NARUC Electric Vehicles State Working Group

FLEXIBLE INTERCONNECTION

MARCH 17, 3:00 - 4:30 PM ET

Welcome

EV SWG Chair

Commissioner Staci Rubin, Massachusetts Department of Public Utilities

EV SWG Vice Chair

Commissioner Milt Doumit, Washington Utilities and Transportation Commission

EV Commission Staff Leads

Benjamin Baker, Maryland Public Service Commission

Steve Olea, Arizona Corporate Commission

NARUC Staff

Margerie Snider

Danielle Sass Byrnett

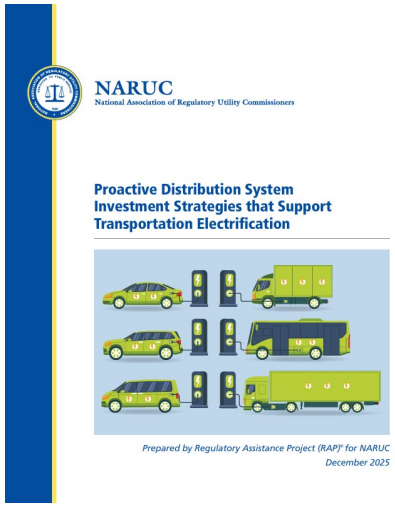
Agenda

Feel free to enter questions into chat at any time

3:00 PM	**Welcome and Announcements: Commissioner Rubin** • Agenda review • Feb 2026 NARUC EV Workshop Recap
3:10 PM	**Speakers:** • **Elizabeth Turnbull**, Alliance for Transportation Electrification • **Mike Zimmerman**, Environmental Defense Fund • **Gerard Westhoff** and **Ben Shapiro**, RMI
4:10 PM	**Member Discussion**
4:30 PM	**Adjourn**

Next EV SWG Meeting:
April 21, 3:00-4:30 pm ET
Managed Charging

New NARUC Publication:
Proactive Distribution System Investment Strategies that Support Transportation Electrification



Feb 2026 NARUC EV Workshop Takeaways: Top 10 Actions to Enable Flexibility & Affordability

Top 5 Actions for Commercial Fleets

1. Create time of use rates with high differentials
2. Enable flexible service connections
3. Enhanced integrated distribution system planning for commercial fleets
4. Increased education on existing studies and pilots with collaboration and outreach to fleet stakeholders
5. A fleet tariff that accelerates fleet electrification while maximizing the benefits of load flexibility and providing incentives for assured load mitigation strategies

Top 5 Actions for Residential Vehicles

1. Increase customer enrollment and activation of managed charging, including incentives
2. Utility incentives for managed charging
3. Enhanced planning including stakeholder engagement
4. Smoother interconnection processes and requirements
5. Updated utility billing systems

Today's Speakers

- **Elizabeth Turnbull**, Alliance for Transportation Electrification
- **Mike Zimmerman**, Environmental Defense Fund
- **Gerard Westhoff** and **Ben Shapiro**, RMI

Alliance for Transportation Electrification

Steering EV Policy in the States

Flexible Service Connections

NARUC EV State Working Group
March 17, 2026

Elizabeth Turnbull

Alliance for Transportation Electrification

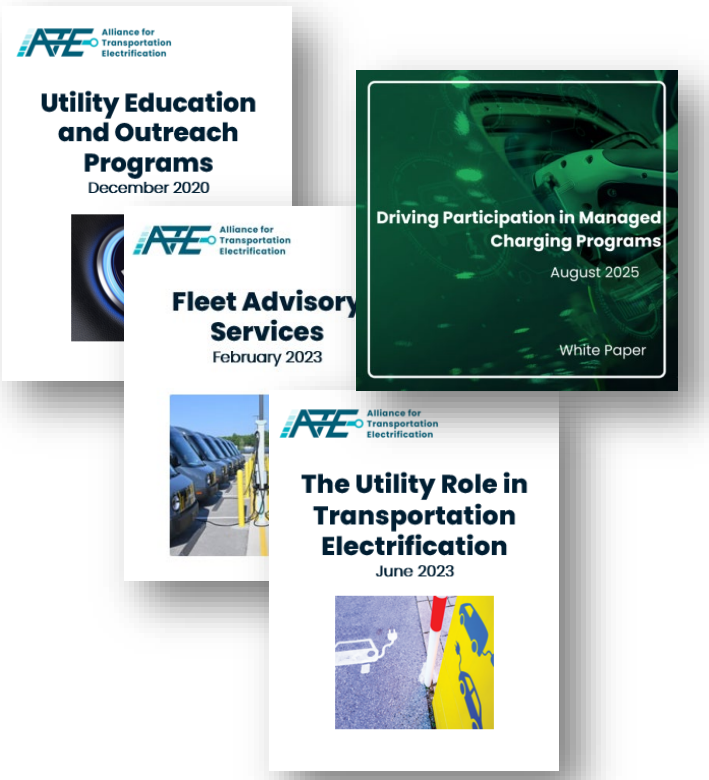
Over 50 Member Companies Across North America

Our Thought Leadership

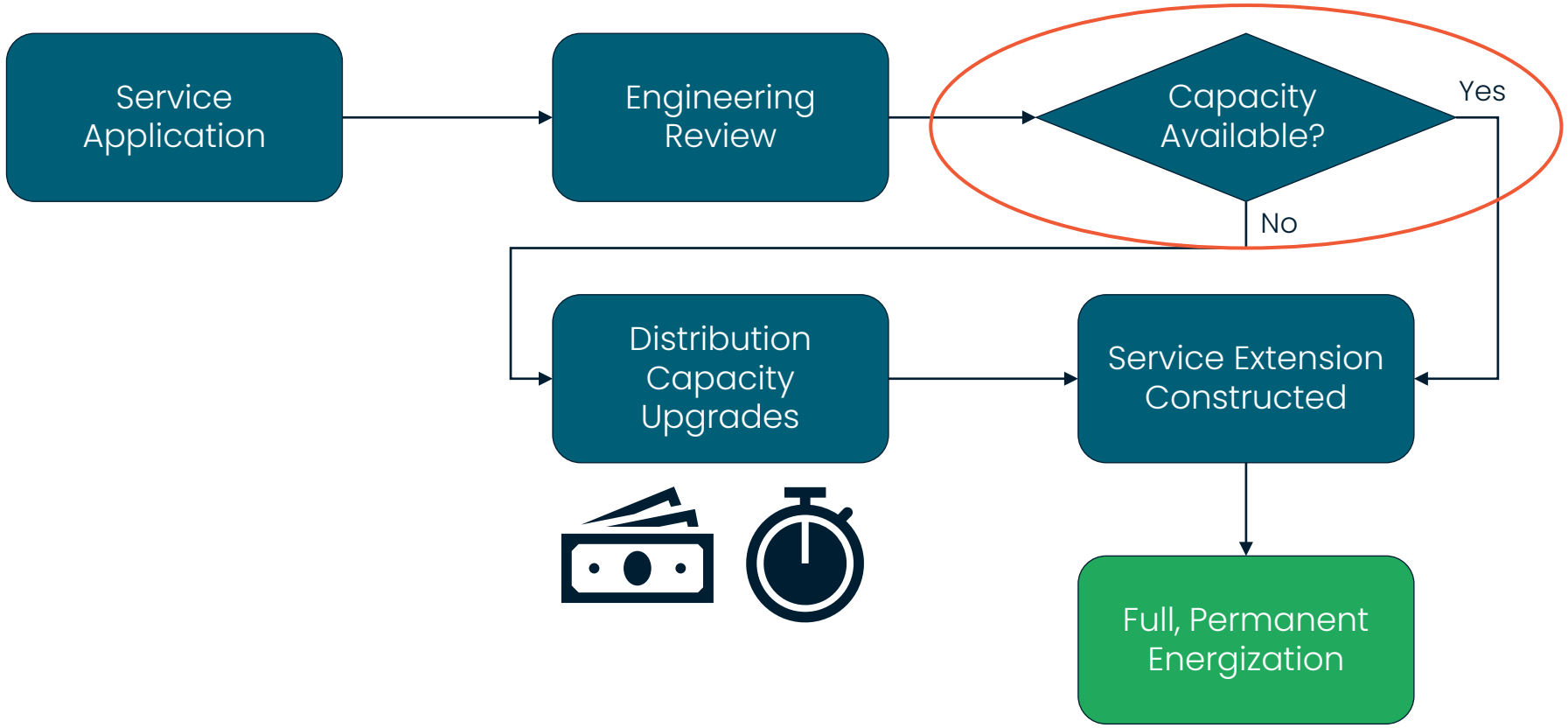
Interconnection

Rate Design

Utility Program Design



Typical Utility Service Connection Process



Reasons for Lengthy Energization Timelines

	Distribution System Capacity Upgrades	Service Extension Construction
Purpose	• Prepare to Serve Load	• Connect Load
Constraints	• Substation Capacity • Feeder Capacity	• Transformer Availability • Utility Personnel Bandwidth • Local Permitting Timelines
Timeline	• 1-10 years	• Up to 2 years
Solutions	• Proactive Investment • Decision Support Systems • Bridge-to-Wires Solutions • Long-Term Load Flexibility	• Process Improvements • Pre-Ordering Equipment • Additional Personnel • Local Permitting Reform

Risks of Energization Timeline Delays

Utility Risks	Customer Risks	Policymaker Risks

• Unmet customer expectations
• Potential for canceled, delayed or lost projects, resulting in lost revenue
	• Higher uncertainty and complexity
	• Delayed revenue and rising soft costs (estimates are no longer valid, cost of materials change, projects may have to be rebid)
	  ◦ $100,000-$150,000 NPV for LDV charging
	  ◦ $1.5 MM - $3.5 MM NPV for MHDV charging
		• Missed opportunity for downward rate pressure
		• Weakened economic development
		• Slowed or stalled electrification, potentially affecting state energy policy goals

Source: Atlas Public Policy, Cost Savings from Improving Energization Timelines for EV Charging, Feb 2026

New and Flexible Solutions Are Available

Decision Support Systems

- Hosting Capacity Maps
- Advisory Services
- Capacity Checks
- Service Sizing Refinements

Tools to help find and better use existing distribution capacity

Bridge-to-Wires Solutions

- Mobile Asset Deployment
- Phased Service Connections
- Flexible Service Connections

Programs to flexibly use existing capacity while long-term capacity is built

Long-Term Load Flexibility

Tools to flexibly use existing capacity…. forever?

Bridge-to-Wires Solutions

Using existing capacity flexibly while new capacity is built

Mobile Asset Deployment

- Utility-owned mobile batteries or substations
- Can be deployed and redeployed as needed

Phased Service Connections

- Connection size increases stepwise over time
- Customer builds out infrastructure in tandem

Static Flexible Service Connections

- Schedule-based capacity limits
- Customer uses behind-the-meter load management or DERs

Dynamic Flexible Service Connections

- Utility uses grid technology to send granular (e.g., hourly day-ahead) capacity limits

Greenlane – Colton, CA site

Limitations of Bridge-to-Wires

- Temporary – do not avoid grid upgrade costs
- Do not impact service extension timelines
- Implementation learning curve
- Limited scalability presently
- Dynamic FSC may require utility DERMS platform

Recommendations

Recommendations for Utilities

- Identify specific challenges
- Develop tailored solutions
- Evolve technologies, analysis and operational readiness
- Consider necessary tariff and rule changes
- Design for success
- Share data and learnings

Recommendations for Public Utility Commissions

- Proactively address the topic
- Accelerate your process and be flexible
- Support utility research and development
- Address cost allocation and recovery
- Obtain data and learnings
- Consider cost-effectiveness

Thank You

Elizabeth Turnbull

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Flexible Service Connections

You don’t always need a DERMS for that: Unlocking grid capacity without new control systems

Mike Zimmerman
Interim Director & Senior Attorney, Clean Affordable Power

Environmental Defense Fund

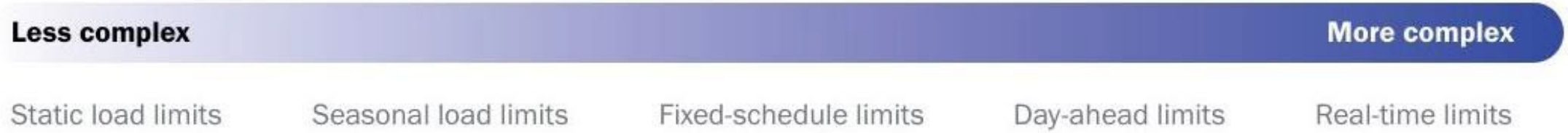
Many Factors Determine the Right FSC Design

- Grid topography & loading
- Utility operational capabilities (SCADA, DERMS, etc.)
- Customer expectations & technology
- Cost
- Regulatory requirements

Standardization helps, but
FSCs should not be one-size-fits-all

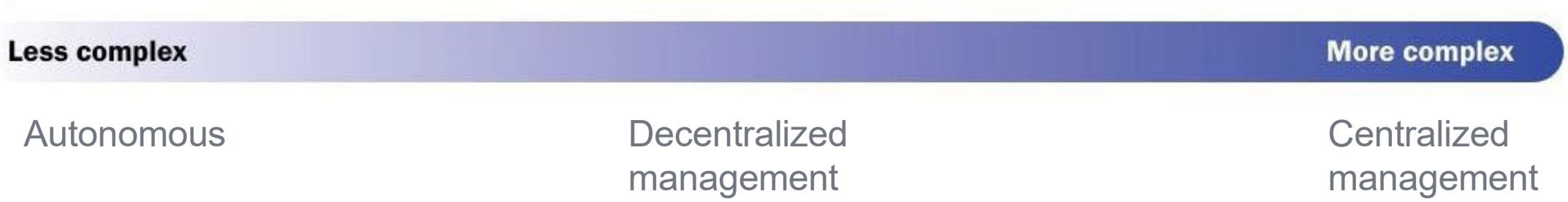
Design Choice #1: Load Limit Structure

How often will the customer's load limit change?



Design Choice #2: Communication Method

How will the utility exchange information with the customer related to the customer's load limit?



Design Choice #3: Compliance Mechanism

How will the utility enforce the customer's adherence to the load limit?

Hard cap, automatic disconnect

Hard cap, engineering safeguards

Soft cap, financial incentives

FSC Options “Menu”

TABLE 1

Comparison of different possible flexible interconnection structures and considerations.

Interconnection structure	Use case	Suitability criteria
Static hard cap autonomous	250 kW charging limit always, customer cannot exceed limit or LCMS curtails charging. Customer-side hardware is configured to automatically limit the customer's energy usage by shutting off when the limit is reached.	Where local assets immediately upstream of customer meter are at or near capacity and utility lacks DERMs and/or the customer is not able to install LCMS.
Dynamic soft cap autonomous	250 kW charging limit during the day, during evenings the limit increases to 500 kW. Customer can exceed limit subject to additional fee. LCMS is pre-set to adjust limit from day to night.	Where local assets immediately upstream are limited to an extent during peak demand periods. Customers must be willing and clearly understand pricing structure if able occasionally exceed the limit.
Semi-static hard cap autonomous	250 kW during summer, raised to 500 kW during winter, repeating limits until grid upgrades are complete.	Where local assets immediately upstream are limited to an extent during peak demand periods. Customers must be willing and clearly understand pricing structure if able occasionally exceed the limit.
Dynamic hard cap communication-based	Upper load limit varies between 250-500 kW depending on grid conditions. Utility sends signals to customer on day-ahead schedule communicating changing limits to LCMS. Customer can manage their load under the cap or hardware will limit power.	Where local assets immediately upstream are limited by a thin, variable margin with a sophisticated DERMS, customer-side communications-based LCMS that can reliably interface with customer and has backstop for grid security.

Lower-Tech Option: “Trust & Verify” Model

- Customers commit to load limits
- Utilities verify using AMI data
- No utility commissioning or programming of customer tech
- Customers manage their own load controls
- Exceedances handled through follow-up and remediation
- Result: Faster energization without compromising safety or reliability

California Example: CPUC Endorses "Trust & Verify”

- CPUC Decision (Docket R.24-01-018, Feb. 20, 2026)
  - Endorsed PG&E’s “trust and verify” approach
  - Directed PG&E and SCE to standardize FSC framework
- PG&E Implementation
  - Limited Load Profiles define import limits
  - AMI data verifies compliance
  - No mandated technology stack
- Emerging Example
  - AMI 2.0 pilot – manages loads using local meter assets

FSCs Can Unlock Grid Capacity Today

- States can deploy FSCs now by:
  - Using standardized frameworks
  - Leveraging existing utility systems
  - Offering “Trust & Verify” as a baseline option
- Next frontier:
  - Integrating FSCs into grid planning
  - Designing compensation structures

Thank you!

Michael Zimmerman
Interim Director & Senior Attorney, Clean Affordable Power
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Environmental Defense Fund

Flexible Service Connections for Vehicle Fleets

NARUC EV State Working Group

March 2026

Access to charging infrastructure remains a key barrier to fleet electrification.

- **High upfront costs and slow timelines discourage fleet customers from pursuing electrification.**
- **Flexible service connections (FSC) can be a fast, inexpensive solution to electrify these customers.**

How much of an impact can FSC have on the distribution grid?

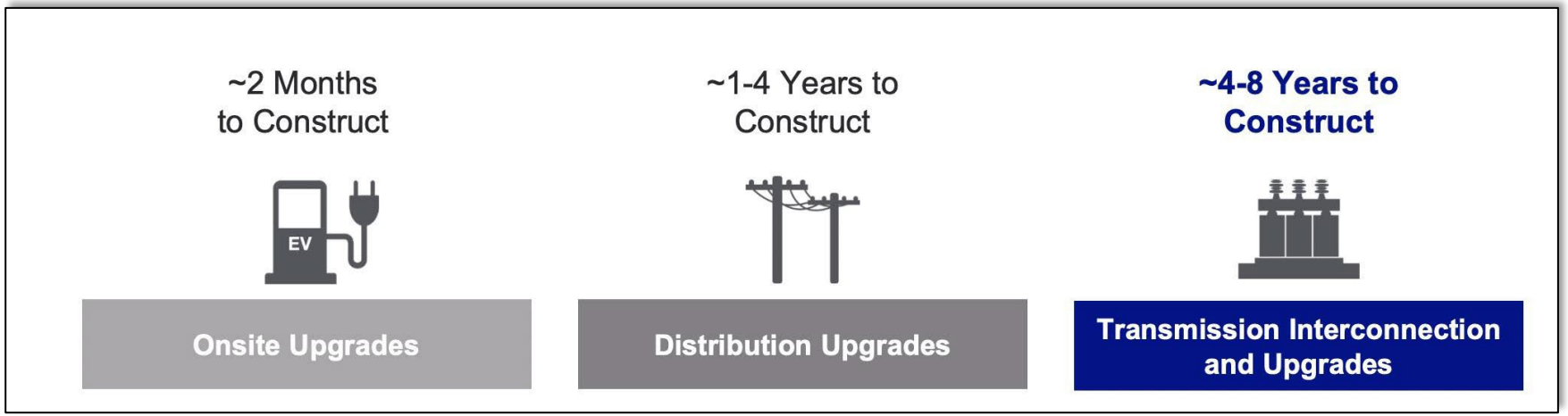
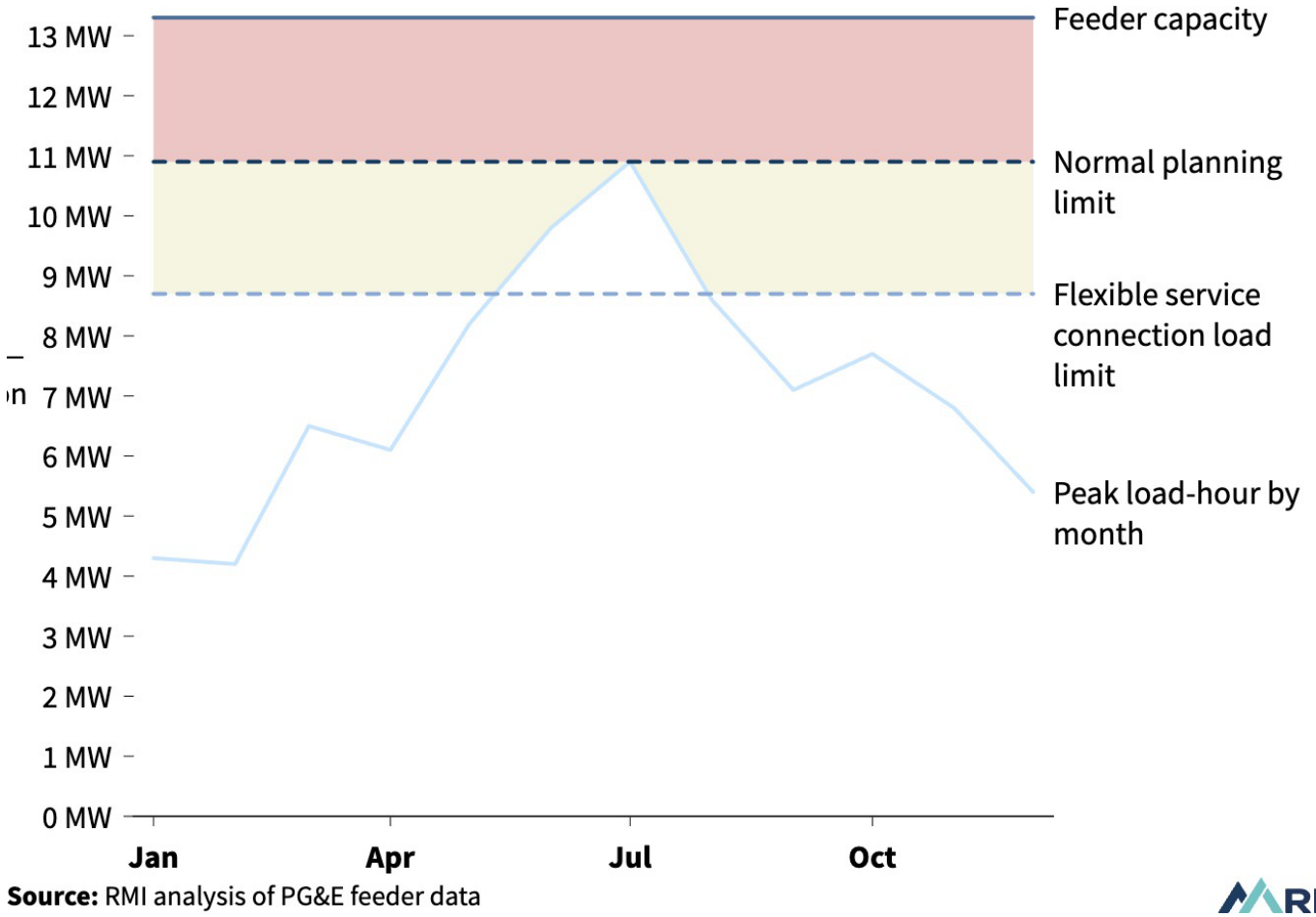


Image source: National Grid

The existing grid planning paradigm leaves significant "untapped" capacity on the table.



Source: RMI analysis of PG&E feeder data

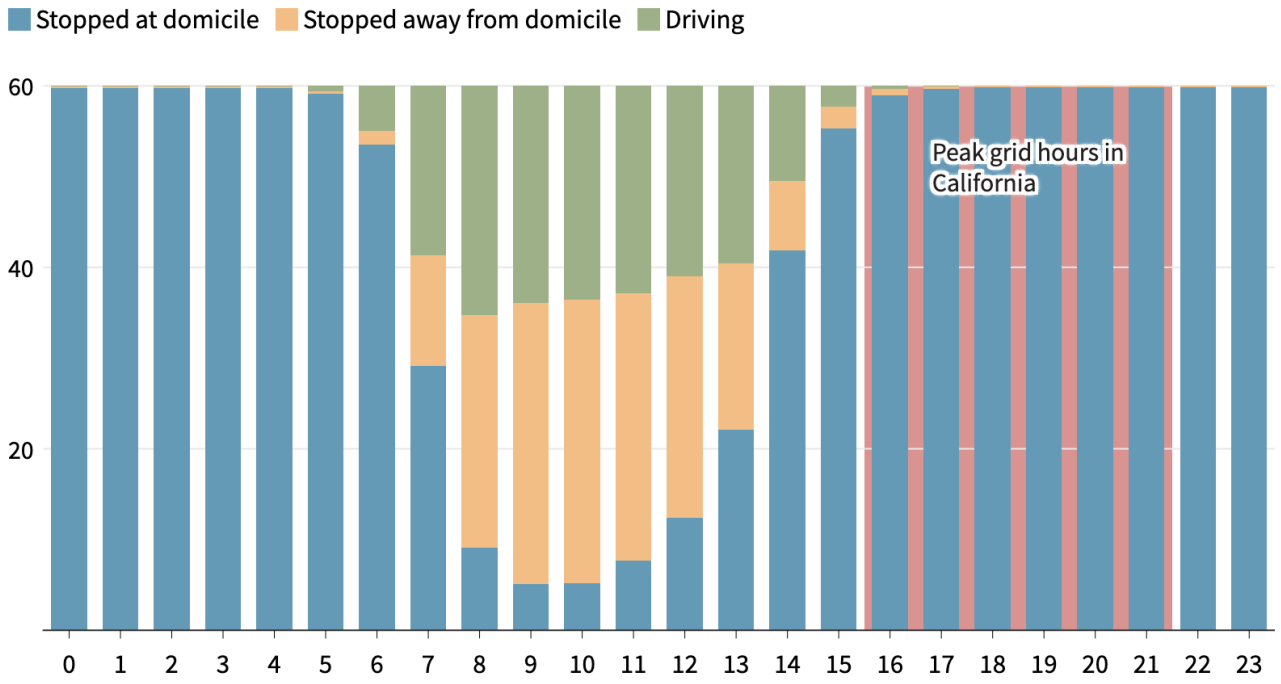
- **New connections cannot exceed a fixed limit based on peak (worst-case) load for given equipment.**
- **RMI built a model to estimate the scale of this untapped potential for charging vehicles.**
  - Initial: PG&E data
  - Expanded: National Grid territory

PG&E: Pacific Gas & Electric

Trucks are often parked long enough to fully recharge while still meeting flexibility requirements.

The majority of heavy-duty trucks are at their depot during peak grid hours, requiring load shifting under flexible service connections

Median activity by hour of day for regional and urban heavy-duty trucks



This analysis from a 2024 RMI study looked at the telematic data for HD trucks driving 300 miles or less in California and 14 other states which had signed on to its now revoked Advanced Clean Trucks rule.

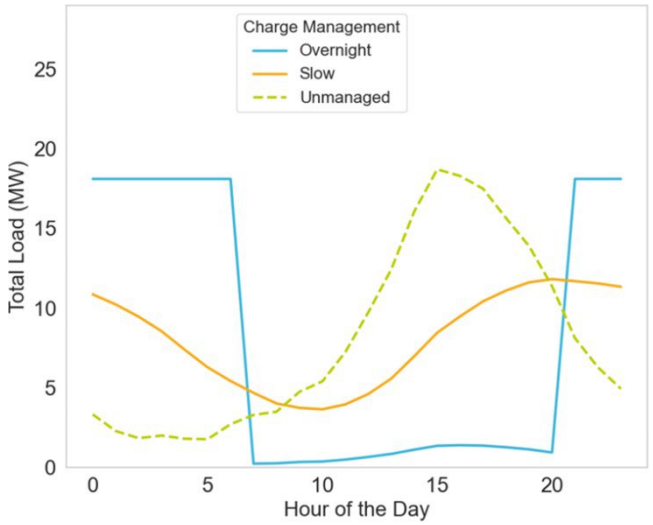
Source: Geotab

RMI

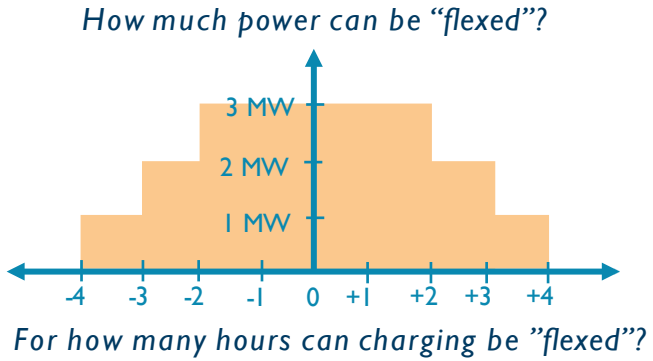
- **In California, average heavy-duty truck requires <50% of domicile time to charge at 75 kW.**
- ***Supporting evidence*: Fleet vehicles often plug in with 40% battery life remaining (Ampcontrol).**
- **RMI model uses this typical behavior to explore *how far* charging might be shifted.**

Modeling "flexibility windows" with real truck charging behavior helps explore potential to reduce capacity needs.

1 Truck Load Curves



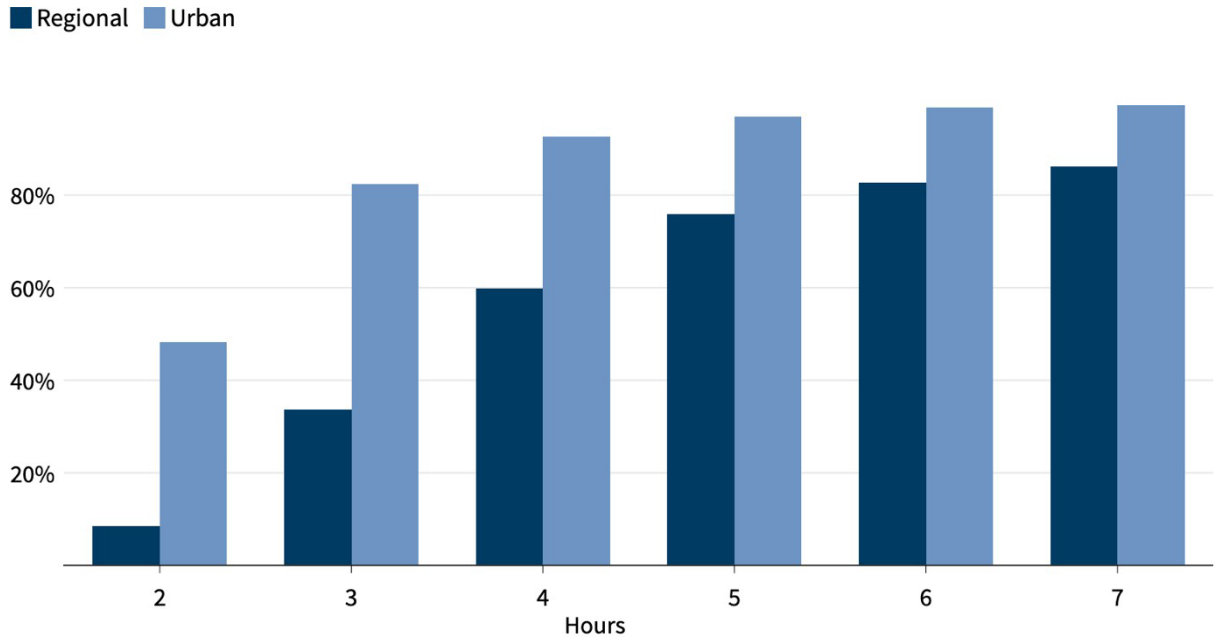
2 Defining Flexibility



3 Results

Increasing the number of hours fleets can shift some of their charging load, increases the number of feeders that can power more trucks

Share of feeders that can accommodate charging 10 extra HD trucks by length of flexibility window



Note: Regional trucks in this analysis drive routes of an average of 300 miles per day, urban trucks drive 100 miles.

Source: RMI analysis of public PG&E feeder data

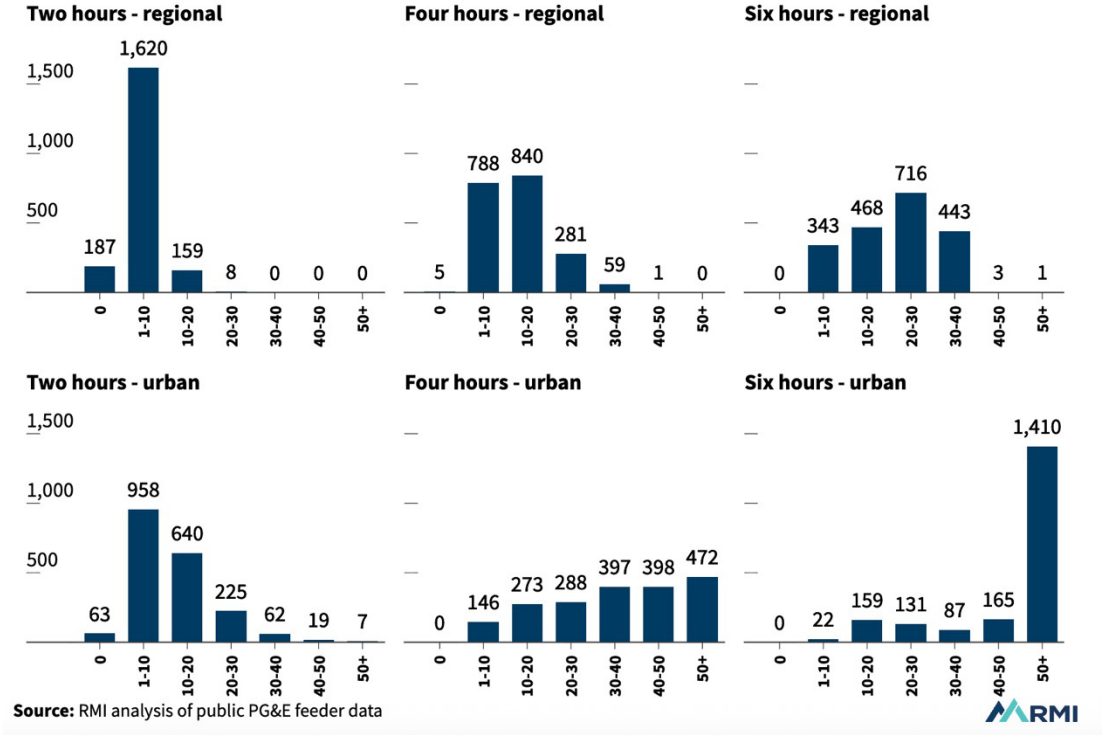
RMI

Greater load flexibility by fleets expands benefits to more feeders.

It also expands the *scale* of the benefits on all feeders.

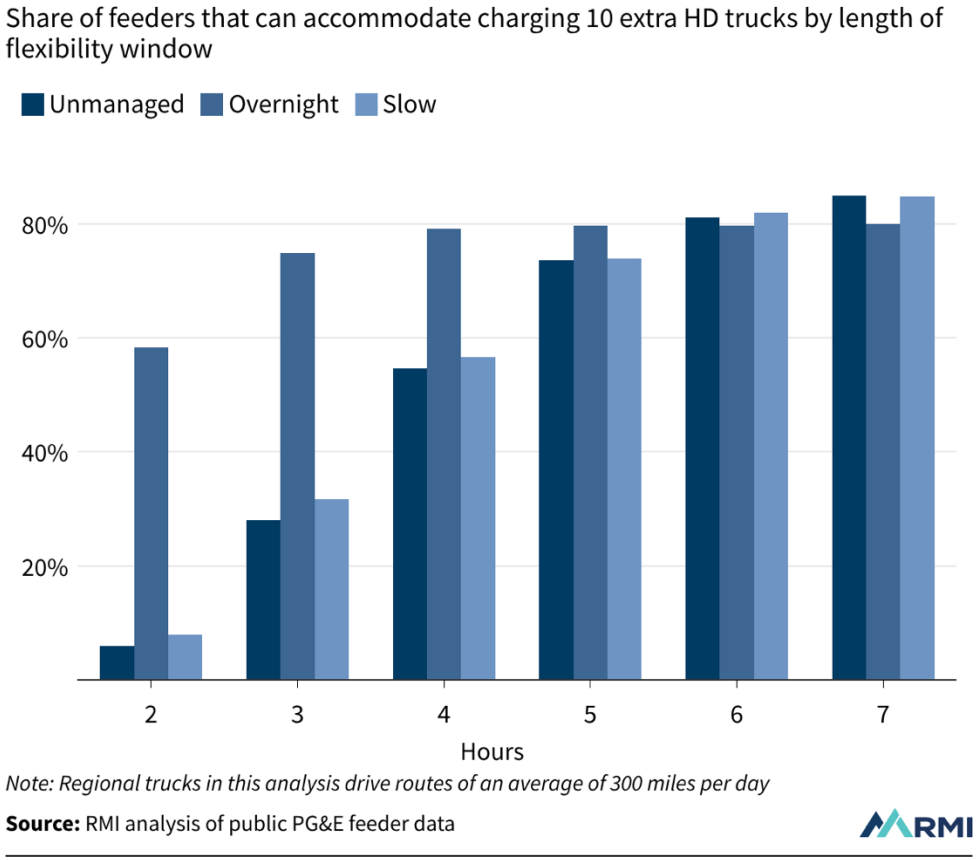
Range of additional heavy-duty trucks able to be charged by feeder count for different load flexibility windows

The potential benefits of flexibility varies by the existing load shape for each specific feeder, but broadly increases as flexibility window increases. Urban duty-cycle trucks have lower power requirements than regional, so lead to greater net additional trucks charged.



- **Scaled across PG&E this equates to enabling an additional 25,000-70,000 HD trucks to charge.**
- **Median incremental benefit increases as flex window increases (2 → 6 hours).**
  - Regional fleet: 3 to 22 trucks
  - Urban fleet: 9 to 64 trucks
- **Some feeders have vastly more potential than others, such as those with narrow but prominent peaks.**

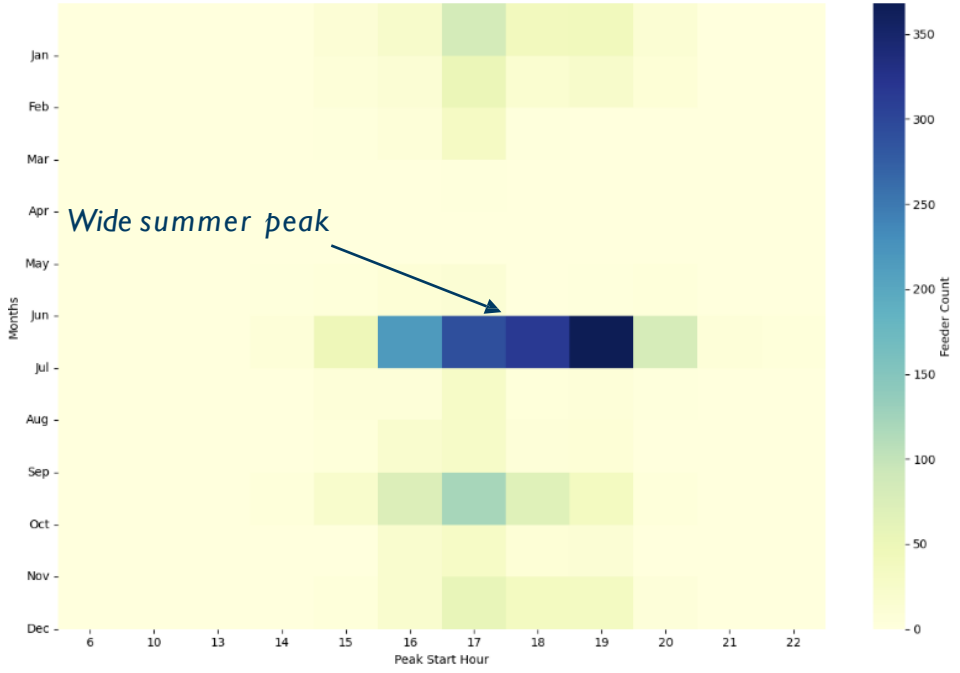
Encouraging fleets to charge overnight improves the performance of FSC.



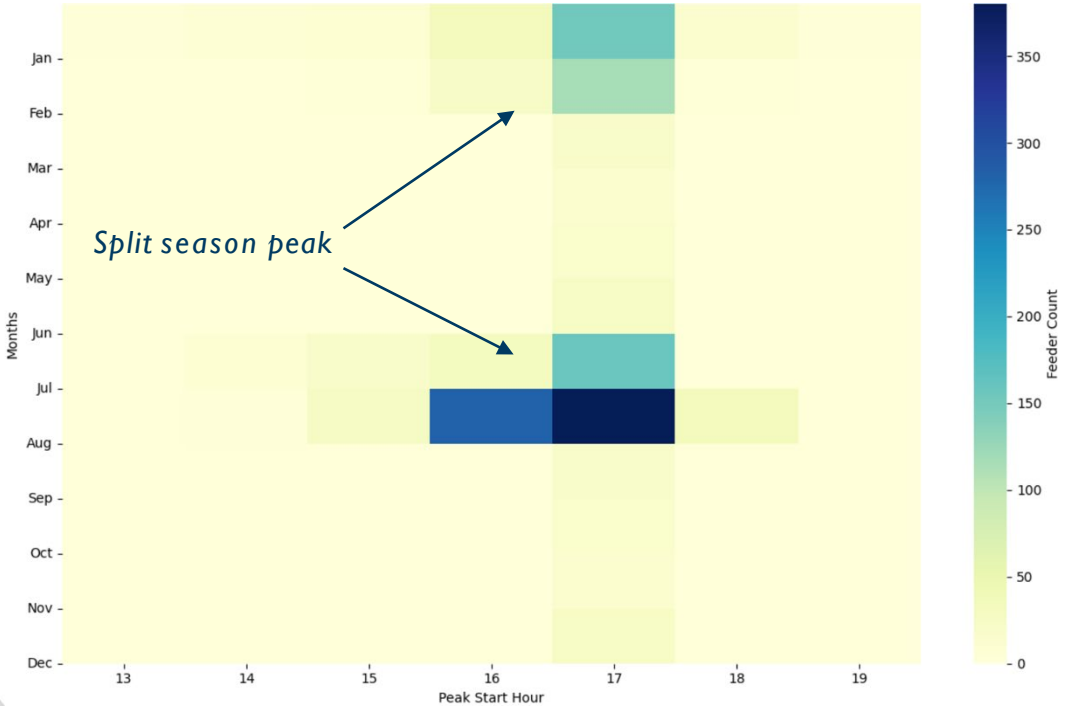
- **Overnight benefits plateau once fleets have shifted load beyond the "tail" of the evening peak.**
- **Slow charging gets marginally greater benefits from FSC than unmanaged charging but may be more operationally challenging for fleets.**
- **On National Grid feeders overnight charging has slightly less benefits due to higher nighttime loads than PG&E.**

Comparing results across different utilities highlights the value of flexibility in addressing diverse system constraints.

PG&E



National Grid



Heatmap showing feeder counts of peak load-shift start hour by month where flexibility is necessary, for regional trucks. Analysis looked at approximately 2000 feeders in PG&E and 900 in National Grid territory.

How and where should we scale this promising opportunity?

- **Big opportunity**
  - Flex service connections show great promise.
  - Tools and data identify where the promise is greatest.

- **Don't forget the fleets**
  - Key to work with fleets to understand appetite for modest operational changes.

- **Putting it together**
  - Target best combo of strong grid potential + fleet interest in modest shifts to maximize benefits for all.

Thank You!

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Speaker Q & A

- **Elizabeth Turnbull**, Alliance for Transportation Electrification
- **Mike Zimmerman**, Environmental Defense Fund
- **Gerard Westhoff**, RMI

Member Discussion Questions

1. Are you exploring flexible service connection opportunities in your state?
2. Are there any solutions or design choices you heard during today's presentation that you would like to explore further?
3. What short-term next steps should the EV State Working Group take to support Commissions in considering the top 10 actions identified at the NARUC EV Workshop in February 2026?

Next EV SWG Meetings

Managed Charging
April 21, 3:00-4:30 pm ET

EV-related Load Growth Projections (*tentative*):
May 19, 3:00-4:30 pm ET

FIND ALL PAST RECORDINGS AND PRESENTATIONS:

WWW.NARUC.ORG/CORE-SECTORS/ENERGY-RESOURCES-AND-THE-ENVIRONMENT/ELECTRIC-VEHICLES/