, & Planning (1:45 pm – 2:45 pm).

- **Overview of EPRI EVs2Scale2030 and eRoadMAP™** (*moderated presentation & questions*)
  - Moderator: Sarah Mullkoff, Michigan Public Service Commission
  - Featured Speaker: Katherine Stainken, EPRI
  - Q & A: All attendees
- **Predicting Charging Needs: Engagement with the eRoadMAP™ Tool** (*interactive exercise*)
  - Facilitator: EPRI & NARUC
  - Interactive Exercise: All attendees (bring a laptop or use a NARUC laptop)
- **Closing and Next Steps**
  - Danielle Sass Byrnett, Senior Director, NARUC Center for Partnerships & Innovation

DOE Support for NARUC on EVs

EV State Working Group

- DOE staff support & participation

DOE is always interested in hearing what kinds of assistance would be most helpful to PUCs. Reach out, ask here, or connect through Robert / Danielle at any time.

NARUC-DOE EV Leadership Dialogues

- June 2023: DOE's Vehicle-Grid Integration Initiative
- Aug 2023: Load Forecasting and Supply Chain
- Oct 2023: Affordability and Cost Allocation
- Dec 2023: EV Deployment Trends and Challenge of Service Load Requests

Today's Presentation

Moderator: Commissioner Milt Doumit, Washington Utilities and Transportation Commission

Guest Speaker

- Patrick Walsh, Vehicle Technology Office

U.S. DEPARTMENT OF ENERGY

Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

NARUC EV WG – Supply Chain, End-of-Life, Cold Weather, Battery V2G Impacts

Patrick Walsh
Technology Manager; Data, Modeling & Analysis
Vehicle Technologies Office
January 30, 2024

Questions Received

1. "What's the status of the battery supply chain? Will we have enough resources to support the batteries needed for wide scale EV adoption?"
2. "What happens to vehicle batteries after they are no longer used for EVs?"
3. "How do vehicle batteries react in cold weather? "
4. "Is there a negative impact on batteries if they are used for V2G?"

"What's the status of the battery supply chain? Will we have enough resources to support the batteries needed for wide scale EV adoption?"

- Sufficient global resources to support the transition to electrified transportation at scale
- No evidence to suggest a shortage of lithium, even domestically (e.g. recent Salton Sea discovery)
- Two recent DOE assessments of the battery supply chain
  - Federal Consortium for Advanced Batteries (FCAB) FCAB National Blueprint
  - Li-Bridge Report
- Acknowledge that supply chains need to adjust and that is well underway thanks in large part to the Inflation Reduction Act

"What happens to vehicle batteries after they are no longer used for EVs?"

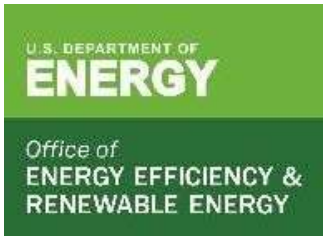
- We believe the recycling supply chain will be ready when significant numbers of EVs reach end of life
- Several offices across DOE are working to ensure that, and that all critical minerals can be recycled
  - Lead batteries success story: the most recycled consumer product in the U.S. at 99%, according to the National Recycling Rate Study released in 2023 by Battery Council International.
- Currently not a significant number of EVs that have reached end of life
  - Those that have – batteries removed in the recycling supply chain and shelved, but these batteries contain critical materials that can be recycled and reused to strengthen the domestic supply chain
- End-of-life EV batteries that retain 70-80% of original energy – second-use applications such as stationary storage
  - Useful for bolstering renewable power sources
- All other end-of-life batteries (damaged, defective, recalled) could be recycled to recover key minerals – cobalt, nickel, lithium or graphite – and be reused in domestic battery manufacturing
  - Recycling and second use are vital to offset materials scarcity concerns and to enhance sustainability and security/resilience of a circular domestic supply chain
- Office of Manufacturing and Energy Supply Chains (MESC) is supporting projects to stand-up battery recycling processing in the U.S.
- Vehicle Technologies Office (VTO) is supporting the demonstration of second-life applications of EV batteries
  - Lithium-Ion Battery Recycling Prize
  - ReCell Advanced Battery Recycling Center
  - VTO + AMMTO + ARPA-E: R&D on more efficient recycling methods, other pathways to re-use, remanufacture, and refurbish

"How do vehicle batteries react in cold weather? "

- Like internal combustion engine (ICE) vehicles, EVs will consume more energy in cold to heat the cabin, but EVs available for purchase today are capable of meeting typical driving requirements even under extreme weather conditions, and can maintain cabin comfort for extended periods of time
  - EVs have high powertrain efficiency = much less waste heat available
- BEV energy use and range are more sensitive to extreme cold conditions (such as 0F) than ICE counterparts
  - Charging rates and energy needed for battery conditioning are also affected by cold temperatures
- Ongoing DOE-funded research for decades – today's EV batteries are significantly better (energy density, cost, power, cold performance) than 10 years ago, and will continue to improve
- Current batteries exhibit some reduced chemical performance in the cells in extreme cold conditions, but Argonne National Lab (ANL) test data has shown:
  - Vehicles with battery heaters recoup almost half of the usable battery energy lost to extreme cold at 0F; those with heaters show only a ~4% loss of usable energy at 0F and those without show only an 8% loss
  - Heat pumps offer a significant technological advance in heating efficiency for electric vehicles, often drawing only a fraction of the power of electric resistance heaters
- Preconditioning significantly helps avoid cold-weather energy loss
  - ANL test data points to reduced energy consumption of up to 20% in short, city-like trips at 20F
  - Similar to remote-start for ICE vehicles – warm up the powertrain and the cabin before driving

"Is there a negative impact on batteries if they are used for V2G?"

- No evidence to suggest that V2G can or will harm EV batteries
  - Power draw for grid services is lower than power required by typical driving needs that batteries are sized for (100 kW+)
- Vehicles would need to certify / meet standards to participate in such programs
  - Vehicle manufacturers would help bound what goes in / out of the battery (warranty/durability protection)
  - Potential negative impacts would be minimized with standardization and cooperation
- Grid benefit could greatly outweigh any impact on battery life
  - Would need V2G programs to adequately pass on benefits to vehicle owner to incentivize uptake
- V2G technology applications depend on how batteries are used and how often
  - Generally passenger vehicles are parked 90%+ of the time
  - EVs parked and plugged in offer a compelling potential distributed resource if implemented properly
  - Success of V2G will depend on the value proposition to utility and vehicle owner, as well as technical standards
- Energy Services Exchange Standard
  - Funded in part by DOE as part of the EVs @ Scale Lab Consortium
  - Vehicle-grid 'energy marketplace,' including open communication protocols and arbitrage valuation
  - Supports bidirectional information and power flow across the value chain (utilities, DER service providers, aggregators, charge network/station operators, vehicle owners)
  - Communication between utility operator : EVoke has 1500+ L2 chargers reporting load every 5 minutes and ESX is and charge network operator is deployed as Proof-of-Conceptaggregating the load for each of ConEd's 82 load zones
- SAE J3400 standards work is creating a new opportunity to write purpose-built sections of the standard requiring compliance and compatibility for vehicles



Thank you!

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With significant contributions from DOE Offices of MESC, JOET, and Policy

Questions

Moderator: Commissioner Milt Doumit, Washington Utilities and Transportation Commission

Guest Speaker

- Patrick Walsh, Vehicle Technology Office

Are there other topics for which you would like to hear some myth busting this year?

Add your ideas / requests in chat at any time today.

Member EV Roundtable

- Please share what EV decisions, developments, or actions are anticipated in your state for 2024?
  - **Please limit remarks to 5 minutes and to one person per state.**

2024 EV State Working Group Topics

- In 2024, the EV SWG aims to have a topic schedule published in advance.
- Please vote for the top 2-3 topics you would like to see addressed by the Working Group this year.
- Zoom poll

No virtual meeting in February! (See you in DC.)

Next EV SWG meeting: March 26, 3:00-4:30 pm ET via Zoom

WWW.NARUC.ORG/CPI-1/ENERGY-CUSTOMERS/ELECTRIC-VEHICLES/