



**Alliance for  
Transportation  
Electrification**

# **Summary of Publications**

**Recent Literature on EVs, EV  
Charging and the EV Ecosystem**

**Quarter 1, 2026 Edition**

**March 2026**

## Overview

In November 2025, the Alliance for Transportation Electrification (ATE) issued a paper that summarized recent literature focusing on transportation electrification issues in small vehicle fleet markets and multi-family (MFH) housing. That report was a part of a U.S. Department of Energy (DOE) supported study by EPRI, for which ATE was a sub-contractor. The DOE/EPRI study was designed to understand gaps and opportunities to improve electric vehicle supply equipment (EVSE) energization timelines and experiences, focusing on the two small commercial customer segments: businesses with small vehicle fleets and MFH properties. ATE’s Summary of Recent Publications was intended to augment the Final Report of that Study by providing some additional perspectives. The November 2026 ATE Summary of Recent Publications is available at <https://ate-ev.org/resource/summary-of-publications-recent-literature-on-ev-energization-for-small-fleets-multifamily-housing/>. The Final EPRI report on small fleets and MFH, “Simplifying Utility Service Connections for Small Fleet and Multi-Family Housing Electric Vehicle Charging” is available at <https://www.epri.com/research/products/000000003002031384>.

The summary published by ATE last November was well received and ATE has decided that summarizing new publications focusing on EVs, EV charging and related subjects would be a useful service to ATE members and industry stakeholders. Thus, we will publish such a short summary on a quarterly basis. Rather than focus on specific themes as in the November 2026 report, we will be choosing reports which we think will be of the greatest interest to our membership and reports that have received significant attention. This series will provide a high-level summary of the findings of these recent reports focusing on key findings, methodologies, and conclusions.

In this First Edition of 2026, we cover five reports that address cost savings from improving energization timelines, a characterization of state EV policies, proactive distribution system investment strategies, a case study on demonstrating the value of EV managed charging, and fire safety considerations for EVs and EV charging

## Contents

Overview .....	2
I. Cost Savings from Improving Energization Timelines for EV Charging.....	3
II. U.S. Electric Vehicle State Policy Landscape Report.....	6
III. Proactive Distribution System Investment Strategies that Support Transportation Electrification.....	8
IV. Demonstrating the Full Value of Managed Electric Vehicle Charging .....	10
V. Fire Safety Considerations for Electric Vehicles and Charging Stations for Fleet Managers.....	12

## Recent Literature on EVs, EV Charging and the EV Ecosystem

### I. Cost Savings from Improving Energization Timelines for EV Charging

<b>Issuing Organization:</b> Atlas Public Policy
<b>Authors:</b> Rachael Nealer and Ben Sharpe
<b>Publication Date:</b> February 2026
<b>Link:</b> <a href="https://atlaspolicy.com/wp-content/uploads/2026/03/Cost-Savings-from-Improving-Energization-Timelines-for-EV-Charging.pdf">https://atlaspolicy.com/wp-content/uploads/2026/03/Cost-Savings-from-Improving-Energization-Timelines-for-EV-Charging.pdf</a>

**Description:** The report demonstrates that the lengthy and costly process of energizing electric vehicle (EV) charging stations at some sites is a key barrier to speed and scale of transportation electrification. It examines the financial impact of delays on Direct Current Fast Charging (DCFC) stations for light-duty and medium-heavy duty vehicle (MHD) charging. The study looked at models of charging stations with capacities typical of those in operation today. It does not examine the costs of making improvements to timelines. The authors also interviewed stakeholders including EV service providers, site hosts, and researchers in order to highlight systemic challenges and actionable solutions.

#### Key Takeaways

##### Introduction and Background

- The timeline for energization for the purposes of the report’s modeling starts at site identification and ends with a fully operational, energized site.
- The report cites numerous references that have documented these timelines, which can extend up to two to three years, and have identified a range of factors that can contribute to delays, such as fragmented utility processes, permitting hurdles, and supply chain constraints.
- California is used as an example of the length of delays that can occur, including the design and permitting phase which alone can take more than a year, especially for complex sites like MHD fleet charging installations either at depots or on corridors.

##### Defining the Challenges and Solutions

- The report cites the Interstate Renewable Energy Council’s (IREC) survey of EV charging station developers, which concluded that delays stem from interconnection process inefficiencies, difficulties securing utility easements, slow permitting procedures, and a lack of dedicated utility staff and EV-specific policies
- Also cited by developers are long lead times for equipment upgrades, limited grid transparency, and the absence of performance incentives for utilities.
- The report points to solutions and best practices that have been developed by IREC and Idaho National Lab (INL) and the Alliance for Transportation Electrification (ATE).
- Among other recommendations, IREC suggests utilities assign dedicated EV teams, implement make-ready programs, publish clear interconnection timelines, and maintain inventories of common upgrade equipment.
- INL builds on these recommendations by proposing automated load service request tools, flexible interconnection agreements and proactive grid investments.

- ATE highlights the need to mitigate supply chain delays through measures such as pre-ordering transformers and switchgear, standardizing equipment specifications, and establishing “zones of no regret” for proactive upgrades in high-demand areas. ATE also recommends utilities provide interim onsite storage options and work closely with regulators to approve advance cost recovery for prudently incurred capital investments.

#### Actions to Improve the Energization Process

- The report cites several States that have taken action to attempt to reduce energization timelines. These include:
  - The **California** Legislature enacted The Powering Up Californians Act (Senate Bill 410) which led to California Public Utility Commission (CPUC) Decision 24-01-018. This decision established energization timeline targets for the state’s three major investor-owned utilities (IOUs).
  - **Colorado** followed suit with the passage of Senate Bill 218, titled Modernize Energy Distribution Systems, in early 2024. This legislation requires utilities to provide transparent energization deadlines and develop flexible interconnection programs.
  - The Power Up **Illinois** Act (SB 25) was recently enacted to address shorter energization timelines.
  - The **New York** Department of Public Service (DPS) recently approved a set of standardized utility practices to streamline internal utility processes related to the service application and energization.
- The report also refers to states that have taken action to streamline permitting requirements. These States include California, Colorado, Delaware, New Jersey and Massachusetts.
- The report mentions Grid Capacity Transparency as an important factor in reducing energization timelines by reducing time needed for site selection. States that have taken action to require capacity maps or some other form of grid transparency include New Jersey, Nevada, Minnesota, and California.
- Bridge-to-Wires solutions are also cited to reduce timelines for customers, including schedules both for EVSE and other forms of electrification (referred to as BE, or beneficial electrification in CA, MN, and MA). The report suggests that these actions signal a broader trend toward regulatory support for dynamic and temporary solutions that bridge capacity gaps.
- Finally, the report notes that utility process improvements can provide significant gains in timelines and provides citations to examples of possible improvements.

#### Methodology

- The report employs a dual-method approach to assess the cost savings available from utility energization timeline reductions. First, a modeling tool was developed to estimate the net present value (NPV) of time delays across the energization timeline, enabling scenario-based analysis of cost implications. Second, the study authors conducted several interviews with industry stakeholders to validate the model’s assumptions.
- The NPV figures presented represent gross benefits of timeline reduction rather than net benefits after accounting for implementation costs. The authors suggest that sufficient data is

not available to assess the costs to various participants in the process.

- This analysis quantifies the NPV of reducing EV charging station energization timelines by comparing two hypothetical scenarios:
  - a) a Baseline Scenario, in which projects face current energization timelines
  - b) an Improved Scenario, in which projects face reduced timelines
- The Baseline considered was 18 months and the Improved scenario was 12 months based on EVgo estimates and California requirements for light-duty. MHD charging has longer timeframe assumptions.
- Financial benefits of improved station deployment timelines are modeled to occur through three mechanisms. First, costs accumulate during the Baseline Scenario that are avoided under the shorter Improved Scenario timeline. These include ongoing project management expenses, financing costs on committed capital, permitting fees, and equipment storage costs. Second, accelerated revenue streams provide substantial value in the Improved Scenario. Third, for the HDV stations the accelerated health benefits associated with realizing emissions reductions more quickly under the Improved Scenario timeline were estimated.

### Industry Perspectives

- In this Section of the report, the authors summarize the results of interviews with stakeholders to validate assumptions, refine inputs, and gather qualitative insights on energization timelines.
- The questions were focused on best practices, quantifying the financial and operational impacts of energization delays, and gaps in data collection and analysis.

### Results

- For two different station sizes for both LDV and HDV and the six-month timeline improvement, the NPV of deployment savings over the forecast period were \$104,200 and \$165,500 for LDV and \$1,791,000 and \$3,401,000 for HDV.
- HDV stations exhibit substantially larger NPV benefits, reflecting higher utilization rates, greater charging throughput, and significant net health benefits from replacing diesel HDV vehicles.
- Sensitivity analysis found that net revenue per kWh, utilization rates, and analysis period were the major sensitivities for most scenarios.
- Insights from stakeholders are discussed. Some of the major factors they cited influencing timelines were permitting and easement delays (the most significant factor), the lack of dedicated utility intake, design, and construction teams for EV projects, and other utility process improvement opportunities.
- Make-ready tariffs and flexible interconnection programs, such as PG&E's FlexConnect, were recognized as effective for accelerating deployment of large projects, though not yet scalable for widespread DC fast charging installations.
- Stakeholders urged regulators to consider the economic opportunity cost of delays and incentivize faster timelines through streamlined requirements.

## II. U.S. Electric Vehicle State Policy Landscape Report

<b>Issuing Organization:</b> Environmental Defense Fund
<b>Publication Date:</b> January 2026
<b>Link:</b> <a href="https://library.edf.org/AssetLink/sw70usq8ivu2b3xp077blll1xj48j0tr.pdf">https://library.edf.org/AssetLink/sw70usq8ivu2b3xp077blll1xj48j0tr.pdf</a>

**Description:** This EDF report provides an inventory and assessment of the different policies and programs that the states have implemented to support transportation electrification (TE). . The report covers programs through September 2025 and focuses on policies adopted by state government agencies, including state PUCs, as well as local governments and utilities. The research catalogues a total of 16 types of individual state-level EV policies in use across the U.S organized into seven categories. The report covers profiles of each state using this structure. These profiles include demographic and geographic metrics and high-level summaries of the EV policies in each state. The report found that while some states have taken more steps than others to encourage EV adoption, all states have taken at least four different types of actions to promote it. The data in the report are contained in a spreadsheet with worksheets for each state, using a common template that arrays the 16 EV policy types across seven categories. The dataset also includes a policy matrix that indicates which individual policies each state has adopted.

### Key Takeaways

#### State EV Policy Review

- The EV Policy Landscape research was organized into seven EV policy categories, ranging from one to three individual policies per category:
  1. ZEV Procurement (1 policy)
  2. Direct ZEV Purchase Incentives (2 policies)
  3. Indirect ZEV Purchase Incentives (3 policies)
  4. ZEV Charging Infrastructure (3 policies)
  5. Utility Incentives (3 policies)
  6. Education (2 policies)
  7. Research and Collaboration (2 policies)
- The sections that follow provide additional information on these categories and the individual policies that comprise them. The narratives discuss the goals underpinning the different policy areas and highlight the range of approaches that different states have taken in implementing individual policies
- A matrix that is the crux of the report lists the seven policy categories and 16 individual EV policies that states have put into place and indicates which states have enacted them.

#### ZEV Procurement

- This category includes state programs that require or encourage public fleets to procure a certain share of ZEVs.
- The report notes that 31 states have ZEV procurement policies.
- Examples provided include Alaska, Connecticut, Maine and California

#### Direct ZEV Purchase Incentives

- 28 states offer direct financial incentives for the purchase of light-duty EVs, and 40 states provide a variety of incentives for the purchase of medium- and heavy-duty EVs and off-road EVs.
- the Direct ZEV Purchase Incentive category contains two policy types:
  - Light-Duty Vehicle Purchase Incentives
  - Other Vehicle Purchase Incentives (including off-road and medium- and heavy-duty vehicles)
- State incentive payments for passenger vehicles generally range from \$1,500 to more than \$10,000 for purchase of a light-duty EV.
- Example state programs for LDV incentives cited include CO, IL, MA, OR, CA, VT and Texas.
- Example state programs for MHD incentives cited include UT, TX, MD, CT and CA.

#### Indirect ZEV Purchase Incentives

- 31 states offer indirect purchase incentives for light-duty EV owners and prospective purchasers.
- These incentives often take the form of reduced fees, excess weight exemptions, emissions testing exemptions, and, in some cases, reduced taxes.
- There are three policy types in this category: (1) Parking Policies; (2) Priority Access (HOV Lane)/Other Access-related), and; (3) Reduced Fees and Other Exemptions
- The purpose of these incentives is to provide EV owners with benefits generally not provided to others, thereby indirectly supporting and incentivizing the sales and use of EVs.
- Examples cited include AZ, NV, MD, NC, GA, DC, and NM.

#### ZEV Charging Infrastructure

- The report found that incentives for charging infrastructure were more widespread than for vehicles
- Three policy types were found: (1) Charging Infrastructure Incentives and Rebates; (2) EV-Ready Building Codes, and; (3) NEVI Plans
- The report found that many states, through local utilities, offer some form of a “make ready” program
- Also prevalent were residential rebates for EV chargers, usually offered by utilities
- The wide array of charging incentive programs offered cited in the report include CT, DE, GA, KY, ME, MD, MI, NY, and OH.
- EV-ready building codes were not as prevalent and examples cited include those in CA, IL, and OR

#### Utility Incentives and Programs

- The Utility Incentives category includes the following three policy types: (1) Residential EV Rates; (2) Commercial EV Rates, and; (3) Other Programs
- Utility residential EV rates, typically in the form of TOU rates, are offered by 43 states, and commercial EV rates for medium- and heavy-duty EV charging are offered in 26 states.
- Other utility incentive programs, including managed charging, hosting-capacity maps, and utility planning tools, were found in 36 states, with numerous examples cited.
- 

#### Education

- Two typical types of programs for education are signage and outreach and information sharing.

- NEVI provided guidance on signage
- Outreach and information sharing involves the preparation and dissemination of public-facing outreach materials to educate consumers and raise awareness of EV incentive programs and charging locations. Numerous examples are provided.

Research and Collaboration

- Twelve states are engaged in research related to TE.
- Forty-three states have also established collaborative efforts and joint task forces with neighboring states to define goals and responsibilities for initiatives that promote EV uptake and the expansion of electric infrastructure needed to power EV charging locations.

Emerging and Other Policies

- Some of these include
  - State greenhouse gas emission caps or cap and trade – three (CA, WA and OR) - have enacted policies that place an enforceable limit, or “cap,” on GHG emissions from transportation, each as part of a multi-sector program
  - Indirect source review
  - Feebates
  - VGI policies and standards
  - Flexible interconnection policies
  - Load management policies
  - Climate risk disclosure requirements

State EV Outcomes

- The study provides Table 2, which is useful in showing the correlation between incentives for EVSE policies and the market adoption of EVs in those states.

III. Proactive Distribution System Investment Strategies that Support Transportation Electrification

<b>Issuing Organization:</b> National Association of Regulatory Utility Commissioners (NARUC)
<b>Author:</b> Regulatory Assistance Project
<b>Publication Date:</b> December 2025
<b>Link:</b> <a href="https://pubs.naruc.org/pub/OD82F4C1-0DA0-FEEB-22EF-881C144EC5A6?_gl=1*yh9h4n*_ga*MjEzMzUzNzg0OC4xNzQ2NjM3MzMw*_ga_QLH1N3Q1NF*czE3NzQzOTI1NjMkbzQkZzEkdDE3NzQzOTI2OTkkajYwJGwwJGgw">https://pubs.naruc.org/pub/OD82F4C1-0DA0-FEEB-22EF-881C144EC5A6?_gl=1*yh9h4n*_ga*MjEzMzUzNzg0OC4xNzQ2NjM3MzMw*_ga_QLH1N3Q1NF*czE3NzQzOTI1NjMkbzQkZzEkdDE3NzQzOTI2OTkkajYwJGwwJGgw</a>

**Description:** This report looks at efforts that five states (CA, CO, MA, MN and NY) have undertaken to manage the uncertainty and risk of forecasting distribution system needs for charging stations in a manner that avoids or reduces unnecessary delays for energization of EV charging installations while providing a cost-effective long-term buildout of the distribution system. These forward-looking efforts to deal with the challenges of transportation electrification have been described as proactive investment strategies. This paper, which was supported by an award from the U.S. Department of Energy, documents the state of proactive investment in the distribution system supporting

transportation electrification, largely as of January 2025. First, it describes background on EV adoption and distribution system planning, and then it focuses on three key aspects of proactive planning proceedings:

- An explanation of how proactive planning and investment is different from other recent efforts to improve distribution system planning;
- The benefits of making proactive investments in the distribution system, and the use cases that are driving the proactive approach; and
- A discussion of the key planning, regulatory and decision-making considerations that have surfaced from proceedings in five leading states.

The report finds that leading Commissions are exploring and developing additional data and methodologies that account for multiple factors, identifying and coordinating areas of continual improvement in proactive planning forecasts to ensure consistency and responsive action using the best available data, and mitigating the risk of stranded or underutilized assets not only through better forecasts, but also through operational adjustments in the grid.

### **Key Takeaways**

- The first section of the report covers a background on EV Adoption and distribution system planning
- Forecasting EVs expected to be on the road during the utility's planning period is essential to accurate load forecasting.
- Electric distribution system planning received limited attention in the 1990s and 2000s, but, in the last 15 years, many state utility commissions have issued new requirements and implemented new processes.
- Many advances in distribution system planning have only become possible in the recent past because of the new functionalities and data collection enabled by advanced metering infrastructure as well as new sensors, communications, and controls.

### **Proactive Planning Benefits, Challenges, and Strategies**

- Requests to provide electric service to charging stations differ from those of more traditional sources of organic demand growth that tend to increase more gradually over time or, in the case of large traditional load additions, with sufficient advanced notice through forward-looking construction timelines and new service requests. As a result, some new emerging sources of demand, including EV charging facilities, are more challenging to anticipate and forecast using traditional methods alone.
- Capacity investments, when they are needed to serve new EV load, can take considerably longer than construction of the station itself – creating additional costs and uncertainty.
- Proactive investments resulting from such planning are designed to ensure that the electric system can accommodate future demand (including from EV charging and other large loads) efficiently, reliably, and at lower long-term costs, recognizing today's affordability challenges.
- By assessing EV adoption, regional development, policy-driven electrification goals and other refinements in forecasting, utilities can identify where capacity constraints are likely to emerge and invest strategically in substations and feeders before they become bottlenecks.
- One benefit of proactive investment is reduced delays in energizing stations. In the absence of proactive investment, a lack of hosting capacity can lead to delayed energization of EVSE.
- Proactive planning can also help with right-sizing investments – that is building sufficient capacity just

once to consider future needs not otherwise in the load forecast.

- Though the risk of taking the wrong action in response to more uncertain forecasts of EV demand is clearly present and top of mind, there are also risks associated *with inaction* in pursuing solutions to this growing segment of energy demand.
- Options for mitigating risks can include: exploring and developing additional data sets and methodologies, identifying and coordinating areas of continual improvement in EV planning forecasts, mitigating the risk of stranded or underutilized, and considering diversity in customer project type and charging application when assessing risks.
- Risk may not be uniform across all EV demand served, classes of vehicles, or desired configurations. Thus, a mitigation strategy tailored to the dynamics of specific charging facilities may be more appropriate than a blanket approach.
- To address these uncertainties, utilities are working to increase the quality of their load forecasts in a more granular and location-specific way.
- These granular forecast methods are a distinguishing feature of proactive investment planning. Two examples are highlighted in the report, one from New York and one from Colorado, and illustrate how more temporally and spatially granular load forecasts are being used to address the uncertainty of making a proactive investment.
- Once the timing, size and location of the load has been forecast, distribution system planning (DSP) can begin to identify networks where investment is likely to be needed.
- While the use of benefit-cost analysis (BCA) is a relatively new best practice in the context of distribution system planning, providing quantitative evidence that proactive investments are cost-effective or pass a relevant BCA test is an important criterion in many states.
- All five states investigated for this paper incorporate equity into proactive planning through mechanisms ranging from quantitative scoring to formal procedural requirements.

#### Proceedings & Processes

- The authors identified states where proactive planning was being considered in regulatory proceedings. In this Section, details are provided on key proceedings and orders in five states before synthesizing key process issues, including cost recovery.
- Most of the activity regarding proactive planning and investment has occurred in five states to date (CA, CO, MA, MN, NY), but the approach has differed by state.
- Several commissions have found that a non-adjudicative approach, prior to opening a potentially formal adjudicative docket, is especially informative and useful in this somewhat novel context of proactive investment where there are few readily available models for action.
- Case by case adjudication and scoping orders are another alternative.
- Commissions issue scoping orders, as the name suggests, to notify parties of the extent of a formal investigation. Scoping orders also serve to focus parties' attention on the topics and issues that a commission wants to consider and those that it does not.
- Based on research for this paper, cost recovery for proactive investments appears to make use of existing rider and rate case mechanisms (summarized in Table 6).
- CA and MN (as proposed) incorporate costs into base rates. CO, MA and NY use rider mechanisms.

#### IV. Demonstrating the Full Value of Managed Electric Vehicle Charging

<b>Issuing Organization:</b> Brattle Group for EnergyHub
<b>Authors:</b> Ramakrishnan, A., Hagerty, J.M., Snyder, E., Sergici, S, Hledik, R.
<b>Publication Date:</b> January 2026
<b>Link:</b> <a href="https://www.brattle.com/wp-content/uploads/2026/01/Demonstrating-the-Full-Value-of-Managed-Electric-Vehicle-Charging-1.pdf">https://www.brattle.com/wp-content/uploads/2026/01/Demonstrating-the-Full-Value-of-Managed-Electric-Vehicle-Charging-1.pdf</a>

**Description:** This study summarizes the results of a trial of EnergyHub’s EV managed charging solution with EV drivers in the state of Washington. Data from the pilot programs was used to estimate the value of managed charging in avoiding electric system costs and to assess the differences in value between active and passive managed charging strategies. The study evaluates two forms of active managed charging against two baseline scenarios, one unmanaged charging and the other passive TOU rates. The two forms of active managed charging are (1) TOU + Load Limit where EV charging is actively controlled and optimized to minimize customer electricity bills, assuming a TOU rate schedule. Load limits are applied across customer groups served by the same distribution assets to reduce the local distribution system peaks caused by coincident charging, and (2) Wholesale + Load Limit where EV charging is actively controlled and optimized to minimize energy, generation capacity, and transmission system costs. Load limits are applied across customer groups served by the same distribution assets to reduce the local distribution system peaks caused by coincident charging.

### **Key Takeaways**

#### Defining Features of the Study

- Based on a real-world trial of strategies for active management of EV charging
- Illustration of the value of active managed charging relative to two baselines – unmanaged charging and passive managed charging
- Analysis of value to the system at transmission level is based on historical wholesale market prices and marginal transmission costs
- In-depth analysis of impacts on the distribution system, including at secondary transformers
- Forward-looking estimation of value to the distribution system based on how impacts could change as EV penetration grows over time
- Customer feedback on managed charging strategies

#### Shaping Charging with Active Management

- Both active and passive management can shift charging out of the grid’s peak demand periods. However, active management mitigates the TOU snapback effect and reduces aggregate peak charging loads.
- Under the baseline scenario, 31% of charging was in peak window for unmanaged charging and 3% of charging was in peak window for passive TOU (but with significant snapback).
- For active management scenarios, 5% occurred in peak window for TOU + Load Limit Strategy and 12% occurred in the peak window for the Wholesale + Load Limit Strategy.

#### Distribution System EV Benefits of Active Managed Charging

- Active managed charging allows distribution grid assets to host 1.3x to 3.2x more EVs. The modelling shows that distribution engineers may defer grid upgrades by up to 10 years in a location facing EV-driven capacity constraints.
- Active management improves utilization of the existing grid in EV adoption hotspots and reduces distribution grid costs by up to \$230 per EV per year in the long run.
- The cost of serving new EV load varies widely across the US due to differences in bulk system costs and distribution system hosting capacity. The study extrapolates data from EnergyHub’s trial to various regions and estimates that the value of active managed charging that optimizes distribution system loading can be as high as \$400 per EV per year.
- *Key findings. Active Managed Charging:*

- Reduces EV charging peaks by up to 55%
- Increases the distribution grid’s EV hosting capacity by up to 3.2x
- Could defer distribution grid upgrades by up to 10 years
- Reduces distribution grid costs by roughly \$200/year per EV
- Provides reliable performance with only 2.3 session opt-outs per month
- The trial showed that active managed charging is highly effective, both at shifting load out of the bulk system’s high-cost periods and at limiting coincident peaks of EV loads.
- The performance of the Wholesale + Load Limit active managed charging strategy showed that dynamic management in response to wholesale energy prices can provide significant system cost savings by moving charging to hours with lower prices in a more targeted manner.
- The active managed charging strategies resulted in significantly lower coincident peak loads per EV at all group sizes, particularly when compared to the Passive TOU Baseline.

## V. Fire Safety Considerations for Electric Vehicles and Charging Stations for Fleet Managers

<b>Issuing Organization:</b> EPRI
<b>Contact:</b> J. Halliwell
<b>Publication Date:</b> March 2026
<b>Link:</b> <a href="https://www.epri.com/research/sectors/technology/results/3002033406">https://www.epri.com/research/sectors/technology/results/3002033406</a>

**Description:** This report provides a high-level overview of infrastructure and vehicle safety considerations for EVs, some of which may be unique in comparison to ICE (internal combustion engine) vehicles. It also notes developing best practices for fire prevention and mitigation for fleet managers deploying electrified vehicles. Many of the recommendations are equally applicable to ICE vehicle fire prevention and mitigation. The report is geared to fleet managers.

### Key Takeaways

#### Top 10 Takeaways

1. Develop an emergency fire response plan for your fleet and train your employees to execute that plan.
2. Work and coordinate with your local fire department
3. EV fires are expected to be rare but can pose unique challenges to fleet managers and firefighters
4. Thermal runaway is the key differentiator when compared to ICE vehicle fires
5. Charging safety – Use listed chargers and qualified installers, inspect equipment regularly, post emergency shutdown instructions, and have an emergency plan
6. Train drivers and staff
7. Adapters - Never use a damaged adapter and only use manufacturer-approved adapters to prevent electrical overheating issues.
8. Parking strategy matters – Where possible maximize space between vehicles
9. Handle damaged EVs carefully
10. Expect longer firefighting times

#### Context and Background

- Vehicle fire safety and planning are important for any fleet manager to consider,

independent of vehicle fuel type.

- While stored energy in the battery is needed for propulsion, it also presents the risk of being able to ignite and/or sustain a fire and is the primary source driving the need to develop unique approaches to fire fighting for an electrified vehicle.
- One of the unique aspects of plug-in electric vehicles is that they can be charged where they are parked, unattended, for many hours. For firefighters responding to an electric vehicle fire, where the vehicle is plugged into a charger, this means there may be a live electrical connection to the vehicle. Firefighters will look for a means to turn off power to the electric vehicle charger quickly or to remove the charging cable from the vehicle.
- The sealed nature of the traction battery means that during a thermal runaway event the ability to apply cooling to the internal battery components from outside is limited. Energy stored in the battery itself can sustain the internal heating needed to drive thermal runaway which can be maintained for long periods of time (e.g., hours to days).
- During a thermal runaway event this may lead to the gases, which are hazardous and potentially flammable, produced inside the battery being released from the battery enclosure to the atmosphere.

#### Effective Practices to Address EV Battery Fire Safety

- Independent of the type of charging equipment deployed, one of the first lines of defense related to fire safety and electric vehicles is to address the safety of the charging equipment, or EVSE. Several best practices are listed in the report
- Only equipment that is listed by a Nationally Recognized Testing Lab (NRTL), such as Underwriting Laboratories (UL) or others, for electric vehicle charging should be used.
- Vehicle operators should be familiar with charging hazards and emergency response plans. Among the recommendations (best practices) cited are inspecting the plug and plug inlet prior to each use, users should be trained in proper charger use and operation and be familiar with any available charger or vehicle safety indicators, and clear signage should be provided for the EVSP (EV service provider) or host site, including emergency shutdown procedures for the EVSE. Many other best practices are cited.
- A vehicle that has known damage to the traction battery or battery housing should not be operated until inspected by a qualified electric vehicle technician.
- In-vehicle alerts related to the traction battery system should be addressed as soon as possible.
- If smoke, hot or burning plastic, or hot electronics odors are observed while operating an electric vehicle, the vehicle should be safely parked outside at the earliest opportunity at a safe distance from any adjoining structure.

#### Parking Layouts and Vehicle Storage

- Whenever possible the distance between parked vehicles should be maximized.
- Parking garages present unique challenges due to vehicle density, enclosed spaces, height restrictions, and complex multilevel structures. Parking structures may also be collocated with occupied buildings where emergency response and occupant evacuation plans should be considered. Best practices for parking garages are cited.
- Users should consult with the vehicle's OEM for guidance on best practices for the storage of

specific electric vehicles.

- Prevention and Mitigation Strategies
- Many fire departments are willing to work with site owners to develop pre-plans for emergency response and may even have an assigned Pre-Planning Officer, a Fire Prevention Office, or a Fire Prevention Officer on staff.
- Pre-planning addresses issues such as access routes for first responders, facility layouts, including building floor plans, entry and exit points and construction materials used in structures, locations of utility shut-off points (electricity, natural gas, and water), hazardous materials that may be on-site, and documentation of on-site fire protection systems.
- The report outlines the emergency response practices for EV fires, and suggests the best approach is consulting with your local fire department as to their practices.
- Fleet managers will likely already have existing maintenance and safety plans for their existing ICE-powered vehicle fleets. In the transition to electric fleet vehicles, fleet managers must become familiar with the items that differentiate the two vehicle fuel types.
- Emergency response plans that include EV fires are critical.