Committee on Energy Resources and the Environment

This session will begin at 11:15 a.m.
Impact of EVs and V2G on the Grid?  
A Colorado Regulator Perspective

NARUC Summer Policy Summit  
July 17, 2023

Eric Blank, Chairman  
Colorado Public Utilities Commission
Potential 2030 Impact of EVs in Colorado?

<table>
<thead>
<tr>
<th>Category</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>EVs on the Road (2030)</td>
<td>940,000</td>
</tr>
<tr>
<td>Average Battery Size</td>
<td>60 Kwh</td>
</tr>
<tr>
<td>Total Storage Capability</td>
<td>56,400 MWh</td>
</tr>
<tr>
<td>4-Hour Duration Capacity</td>
<td>14,100 MW</td>
</tr>
<tr>
<td>Xcel Energy BAA Peak Demand</td>
<td>9,000 MW</td>
</tr>
<tr>
<td>Cost of Utility-Scale Storage</td>
<td>$250 per KWh</td>
</tr>
<tr>
<td>Value of Battery Storage?</td>
<td>$14 Billion</td>
</tr>
<tr>
<td>PSCo 2022 Electric Rate Base</td>
<td>$11 Billion</td>
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</tbody>
</table>

The potential $ and MW peak demand impact of EVs on the CO electric system is enormous.
Impact on Energy and Demand Forecasts?

EVs are the single biggest uncertainty in the energy forecast and may increase energy needs in CO by 25-35% by the early 2030s w/ a potential doubling or tripling by 2045?

PSCo ERP, Proceeding No. 21A-0141E, HE 101, Technical Appendix, at p. 46.
Impact on Distribution Planning / Investment?

Distribution already accounts for over 40% of Xcel CO’s total capital investment (DERs, aging equipment, new growth), with the potential for a restructuring of planning, investment, and cost recovery to accommodate EVs and V2G.

PSCo Rate Case, Proceeding No. 22AL-0350E, HE 101, at p. 28.
Impact on Rate Design?

→ Need to better align customer incentives w/ the needs of the grid to dynamically shape customer behavior.
Over the coming years, EVs and V2G may be the single biggest change to CO energy systems driving peak demand and energy growth and complicating load forecasting and resource planning. Issues surrounding distribution system planning, investment, and cost recovery as well as more dynamic approaches to rate design will also play a critical role requiring new programs and approaches so that EVs and V2G are a substantial benefit, not a cost. I very much look forward to hearing and learning from the panel!
A Microgrid on Wheels- Can V2H and V2G Applications Transform the Home and the Grid?

- Evan Belser, Managing Counsel and Policy Strategist, Ford Motor Company
- Zach Woogen, Senior Policy Manager, Vehicle-Grid Integration Council (VGIC)
- Stephanie Gossman, Director of Electric Transportation, Georgia Power Company
A Microgrid on Wheels- Can V2H and V2G Applications Transform the Home and the Grid?

National Association of Regulatory Utility Commissioners
2023 Summer Policy Summit
Austin, Texas
July 17, 2023

Evan Belser
Policy Strategist and Managing Counsel
Ford Motor Company
600,000 EV Production Run Rate

150,000 F-150 Lightning
   North America

150,000 E-Transit
   North America & Europe

270,000 Mustang Mach-E
   North America, Europe, China & Oceania

30,000 Explorer
   Europe
   (Production begins 2023 and ramps significantly in 2024)
US Stock of Electric Vehicles
International Energy Agency, Global EV Outlook 2023

> 2.1 million EVs now on the road

Additional Electricity Demand from EVs
Bloomberg NEF Electric Vehicle Outlook 2023

US EPA Proposal, by 2032

~70% EV penetration for light-duty cars, SUVs, and pickup trucks
~40% EV penetration for medium-duty van and pickup trucks
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Unlocking EVs as a Strategic Grid Resource

Zach Woogen, Senior Policy Manager of VGIC
July 17, 2023 | NARUC Summer Policy Summit
Vehicle-Grid Integration Council is exclusively focused on unlocking the value of flexible charging and V2X

VGIC:
- Prioritizes integrity and credibility
- Supports collaborative engagement with all VGI champions
- Promotes healthy competition
What is vehicle-grid integration (VGI)?

VGI encompasses the suite of ways EVs can provide services to the grid and increase the value proposition of EVs:

- **V1G**: one-direction, managed charging
- **V2B/V2H**: vehicle used to power a building or home
- **V2G**: bidirectional charging and discharging for grid services
- **Station Demand Management**: minimize cost and time for utility infrastructure upgrades
- **Integrated DERs**: co-located EV charging with solar and stationary energy storage
Why VGI now?

- Accelerate Transportation Electrification
- Support the Decarbonizing Power Sector
- Increase Affordability of Electricity
- Improve Grid Resiliency
- Foster Economic Activity
Since its founding, VGIC has:

- Helped establish the nation’s first scalable VGI aggregation program for load reduction and V2G exports (*ELRP*).

- Led partnership to create the nation’s first V2G Export Rate (*PG&E DAHRTP Settlement*).

- Helped secure approval of submetering in California, and a path forward for telematics-based VGI in CA and NY (*Submetering Decision*).

- Published tone-setting recommendations for advancing the connection of V2X equipment (*V2X Interconnection Best Practices*)

*And much more...*
**VGI Playbook: opportunities to advance VGI**

### Charging infrastructure
- Consider and promote VGI strategies alongside charger deployment, not after
- Ensure VGI strategies are included in make-ready program marketing, education, and outreach

### Rates
- Offer optional time-varying rate opportunities to manage load
- Offer optional export compensation for V2X and storage-backed charging

### VGI forecasting
- Recognize value of flexible charging and discharging in grid planning practices

### Grid modernization
- Support non-wires solutions to secondary distribution system upgrades

### Programs
- Modify traditional demand response programs to support EVs
- Establish new managed charging, V2X, and tech-agnostic VPP programs for year-round optimization

### Submetering and Telematics
- Develop pathways to submeter using vehicle or charger to increase participation in EV rates and V2X use cases

### V2X bidirectional charger interconnection
- Adopt streamlined framework for interconnection, leading to lower soft costs and faster deployment
EV and charging providers offering V2X bidirectional charging capabilities today (or soon)
Four Pillars of Unlocking V2X Bidirectional Charging

Energization + Interconnection
Compensation Mechanisms
Upfront Cost / CapEx Support
Technical Standards
Strategic focus area: V2X EVSE connection and interconnection

Key Recommendations for Utilities and Regulators

1. If a notification, approval, or interconnection pathway for distributed energy resources exists, it is unlikely that a new process would need to be created for V2X bidirectional charging systems. For example:
   - Islanded systems (A) fit into existing processes for fossil fuel backup generators
   - Grid-parallel systems (B) fit into existing processes for grid-parallel energy storage systems

2. The appropriate process, technical requirements, forms, timelines, shared documentation, and applicable fees for each configuration should be clear and readily accessible. Any requirements for site plans or single-line diagrams to be certified by a Professional Engineer (PE) should be communicated early in the process.

3. Grid-parallel systems should not be prohibited from operating in islanded mode during an outage if the appropriate equipment is installed.

4. Flexible process entry points are critical to unlocking V2X bidirectional charging value for the grid and customers. Equipment should be permitted to notify and seek approval for any configuration upon installation and then notify and seek approval for a different configuration in the future. For example:
   - Load only systems (C) should be permitted to seek small generator interconnection at a later date.
   - Island systems (D) should be permitted to seek small generator interconnection at a later date.

Common V2X bidirectional charging system configurations

ENERGIZATION:

A. LOAD-ONLY MODE
No generator interconnection and little-to-no review required

B. ISLANDED (FOR BACKUP)
No generator interconnection and little-to-no review required (e.g., notification-only, similar to fossil-fuel backup generator)

INTERCONNECTION:

C. PARALLEL, NON-EXPORT (discharge < site load)
Can fit within existing non-exporting small generator interconnection frameworks

D. PARALLEL, EXPORT (discharge > site load)
Can fit within existing exporting small generator interconnection frameworks

Strategic focus area: V2X compensation

<table>
<thead>
<tr>
<th>Program</th>
<th>Description</th>
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<tbody>
<tr>
<td>CA Emergency Load Reduction Program – EV/VGI Aggregation Pilot</td>
<td>Resi + Commercial Through 2025</td>
</tr>
<tr>
<td>PG&amp;E SB 676 V2X Pilots</td>
<td>Resi + Commercial Through 2025</td>
</tr>
<tr>
<td>National Grid Connected Solutions</td>
<td>Commercial Only</td>
</tr>
<tr>
<td>NY VDER Tariff: ConEd, O&amp;R, National Grid</td>
<td>Commercial Only</td>
</tr>
<tr>
<td>PG&amp;E Commercial Day-Ahead Hourly Real-Time Pricing (DAHRTP) Export Compensation Rate Pilot</td>
<td>Commercial Only Through 2026</td>
</tr>
<tr>
<td>SDG&amp;E Proposed Export Compensation Rate</td>
<td>Commercial Only – Timing TBD</td>
</tr>
</tbody>
</table>

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2023 Annual Member Meeting

Tuesday, October 17, 2023
Newlab Detroit

REGISTER NOW
Thank you!

Vehicle Grid Integration Council (VGIC) is a national 501(c)(6) membership-based trade association committed to advancing the role of electric vehicles and vehicle-grid integration through policy development, education, outreach, and research.
Appendix
**New York**
- Currently launching mass-market residential managed charging programs, both EV- and charger-based
- Commercial managed charging programs to launch Q4 2023
- Load factor demand charge alternative rate option to begin 2024/2025

**California**
- Codified rules for V2G interconnection
- **Novel EV aggregation program pays $2/kWh for V1G/V2G during extreme load events** (Emergency Load Reduction Program)
- Nation’s first export rate designed for EV customers (PG&E DAHRTP)
- Large-scale PG&E pilots for managed charging (evPulse) and V2X (VGI Pilots) across all customer groups
- Several active commercial deployments of V2G school buses (SDG&E)
- Adopted submetering protocol to increase EV rate participation

**Illinois**
- Blue Bird and Nuvve V2G deployment

**Colorado**
- Xcel Charging Perks OVGIP Pilot with BMW, Ford, GM, Honda
- V2G chargers can interconnect to the grid
- Fermata and Alliance Center V2B deployment
- Utility funding for EVs includes VGI pilots

**Massachusetts**
- Customers currently earning over $10,000/vehicle/year with V2G in Connected Solutions program
- VGI-capable (both V1G and V2G) chargers may claim Clean Peak Energy Certificates

**Nevada**
- School bus V2G trial includes battery incentive and export credit
- School bus V2G trial includes battery incentive and export credit

**Florida**
- FP&L subscription-based unlimited off-peak charging program

**VGI Programs on the rise:**
Strategic focus area: Telematics-based VGI and EVSE submetering

- BG&E evPulse
- Xcel Charging Perks Pilot
- PG&E and BMW ChargeForward
- Duke Subscription Pilot
- SVCE and MCE Programs
- National Grid Charge Smart MA
- ConEd and GM Pilot
- PCE Telematics Pilot
- Connecticut EV Charging Program
- SMUD Managed EV Charging Pilot
- Colorado Springs Rebate
Strategic focus area: ALM and storage-backed charging

Software-Based ALM (workplace charging, multi-family homes)

Integrated or Co-Located Energy Storage (fleet depots, public DC fast chargers)

1. Instead of each station operating at full power all the time, stations are controlled individually based on charging demand.
2. This allows more charging stations to be installed while only using a fraction of the aggregate power traditionally required.
3. Businesses save as much as 60% off the cost of electrical system upgrades and peak demand charges.

Source: PowerFlex / EDF Renewables

Source: FreeWire Technologies, Inc.

Source: Veloce Energy
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Electric Transportation Overview

Stephanie Gossman  
Electric Transportation Manager  

July 17, 2023
More than Light-Duty On-Road Vehicles

80 unique EV on-road models by end of 2023 with many electric school and transit buses coming to Georgia via federal grant funding assistance

Source: EPRI
Many Off-Road Options, too

OEMs like John Deere have commitments to go electric, and electric aviation has been announced in Augusta.
Powering Georgia’s Electric Vehicle Future

- Investing in the Electric Grid
- Fueling EVs with Cleaner Energy
- Bringing ET Technologies to GA
Make Ready Program

Includes
ET Charging Infrastructure includes panels, conduit, wiring and associated infrastructure on customer side of the meter.

May Include
Transformers and other power delivery equipment will utilize the standard line extension polices. Any additional upgrade costs may be covered through Make Ready program.

Does Not Include
• Charger equipment, future proofing
• Painting, wheel stops, bollards, etc.
• Restricted Access Chargers Outside Publicly Owned Fleets
Thank You
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New Resource from the NARUC Center for Partnerships and Innovation:

Getting Started Guide for Electric Vehicles

July 2023
Thanks for attending. The next session begins at 1:45 p.m.