2025 TECHNICAL REPORT

Simplifying Utility Service Connections for Small Fleet and Multi-Family Housing Electric Vehicle Charging

Research on Challenges and Emerging Leading Practices (DOE Project EE0010632)

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3002031384

Final Report, January 2025

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ACKNOWLEDGMENTS

EPRI and the project team would like to thank the myriad stakeholders who provided input to this report, including 10 Clean Cities and Communities Coalitions that were integral in recruiting EV customers for interviews, the 23 commercial EV customers who participated in interviews or small group discussions, and the more than 30 representatives from 14 utilities who participated in the utility interviews.

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This material is based upon work supported by the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy (EERE) under the Technology Integration/EEMS Office Award Number **DE-EE0010632**.

This publication is a corporate document that should be cited in the literature in the following manner: *Simplifying Utility Service Connections for Small Fleet and Multi-Family Housing Electric Vehicle Charging: Research on Challenges and Emerging Leading Practices (DOE Project EE0010632).* EPRI, Palo Alto, CA: 2025. 3002031384.

ABSTRACT

The objective of this work is to understand gaps and opportunities to improve electric vehicle supply equipment (EVSE) energization timelines and experiences, focusing on two small commercial customer segments: businesses with small vehicle fleets and multi-family housing (MFH) properties, both of which tend to have fewer resources for energy upgrades and management, and likely do not have dedicated account representatives at utilities. The customer-centric challenges and overarching physical and technical challenges with rapid EVSE energization identified in this research form the basis for developing a roadmap towards streamlined EVSE energization processes to benefit customers, utilities, and the public.

Keywords

Electric Vehicles
Electric Vehicle Supply Equipment (EVSE)
Electric Vehicle Chargers
Customer Experience
Service Connection Processes
Energization

EXECUTIVE SUMMARY

Deliverable Number: 3002031384

Product Type: Technical Report

Product Title: Simplifying Utility Service Connections for Small Fleet and Multi-Family Housing Electric Vehicle Charging: Research on Challenges and Emerging Leading Practices (DOE Project EE0010632)

Primary Audience: Utility employees involved in electric vehicle supply equipment (EVSE) energization or new service connection processes, fleet advisory services or other electric vehicle (EV) commercial customer-facing utility roles, and EV program developers; commercial customers likely to have relatively small EV charging load, including multi-family housing (MFH) property managers and businesses with small vehicle fleets; industry stakeholders including EV service providers, EV supply equipment providers, and nonprofits and others working to streamline processes to achieve EVs at scale.

Secondary Audience: Utility planners, customer program and account representatives

KEY RESEARCH QUESTIONS

What does the service connection process involve for connecting EVSE to the grid for small fleets and MFH customers? What are the associated challenges for utilities and customers, including those in disadvantaged communities? What are some leading practices for streamlining EV charging service connections?

RESEARCH OVERVIEW

To support the rapid scaling up of EV infrastructure, various U.S. electric utilities are examining their processes to seek efficiency improvements for connecting new EV charging infrastructure to the grid. Utility processes for new or upgraded electric service are often lengthy and require extensive technical information and stakeholder coordination, partly necessitated by the complexity and criticality of the electric grid. Such complex processes can, however, lead to inefficiencies and redundancies, especially when applied to diverse use cases that are not always well-suited to a one-size-fits-all approach.

This report summarizes insights from independent desk research as well as interviews with 14 utilities and 23 multi-family housing (MFH) and small fleet customers or representatives, along with other industry experts, on current process timelines, challenges, resources, and connection goals.

The report is part of the U.S .Department of Energy (DOE)-funded Charging Infrastructure Interconnection Streamlining Resource (CIISR) project, which focuses on small fleets and multi-family housing (MFH) customers. It aims to develop a roadmap towards streamlining EV service connections for these customers, as well as develop and adapt customer support resources. CIISR is also part of EPRI's EVs2Scale2030™ initiative, which aims to develop resources and help align industry stakeholders in order to prepare for EV load at scale.

KEY FINDINGS

- Small fleets and MFH properties, particularly those in disadvantaged communities (DACs), possess characteristics that need consideration in EVSE energization projects, including disproportionate cost burdens (e.g., the cost to add EVSE is a much larger portion of a company's operating expenses), availability of dedicated space for EV parking, costs to run electrical service from nearest building, customer electrical panel capacity, and split incentives due to site ownership (e.g., costs to property owner, benefits to renters) compared to larger customers and fleets.
- Current EVSE service connection processes present a unique challenge to widespread charger deployment compared to other types of new load connecting to utility systems, particularly as the volume of requests grows locally.
- Challenges to EV service connections can include utility and customer staffing limitations, supply chain delays, unforeseen upgrade costs, customer education and awareness, service connection processes that do not allow for special considerations associated with EVSE service connections, and external timeline dependencies involved in permitting and easement processes, all of which can lead to processing delays.
- Customer-identified preferred practices include the ability to readily find where they are in the connection process to know what's needed of them and what's coming, which may be accomplished by having a single point-of-contact for EV projects as well as set check-in cadences; the availability of incentive programs or other funding opportunities, the more flexible, the better; and making available information regarding funding opportunities, EVSE contractor or support expertise, or other resources targeted to smaller customers with limited resources and who likely do not have dedicated utility representatives.
- Some leading practices with utilities include creating working groups to examine and propose process improvements, including measuring speed to goal, flexibility and innovation, fair process, participant experience, and transparency; offering technical pre-energization services (e.g., project planning, EVSE needs assessment, grant writing, filling out applications) as well as post-energization support for small fleet and MFH (among other) charging infrastructure projects; undertaking customer awareness drives as well as customer training sessions and monthly webinars; pre-emptively engaging with fleets (e.g., school buses, municipalities) and others for EVSE planning in new building construction; and maintaining trade ally networks to connect customers with experienced electricians and contractors.
- For organizations that have a role in these processes, there are a range of approaches from low-cost options (e.g., making online materials/resources easier to find at a central location, periodic brief webcasts hosted by current staff) to options requiring more investment (e.g., additional fulltime employees, organizational changes) that may be taken to address

identified challenges cost-effectively (i.e., considering available resources), and in a collaborative manner. Many types of organizations do or could play a role in reducing barriers (e.g., financial, informational) that contribute to identified challenges.

WHY THIS MATTERS

This work can form the basis for understanding new opportunities to address challenges in order to ultimately accelerate transportation electrification, as well as help to reduce electrification barriers for businesses located in or serving disadvantaged communities. This could bring major benefits associated with addressing the significant health, environmental, economic, and access barriers.

HOW TO APPLY RESULTS

These results can be used to inform new programs or support resources for small fleet and MFH utility customers. Indeed, planned follow-on work from the CIISR project includes a roadmap[1] containing solution ideas for streamlining EVSE service connection procedures and the development and refinement of informational resources targeted toward small fleets.

LEARNING AND ENGAGEMENT OPPORTUNITIES

The CIISR project's Community and Workforce Development advisory group is informing these work products by contributing diversity, equity, and inclusion (DEI) oversight, and the project's full advisory structure also informs the work products. These groups are participating in the communications of project outcomes to achieve a broad industry reach, and EVs2Scale and other partner networks are also being leveraged. Also planned is the development of a curriculum to take high-level project insights and education to a broader audience, which may include schools, career technical centers, and industries that engage with MFH and small fleet customers.

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PROGRAM: P18 Electric Transportation

[1] *A Roadmap Towards Simplifying Utility Service Connections for Small Fleet and Multi-Family Housing Electric Vehicle Charging: DOE Project EE0010632.* EPRI, Palo Alto, CA: 2025. 3002031160.

ACRONYMS AND ABBREVIATIONS

AB	Assembly bill
ACF	Advanced Clean Fleets Regulation
ADA	Americans with Disabilities Act
AHJ	Authority having jurisdiction
ATE	Alliance for Transportation Electrification
BIPOC	Black, Indigenous, or people of color
CBO	Community-based organization
Co-op	Cooperative utility
CPUC	California Public Utility Commission
DAC	Disadvantaged community
DCFC	Direct current fast charging
DOE	Department of Energy, U.S.
DPU	Department of Public Utilities, Massachusetts
EAMs	Earning adjustment mechanisms
EJ	Environmental justice
EV	Electric vehicle
EVSE	Electric vehicle supply equipment
EVSP	Electric vehicle service provider
GPI	Great Plains Institute
HOA	Homeowners association
HVAC	Heating, ventilation, and air conditioning
ICC	Illinois Commerce Commission
IDI	In-depth interview
IIJA	Infrastructure Investment and Jobs Act
IOU	Investor-owned utility

IRA	Inflation Reduction Act
IREC	Interstate Renewable Energy Council
kW	kilowatt
LDV	Light-duty vehicle
MFH	Multi-family housing
MHDV	Medium- and heavy-duty vehicles
Muni	Municipal utility
MW	Megawatt
NEVI	National Electric Vehicle Infrastructure
NREL	National Renewable Energy Laboratory
NYPSC	New York State Public Service Commission
OEM	Original equipment manufacturer
OPUC	Oregon Public Utility Commission
PGE	Portland General Electric
POC	Point of contact
PUC	Public utility commission
ROI	Return on investment
SB	Senate bill
SEAC	Sustainable Energy Action Committee
STEM	Science, technology, engineering, and math
ZEV	Zero-emission vehicle

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1 INTRODUCTION

Project Objective

Driven by the need to decrease transportation sector emissions, U.S. federal and state policymakers have implemented a suite of policies meant to accelerate the adoption of electric vehicles (EVs) and the installation of chargers across the country, including incentive programs and EV sales mandates. The shift to electrified transportation will require charging infrastructure installation to keep pace with EV charging needs.

For this reason, various U.S. electric utilities are examining their processes to seek efficiency improvements for connecting new charging infrastructure to the grid. Utility processes for new or upgraded electric service can be lengthy and require extensive technical information and stakeholder coordination. This is partly necessitated by the complexity and criticality of the electric grid, but such complex processes can lead to inefficiencies and redundancies, particularly when applied to diverse use cases that are not well-suited to a one-size-fits-all approach. As EV adoption and the commensurate need for EV charging grow, some of these issues are becoming increasingly apparent in utilities' load connection processes. To best support the rapid scaling up of EV infrastructure, these processes to upgrade electric service must be revisited and streamlined to help customers install and access EV charging and help developers meet project timelines and funding requirements.

No one organization or entity can solve service connection challenges alone. Since service connection is inherently a localized process involving many stakeholder groups—the customer, electric utility, the regulatory body that establishes the rules (typically a Public Service Commission), and local authorities having jurisdiction (AHJs), e.g., municipalities—connection challenges vary widely depending on location. In addition, the challenges are multi-disciplinary and require expertise in electrical engineering, economics, regulation, technology, and communication of the processes to customers. Solving service delays and streamlining the approval process, therefore, requires an inclusive and collaborative "all-hands-on-deck" approach. Involving everyone across the service connection ecosystem will help reimagine, retool, and improve the processes of the future.

The U.S. Department of Energy (DOE)-funded ***Charging Infrastructure Interconnection Streamlining Resource (CIISR)*** project aims to develop a roadmap towards streamlining EV service connections, as well as develop and adapt support resources for EV customers. This effort includes assessing the status quo for the service connection process, identifying the challenges and impacts these processes pose to both utilities and customers and understanding the resources and support available to customers seeking to install EV charging equipment. CIISR focuses on small fleets and multi-family housing (MFH) owners, developers, or managers since they may be more likely to have limited resources to access project support, and since smaller customers represent a large number of utility customers. EPRI leads the CIISR project in partnership with the Alliance for Transportation Electrification (ATE), Interstate Renewable Energy Council (IREC), and RMI, as well as Clean Cities Coalition partners Louisiana Clean Fuels and Metro Energy Center, which in turn coordinate contributions from eight other Clean Cities organizations. CIISR is also supported by EPRI's EVs2Scale2030™ initiative, which aims to develop resources and help align industry stakeholders in order to prepare for EV load at scale.

This report summarizes the initial research task of the CIISR project and contains insights from independent desk research and interviews with 14 utilities and 23 multi-family housing (MFH) and small fleet customers or representatives (e.g., EV consultants, electrical contractors), along with other industry experts on current process timelines, challenges, resources, and connection goals.

Supporting Rapid EV Charger Deployment

Electrifying the transportation sector, a major global and U.S. greenhouse gas emitter, is crucial to reducing carbon emissions and limiting global warming to 1.5°C. Transportation emissions account for 28% of all greenhouse gas emissions in the U.S. [1], out of which on-road transport, including light-duty vehicles (LDVs) and medium and heavy-duty trucks (MHDVs), accounts for over 80% of these emissions [2]. As part of a broader strategy to reduce greenhouse gas emissions and combat climate change, in August 2021, the Biden administration announced a national goal for 50% of all new U.S. LDV sales to be zero-emission vehicles (ZEVs) by 2030. The U.S. will require a significant expansion of its charging infrastructure to support this anticipated growth in EVs, including increasing the number of EV chargers from about 216 thousand in 2020 to 2.4 million by 2030 [3]. The total annual EV charging demand is accordingly expected to approximately quadruple from 2025 to 2030, presenting a pressing need for sufficient grid infrastructure to be provided rapidly and at scale (Figure 1) [4].

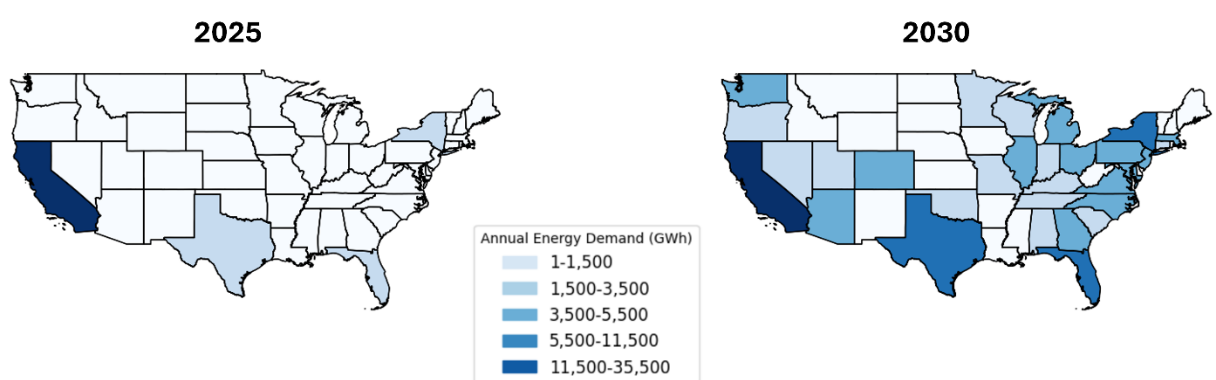


Figure 1. Growth in U.S. total annual EV charging energy demand from 2025 to 2030 (Source: EPRI [4])

In addition to public and private investment, the federal government previously introduced key accompanying legislative components to contribute to the investment needed for expansion of infrastructure in support of this transition. This includes building 500,000 fast charging stations and investing $19.25 billion in EV supply equipment (EVSE) through the Infrastructure Investment and Jobs Act (IIJA) and the Inflation Reduction Act (IRA) [5]. The National Electric Vehicle Infrastructure (NEVI) formula program will fund EV charging stations along U.S.

Alternative Fuel Corridors [6] with deployment plans approved for all 50 states, Washington D.C., and Puerto Rico—$100 million of which has already been awarded [7]. The alternative fuel vehicle corridors designed by the Federal Highway Administration (FHWA) identify strategic locations for EV charging and alternative fueling stations.

The National Renewable Energy Laboratory (NREL) estimates that, with strong clean energy policies and growing EV demand, there could be 30-42 million light-duty EVs on the road by 2030 [8]. States are increasingly addressing this shift for both personal and fleet vehicles, and sales are expected to increase such that EVs will comprise a majority of vehicle sales in many states by 2030 (Figure 2). With these increases in sales and investment of public and private funds, planning for increased access to EV charging is vital to support a sustainable and equitable transition for the transportation sector.

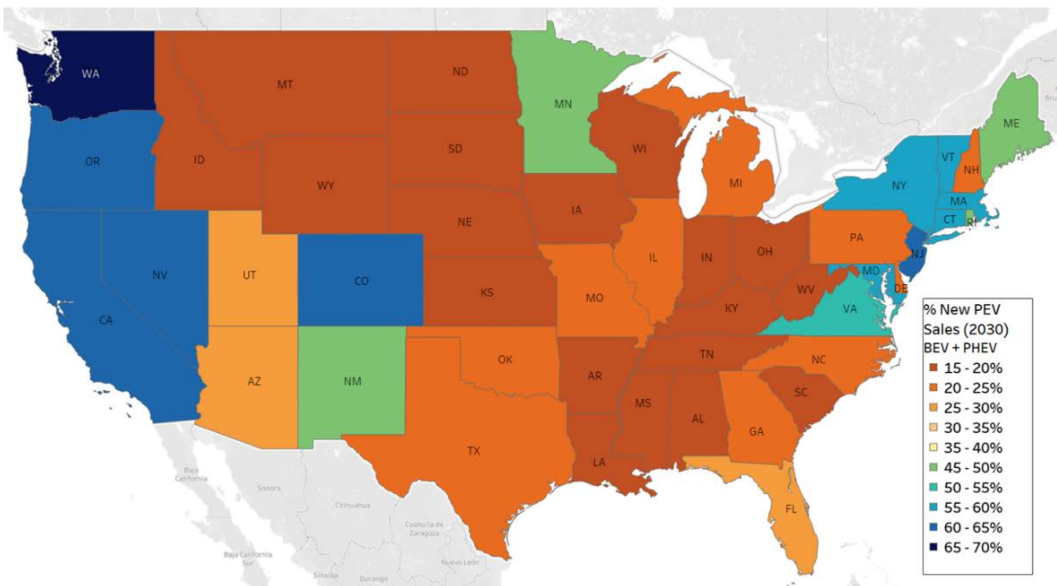


Figure 2. Projected U.S. light-duty EV sales percentage by state in 2030 (Source: EPRI estimates, Q4 2024)

2023 was a record year for EV sales, with global sales of electric cars nearing 14 million or 18% of all cars sold, up from 14% in 2022. One point four million of these sales occurred in the United States in 2023, up 40% from one million sales in 2022 [7]. While this growth is driven by higher model availability and financing options, consumer feedback indicates that further growth in EV adoption will also be influenced significantly by easy access to EV charging[2] [9]; thus, the unavailability of sufficient charging opportunities could risk a slowdown in EV sales. A slowed transition could incur a substantial opportunity cost due to environmental and public health degradation, economic loss, and technological stagnation. Additionally, many federal and state funding opportunities, such as those listed above, come with expiration dates and project activation timeline requirements. Charger deployment delays may cause project

[2] Customers indicate that access to EV charging is the 3rd most important factor in EV uptake [9].

developers to lose out on significant financial support. These risks emphasize the importance of supporting accelerated growth in EV charging infrastructure.

EV adoption has also not been geographically uniform: significant disparities in adoption exist across the U.S., driven by income levels, state and local incentives, and infrastructure availability, among other factors. For example, in the first quarter of 2024, California accounted for 34% of all EV sales in the U.S. [10], driven by state policies, a large charging infrastructure network, and high consumer demand, while parts of the Southeast and Midwest have been slower to adopt EVs [11], with fewer incentives and less developed infrastructure. Additionally, income levels also influence this trend, with EV adoption skewing towards wealthier households [12] due to economic constraints (i.e., higher upfront costs) and access to charging. A 2019 study on used and new car purchases in California from 2011 to 2015 found that households with an annual income under $100,000 accounted for 72% of ICE vehicle purchases but only 44% of EV purchases [13]. These disparities have created scattered adoption, which could potentially deepen if they are unaddressed, exacerbating gaps as regional EV leaders charge ahead. To meet charging demand in growing areas, reduce future slowdowns in EV adoption, and ensure no regions and communities are left behind, it is critical to make installing and energizing these chargers faster, easier, and more economical.

The Need to Streamline Utility Service Connection Processes

Work is underway across the industry to understand how to streamline utility service connection procedures given the volume and variation of EV charging projects underway in some areas and coming soon in others.

In general, connecting any load to the grid, including EV chargers, involves the customer (often the project developer or site host) submitting an application to the local electric utility to provide a new service connection for the load to be energized. The utility must then evaluate existing grid resources at the site to determine whether the project can be supported effectively and reliably by present capacity or if electrical or civil upgrades may be required. The utility then enters into a contract with the customer to complete all required wiring, installations, and upgrades to establish the connection.

Utility customers install EV chargers for various use cases at different location types, such as residences, workplaces, public destinations, and fleet depots. The utility service connection process for some customer situations can be relatively straightforward, such as for some single-family properties, and others may make use of access to curated charging solution options as well as dedicated support from the electric utility, as with some large commercial customers with vehicle fleets. There are also many other variations in between that deserve attention, such as those that are the focus of the CIISR project, namely multifamily housing and smaller fleets, including customers located in disadvantaged communities.

Some of the unique circumstances of these types of EV customers are described in detail in Section 2 and include the fact that EVs and EV charging may be completely new paradigms for these customers, so they may require additional assistance in installing and energizing charging stations. At the same time, smaller customers may be less able to access available resources to enable this support. Smaller customers may represent smaller individual loads, so their challenges may be less about grid capacity availability—though this could change as EV adoptions scale and cluster in specific areas—and more about having their specific needs met throughout their energization journey, especially given the sheer number and variation of smaller customers for any given utility.

Service connection timelines are another issue, for small and large EV projects alike. As EVs can be procured quickly—on the order of days to weeks for light-duty vehicles and weeks to months for heavy-duty vehicles—new or updated electric service is also needed relatively quickly to enable charging. This can be a departure from traditional utility practices, where the timeline to provide new or upgraded service is generally longer—for example, as with newly constructed buildings, where the utility might have months or even years of advance notice of the new load to be served. These and other unique traits of EV service connections are explored in Section 3.

Challenges such as lengthy and complex service connection processes are outlined in Section 4, which summarizes the challenges identified through the customer and utility interviews. Such challenges could become amplified in coming years by the need to deploy hundreds of megawatts of renewables and storage, as well as new service for other electrified loads to meet demand and climate goals. Indeed, many new (generally larger) EV charging and clean energy projects have been delayed in connection queues, sometimes for years, awaiting review and approval. At the same time, clean energy interconnection projects also represent an important source of learning—interconnection procedure streamlining has been underway for years to improve connection timelines for clean energy resources, resulting in a 50% or greater reduction in solar interconnection timelines for projects less than 50 kW in some regions [14]. A growing volume of EV charging projects calls for similar process improvements to facilitate streamlined EVSE connections.

While it is important to ensure that adding these new systems to the grid does not result in safety issues, equipment problems, power outages, or high operational costs to the customer, existing service connection procedures could no doubt benefit from streamlining to accommodate accelerated EV charging connections and to provide target support for small fleet and MFH customers, now and in the near future. Section 5 summarizes other resources on the topic of streamlining, as well as some existing utility practices and activities underway and customer perspectives on positive experiences.

Finally, Section 6 concludes with some high-level opportunities to address some of the challenges identified, which, along with the overall research insights, will feed into the next step in the CIISR project, a roadmap of solution ideas to help streamline utility service connections for small fleet and MFH EV projects, forthcoming in March 2025.

2 CUSTOMER SPOTLIGHT: SMALL FLEETS AND MULTI-FAMILY HOUSING PROPERTIES

Small Fleets

Many businesses and government agencies rely on a fleet of vehicles, with examples including small shipping and logistics companies and construction, heating, ventilation, and air conditioning (HVAC) companies, landscaping, healthcare, law enforcement, education, and transit services, to name a few [15]. While many think of fleets as large collections of vehicles, small fleets of 10 vehicles or fewer account for 90% of registered U.S. trucking companies, and over 60% of U.S.-based fleets operate a single truck [16]. While there are various definitions of "small fleet," in general, they are considered to be comprised of 20 or fewer trucks [16], [17], [18].

While small fleets constitute the majority of all fleets, their unique circumstances, described in Table 1, can mean they face disproportionate challenges to transportation electrification. Such small fleets, including small HVAC companies, "mom-and-pop" businesses, small food delivery operations, etc., are often faced with the challenges of having limited staff and financing, no key account benefits from utilities (due to individually small electric loads), and often fewer centralized parking spaces available for charging. Small municipalities with small fleets can face similar circumstances when local budgets are strained. While larger fleets, too, can face significant challenges to electrification, they can also generally dedicate comparatively more personnel and financing resources to this effort than small fleets. Additionally, larger businesses with fleets can often qualify as key accounts for utilities due to large electrical demands and, thus, may have access to dedicated utility personnel and other benefits.

Table 1. Some typical circumstances of small fleets considering EVs and EVSE deployment

Category	Circumstance
Disproportionate Cost Burden	Small fleets are often already capital- and resource-constrained, making the high upfront and total costs of electric vehicles, chargers, installation, contractors, and staff time spent navigating the connection process a disproportionately larger burden.
Availability of Central or Dedicated Parking Spaces and Site Ownership	Small fleets often rely on street parking or leased spaces instead of a dedicated depot, leading to ownership and right-of-way conflicts for charger deployment.
Vehicle Ownership	Small fleet vehicles may also often be leased rather than owned, making the high upfront costs even more of a barrier and lowering the motivation to invest in infrastructure for a temporary asset.

Category	Circumstance
Customer Awareness	Limited staff capacity and access to resources can lead to gaps in awareness and technical know-how on the electrification process, including utility engagement, charging needs assessment, construction, and related costs.
Dedicated Utility Support	Due to relatively low electric demand, small fleet customers may not receive the same utility support as large commercial customers who qualify as key accounts.

Source: Authors, [3],[16], [17], [18]

Multi-Family Housing

Multi-family housing presents a large and growing portion of housing available in the United States. Thirty-one percent of U.S. households live in MFH, including owned and rented homes in apartment buildings, condominiums, townhouses, and mixed-use developments [19].

As a means of addressing demographic changes and increasingly unaffordable and inaccessible housing, some jurisdictions are loosening zoning regulations [20], which has led to an increase in MFH units [21] that may be expected to continue. From 2021 to 2022, MFH developments increased to 41% of all new housing, a jump from 35% and the highest share since 1985, while the share of single-family housing (SFH) declined [22]. This increase is particularly strong in the Midwest and Western regions of the United States, which have historically had low shares of MFH, as demonstrated in Figure 3 [22].

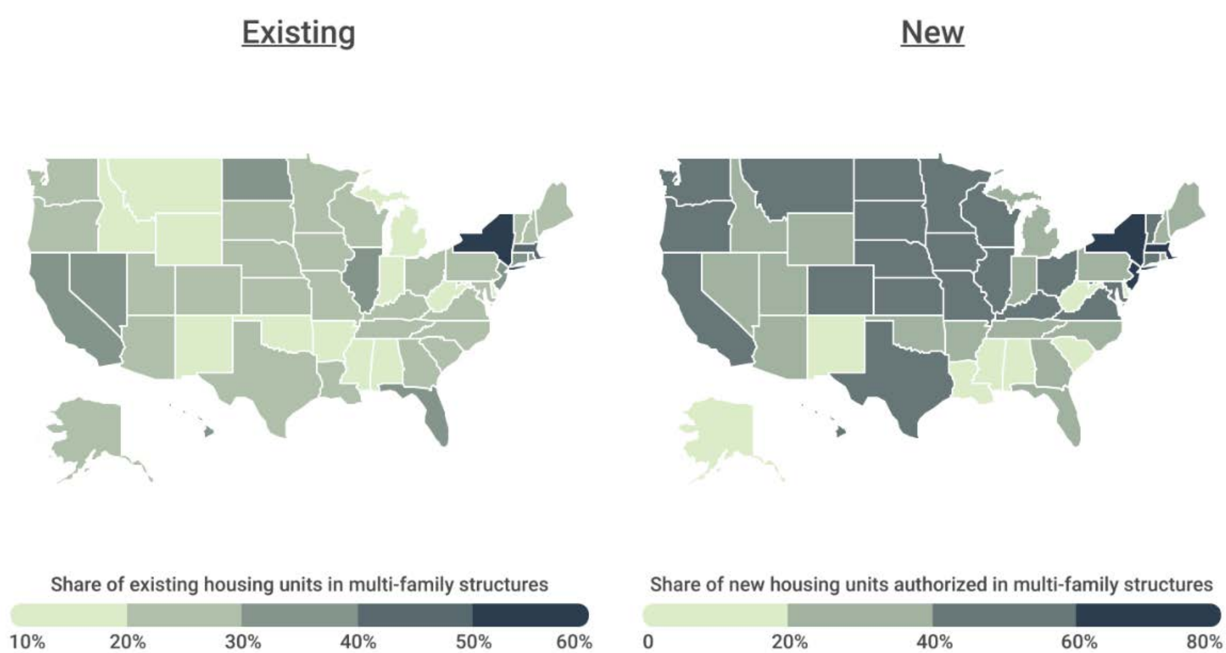


Figure 3. Share of multifamily housing (MFH) developments by state (Source: Construction Coverage analysis of 2023 U.S. Census Bureau American data, Image Credit: Construction Coverage, [22])

MFH tends to be concentrated in historically underserved communities. Sixty-three percent of all rental households are MFH, and about 80% of households residing in small to medium MFH rental units have incomes at or below 80% of the local area median income [23]. Residents in these communities tend to be disproportionately Black, Indigenous, or people of color (BIPOC) and are often younger. Adequate EV charger access is already a concern with these communities [24], often compounded by challenges in charger deployment at MFH properties.

Like small fleets, the unique circumstances of many MFH developers, owners, and building managers, described in Table 2, mean they can face unique challenges to EV charger installation, particularly in non-luxury properties.

Table 2. Some typical circumstances of MFH considering EVSE deployment

Category	Circumstances
Site Ownership and Split Incentives	Chargers at MFH are often provided as an amenity to residents (often renters). This introduces a split incentive since the capital cost of installation is often not borne by the user, making for a difficult business case.
	An individual resident, the property manager, or a third-party provider can lead charger installation at MFH. This often leads to a complex project ownership structure and requires approval from multiple parties, such as the homeowners' association (HOA) and property owners, making it challenging to obtain the correct permissions.
Electrical Infrastructure Constraints	MFH properties often do not have spare electrical capacity to support EV charging load.
	This is amplified in older buildings due to old circuitry and infrastructure. In the United States, 55% of small- to medium-sized multifamily developments were built before 1980.
Parking and Access Constraints	MFH properties often have limited or no available on-site parking, which can make it difficult to site chargers. If parking spots are assigned, it may be challenging to balance the parking needs of residents with EVs and those with internal combustion engine vehicles.
	If there is no on-site parking, curbside charging may be explored, requiring right-of-way easements, pole-mounted chargers, etc., or there may be impediments due to municipal regulations.
Installation Costs	Parking and charging sites may be located far from the electrical room or transformer or underground amidst thick concrete and steel leading to high boring, wiring, communications, and conduit costs.
	Installation costs include landscaping and other civil costs to provide accessibility, such as making charging spaces ADA-compliant [25] and providing lighting and other safety features, such as no-trip cabling.

Source: Authors, [19], [23]

Disadvantaged Communities (DACs)

Disadvantaged communities (DACs) are faced with unique challenges for EV infrastructure deployment. To be considered a DAC, a census tract must rank in the 80th percentile of the cumulative sum of the 36 burden indicators and have at least 30% of households classified as low-income. Federally recognized tribal lands and U.S. territories, in their entirety, are also categorized as DACs [21]. Section 223 of Executive Order 14008 (Tackling the Climate Crisis at Home and Abroad) created the Justice40 Initiative [26], which established the goal of flowing 40% of the overall benefits of certain Federal investments to DACs [27].

These communities often pay a higher portion of their household income towards utility bills than other households and are thus more likely to be burdened by an increase in electricity costs due to charging. In rural areas, DACs often have higher transportation costs due to the distance needed to travel to access goods and services, and a higher prevalence of older, fuel-inefficient vehicles [29].

Housing in many DACs is often dense and aging and can require added costs to accommodate new electrical loads, such as customer-side panel upgrades. Marginalized communities can also have less resilient grids and be more prone to outages for various compounding reasons [28].

These barriers, among others, impact the likelihood of underserved and/or minority community members purchasing and using EVs. The lack of infrastructure can feed range anxiety and hinder future EV adopters. Indeed, Black and Hispanic majority neighborhoods are less likely to have access to public chargers [30], and the charger access gap is more significant in areas with more MFH. If a neighborhood is dominated by renters over homeowners, this disparity can be further entrenched. These factors can inhibit demand, which in turn make it more difficult for utilities to justify EV programs or grid upgrades. All of these issues make increasing EV adoption more challenging and pose a barrier for these communities to achieve clean, efficient, and economical transportation. Additionally, some DACs can be disproportionately impacted by extreme weather events [31], so there is a need for resilient EV charging infrastructure that operates during natural disasters such as hurricanes.

3 UTILITY SERVICE CONNECTION PROCESSES

Overview of New Service Connection Process

Each request for a new service connection to the grid follows a similar overall process, as illustrated in Figure 4. The details of this process are unique to each utility and may differ based on load size, customer type (residential vs. commercial vs. industrial), and application (new build vs retrofit), among other factors. EVSE is, simply put, another type of equipment that brings load onto the grid, often requiring a new service connection or upgrade. For chargers that utilize regular 120 V outlets (1-2.4 kW) or individual Level 2 chargers (3-19 kW), new utility service is rarely required.[3] However, DC fast charging (DCFC) (50-350 kW) and multiple Level 2 deployments often require new service to be established due to their power requirements and locations in parking lots or at curbside parking detached from buildings with pre-existing wiring.

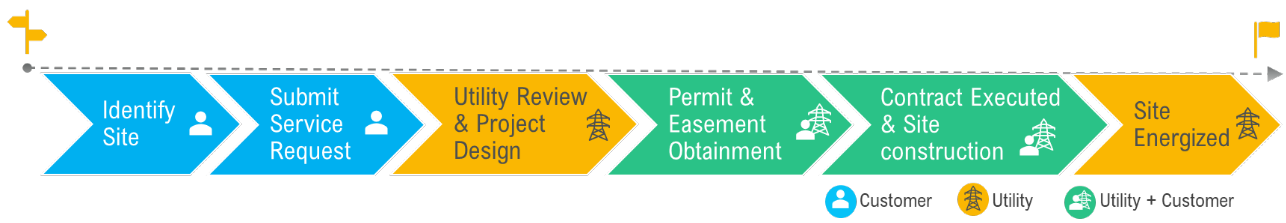


Figure 4. High-level process flow for EVSE utility service connections with leading stakeholder

The requirements for each stage of the process often vary by utility and are affected by the utility's business practices and state PUC actions and requirements. In addition to utility responsibilities, electricity customers, developers, contractors, and local AHJs also play important roles. Table 3 expands the above figure with more detailed process stages, along with stakeholder roles and responsibilities.

Table 3. Stakeholder roles and responsibilities in each service connection process step

Stakeholders	Description
0. Project Concept	
Lead: Customer **Supporting**: Relevant stakeholders, e.g., property owner, investors	• Includes proposing and making the project business case through preliminary financial and operational analysis. • Project motivations include emission reduction targets, cost savings, business strategies, consumer demand, etc.

[3] Though new utility service may ultimately not be required, utilities still generally require that they be informed of any material changes to a customer's equipment or operations for which the utility is supplying electric service.

Stakeholders	Description
1. Site Selection and Assessment	
Lead: Customer, electrical contactor **Supporting**: Utility	• Customer determines the charger location and draws up a site plan, typically with the services of an electrical contractor. The customer could be the property owner or the renter who wants to purchase an EV. As a renter, there are the additional steps of working with the property owner, HOA, etc., to secure permission before site selection. • Site assessment of available electric infrastructure and estimates of required civil and electrical work, e.g., wiring, trenching, laying concrete, panel upgrades. • Utility may support site assessment through site walks and hosting capacity analysis.
2. Preparation and Submission of Service Request	
Lead: Customer, electrical contactor **Supporting**: Utility	• Customer requests new service from the utility through a formal application. Typical required documents include site plan, points of entry, meter locations, estimated extent of utility work, and service activation documents. • Some utilities expect applicants to provide information on the expected minimum, maximum, and normal demand and load characteristics to size meters and other components. • Application submission may be online or require physical paperwork.
3. Application Review	
Lead: Utility **Supporting**: Customer, Electrical contactor	• Utility begins its formal review process upon application submission. This can involve following up with the customer for additional details or with clarifying questions. • Initial challenges with the project may be communicated to the customer at this stage.
4. Engineering Design and Cost Estimation	
Lead: Utility	• Utility engineering design teams conduct a design review to assess the request's load requirements, complete design drawings and specifications, and estimate required upgrades and project costs.
5. Final Design and Contract	
Lead: Utility, Customer **Supporting**: Electrical contractor	• After project design is completed, the details are finalized with the customer and a service contract is drafted. • This may include an invoice paid by the customer for upgrades and other construction services provided by the utility.

Stakeholders	Description
6. Permitting and Zoning Approvals	
Lead: Customer, Utility, AHJ **Supporting**: Civil and electrical contractors	• The customer is typically expected to obtain the appropriate construction and electrical permits required from local AHJs. • The customer and the utility may share the responsibility to submit required materials. • This stage is often time intensive due to required customer, contractor, utility, and AHJ coordination, as well as permitting complications and delays.
7. Obtaining Required Right-of-way and Easements	
Lead: Customer, Site owner, AHJ **Supporting**: Civil and electrical contractors	• Easements provide right-of-way and allow utilities to access private (or public) land, required by utilities for infrastructure work in the public right-of-way, e.g., installing curbside EVSE, adding a service transformer. • Easements must be obtained unless utility access is provided under an existing easement; if the customer is not the site host, easements must be obtained from the property owner. • The customer and utility may share the responsibility to submit required materials.
8. Civil Work and Installation	
Lead: Civil and electrical contractors (both utility and customer-side)	• Once approvals are obtained, the contract is signed, and invoices are paid, the utility proceeds with construction, e.g., trenching, laying conductors, transformer upgrades, switchgear. • The customer's civil and electrical contractors complete customer-side work to prepare the site, e.g., wiring and panel upgrades.
9. Energization	
Lead: Utility **Supporting**: Customer, Electrical contractor	• Once all contracted electrical and civil work is complete, charging equipment is connected to the power supply and deemed ready to use.

While the process described above broadly represents nationwide experiences, there is variation in the details of each stage by utility and region, driven by utility ownership structures, regulatory requirements, and application of special utility programs and services. Some utilities have dedicated processes for EVSE service requests while many use a common process across different load types. In regions seeing high EV uptake and corresponding increases in service request volume, utilities may have dedicated staff and engineering and design teams to review EVSE requests and provide customer support. This support can be advisory and financial in nature, with different levels of involvement depending on the utility's EV program offerings. Section 5 lays out examples of such programs offered by utilities.

Investor-owned utility (IOU) processes may be influenced by the government body that regulates their operations, a public utilities commission (PUC), as described in Section 5. Publicly owned utilities or municipal utilities (munis), are often run as a division of government, and their processes are impacted by governing boards or councils. These utilities can significantly overlap with the local AHJs, which can, in turn, reduce permit processing time, paperwork, and requirements. Cooperative utilities (co-ops) are owned by their members and governed by an elected board and certain government regulations. These utilities are typically characterized by small staff and limited resources with a focus on keeping costs low and rates affordable, and thus often lack the capacity to provide separate support for EVs, though there are exceptions.

Unique Characteristics of EVSE Service Connections

While all loads have distinct considerations for being connected to the grid, EV charging infrastructure presents several unique challenges for the load connection process [32]. This can be attributed to the early adoption stage the technology is still in, including a lack of precedent and sufficient utilization data; high-power "spikes" from intermittent charger usage, particularly at lower penetrations; and supply chain constraints for the specific types of equipment needed to connect chargers to the grid. These and other examples are outlined in Table 4.

Table 4. How EVSE service connections can differ from traditional utility service connections

Category	Consideration
Project timelines	• EVs and EVSE can be procured relatively quickly (on the order of days to weeks for light-duty vehicles and weeks to months for heavy-duty vehicles), and so new or updated electric service is also needed relatively quickly; traditional new building projects generally take longer due to the time required for site preparation and construction. • Energization date certainty is generally more critical for an EV site, especially fleets, as the customer is ready to begin operations when the utility service is energized; for traditional building projects, utility service energization is usually a milestone on the overall plan, and full customer operations are frequently not in effect until weeks or months after utility service is completed.
Site identification	• Ownership structures of parking locations, especially for rental properties or leased commercial space, leading to challenges obtaining approvals, easements, and addressing the split incentive for infrastructure installation.
Electrical infrastructure upgrades	• Charger installation may require upgrades to wiring, panels, switchgear, and transformers, as well as distribution system upgrades, which can be costly, prone to supply chain delays, and both labor- and time-intensive. • Older buildings, such as apartment complexes and warehouses, with outdated electrical infrastructure may require even more significant upgrades for EVSE.

Category	Consideration
Load characteristics and uncertainty	• Insufficient data and precedence for EVSE loads can hamper rapid and confident utility estimation of equipment sizing needs. Utilities need to understand users and use cases from real-world installations. • Intermittent load “spikes” from EV charging can further complicate utility design reviews and trigger load studies. • For fleets, changes in business operations can have immediate and significant load impacts, potentially even for small fleets. For example, load requirements for a two-shift operation can be dramatically different than for a single shift, as moving from overnight charging (long dwell time) to a slip-seating operation (short dwell time) can increase maximum loads; in contrast, without EVs, moving from one to two shifts would increase energy consumption, but likely not maximum demand.

4 CURRENT INDUSTRY ACTIVITY

Existing Resources

Several recent studies have highlighted the need to streamline and improve current connection procedures, identifying possible solutions and motivating further work in this area. While these studies did not necessarily focus on small fleets, MFH customers, or disadvantaged communities, they are instructive nonetheless.

The **Alliance for Transportation Electrification (ATE)'s Issue Brief Series on EVSE Interconnection** [33][34][35] recognizes that planning to connect increasing numbers of public chargers with varying levels of power and different usage levels to the grid is a significant issue and provides best practices to shorten charger installation timelines that can be adopted by utilities, PUCs, state/local governments, and project developers. A key takeaway is that delays and long processing times can be caused by slow turnaround times on the utility and customer side, as well as by supply chain and required distribution upgrades. Early collaboration and proactive engagement among all stakeholders, state and federal regulatory action to facilitate utility investments, clear process guidelines, customer education and awareness, siting assistance from utilities, and foreseeing electrical equipment sourcing delays are some leading practices that can shorten overall connection times.

The **Interstate Renewable Energy Council (IREC)'s report, Paving the Way: Emerging Best Practices for Electric Vehicle Charger Interconnection** [36] identifies several challenges that lead to delays in establishing EVSE connections, and the emerging best practices to address these issues. This work surveyed a variety of charging developers to understand gaps in the current process and revealed three main factors that contribute to long connection timelines, building on ATE's brief:

- interconnection process delays
- difficulty obtaining easements for the right to install equipment at a property
- slow permitting processes

These issues arise from underlying factors that contribute to overall delays as summarized in Table 5 [33].

Table 5. EVSE service connection challenges

Category	Challenges
Interconnection Process Delays	• Lack of dedicated utility staff and resources • Lack of EV infrastructure-specific programs and policies • Lack of clear interconnection processes, timelines, and steps • Long lead times for utility equipment upgrades • Lack of transparency about grid capacity • Lack of utility performance measures or incentives

Category	Challenges
Obtaining Easements	• Requirement for easements and language for applications aren't easily available • Easements can be difficult to obtain
Slow Permitting Processes	• Permits for electrical and construction work can be difficult to obtain • Lack of clarity for permitting EVSE projects

Source: [33]

GridWise Alliance's **Near-Term Grid Investments for Integrating Electric Vehicle Charging Infrastructure** report [37] states that to enable benefits from recent infrastructure investments, similar investments will be needed in hardening, upgrading, and modernizing the grid to ensure a safe, secure, reliable, and affordable electricity system. This will be particularly important for meeting an exponential EV share increase without overwhelming the grid. The report lists relevant near-term investment needs, such as:

- Integrated planning for grid hosting capacity to support increased electricity demands, with load forecasting assumptions and methodologies inclusive of anticipated EV demand.
- Communication and coordination with customers needing significant capacity upgrades.
- Emerging grid architecture, such as "make-ready EV charging infrastructure sites", where utilities build out nearly completed sites such that customers with EVSE can quickly connect to the grid [37].

Limited access to EV charging presents a significant barrier to the uptake of EVs for MFH residents, especially those in low-income communities. RMI's **Plugging Into Mobility Needs at Lower Income Multi-Family Housing** report provides scalable, replicable solutions and recommendations for policymakers, utilities, and other stakeholders to prioritize equity in charging infrastructure development plans [38].

In tandem with utility initiatives, efforts are underway to streamline parts of the process that require approval from Authorities Having Jurisdiction (AHJ) (e.g., municipal and county government) since permitting and code compliance can significantly impact the timeline and viability and speed of EV charging projects. In 2023, RMI, IREC, and SEAC published a report on **Planning and Zoning Guidance for Electric Vehicle Charger Deployment** [39] providing actionable recommendations for AHJs to make local approval processes for the siting and installation of EV charging infrastructure clear, predictable, and equitable. This critical work is set to continue through the implementation of the **Charging Smart** [40] program led by IREC and Great Plains Institute, supported by RMI and other partners. Funded by the U.S. DOE, Charging Smart offers free technical assistance for local governments to adopt policies, practices, and incentives supporting efficient and equitable EV charger deployment, and rewards that work by awarding different levels of the "Charging Smart" designation based on the degree of progress made.

Revisiting these efforts highlights the intense collaboration underway to address EVSE deployment. Only through comprehensively identifying challenges and targeted solution development for each stakeholder and stage in the process can widespread access to EV charging become a reality.

Utility Regulation in EV Service Connections

Governing authorities often influence the near- and long-term investment decisions made by utilities and can play an important role in shaping their priorities by introducing process requirements and motivations for streamlined operations. IOUs are regulated by state public service commissions or public utility commissions (PUCs); electric cooperatives (“co-ops”) are usually governed by boards accountable to their members (i.e., customers); and municipal utilities (“munis”) are directly part of the local city government [35]. The variety in utility ownership and structure, as well as differing state regulations, highlights the variation within the industry, which leads to associated dissimilarity in the approach to regulating utility processes.

By and large, regulators have not played a large role in the details of load connection procedures. However, PUCs in some regions have more recently pushed to accelerate EVSE deployment, often through performance incentives or other requirements. Below is a non-exhaustive list of examples of actions by state PUCs that aim to improve electric utility service connection timelines and customer experiences.

[1] California Public Utilities Commission (CPUC)

- **Electric Rule 21** [41] sets out the timelines and procedures for utilities to connect distributed energy resources (like solar panels) to the grid. It requires utilities to respond to connection requests in a timely manner and outlines specific timeframes for different steps in the connection process. This regulation helps streamline the process for customers looking to connect renewable energy systems to the grid.
- In early 2024, the CPUC initiated an Order Instituting Rulemaking (OIR) [42] focused on establishing customer energization timelines for IOUs through two pieces of legislation: **Senate Bill 410 (2023) and Assembly Bill 50 (2023).**

SB 410 or the **Powering up Californians Act** [43] requires the CPUC to establish, on or before September 30, 2024, reasonable average and maximum target energization time periods and certain reporting requirements so that electric utility performance can be tracked and improved. This in turn requires the utility to take any remedial actions necessary to achieve the CPUC’s targets and for all reports to be publicly available, among other reporting criteria.

AB 50 [44] requires the commission to determine the criteria for timely service for electric customers to be energized, on or before January 1, 2025, including reasonable average energization time periods for categories of timely service.

New York State Public Service Commission (NYPSC)

- NYPSC has established specific **service connection timeline requirements** for utilities to complete service connections for distributed energy resources (DER) that go through the Standardized Interconnection Requirements. For example, utilities are required to provide electric service connections within 10 business days for new distributed generators and/or energy storage systems 5 MW or less, subject to meeting all requirements [45]. Utilities must also clearly communicate to customers about the status of their connection requests.

- Building off this work, the NYPSC also established the EV Infrastructure Interconnection Working Group (EVIIWG) to address EV-specific service requests, Matter Number 24-00339, "In the Matter of EV Infrastructure Working Group." Through this working group, the Joint Utilities of NY presented a straw proposal on how best to streamline the interconnection process. While the work is ongoing at the moment, the EVIIWG was formed to identify, discuss, and resolve the technical barriers and challenges associated with the electric vehicle (EV) interconnection process, including queue management and EV-specific standardized interconnection requirements (SIR) in a collaborative, efficient and effective manner. The work is specific to EVs, building electrification and any other process that includes an interconnection application queue, review and approval process.
- NYPSC and New York utilities have been developing **Earning Adjustment Mechanisms (EAMs)** since 2016 to reward utilities for their performance in energy efficiency, building electrification, and, most recently, vehicle electrification. These mechanisms have evolved into a series of utility-specific metrics that can encourage innovation and collaboration.

For example, in 2022, Con Edison reported that participating in a "Beneficial electrification" EAM incentivized the utility to support EV adoption, leading it to overachieve its DCFC target through expanding EV charging make-ready program participation [46].

In 2023, Con Edison's Transportation Electrification Interconnection Timeline EAM was adopted by the NYPSC, which encourages shorter energization timelines for projects 300 kW and larger by financially rewarding the utility when it reduces average timelines compared to historical timelines [47].

NYPSC order earmarks a share of a utility's authorized incentive budget to be used for EV advisory service.

Massachusetts Department of Public Utilities (DPU)

- The DPU established policies through **D.P.U. 12-76** [48] to encourage the regulated electric companies (Eversource, National Grid, and Unitil) to adopt **grid modernization** technologies and practices to upgrade electricity distribution and transmission systems. These plans must be updated every five years and include a discussion of how distribution system improvements will facilitate transportation electrification.
- **D.P.U. 12-120-D** (2016) adopted revised service quality guidelines that include metrics for new service connections, focusing on timeliness and reliability. The guidelines require electric companies to present service quality plans on how these are implemented. Utilities are required to file annual service quality reports and face penalties if they fail to meet the required standards [49].

Illinois Commerce Commission (ICC)

- Illinois **Administrative Code 83 for public utilities** contains specific rules that require utilities to establish service connections within reasonable timelines and provide customers with clear information regarding the application process.

This rule requires that initial acceptance or rejection of an application must be completed within two business days of receiving all required information from the applicant. Specific reasons for rejection must be provided so the applicant may have the opportunity to remedy it.

These rules also mandate that utilities offer various customer support services, including assistance with understanding connection requirements and potential costs. Additionally, the utility must report to the ICC in instances where connection timelines are not met.

Oregon Public Utility Commission (OPUC)

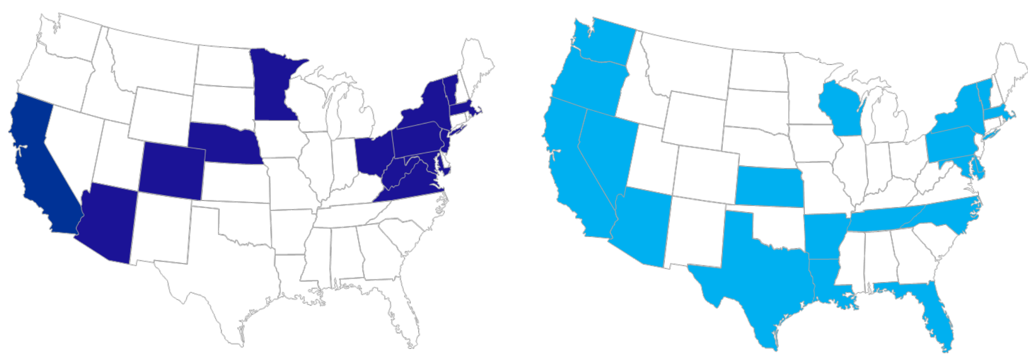
- **In 2016, Senate Bill (SB) 1547** directed IOUs to file programs with the PUC to accelerate transportation electrification. As a result of this, three utilities presented dockets—Portland General Electric (PGE), PacifiCorp, and Idaho Power—documenting seven programs the utilities have been running.

Of these, the PUC has approved three pilot programs by PacifiCorp and PGE for charger installations and bus electrification, and an education and outreach program by Idaho Power in its rural service territory.

5 IDENTIFYING CHALLENGES IN CURRENT EVSE SERVICE CONNECTION PROCEDURES

Our Process: Stakeholder Interviews

To obtain a clearer picture of the challenges associated with EVSE service connection processes, the project team conducted interviews with utility representatives, small fleet and MFH customers, contractors, and industry experts. Feedback was sought from these interviewees on their recent experiences with service connection requests pertaining to timelines, costs, utility engagement, available resources, challenges identified, and goals to support a streamlined process. In total, 37 different interviews were conducted between April and August 2024, along with two online small group discussions with customers, capturing a breadth of input from utilities and customers across the United States (Figure 5). The objective of these interviews was to learn more about EVSE project experiences, including challenges and barriers, to understand how utilities can better support these efforts.



Utilities Interviewed
by State

Fleet and MFH Customer (or reps)
Small Group or Interview Participants
by State

Figure 5. Utility and customer interviewees by state

On the utility side, 14 interviews were conducted, consisting of eight investor-owned utilities (IOUs), four public power/municipal utilities, and two co-ops. Overall, more than 30 utility representatives from various departments within the utility were interviewed, including representatives from the new service connection department, transportation electrification department, customer program department, and customer accounts department. This set of utilities was identified to reflect a range of EV demand in their territories and related EV program offerings, varying experiences in EVSE connections, rural vs urban service territories, and current initiatives to streamline processes.

On the customer side, twenty-three interviews and two small group discussions were held to capture customer feedback. These represented 14 small or medium-sized fleets with MHDVs and 11 MFH customers, including five affordable housing providers. Participants were recruited primarily via the Clean Cites and Communities Coalition partners that are part of the CIISR project advisory structure. The small group participants were recruited through an online panel provider, userinterviews.com, and were further screened for eligibility. The participants, located across various regions, included private companies, municipalities, and non-governmental organizations to cover a broad range of vehicle electrification experiences.

Customer Feedback: Barriers to Electrification for Small Fleet and Multi-family Housing (MFH) Customers

The objective of the customer interviews was to understand the organizations' motivations for vehicle electrification, their experiences with electrification projects, including any challenges they faced as well as what went well, the expertise and resources they used, and the resources they would have liked to have had. The interviews also explored engagement with the electric utility. This section offers a detailed view of customer experiences and feedback and highlights opportunities to support these smaller EV customers in their electrification journeys.

While the focus was on small businesses with small fleets, such businesses have been typically slow to electrify for reasons mentioned in previous sections, making it challenging to identify interviewees with electrification experience. This led the interview team to diversify and include small municipalities, covering their experiences with city vehicles, small transit fleets, and public charging. These vehicles and chargers, especially transit buses, typically serve or operate in diverse communities, including DACs, leading to a large impact.

While the interviews covered a range of topics, the following focuses explicitly on the challenges that were identified, while Section 5 includes what interviewees felt went well with their electrification projects. The full customer research report can be found in Appendix B.

Utility Interactions

Most customers interviewed felt that if an EV charging installation project does not necessitate additional power to the building, the utility does not need to be engaged. Others expressed that utility engagement can make projects slow and cumbersome, with confusing requirements and steps and long lead times to gain approvals to advance through the process.

> "As you are probably aware, the utility process could be up to 12 to 18 months. So, we're really trying to avoid the utilities where possible."
>
> *M, EV Consultant*

Some municipalities that work with municipally owned utilities cited a more seamless experience in this regard since most steps take place within the same organization.

Regardless of organization size, both businesses and municipalities indicated that it would be beneficial to have a specified point of contact at the utility to help guide them through the process, as well as support them in project planning and needs assessment.

Some fleet operators offered that it would also be useful if utilities had a better understanding of vehicle duty cycles, including the complexity of duty cycles during cold temperatures, and related charging needs to support fleet electrification.

> "I think it's helpful for [utilities] to have a general understanding of how the transit system works in terms of run blocking and mileage requirements for these buses in a service day. I think that helps to set the framework of a realistic number of buses that should be procured, both from a transit perspective but also from a power supply perspective."
>
> *J, Municipal Fleet*

In the absence of dedicated account managers at the utility, which medium to large companies and municipalities sometimes have, many indicate that a standardized and automated utility process to submit info to and gain info from would improve the experience.

> "If they released a standardized process around EVs, I think that would help. Most of these projects need essentially the same thing [equipment], right? If they got to the point where they said all right, every EV project is looking for something in this ballpark and started planning ahead for that... I think demand is going to continue to grow, so outfitting the utility companies with the tools and staffing that they need to be able to support that is what's needed."
>
> *N, EV Consultant*

Planning Challenges for Small Fleet Operators

For many fleet operators, challenges to charger deployment include physical space, workforce constraints, and concerns around on-route charging, pointing to the need for a comprehensive needs assessment and site planning. Fleet electrification costs are not limited to the vehicles and charging infrastructure and can include equipment maintenance, facility upfitting, employee training, and electric fueling costs when exacerbated by demand charges.

> "We need $84 million according to the consultant's report to build out our corporation yard here at the city. The costs are much more than just chargers."
>
> *D, Municipal Fleet*

Economic Challenges for Multi-family Housing (MFH) Providers

Installing EV charging at MFH properties does not always provide a direct return on investment (ROI) but, as an amenity, can help attract and retain residents. For smaller MFH with fewer resources, installing charging must be weighed against other capital requirements and is often deemed not economically feasible.

> "Being a landlord is really challenging financially these days. There's a ton of pressure, it's very hard to make things pay, and construction costs have become astronomically high—probably doubled in the past five years. And so, landlords

> are very reluctant to get involved with big capital projects. So, when you tell someone you can put EV charging in your building, but you're going to have to completely repower your building, a lot of landlords will say, forget it, I'm done."
>
> *J, MFH*

Many MFH units in DACs also face unique challenges in covering the ongoing cost of charger use and maintenance. For example, a nonprofit housing development corporation wanted to install EV chargers at a few of their properties located in DACs and not charge for usage. They would receive funding to cover the installation costs, but there was no long-term revenue plan to cover ongoing operating and maintenance costs. Other elements to be considered and managed include the charging location and fair access to chargers.

A more complete summary of the challenges identified by the fleets and MFH customers interviewed is summarized in Table 6, with full details in the customer research report in Appendix B.

Table 6. Small customer electrification challenges

Challenge	Impact
Project Costs	
High upfront costs and insufficient rebate opportunities	Installation expenses are often significant. Rebates can help decrease upfront costs by widely varying amounts, dependent on applicable state and utility funding programs.
Fluctuating cost estimates	Firm cost estimates are difficult to obtain. Fast-evolving EVSE technology can mean cost estimates remain relevant only for a few weeks as material and product costs change regularly based on demand and availability.
Low potential for cost recovery	Few attractive business models exist to facilitate cost recovery, particularly for MFH properties. Monthly fixed utility fees can cause the project owner to lose money with low charger utilization.
Customer Preparedness	
Limited customer knowledge of technology and needs assessment	Choosing the right technology for a small business's specific use case without a comprehensive needs assessment using real-world energy and mileage data. Customers may be driven to pursue more expensive and/or higher-power equipment than required.
Lack of access to dedicated project managers	Due to funding and staffing limitations, small businesses often cannot dedicate personnel to the planning, execution, operation, and maintenance of EVSE projects.
Complex grant application processes	Many customers have limited knowledge of available funding opportunities beyond utility rebates. The grant application process itself can be complex, time-consuming, and resource-intensive, deterring many from pursuing them. Further, investing the time to apply for a grant does not guarantee the applicant will be awarded.

Challenge	Impact
Perceived complexity of electrification	Project planning and the unique logistics of E-fleet operations can make shifting to EVs seem complicated for a business. Process complexity can be compounded if the fleet does not have an overall transport electrification plan. Sharing proposed fleet transition plans with the utility can help with future-proofing of EVSE and load management.
Utility Processes	
Lack of awareness of utility resources	Small customers may not easily find resources on applicable utility programs, application guidelines, and qualification requirements.
Absence of clear, regular communication	Communication between utilities and customers can be challenging. Customers are often not aware of process steps, requirements, and timelines, which can be exacerbated in the absence of a dedicated POC.
Long processing times	Lengthy lead times for application processing, work orders, and project execution can add to project delays.
Lack of visibility into costs	At times, utility costs to the customer may not be made clear until after construction has begun.
Regional non-uniformity between utilities	Utility program requirements, rebates, and process details can be complex for customers, electricians, and contractors working on multiple projects.
Non-utility Processes	
Permitting delays and application complexities	Lengthy permitting timelines add to delays, often due to slow AHJ processes and limited staffing. In some regions, the customer is on point to obtain the permit or easement without utility involvement or support, adding inefficiencies and potential delays.
EVSE providers requiring high volumes	Some EVSE providers may require higher volumes than small customers may need, limiting available technology options.
Complex and slow EVSE maintenance	It can be challenging to have charging equipment repaired in a timely manner, which can be exacerbated when EVSE software is proprietary and requires repair by the EVSE provider only.
Insufficient workforce development opportunities	EVSE workforce development, due to limited EV maintenance training programs. Companies often rely on training provided by OEMs or EVSE providers, and local staff gain knowledge and experience over time. With high demand for newly trained staff and competition with higher-paying jobs, turnover can be a problem.
Support for Disadvantaged Communities (DACs)	
Outdated infrastructure and insufficient electrical capacity	Infrastructure in DACs can be outdated due to historical disinvestment, leading to the need for significant electrical and civil upgrades at the site.
Low charger utilization	Charger utilization in DACs may be lower due to low EV ownership, exacerbating challenges in recovering upfront and ongoing costs.

Utility Feedback: Process Challenges to Streamline Connections

Utility insights on current EVSE connection processes highlighted several key challenges as barriers to a fast and streamlined process. These primary challenges and their underlying reasons are captured in Table 6 relating to internal utility processes, externalities, and customer preparedness. Feedback gathered from utility representatives during interviews highlighted a range of challenges faced by both the utilities and their customers in the timely installation of EVSE. This included discussions around the availability of educational resources and guidelines to help customers navigate the installation process, as well as insights into future utility initiatives aimed at enhancing the current processes and offerings.

Need for Customer Preparedness

One of the most frequently mentioned issues was the need for greater customer preparedness and awareness regarding the EVSE installation process. Utilities emphasized that customers often lack understanding of the service connection application requirements and other critical steps in the installation process, such as obtaining necessary approvals from the AHJ and site owners. This lack of preparedness often results in incomplete applications, which ultimately slows down processing time and delays installations. This was identified through the utility research as an opportunity for utilities to expand customer engagement through education and awareness programs, clear application materials, and transparent process guidelines. Similarly, simplifying process details for customers, making sample application materials and links for local permitting offices available and easily accessible to customers were noted as solutions considered to increase customer support in utility interviews.

Staffing and Resource Constraints

Additionally, the majority of utility representatives pointed to significant constraints, including insufficient funding and a shortage of trained personnel dedicated to administering EVSE-specific support. These limitations hinder the ability of utilities to provide timely and effective assistance to customers seeking to install EV charging infrastructure.

Providing Increased Customer Support to Accelerate Applications

Utilities also recognized the importance of providing more robust project planning and application resources to their customers. They suggested that a collaborative approach involving a larger ecosystem of entities—each offering varying types of support—would be more effective than relying on what a single organization is able to develop. By leveraging the diverse capabilities of multiple regional entities, utilities could better facilitate the installation process for customers.

Several utilities already offer program-level support for fleet and multifamily housing (MFH) residential EVSE projects. Moreover, some are actively working on initiatives designed to enhance their existing program offerings and streamline service connection applications. Utility processes can be complicated, wherein applications require comprehensive submissions from customers, and multiple handoffs and reviews between design and engineering teams, increasing the potential for delays and bottlenecks. Modifying these processes is cumbersome and time-consuming and must be informed by an analysis of process inefficiencies and gaps. Process improvement targets and practices are being enacted by some utilities typically operating in an encouraging regulatory environment and in areas experiencing growing EV demand. These efforts aim to address the challenges discussed and improve the overall experience for customers seeking to install EVSE, ensuring that the transition to electric vehicles is as smooth and efficient as possible. A detailed overview of these initiatives and proposed improvements is provided in Section 5.

External Process Delays

Supply chain issues and complex permitting can also create delays. Sourcing electrical equipment such as panels, switchgear, and transformers often required for upgrades has entailed long lead times due to manufacturer and shipping delays. While this is primarily largely due to manufacturers catching up with growing demand, it is exacerbated by utilities not being able to stockpile and plan ahead for needed equipment, which may require regulatory action.

Supporting Customers in DACs

When discussing support for DACs, utility representatives acknowledged that lower demand per home or business, and more rented or leased property in these areas pose barriers to electrification in these spaces. Furthermore, the relatively older grid infrastructure and historical disinvestment in these neighborhoods could necessitate more costly upgrades to accommodate new EV charging stations. These challenges complicate efforts to deliver equitable support for EVSE installations, and broader transport electrification, in under-resourced areas.

A summary of utility EVSE deployment challenges and potential impacts is provided in Table 7.

Table 7. Electric utility EVSE deployment challenges

Challenge	Impact
Project Costs	
High electric upgrade and construction costs and lack of clarity for customers	• New service may require capacity upgrades or line extensions on the utility and customer sides, which can drive up upgrade costs, though this can be less of an issue with smaller EV customers. • Customers often do not expect these costs, which can derail projects or cause significant delays. • Sometimes costs occur due to suboptimal site and project planning, e.g., choosing a location further away from an available panel or transformer. • Customers may lack clarity on costs of required civil, landscaping, and other site prep for installation, including ADA-compliance.

Challenge	Impact
Customer Preparedness	
Lack of access to qualified contractors	• Service request applications often require a site plan developed by a certified electrician or utility service. • The customer may not know where to start when identifying a qualified contractor with EVSE experience and may not be clear about average contracting costs. • This can delay the customer and pose the risk of engaging a contractor not qualified for the job, leading to substantial cost and time sinks later in the process.
Incomplete application materials	• The applicant may not have sufficient clarity to prepare application materials, causing processing delays and increased back-and-forth with the utility.
Misaligned expectations	• Customers often come in not knowing how long the process may take, leading to misaligned expectations.
Utility Processes	
Lack of dedicated resources for EVSE connection applications	• Lack of enough dedicated trained staff to support EVSE requests and speedily process applications, affecting the ability to offer dedicated EVSE program services and lengthens review timelines. • This can lead to insufficient resources for an EVSE program and lack of consistent communication during application processing.
Complex and lengthy utility processes	• The utility process after submittal may not be streamlined, requiring multiple hand-offs between design and engineering departments, leading to bottlenecks and potential delays.
External (Non-utility) Processes	
Lengthy and complicated permitting and site owner approval processes	• EVSE installation often encounters site ownership and permitting complexities, which are amplified for small fleets and MFH, resulting in project delays and even indefinite pauses. • Customers may not be aware of all right-of-way and other easements and permitting approvals required and the time they take to obtain.
Supply chain delays in sourcing equipment	• Sourcing electric equipment, such as wiring, conduits, transformers, panels, etc., has experienced long lead times, leading to delays. • These affect both utility and customer-sourced equipment.
Support for Disadvantaged Communities (DACs)	
Low EV demand in DACs	• Utilities consider a lack of demand for EVSE support and services in DACs stemming from low EV ownership currently, and this can mean it is difficult to justify the creation of resources aimed at supporting customers in DACs for service connections.

Challenge	Impact
	• Some financial support is currently offered for infrastructure and/or charging for DACs through make-ready programs and billing incentives, and many utilities do not yet see the need to provide separate application support resources.

6 IDENTIFYING LEADING PRACTICES

Having identified the challenges associated with EVSE service connections, this section focuses on leading practices and other activities underway to streamline utility processes, as well as customer perspectives on what worked well with their overall transportation electrification experiences.

Customer Feedback on What is Working

Most interviewees readily shared what went well with their projects when asked.

Some expressed satisfaction with the pace of activity, especially those with smaller projects or prior project and utility interaction experience. Some interviewees also shared that, when the time came, the charger installation by the electrician or contractor went well, even if there had been other challenges related to the project.

> “When we were able to install the chargers, they went rather smoothly, didn't run into a whole lot of hiccups, no surprises underground. We haven't had any vandalism. People have accepted that is kind of the direction this is going.”
>
> *B, Municipal Fleet*

A few cited the available funding has been a bright spot in their electrification project. Some acknowledged that several projects in disadvantaged neighborhoods would not happen without utility funding. Others appreciated funding that made them whole for new vehicles.

> “Well, definitely from a financial perspective, [state] has put a lot of pressure on us to move towards this fleet electrification, but they've also committed to making sure that we're not on the hook for a more local match than what a diesel bus would cost. So that's been helpful, so at least financially, we’re no worse off. And then the local utility providing the essentially bonus funding for the buses has basically made it so that [customer] has no local match and investment in the buses and that frees up our local funds to keep as much service on the road as we can. So financially, it's been a really good partnership.”
>
> *J, Municipal Fleet*

Some saw utility funding as more viable than state or federal funding. Also, incentive programs for chargers were valued, and in some cases, rebate payments after charger purchases were cited as quick and easy.

Funding that allowed for some flexibility was identified as highly valuable—for example, funding that allowed MFH property managers to do things like hire part-time staff to support them since there is so much for property managers to do with EV charging projects , some of which is hard to imagine upfront when initially applying for funding (forms, fixing Wi-Fi, etc.).

Those who worked with consultants shared that their consultants' established relationships with utility companies and other organizations worked well to simplify the process and help drive the project to completion.

> "The bright spot, I'd say, was the pre-existing relationships that [consultant] had with [utility] was helpful, to know what their expectations were, and what we needed to do to fulfill those, to meet our grant requirements, also helping us build out the applications for the technical aspects and helping us make it like a vision for it. And then [project partner]; there was a pre-existing relationship between [consultant] and [project partner]."
>
> *R, MFH*

Regarding utility relationships, a single point of utility contact for the customer was also appreciated, as were set check-in cadences. Customers often viewed this type of relationship as a partnership for longer-term discussions on future projects and plans. In one case, the interviewee worked with a utility that had key performance indicators (KPIs) they were required to meet regarding application throughput timelines, and it was felt that this made a difference in project efficiency. Another appreciated practice cited was utilities making it clear upfront the size threshold above which a longer process would be likely, for example, because a load study is triggered. Finally, some municipal fleets (including transit agencies) whose utility is also municipally owned cited collaborative experiences.

Valuable Resources

The interview participants were also asked about the expertise and resources they used as they sought to electrify their fleets or install charging infrastructure, as well as the educational and other resources they would have liked to have had.

Many companies and municipalities consider EV consultants a key resource in their electrification journeys. Small and medium-sized companies and municipalities that had the means to hire EV consultants relied heavily on them to manage their electrification projects while they focused on the daily operations of their business. Consultants managed projects, developed plans and cost estimates, brought together necessary partners, and provided education to customers. They also provided visibility into various funding sources and wrote grants and completed applications, which is often daunting and arduous, especially for smaller businesses.

> "They're helping us identify government help, grants. All this information is all over the place, and we've already applied to two proposals… They're helping us, you know, $3,000 here, $10,000 here, and just kind of bringing all the actors together, including what software to use, what charger to use, they've been making it much easier for us."
>
> *D, Small Fleet*

It is worth noting that some that small companies may not have ready access to EV consultants due to lack of funding and lack of awareness of EV consulting agencies. This means they may also be less aware of funding opportunities for electrification projects beyond utility rebates.

> "…I have not had any direct knowledge of any grants. Maybe I'm looking at the wrong places for it or the information is not being communicated properly."
>
> *V, Small Fleet*

In addition to EV consultants, some smaller customers talked about how their electricians were invaluable.

Networking is considered a valuable resource, and many interviewees sought opportunities to network with other companies and municipalities that were electrifying, utility company representatives, industry experts, and consultants.

> "Networking is probably the greatest thing since sliced bread. You know, there's so many people out there that are willing to share their information that they have. You don't need to reinvent the wheel."
>
> *D, Municipal Fleet*

Some mentioned the idea of having a forum to share experiences and ask questions of others who are going through or have been through an electrification project.

> "I think the best people would be other small fleet operators. They have had the direct experience, the direct knowledge, and know-how. I think they would be my number one go-to. If I could find that resource, it's like the holy grail."
>
> *V, Small Fleet*

Many mentioned the desire for a one-stop shop for trustworthy EV and EV charging education and resources, identifying utility companies as the top choice to house and disseminate this information.

> "It's not that the information is lacking, but maybe there's just not a central source for people to go to that they feel is trustworthy."
>
> *N, EV Consultant*

When asked who they consider trusted sources, answers included (in no particular order) academic institutions, Clean Cities and Communities Coalitions [50], consultants, electricians, fleet industry associations, nonprofit organizations, nonprofit research organizations, public transit industry associations, utilities, etc.

Some Leading Practices of Utilities

Various utilities across the U.S. have examined their service connection processes from the perspective of EVSE connections. The following are some examples that include streamlined processes, performance tracking, goals for interconnection timelines, and resources for customers, among others. This is not intended as an exhaustive list and was compiled primarily from desktop research and a limited set of interviews with utilities. Their practices have been mapped as potential opportunities to address the key challenge areas identified in the previous section, namely project costs, customer preparedness, utility processes, external (non-utility) processes, and support for disadvantaged communities.

Consolidated Edison (Con Edison)

States Served: New York

Con Edison is focused on streamlining the EVSE service connection process by improving speed, process clarity, and customer education and support. Their approach includes incentive programs, advisory services, online resources, added financial support for DACs, and dedicated staff, as summarized in Table 8.

Table 8. Con Edison process evolution work

Leading Practices
Project Costs
• Customers are encouraged to apply for the **EV Incentive Programs for all EV projects, including MFH and MHD fleets,** to leverage available funding for infrastructure costs.
Customer Preparedness
• The PowerReady Contractor and Developer Resources webpage, available through the utility website [51] provides training videos, an incentive dashboard, load letter checklists, and other guides, including an installation guide that provides clarity on the service connection process, customer/utility responsibilities, sample submission materials, and a glossary of terms.   ○ Additional self-serve resources, including a FAQs page, resources for projects in disadvantaged communities, and contractor materials are available at the PowerReady home page [51]. These **educational resources** are tailored to different types of customers, sites, and applications. • The utility provides a **free e-mobility advisory service** that offers project planning support and site assessment services for all EV projects. This includes a website [52] with scheduling options [53] for ease of access. • Project information is collected for the charging incentive application and engineering review at the same time to collate and streamline information gathering; customers are assigned an **Assistant Program Manager (APM)** to support information requests related to the incentive application. Participants with multiple projects work with the same APM on a consistent basis. • During high-volume application periods that resulted in a waitlist, the Assistant Program Managers removed projects from the waitlist in batches to streamline the application management: each project in a batch received the same cadence of reminders on the same dates, ensuring the Participants were supported in moving forward their application to service determination. • In the engineering review phase, customers are assigned a point of contact, a **Construction Project Manager (CPM)**, who manages the project from engineering through construction and energization.

Leading Practices
• Materials such as an [EV charging rates calculator] [54] and [hosting capacity maps] [55] are available for customer use to determine costs and help with siting decisions.
Utility Processes
• The Energy Services team checks applications for completeness before the engineering review begins. • An **“auto rule”** process allows the design and engineering teams to quickly determine whether service at the location is adequate or not during service determination. For projects below threshold kW, **auto rule speeds up the review for** low-load applications not requiring upgrades and when a full load study is not required.   ○ The auto-rule process may be applied to projects under 100 kW in size (additional restrictions apply based on whether the project is in a Networked or Non-networked area). • For projects requiring upgrades, a **CPM** supports the customer through the design and construction process. • The utility typically assigns the same **engineers to EV projects** largely due to the volume of requests. • A Straw Proposal [56] submitted to the New York Public Service Commission (PSC) outlines an approach to **streamline, accelerate and clarify the EVSE connection process**. This approach is based on the guiding principles of speed to goal, flexibility and innovation, fair process, participant experience, and transparency. • **Earning Incentives (Earning Adjustment Mechanisms or EAMs)** motivate the utility to **improve connection timelines and meet a state-set plug target** to increase earning potential**.** • The utility has an inter-departmental task force to systematically identify and address areas for improvement in the interconnection process; the task force provides regular updates to company leaders.
External (Non-utility) Processes
• Program resources indicate when in the design and construction process permits must be submitted.
Support for DACs
• The New York PSC has authorized incentives that cover up to 100% of infrastructure costs for publicly accessible plugs in DACs or plugs in qualifying low-income multifamily properties. For small, light-duty fleets, customer-side and utility-side project costs other than the chargers themselves can be covered if being installed in a DAC. • A map of disadvantaged communities can be overlaid on the capacity map provided on Con Edison’s website.

FirstEnergy

States Served: Maryland, New Jersey, Ohio, Pennsylvania, West Virginia

In July 2023, FirstEnergy kicked off a Customer Connections project to document the current-state process, identify pain points and inconsistencies, and recommend improvements to enhance the connection experience for all customers and FirstEnergy Employees. The project has representatives from across FirstEnergy operating companies and sub-groups for various business units/functions as well, e.g., transmission, distribution, DER interconnection, and EV charging.

The sub-groups from across FirstEnergy distilled 64 recommendations to address identified pain points and move towards a desired future state, prioritized by factors such as the value to customers, effort to implement, alignment with customer service values, etc. Phase II involved developing a future-state Customer Connection process, identifying roles, responsibilities, and ownership for alleviating pain points and standardization across operating companies. Thirty-five challenges were elevated to move into Phase III work to develop and implement changes, including change management considerations for communication, education, and training.

A summary of various pain points and challenges highlighted by the FirstEnergy team in discussing their process is provided in Table 9.

Table 9. FirstEnergy process evolution work.

Identified Opportunities
Customer Preparedness
• Have a **new online system** with a **customer guide for new service** available. • Identified a high-level **need to simplify wording in customer-facing documents**/materials. • Customer-facing business units working to understand customer segments that may transition to larger accounts (with dedicated account reps) with electrification, interested in understanding who supports those customers and where that transition may take place. • **Exploring the concept of a "concierge"** to support customers who are likely to move into a major account category once charging load is added to their account.
Internal Utility Processes
• Exploring alternatives to queuing as first to submit an application, e.g., first ready for service. • **Considering a "fast track" option** for simple applications that don't require construction on the utility side. • Working to provide more useful **information to customers throughout the updated process**, currently get automated emails periodically throughout the workflow. Working to understand the right data to provide to customers throughout in order to have updates at each step where they currently don't have a way to check progress.
Support for DACs
• Some states have customer programs meant to address EV charging infrastructure in DACs or where there is money earmarked for Environmental Justice areas.

National Grid

<u>States Served</u>: Massachusetts, New York

National Grid focuses on customer awareness and support to improve the EVSE connection process through streamlined online application portals, advisory services, customer training and webinars, online application and planning resources, and dedicated regional teams, summarized in Table 10.

Table 10. National Grid process evolution work

Leading Practices
Project Costs
• Customers are encouraged to apply for the **Make Ready Program** to leverage available funding for infrastructure costs.
Customer Preparedness
• Free planning and application assistance is offered through **customer training and monthly webinars** on grid capacity and EV-connection application process requirements. • These trainings include **pre-application and application support,** as well as a **documents checklist**. Materials are posted on the **EV fleet advisory and make-ready program websites**. • The utility **engages stakeholders** interested in electrifying fleets, e.g. school bus fleets, and municipalities on installing EV charging in new buildings and businesses. • A fleet and DCFC **advisory service program provides** a no-cost high-level assessment and engineering review prior to application for qualified customers. • NY utilities are required to publish **hosting capacity maps** to provide siting support. • Individual teams provide tailored support to residential, MFH, and commercial EV customers.
Utility Processes
• Applications are encouraged through the **Make Ready Program Portal** to streamline intake. **Regional EV managers** review applications and support customers through requirements. A Customer Connections representative is also assigned to EV projects to provide support throughout the interconnection journey. • EV projects participating in the Make Ready Program go through a screening process to allow projects with no needed grid-side upgrades to go through a **fast-track process**. • Projects that need grid-side upgrades can take significantly longer to be connected. • Within the Fleet and DCFC Advisory Service Program, the utility provides high-level assessments for qualified customers. This method helps establish utility-customer communication channels, set expectations, and aid in shortening overall timelines.
External (Non-utility) Processes
• National Grid is piloting a paid service for distributed generation customers to **obtain permits and easements on their behalf**. Future iterations may expand this to EV customers.
Support for DACs
• The make-ready program may cover up to **100% of qualified infrastructure costs for Light-Duty Vehicle (LDV) DAC customers.** • While the service request process does not provide distinctions for DACs and low-income customers, National Grid is educating developers on charger deployment in DACs.

Salt River Project (SRP)

<u>**States Served**</u>: Arizona

A summary of SRP process evolution work is provided in Table 11.

Table 11. Salt River Project (SRP) process evolution work

Leading Practices
Project Costs
• SRP includes **integrated system and distribution planning** in their formal planning processes, rather than just generation sources, to capture present and future EV loads.
Customer Preparedness
• The utility offers educational resources and advisory services, such as a fleet assessment for small fleets and comprehensive assessments for larger fleet customers to help assess their needs up front [57]. • The utility maintains a list of **trade allies,** such as electricians and civil contractors, and **EV service providers (EVSPs)** to connect customers with experienced and verified technicians and lists qualified EVSE on the program site and with EPRI's vetted product list (VPL) [58]. • SRP engages with new build customers, such as building developers, nudging them to **proactively consider EV charging infrastructure** and incorporate it into new construction. • All customers are assigned **Strategic Account Managers (SAMs)** who connect them to the appropriate departments and resources within SRP and function as their prime **point of contact**.
Utility Processes
• To streamline application tracking and allow for more transparency to the customer, SRP uses a program where customers can input specific information and **monitor the real-time progress** of their connection request. • A **dedicated team** monitors this program and handles customer requests.
Support for DACs
• The utility offers chargers rebates and charging tariffs **for customers located in underinvested areas** to reduce the financial burden on EV owners in DACs [59].

San Diego Gas and Electric (SDG&E)

States Served: California

A summary of SDG&E's fleet advisory services and related process evolution work is provided in Table 12.

Table 12. San Diego Gas and Electric (SDG&E) process evolution work

Identified Opportunities
Project Costs
• Provides **free educational and advisory services** on charging needs assessment, siting, and charging equipment selection to assist customers in financial planning and minimizing costs. • Offers many tariff options for EV charging, including an **EV High Power billing plan** that charges EV customers a constant monthly fee according to the chosen power requirement, eliminating demand charges. • SDG&E offers different levels of **grid infrastructure cost coverage** through its programs and offers **rebates for charging equipment and maintenance**.

Identified Opportunities
Customer Preparedness
• The EV Infrastructure Program provides "**white glove service**". A pre-application **customer intake call** is scheduled to determine the most relevant program options and services for the customer. Desktop review and a site walk are performed after application submittal to support customers in application refinement. • This program assigns a **single point of contact** (POC) for each application to support the customer from intake past energization in navigating program options and requirements, application review, tariffs, etc. • Offers **educational resources** through its website and its representatives on the different programs offered, state electrification rules such as the Advanced Clean Fleets (ACF) Regulation [60], charger equipment options, charger siting and needs assessment, and rate structures. • Offers complementary **Transportation Electrification Advisory Service** (TEAS) program for small businesses and medium and heavy-duty fleets, with potential expansion to other customers. This provides comprehensive **pre- and post-energization support,** including advisory expertise on project planning, charging needs assessment, and grant writing.
Utility Processes
• The utility has internal efforts underway to streamline and tailor the connection process for different customers through **advisory service programs**. • The utility encourages customers to go through their **"Power Your Drive" EV Infrastructure Program** [61] that streamlines application intake, which is facilitated **online** with utility support. • Depending on the customer's level of familiarity with the process, the utility may guide them through an application following Rule 45, an optional new pathway whereby SDG&E designs, installs, owns, and maintains electrical equipment and construction up to the meter [62]. The intake is through a **common new services web portal**, which streamlines the application process and assigns an application manager. SDG&E reports that it is **significantly shorter** in both time and utility involvement compared to the processes the portal replaces.
External (Non-utility) Processes
• As part of its educational services, the utility provides **information on permitting requirements** and additional support on navigating the process within its advisory programs.
Support for DACs
• SDG&Es aims to install chargers at 100 MFH and workplace locations through the EV Infrastructure Program for apartments, condos, and workplaces with **50% of these sites** supporting underserved communities.

7 CONCLUSIONS

The objective of this work is to understand gaps and opportunities to improve EVSE energization timelines and experiences for small fleet and MFH customers, working with customers, utilities, and other industry experts.

Key Findings

- Small fleets and MFH properties, particularly those in DACs, possess characteristics that need consideration in EVSE energization projects, including disproportionate cost burdens (e.g., the cost to add EVSE is a much larger portion of a company's operating expenses), availability of dedicated space for EV parking, costs to run electrical service from nearest building, customer electrical panel capacity, and split incentives due to site ownership (e.g., costs to property owner, benefits to renters) compared to larger customers and fleets.
- Current EVSE service connection processes present a unique challenge to widespread charger deployment compared to other types of new load connecting to utility systems, particularly as the volume of requests grows locally.
- Challenges to EV service connections can include utility and customer staffing limitations, supply chain delays, unforeseen upgrade costs, customer education and awareness, service connection processes that do not allow for special considerations associated with EVSE service connections, and external timeline dependencies involved in permitting and easement processes, all of which can lead to processing delays.
- Customer-identified preferred practices include the ability to readily find where they are in the connection process to know what's needed of them and what's coming, which may be accomplished by having a single point-of-contact for EV projects as well as set check-in cadences; the availability of incentive programs or other funding opportunities, the more flexible, the better; and making available information regarding funding opportunities, EVSE contractor or support expertise, or other resources targeted to smaller customers with limited resources and who likely do not have dedicated utility representatives.
- Some leading practices with utilities include creating working groups to examine and propose process improvements, including measuring speed to goal, flexibility and innovation, fair process, participant experience, and transparency; offering technical pre-energization services (e.g., project planning, EVSE needs assessment, grant writing, filling out applications) as well as post-energization support for small fleet and MFH (among other) charging infrastructure projects; undertaking customer awareness drives as well as customer training sessions and monthly webinars; pre-emptively engaging with fleets (e.g., school buses, municipalities) and others for EVSE planning in new building construction; and maintaining trade ally networks to connect customers with experienced electricians and contractors.
- For organizations that have a role in these processes, there are a range of approaches from low-cost options (e.g., making online materials/resources easier to find at a central location, periodic brief webcasts hosted by current staff) to options requiring more investment (e.g.,

additional fulltime employees, organizational changes) that may be taken to address identified challenges cost-effectively (i.e., considering available resources), and in a collaborative manner. Many types of organizations do or could play a role in reducing barriers (e.g., financial, informational) that contribute to identified challenges.

Opportunities and Next Steps

The challenges and leading practices identified in this research represent opportunities for new processes and support activities as outlined in Table 13. Change models that can be leveraged include utility planning activities, customer engagement and educational resources, and tracking of internal inefficiencies.

Table 13. Some opportunities for addressing challenges

Identified Opportunities for Intervention
Project Costs
• Increase availability of make-ready programs and other upfront cost reduction incentives and opportunities. • Encourage early-stage planning and needs assessments to optimize available electrical infrastructure. • Conduct utility pre-reviews to foresee gaps in project planning and pre-empt the need for upgrades. • Increase awareness for utility staff and electricians on expected project costs.
Customer Preparedness
• Provide customers with access to qualified and experienced contractors through trade ally groups, ideally backed by utilities. • Provide utility site assessment services or turnkey solutions for small customers including a single point of contact (POC). • Provide supporting resources for customers to navigate the EVSE service connection process, including a clear checklist of application materials. • Conduct utility pre-reviews to foresee gaps in application submissions and potential bottlenecks.
Utility Processes
• Include spatial EV demand forecasts in all major utility planning activities. • Define the EVSE service connection process internally, create dedicated supporting customer resources and staffing, and track internal inefficiencies. • Form centers of expertise through fleet and MFH charging advisory programs. • Offer alternatives to customers that allow temporary solutions before full power is available at a site, e.g., on-site storage or generation, active load management of EVSE power, or limiting permissible EVSE hours of operation to utility off-peak hours • Proactively purchase commonly used equipment ahead of time to foresee delays.

Identified Opportunities for Intervention
External (Non-utility) Processes
• Incorporate supply delays in utility and customer project planning. • Streamline AHJ approval processes to further reduce project timelines. • Provide educational resources on permits and approvals, complemented by utility POC/program offering to support customer permit applications. • Include permits and approvals as a requirement within applications.
Support for DACs
• Create awareness about gaps in support at the local and state level. • Work with leaders in disadvantaged communities to design programs and other support resources, including a focus on future needs as EVs scale. • Include these future needs and EV demand in distribution system planning, even in areas that currently do not exhibit high EV demand; this can reduce the need for grid infrastructure upgrades triggered by future EVSE connections and improve the ability to socialize the costs.

These opportunities and this research on service connection challenges are being considered and explored to inform other CIISR project activities, including a roadmap of solution ideas to streamline EVSE energization processes for small customers [63], which can be used to assist utilities and other stakeholders, such as state regulators, as they seek to optimize EV charging infrastructure service connection processes.

This research is also informing a framework to identify how GridFAST can be adjusted to meet the needs of small fleets. GridFAST is an information exchange platform that helps EV customers engage early and efficiently with utilities to help accelerate EVSE energization.

This initial research also revealed that some small fleet customers struggled to find resources in the early days as they were considering electrification. To address this need, the CIISR project is also developing an informational website targeting organizations with small fleets, particularly those located in disadvantaged communities.

Both the GridFAST adaptation framework and the small fleet website will also be informed by input obtained through a panel of five businesses located in disadvantaged communities with small fleets.

The CIISR project's Community and Workforce Development advisory group is informing these work products by contributing diversity, equity, and inclusion (DEI) oversight, and the project's full advisory structure also informs the work products. These groups and others are participating in the communications of project outcomes to achieve a broad industry reach. Part of this outreach includes the development of a curriculum to take key insights and education to a broader audience, which may include schools (including STEM-focused secondary and post-secondary), career technical centers, and industries that engage with MFH and small fleet customers.

Ultimately, this report and the broader CIISR work products seek to provide a basis for understanding new opportunities to address challenges in order to ultimately accelerate transportation electrification, which could bring benefits associated with addressing the significant health, environmental, economic, and access barriers.

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A APPENDIX: STREAMLINING INTERCONNECTION FOR OTHER TECHNOLOGIES

Connection challenges are not limited to EV charging; most clean energy sources require interconnection with the grid, involving a process similar to that described above. Interconnection procedure streamlining has been underway for years to improve connection timelines for clean energy resources like solar, wind, and, more recently, energy storage systems. Relevant insights from these initiatives are presented below.

The U.S. Department of Energy's Solar Energy Technologies Office (SETO) and Wind Energy Technologies Office (WETO) spearheaded the **Interconnection Innovation e-Xchange (i2X)** program [64], to revolutionize the interconnection of clean energy resources, prioritizing simplicity, speed, and equity while bolstering grid reliability and resilience. Central to this initiative is the **Transmission Interconnection Roadmap** [65], a framework to strategically address current challenges in transmission system interconnection through stakeholder collaboration and technological advancement. Specifically, its goal to Improve the Interconnection Process and Timeline focuses on solutions to improve queue management practices, affected system studies, workforce development, and fair and inclusive processes. Relevant solutions include:

1. implementing and enforcing more stringent commercial readiness requirements,
2. enforcing interconnection study timelines,
3. automating parts of the process, such as data input and validation, and
4. monitoring interconnection processing times.

The **Building a Technically Reliable Interconnection Evolution for Storage (BATRIES) project** [66], **funded by the DOE and led by IREC,** was focused on overcoming critical barriers to energy storage interconnection on the distribution system, offering recommendations and best practices for addressing eight key challenges in this domain. The initiative includes the **Toolkit and Guidance for the Interconnection of Energy Storage and Solar-Plus-Storage** [67], detailing storage interconnection barriers and potential solutions. Three highlighted barriers include:

- Lack of inclusion of storage in interconnection rules and the lack of clarity as to whether and how existing interconnection rules and related application forms and agreements apply to storage systems;
- Insufficient information on the distribution grid's constraints to guide storage interconnection decisions; and
- Inability to make system design changes to address grid impacts and avoid upgrades during the interconnection review process.

Strategies to address these barriers include:

- Improving grid transparency, such as using pre-application reports and hosting capacity maps to improve site selection and project design;

- Including defined acceptable export controls to maintain safety and reliability during the interconnection procedure; and
- Model language and rules for accommodating energy storage system modifications during the interconnection process.

Nationally, interconnection standards are consistent structurally, with most following the structures of either the Federal Energy Regulatory Commission’s (FERC’s) **Small Generator Interconnection Procedures** (SGIP) or IREC’s Model Interconnection Procedures. The toolkit uses language from SGIP to develop model procedures for interconnection that can be adopted by states. This effort aims to provide clear, consistent standards and accelerate the interconnection process, focused primarily on storage but with potential applications for EV charging connections.

SGIP is a federal rulemaking for small generator interconnection processes (SGIP), adopted by FERC through orders 792 and 792-A [68]. It introduced reforms to ensure that the process is just, reasonable, and not unduly discriminatory or preferential for new technologies while addressing interconnection queue backlogs and improving certainty. Reforms analogous to this work include:

- Publicly posting information pertaining to generator interconnection;
- Allowing developers or customers to request a pre-application report issued within 20 days to preempt issues that may delay or halt the interconnection process; and
- Revising the Fast Track process to ensure developers do not wait more than 5 days for an initial determination, more than 30 days for a supplemental study if the initial determination is negative, or more than 10 days after a post-"supplemental study" determination.

B APPENDIX: SMALL FLEET AND MULTI-FAMILY HOUSING CUSTOMER RESEARCH REPORT

Executive Summary

Between April and August 2024, twenty-three 60-minute in-depth interviews (IDIs) and two 90-minute discussion groups were conducted with organizations across the United States that had experience planning for and installing EV charging infrastructure. The focus was on organizations with small and medium-sized vehicle fleets, as well as multi-family housing properties. The objective was to learn more about their charging infrastructure project experiences, including what went well and the challenges they faced, to better understand opportunities for electric utility companies to better support these efforts. The following is a summary of the findings.

Motivation for Electrification

- Some of the fleets interviewed cited environmental drivers as the main reasons they were interested in electrifying their fleets or supporting residential or workplace vehicle electrification. Return on investment (ROI) was a secondary consideration because upfront capital costs make ROI a longer-term proposition.
- For others, the decision was driven largely by state mandates and requires state funding support due to significant upfront vehicle, charging infrastructure, and project management costs.

Utility Company Operations and Customer Service

- Most customers do not feel that all projects require utility engagement. If the project doesn't require additional power to the building, it is believed the utility company does not need to be engaged.
- The projects that do require utility engagement can be considered slow and cumbersome, with confusing requirements and processes and long lead or wait times to gain approvals to advance through the process.

> "As you guys are probably aware of the utility process, it could be up to 12 to 18 months. So, we're really trying to avoid the utilities where possible."
>
> *M, EV Consultant*

- Municipalities that work with municipally owned utilities seemed to have a more seamless experience in this regard.
- Regardless of organization size, both businesses and municipalities indicate that it would be beneficial to have a specified point of contact at the utility to help guide them through the process.

- Some customers who operate fleets deem it would also be useful if utilities had a better understanding of the transit process, i.e., vehicle duty cycles and related charging needs.

  "I think it's helpful for them to have a general understanding of how the transit system works in terms of the run blocking and the mileage requirements essentially of what these buses achieve in a service day. I think that helps just to set the framework of a realistic number of buses that should be procured, both from a transit perspective but also from a power supply perspective."

  J, Municipal Fleet

- In the absence of dedicated account managers at the utility, which medium to large companies and municipalities sometimes have, many indicate that a standardized and automated process to submit info to, and gain info from, the utility would improve the experience.

  "If they released a standardized process around EV, I think that would help too. Most of these projects need essentially the same thing [equipment], right? I think if they just got to the point where they said all right, every EV project is looking for something ballpark like this and started planning ahead for that a little bit. I just think the demand is going to continue to grow, so outfitting the utility companies with the tools and staffing and whatnot that they need to be able to support that is what they need."

  N, EV Consultant

  "There's no standardization. Every utility has a different site and it's hard to find someone with enough experience in that space to help navigate through those utilities."

  T, EV Consultant

Small Fleet-Specific Considerations

- For many fleet operators, challenges to charger deployment and maintenance include physical space, workforce constraints, and concerns around in-route charging.
- Fleet electrification costs are not limited to the vehicles and charging infrastructure and can include equipment maintenance, employee training, and electric fueling costs that can be exacerbated by hurdles like demand charges.

  "We need $84 million according to the consultant's report to build out our corporation yard here at the city. The costs are much more than just chargers."

  D, Municipal Fleet

MFH-Specific Considerations, including for Disadvantaged Communities

- Installing EV charging at MFHs does not always provide a direct return on investment (ROI) but, as an amenity, can help attract and retain residents. For smaller MFHs with fewer resources, installing charging must be weighed against other capital requirements and is often deemed not worth it.

> "Being a landlord is really, really challenging financially these days. There's a ton of pressure on you, and it's very hard to make things pay, and the cost of construction has become astronomically high. It's probably doubled in the past five years. And so, landlords are very reluctant to get involved with like big capital projects. So, when you tell someone like, oh, you can put an EV charging in your building, but you're going to have to completely repower your building, a lot of Landlords are like, forget it, forget it, I'm done."
>
> *J, MFH*

- Many MFHs in disadvantaged neighborhoods also face unique challenges in covering the ongoing cost of charger use and maintenance.

An example of this is a is a nonprofit housing development corporation that wanted to have EV chargers installed at a few of their properties that were located in disadvantaged areas. However, they did not want to charge for the usage. They would be able to receive funding to cover the cost of installation, but long term there was no revenue plan to cover ongoing costs of use and maintenance.

- Other elements to be considered and managed by MFHs include the location of the charger(s), cost recovery, and fair access to chargers.

Introduction and Objectives

This report provides the findings from qualitative research conducted with small to medium-sized fleets and multi-family housing units across the United States, including some operating in disadvantaged communities, focusing on their experiences installing electric vehicle charging infrastructure. The objective was to understand the organizations' general circumstances; their motivations for considering vehicle electrification or installing charging infrastructure; the experiences they had with their electrification projects, with a specific focus on the role of electric utilities, including what went well and the challenges they faced; and the expertise and resources they used along the way, as well as the educational resources they would have liked to have had. This report synthesizes the insights gathered to offer a detailed view of the customers and their projects, as well as opportunities to support these types of smaller EV customers throughout their electrification journeys.

For fleets, while the intended focus was small businesses with small fleets, such businesses have been typically slow to electrify for reasons mentioned in previous sections, making it challenging to identify interviewees with electrification experience. This led the interview team to diversify and include small municipalities, covering their experiences with city vehicles, small transit fleets, and public charging. These vehicles and chargers, especially transit buses, typically serve or operate in diverse communities, including disadvantaged communities (DACs), leading to a large impact.

Approach

Between May and August 2024, twenty-three 60-minute in-depth interviews (IDIs) were conducted along with two 90-minute discussion groups, each with four participants. Participants were recruited primarily via the Clean Cites and Communities Coalition partners that are a part of the CIISR project advisory structure. The discussion group participants were recruited and screened through the online panel providers, userinterviews.com. The participants, located across various regions, included private companies and city municipalities to better find organizations with vehicle electrification experience.

Motivations for Electrifying

A passion for clean energy, reducing carbon emissions, improving air quality, and EV enthusiasm in general were motivations for considering electric vehicles cited by several companies.

- The personal passions of owners and CEOs have led some companies to develop mission statements and goals tied to combatting climate change.

> "I have a core value that I want to do right by the planet. I feel that I, as a citizen of this planet, take from the planet so I can in my actions or in the position that I am in as a business owner, that I can contribute back to the environment and cleaning the air is one way that I can do that through zero mission trucks."
>
> *R, Small Fleet*

- Cost savings is a secondary motivation for many companies to electrify their fleets, because while attractive in the long term, ROI and cost savings are not realized immediately due to the large upfront capital costs of vehicle acquisition and installation of chargers.
- Most companies expect to realize cost savings in the areas of fuel and maintenance.

Others stated they were electrifying their fleets because they are based in states with mandates for reducing emissions and adopting electric vehicles, and which also make funding available through a variety of sources to help offset the initial costs of purchasing electric vehicles and installing chargers, including additional utility infrastructure that may be needed.

Some of the multi-family housing (MFH) property owners/operators not in disadvantaged communities were motivated to install EV chargers by demand from current residents, as well as perceptions of future potential residents.

> "For us being here in [city], we did have an increased demand from future and current residents to have EV chargers. So, as we saw the increase of demand, that's when we decided to install 29 more chargers in November of last year. We initially had 11 and then we bumped up to 29 so now we have 41 chargers."
>
> *M, MFH*

Planning and Execution

After deciding to start an electrification journey, the decision makers interviewed sought out information and resources via internet search before developing formal plans.

Most organizations interviewed, both on the fleet and MFH side, did not have a dedicated EV expert on staff, and the responsibility to learn about and oversee an electrification project generally fell on the owner, CEO, or department head.

Several medium-to-large size businesses stated they relied on the knowledge and expertise of EV consultants, OEMs (original equipment manufacturers, i.e., the vehicle manufacturers), and EVSE providers (Electric Vehicle Supply Equipment providers, i.e., the charging equipment manufacturers), to help them navigate the process of converting a fleet to EV vehicles and/or the installation of chargers and related utility charging infrastructure.

- Consultants help with project management, OEM or EVSE recommendations, as well as working with OEMs and EVSE providers. They also help identify funding sources, estimated energy usage and costs, and interacted with utility companies on behalf of the customer.
- OEMs and EVSE providers help with cost estimates for budgeting purposes based on the number of vehicles, number of chargers needed to support those vehicles, expected power usage, and current utility rates.

> "So these manufacturers during the onboarding will say, 'all right, this is what you're paying for electricity. This is what would be break even, this would get you to revenue. And this is where that would fall within the [other public chargers] around. So, do you want to charge a premium? Do you want to fall right in line? Do you want to give a discount to drop people to your location?' So, it's actually pretty involved, but they do a great job of helping them figure out, what price should you be at to accomplish the goal that you're trying to accomplish."
>
> *N, EV Consultant*

Utility Company Operations

Many businesses and municipalities have come to learn, through electricians and contractors, that not all electrification projects require utility company involvement.

- Often customers that did not need additional power from the utility company or additional meters installed believed they needed no utility company involvement.

> "I don't think we really engage with the utility company until recently when we really want to expand much larger. And so, yeah, I'm trying to remember, I don't think that the utility company was involved."
>
> *J2, Municipal Fleet*

- Electricians can manage panel upgrades and installation of small transformers on the building side without involvement from the utility company.

> "They [the electrician] had to install the transformers in some locations. I don't think except one location that they actually had to install another service panel… They just look at the service panel, look at how much energy is being accounted for and how much energy is coming into the building. They were like, 'Yeah, no. you're going to need a transformer.' So, the transformer, they vary in sizes. Some of the ones that they installed were probably like a three-foot by three-foot cube that's just sitting on the ground right next to the electrical panel and some of them are like probably four foot by four foot."
>
> *J2, Municipal Fleet*

- For projects that do require the utility company to get involved, often it is the electrician or contractor engaging with the utility company vs. the business owner or project manager because the conversations are very technical.

> "He did all of it, almost all of it. And that's sort of what you're paying for with a licensed contractor is they deal with project. You as the building owner shouldn't be dealing very much with the regulatory agencies, generally the contractor should handle all that. If you're really involved with it, it means the contractor's not doing their job."
>
> *J, MFH*

Most of the customers and contractors interviewed said the electricians and contractors prefer not to engage the utility, when possible, but when it was required, concerns cited included long lead times associated with application processing times, site visits, and issuance of work orders.

> "As you guys are probably aware of the utility process, it could be up to 12 to 18 months. So we're really trying to avoid the utilities where possible."
>
> *M, EV Consultant*

- Most acknowledge that utility companies are understaffed and under-resourced especially in the EV space, which can exacerbate the long lead times.

- Projects that required building permits from the city added an additional layer of frustration as there could be a "back and forth" between the city and the utility company, with the contractor typically in the middle.

Several of the municipalities interviewed indicated they had a collaborative relationship with their local utility company, augmented by municipalities having their own existing account managers at the utility company.

> "[utility company] has been a really significant partner to us. We've had really good relationships with their local representative for local government interactions and had a really strong partnership with them to ensure that the grid, so there are the improvements, the physical improvements that need to be made by us to facilitate the charging equipment on our own campus, but ancillary to that is our improvements to the grid, which are critical to provide enough energy to the system as a whole so that the whole fleet can charge overnight."
>
> *J3, Municipal Fleet*

- In addition, the municipalities interviewed were able to take advantage of utility funding, at a higher rate than privately owned businesses, which affords them additional people resources to help with project management and execution.
- Municipalities that are serviced by their own electric utility have an even more collaborative relationship as both entities fall under the same local government umbrella making it easier to navigate project costs, resources needed, and turnaround times for applications and work orders.

Most projects that receive funding through utility company grants garner engagement from the utility company at the beginning of the project once the funds are awarded.

- Utility companies often provide a project manager and require regular reporting on projects where utility company grant funding is awarded.
- Many businesses, municipalities, and consultants acknowledge that a lot of electrification projects for large fleets and large MFHs in disadvantaged neighborhoods wouldn't happen without grants through the utility company.

> "We look at the state level, the federal level, the utility level for every project. And then there may still be other grants that they're chasing too, but from the rebate side, the utility is kind of the most reliable. The state program is just a set amount of money and there's a wait list. Like this year it opened in July, but there were so many people on the wait list that it closed the same day it opened, so that didn't work. Then there's the federal tax credit, but that's a tax credit so not everybody's gonna be eligible for that, whereas the utility rebates really seem to be more encompassing."
>
> *Nick, EV Consultant*

While the grant application process on the front-end can be long, tedious, and confusing, some reported that the process to obtain any rebates offered was simple, fast, and easy.

- Rebate applications are typically submitted online, so three is no need to have contact with a live person. Reimbursements are sent out in a timely manner making the process fast.

> “[With energy company]…it's a simple form, you fill it out and you can get commercially per charger…. And it's really for the installation to offset some of the installation costs. But did that form, got the check back within probably two weeks. So that program's a great program and they keep evolving on that.”
>
> *N, Small Fleet*

- Positive rebate experiences were expressed both when the process was handled internally by the utility and when it is outsourced to a third party.
- Though not all rebate experiences were positive. At least one interviewee felt it would be too much always:

> “So, they had a separate commercial rebate, but it was very involved. The amount of work to get it was, was daunting, and we decided not to do it… I can't tell you exactly why but it just felt like it would require a whole bunch of other stuff that I thought for $500 and this isn't worth it. So it was cumbersome.”
>
> *J, MFH*

While most businesses are aware of the monthly utility charges associated with operating an electric fleet or EV chargers, very few are knowledgeable about the potential construction costs associated with having to upgrade their electrical power.

- Most businesses learned about what to expect for monthly utility costs, including demand charges, from the OEMs, EVSE vendors or the consultant they are working with.
- While businesses were aware of demand charges that occurred during peak hours, some accepted the increase in cost to minimize the business disruptions in situations where vehicles that were in heavy rotation needed to be charged during a peak period day.

> “It was very clear that the only acceptable rate structure was an off-peak demand charge structure, which basically requires us to charge the buses overnight. So that created some operational challenges, but with two buses, it was fairly easy to overcome. With the next, you know, five buses and then the 17 after that we're not sure that it's feasible to charge 24 buses overnight operationally. So, we're working with the utility on, you know, some other options.”
>
> *J, Municipal Fleet*

At least one small/independently owned MFH property owner did not know about the impact of demand charges until the charges had occurred:

> “However, the big problem was that [utility company] has a demand charge because it's a four-unit building, and I didn't fully understand this or we would have done things differently. It’s on a commercial rate and the actual cost for the master meter for the building, the house meter was very, very low, because like I said, it was like five or six light bulbs. So, it was a few dollars a month, but the demand charge was huge. … once you spike and you hit a peak and there's a certain demand charge, you keep it for 12 months. So having this tenant charge his car a handful of times over the course of like six weeks, I ended up paying an extra couple hundred dollars a month for a year… It was not a good thing.”
>
> *J, MFH*

Small property owners may be less likely to work with a consultant who could apprise them of such information up front, one of the many challenges associated with ensuring small businesses have the key information they need when they need it.

Utility Company Customer Service

The businesses and municipalities interviewed, regardless of size or industry, consistently share they would like to have a single point of contact (SPOC) at the utility company who is knowledgeable about EV infrastructure to help navigate, manage, and execute their electrification projects.

- Projects that involve utility funding and/or construction executed by the utility company are typically assigned an account rep or point of contact that they can contact directly.

> “It was much more organized having one single point of contact for sure. So, I think it was most effective and efficient to have one point of contact.”
>
> *J, Municipal Fleet*

- Companies that do not have an existing contact at the utility company report using the website to search for the right department to contact regarding their electrification project.

Some utility companies have website that are hard to navigate, making it hard to find the right contacts.

> “It would be great if there was some standardization as standard process for sure. Or even you're required to put a landing page on your website that gives people a number that they can call and have the processes shown to them. There's nothing there to help the general public navigate through any of this. Every utility is just different. Nobody does it the same, nowhere. I feel bad for people.”
>
> *T, EV Consultant*

There appeared to be a consistent desire amongst most of the businesses interviewed for utility companies to be more collaborative with other organizations and entities and serve as a stronger strategic partner on projects.

- Smaller companies that can't afford EV consultants wish for more strategic insight and guidance from their local utility to help inform decisions, develop plans and budgets, and identify education and funding resources.

> "I think on the utility side, they could use some more staffing to help with the design. If they had, a division of folks that could help smaller fleets understand what that usage is going to look like, and maybe not do a plan for them but education to help them understand what to look for because people don't know. They don't know what to look for in their fleet."
>
> *D, Municipal Fleet*

- With larger projects for municipal fleets or projects that involve local government, there is a desire for the utility company to better partner with the utility commission to drive more transparency in rates and establish a rate system conducive to operating a municipal fleet at the needed capacity without incurring high utility costs.

Some businesses and municipalities that operate fleets express a desire for utility companies to have a better understanding of how transit works, especially mileage requirements.

- Having the utility company rep walk the fleet depot will help them understand the needs and dynamics of a fleet as well as aid in building stronger relationships.

> "I think that helps just to set the framework of a realistic number of buses that should be procured, both from a transit perspective but also from a power supply perspective. I think one thing that really helped our utility is they kind of learned how we schedule our buses on a daily basis and what the mileage requirements are at the block level of our schedule. They wanted us to go all electric as quickly as possible and not every utility may have that same kind of outlook, but making sure there's realistic expectations discussed at the start of the project, I think is helpful."
>
> *J, Municipal Fleet*

Fleet and MFH operators have ideas on how to reduce the frustration that can occur when interacting with the utility company, most of which involve developing some kind of standard process for managing EV-related requests and projects at the beginning of the project life that provide information and updates without having to interact with a live person. Suggestions include:

- Develop a standard checklist that a customer can review prior to engaging with the utility so they know what information and resources they need to acquire prior to embarking on project

- Develop an online system where a customer can put in their address and the number and type of charger they want to install and get feedback on if the project is feasible without utility company involvement or if more power capacity needs to be added by the utility.
- Develop an online system to track application status so project managers can easily get updates, track progress, and plan for delays.
- Require utility companies to keep an on-hand supply of standard or frequently used equipment, products, and supplies needed for EV projects to minimize long lead times and delays due to equipment acquisition.
- Hire more in-house staff to manage EV projects and requests, and if project management is outsourced to third parties, ensure they are appropriately familiar with electrical infrastructure.

> "[Utility] will not allow you to move forward unless you engage [utility's consultant]. And they do a very, very detailed site assessment. And they give the customer a proposal. So, if total cost of project is going to be like $24,000, [utility] is going to give you $18,000 towards it. Great. So, then the customer gives us this proposal and the electrical cost is probably like $46,000, and they're like, 'no, [utility] said it's this', and so it is just butting heads. Rarely did those projects move forward because the customer took whatever number that was there in their assessment… because [utility's consultant] is non-electrical company, they don't know how to price out the electrical infrastructure."
>
> *T, EV Consultant*

What Went Well with Electrification Projects

While most interviewees readily shared the challenges they encountered during their electrification projects, when asked, they could also readily share what went well with their projects.

Some expressed satisfaction with the pace of activity, especially those with smaller projects or prior project and utility interaction experience. Also, some interviewees shared that, when the time came, the charger installation by the electrician or contractor went well, even if there had been other challenges related to the project.

> "When we were able to install the chargers, they went rather smoothly, didn't run into a whole lot of hiccups, no surprises underground. We haven't had any vandalism. People have accepted that is kind of the direction this is going."
>
> *B, Municipal Fleet*

A few cited the available funding has been a bright spot in their electrification project. Some acknowledged that several projects in disadvantaged neighborhoods wouldn't happen without utility funding. Others appreciated funding that made them whole for new vehicles.

> “Well, definitely from a financial perspective, [state] has put a lot of pressure on us to move towards this fleet electrification, but they've also committed to making sure that we're not on the hook for a more local match than what a diesel bus would cost. So that's been helpful, so at least financially we’re no worse off. And then the local utility providing the essentially bonus funding for the buses has basically made it so that [customer] has no local match and investment in the buses and that frees up our local funds to keep as much service on the road as we can. So financially it's been a really good partnership.”
>
> *J, Municipal Fleet*

Some saw utility funding as more viable than state or federal funding. Also, incentive programs for chargers were valued, and in some cases, rebate payments after charger purchases were cited as quick and easy.

Funding that allowed for some flexibility was identified as highly valuable—for example, funding that allowed MFH property managers to do things like hire part-time staff to support them since there is so much for property managers to do with EV charging projects (forms, fixing Wi-Fi, etc.), some of which is hard to imagine upfront when initially applying for funding.

Those who worked with consultants shared that their consultants’ established relationships with utility companies and other organizations worked well to simplify the process and help drive the project to completion.

> “The bright spot, I'd say, was the pre-existing relationships that [consultant] had with [utility] was helpful, to know what their expectations were, and what we needed to do to fulfill those, to meet our grant requirements, also helping us build out the applications for the technical aspects and helping us make it like a vision for it. And then [project partner]; there was a pre-existing relationship between [consultant] and [project partner].”
>
> *R, MFH*

Regarding utility relationships, a single point of utility contact for the customer was also appreciated, as were set check-in cadences, and customers often viewed this type of relationship as a partnership for longer-term discussions on future projects and plans. In one case, the interviewee worked with a utility that had key performance indicators (KPIs) they were required to meet regarding application throughput timelines, and it was felt that this made a difference in project efficiency. Another appreciated practice cited is when utilities make it clear upfront the size threshold above which a longer process is likely, for example, because a load study is triggered. Finally, some municipal fleets (including transit agencies) whose utility is also municipally owned often cited collaborative experiences.

Existing and Desired Resources

The interview participants were also asked about the expertise and resources they used as they sought to electrify their fleets or install charging infrastructure, as well as the educational and other resources they would have liked to have had.

Many companies and municipalities consider EV consultants a key resource in their electrification journeys. Small and medium size companies and municipalities that had the means to hire EV consultants relied heavily on them to manage their electrification projects while they focused on the daily operations of their business. Consultants managed projects, developed plans and cost estimates, brought together necessary partners, and provided education to customers. They also provided visibility into various funding sources, and wrote grants and completed applications, which is often daunting and arduous, especially for smaller businesses.

> “They're helping us identify government help, grants. All this information is all over the place, and we've already applied to two proposals… They're helping us you know, $3,000 here, $10,000 here, and just kind of bringing all the actors together, including what software to use, what charger to use, they've been making it much easier for us.”
>
> *D, Small Fleet*

However, it is likely that many small companies do not have access to EV consultants due to lack of funding and lack of awareness of EV consulting agencies. This means they may also be less aware of funding opportunities for electrification projects beyond utility rebates.

> “Like I have not had any direct knowledge of any grants. Maybe I'm looking at the wrong places for it or the information is not being communicated properly.”
>
> *V, Small Fleet*

In addition to EV consultants, some smaller customers talked about how their electricians were invaluable.

Networking is considered a valuable resource, and many seek more opportunities to network with other companies and municipalities who are electrifying, utility company representatives, industry experts and consultants.

> “Networking is probably the greatest thing since sliced bread. You know, there's so many people out there that are willing to share their information that they have. You don't need to reinvent the wheel.”
>
> *D, Municipal Fleet*

- Some mentioned the idea of having a forum to share experiences and ask questions of others who are going through or have been through an electrification project.

> "I think the best people would be other small fleet operators. They have had the direct experience, the direct knowledge, and know-how. I think they would be my number one go-to. If I could find that resource, it's like the holy grail."
>
> *V, Small Fleet*

Many mentioned the desire for a one-stop shop for trustworthy EV and EV charging education and resources, identifying utility companies as the top choice to house and disseminate this information.

> "It's not that the information is lacking, but maybe there's just not a central source for people to go to that they feel is trustworthy."
>
> *N, EV Consultant*

- EV strategy and help with vehicle usage estimation were consistently mentioned as areas customers wanted more guidance and assistance.
- Customers seek information that is simple and provide specific steps and actions.

> "I think what would have helped me is a dumbed down version of step one, step two, step three. If you are interested in deploying a fleet like, dumb it down for me so I get it. At the end of the day, it's not that complicated. But between the acronyms and the jargon and stuff that you kind of have to learn on your own. A lot of this stuff could be simplified for a lay reader like myself."
>
> *D, Small Fleet*

When asked who they consider trusted sources, answers included (in no particular order) academic institutions, Clean Cities and Communities Coalitions, consultants, electricians, fleet industry associations, nonprofit organizations, nonprofit research organizations, public transit industry associations, utilities, etc.

Small Fleet-Specific Considerations

Most companies and municipalities that operate fleets and many MFH properties share similar needs and pain points regarding EV charging installation and their interactions with local utility companies. However, companies with fleets have unique considerations given they are also purchasing electric vehicles, having to account for space to store the vehicles, budgeting higher construction costs to accommodate the number of chargers and power needed to run them, and planning optimal charge times to minimize business disruptions and remain efficient with utility usage.

Companies and municipalities preparing to electrify their fleets have numerous considerations that can impact execution, business continuity, and the return on their EV investment.

- Many do not have the internal resources to project manage an EV conversion and installation of chargers and thus rely on consultants.

> "My job is to get work, to make sure operations running smoothly that would deliver a service, that we're complying with DOT regulations. [Electrifying vehicles is] very time-consuming. I mean, you would have to hire probably one or two people to deal with that on a full-time basis. It can't be me trying to do my day job and then trying to take that on because it is pretty involved."
>
> *R, Small Fleet*

- In general, workforce development can be a challenge because people are not being taught EV maintenance in school and training programs, and companies often rely on training from OEMs and EVSE providers. Staff do become experienced over time, at which point they can be difficult to retain as they can often be recruited for other higher-paying jobs, creating a perpetual cycle of workforce development needs.

> "A lot of the mechanical expertise does reside on our team, but it is really hard to recruit for and once you train somebody up they become a target for people poaching them and taking them to some other system where they can pay them a little bit more. From a workforce development perspective, it has been a real challenge being able to get access to the right training. There are some OEM training opportunities with the bus manufacturers and some of the charging equipment, but much of this is troubleshooting and stuff you learn just by doing."
>
> *J3, Municipal Fleet*

- Space in existing depots can be limited for larger electric vehicles such as trucks and buses, as well as for adequate space to maneuver for charging. Additionally, converting a fleet is not always a one-for-one swap of vehicles.

> "What we've discovered after running this fleet now for almost six years is that the vehicles themselves don't perform at the same level as a diesel. So in reality, we probably need two electric buses to substitute for the operational capacity of one diesel fleet bus."
>
> *J3, Municipal Fleet*

- The ability to charge while on route is of major consideration and concern for companies looking to convert heavy-duty vehicles.

> "The infrastructure not being in place to charge fast enough and also keep our customers happy with all time service. Because if the battery, let's say if the battery takes five hours to charge, that's five hours later we are going to be to a customer. Are they going to be happy with that? They can say, oh well, sorry, we'll do business with somebody else who will get us our product a little bit faster."
>
> *S, Small Fleet*

Project costs for some companies and municipalities wanting to convert their fleets to EVs can be high. While funding is available to help offset costs, many still have to fund elements of the project from their own budgets.

> "I think hiring somebody for capacity and expertise would be critical. We didn't have the funding necessarily to do that. The [specific award], you have to spend 5% of the total project on training, but through our understanding of the federal regulations you can't hire like a project manager with that money, unfortunately. So we were, from a technical capacity, we were somewhat limited, and then from just a general workbook capacity, we were very limited."
>
> *J, Municipal Fleet*

- Heavy-duty trucks are expensive, and a grant may cover the cost of one truck, but the remaining cost of construction to install charging infrastructure remains the company's responsibility (unless they can obtain separate grants for infrastructure).

> "Even with the grant money, you can get up to 90% of the value of the truck in grant money, it's still a $150,000 truck. Either you have to pay that out or finance it. Just that alone for some smaller fleets is daunting. Like, where am I going to get money to pay that off, right? I'm going to have a $1,500 payment, I'm not sure I can afford that. We're not even talking infrastructure, like charging. We're not even talking insurance. We're not talking employees. We're not talking benefits, worker's comp. It is expensive and that's not even getting into the price of the charging and all that. Just to start, and I think for a small business or smaller companies it's probably very daunting for them."
>
> *R, Small Fleet*

- There are added costs associated with training employees on how to maintain an EV fleet and chargers.
- Companies working with consultants may incur fees for site inspections that are used to determine project feasibility, scope, and costs.

For some businesses and municipalities, the person managing the fleet does not have visibility to the electric bill as the bill is paid out of a different department (e.g. accounting)

> "As far as the [utility], or the electric bill, we have another division that pays the electric bill, we don't really see that."
>
> *J, Municipal Fleet*

- The utility cost is a line item in the fleet or transportation department budget, similar to what fuel charges would be, and often includes not only the chargers' usage but facility and building usage as well.
- Most would like to move toward separate billing in the future, which would require the installation of a separate meter.

> “As a business owner, I want to know how much electricity or how much money I'm spending on electricity for the business and how much I'm spending for the fleet and having two separate meters is kind of the only way to do that easily.”
>
> *D, Small Fleet*

OEMs and EVSE providers can be a wealth of information for some companies and municipalities embarking on an electrification journey but can also be a source of frustration with long lead times and delays.

- The lead times for electric buses and heavy-duty vehicles can take up to 18 months with many customers not knowing this until after a project has started.
- Problems can occur with getting chargers onto the network, with companies having to rely on the EVSE providers for troubleshooting and repair because their own maintenance teams are not trained on EV charger maintenance.

> “So that was another problem. One time, we had like 40% of our chargers offline because we could not get the manufacturer to come out and perform, and they made it proprietary, where they are the only ones who can do it. And we had this big plan that they're going to monitor and they're going to oversee our charging stations and they're going to dispatch a technician as soon as they're offline. Yet none of that happened. And we find that offline, we're calling, we have to call multiple times and it takes months to get the parts.”
>
> *J2, Municipal Fleet*

- Similarly, service calls can take months to complete as EVSE providers rely on local technicians to fill service calls and there are a limited number of experienced EV charger technicians in any given area.

> “Most of them are contracted out to a third party and you know there's so few of them out there. …we're working with a group of community colleges, 14 community colleges…helping them put together some classes for EVSE installation and maintenance so they can start teaching people how to install and repair these chargers that are very complicated.”
>
> *D, Municipal Fleet*

Companies that operate in disadvantaged neighborhoods recognize the impact their operations have on the surrounding neighborhood, including from vehicle emissions.

> “If we were to scale, say 10, 15 diesel vehicles or gas vehicles, I know that any goodwill that we have in the neighborhood would start eroding because we are now causing pollution in the neighborhood. And so, going electric I think is a way to grow responsibly within the neighborhood we operate in. And there's a new school that is literally half a block away from the new facility. I can't have 15

diesel vehicles coming in and out all day long out of this facility. Knowing that these are going to be pollution-free vehicles for me is like the only way to go."

D, Small Fleet

- However, companies' desire to minimize their carbon footprint is not specific to the disadvantaged area. Other companies interviewed expressed that they wanted to do their part across the board to minimize carbon and air pollution emissions for the greater good of the environment.
- Many companies employ residents local to the area in which they are located, and some interviewees expressed that their employees were generally not as motivated about electrification or carbon footprint reduction as were the business leaders, despite the potential positive impact it can have on their community.

MFH-Specific Considerations Including for Disadvantaged Communities (DACs)

The MFH representatives interviewed are open to the idea of having EV chargers available for their residents, with some taking a proactive approach and others a hands-off approach.

- Some developers are planning for charging infrastructure needs with new construction by laying required wires and planning for power, even if they do not plan to install chargers immediately. In some cases, they are required to do so.

"It's now a requirement in our city that if you build, depending on the size of your building, you're going to be required to have x amount of charging units. Now it doesn't mean I need to have them active, like the actual unit head on and working. They're required to have the conduit and everything ready to go."

T, EV Consultant

- For one interviewee in an HOA controlled building, the burden of cost and execution fell to them, as their HOAs did not want to bear the cost of installation or energy use associated with chargers.

A lot of EV charger projects at small or independently owned MFHs do not make it out of the inquiry and planning phase due to the large upfront costs, limited funding available outside of utility rebates, and difficulty allocating utility use charges.

"[I] find that if that property manager calls for a quote, their sticker shock is not with what the price of the equipment is but the installation costs, because they didn't have the prior infrastructure for it. And so those jobs don't tend to really get funded."

T2, EV Consultant

- Larger MFH properties do not always see a positive ROI on the installation of chargers; however, some can absorb the costs, and some use chargers as an amenity to attract and retain residents.
- Small or independently owned MFH properties are faced with decisions on which capital improvement projects to undertake, and often EV chargers are not a high priority.

> "Being a landlord is really, really challenging financially these days. There's a ton of pressure on you, and it's very hard to make things pay, and the cost of construction has become astronomically high. It's probably doubled in the past five years. And so, landlords are very reluctant to get involved with like big capital projects. So, when you tell someone like, oh, you can put an EV charging in your building, but you're going to have to completely repower your building, a lot of landlords are like, forget it, forget it, I'm done."
>
> *J, MFH*

> "If you have to do like the step-down transformer and everything else, you're looking at $60,000-$70,000 and not a lot of multi-families have that kind of money to pay upfront."
>
> *T, EV Consultant*

- Older MFH is more likely to need electrical upgrades, which can be costly and disruptive to residents, forcing owners to prioritize needs over wants.

> "People are trying to keep the roof from leaking, and that's got to be a first priority before even insulating it to 2024 standards to optimize heat, bills, and all of that."
>
> *C, MFH*

Respondents conveyed that sufficient planning is needed to install EV chargers at MFH properties, even in small quantities, and some considerations mentioned included charger locations, revenue generation, and fair and equitable use.

- Charger location:
  - Will chargers be near an existing electricity source?
  - Will they be available to residents only or for public use?
  - Are there ADA requirements for parking spaces?
- Revenue generation:
  - How will users be charged?
  - How will load sharing be managed?
  - How will demand be estimated to determine charge rates?
- Fair and equitable use:
  - How will the building management enforce fair and equitable use?

- How will the building manage non-EVs parking in EV spaces?
- What is the plan if a tenant with an EV moves away or moves in?
- How will the building manage assigned parking and charger requests

While funding is available to assist MFH properties in disadvantaged neighborhoods with the installation of chargers, ongoing costs for use and maintenance remain a concern.

- Many MFHs in disadvantaged neighborhoods struggle to figure out a revenue structure to cover the cost of use and maintenance without passing the costs on to their low-income residents.

> “So we don't have the money, and then there's the additional costs added ongoing. It's $300 a head, on average, to pay the intermediary to manage the charging for you.”
>
> *C, MFH*

- Residents who live in MFH in disadvantaged communities are often not the ones using the chargers as they do not have EVs.
- Some MFH properties in disadvantaged neighborhoods have turned to carshare partnerships as a way of generating revenue to cover ongoing maintenance while offering residents access to transportation.

> “[With carshare,] You buy a membership and then you can use their cars. [The MFH property now has] five EVs, and they wanted a new station in the north end. So, we worked with them on finding a location for us that we would give up one of our parking spaces and let the carshare use it, and they have their own car charger, which is more like a residential type because they just manage it through their own budget. They're paying for the vehicle, the charging, the electricity, everything.”
>
> *C, MFH*

Summary of Key Challenges and Barriers

The following categorizes the challenges expressed by five categories, summarizing the abovementioned challenges.

Project Costs

- The cost of installation is often a significant expense. Rebates help but do not always decrease the upfront cost of charger installation.

> “Being a landlord is really, really challenging financially these days... so when you tell someone like, oh, you can put an EV charging in your building, but you're going to have to completely repower your building, a lot of landlords are like, forget it....”

J, MFH

- Technology changes fast, and cost estimates remain relevant only for a few weeks as material and product costs change regularly based on demand and availability.

> "And it's a volatile pricing industry too… proposals should really only be good for 14 to no more than 30 days. … we just saw a $3 increase per foot of copper wire. And then it might go down next month, and when you're talking about a project that's maybe 150 feet and you're required to pull four of those, big price adjustment."

T, EV Consultant

- The available funding for electrification projects can vary by state, and not all utility companies offer incentive programs or grants.
- Funding is available to help offset costs but can have restrictions

> "…hiring somebody for capacity and expertise would be critical … through our understanding of the federal regulations, you can't hire a project manager with that money."

J, Municipal Fleet

- In some MFH properties where chargers are installed, and usage is still relatively low, monthly fixed utility fees can mean properties are losing money.

Customer Preparedness

- It can be challenging to understand the technology available that's right for a small fleet's specific use case
- Many have limited knowledge about, and thus access to, funding beyond utility rebates.

> "From where? Yeah, I mean, certainly not from the city. There's no money available."

J, MFH

- The grant application process can be arduous, complicated, and time-consuming, deterring many from pursuing.

> "We didn't look at grants. We felt like it's going to be stressful for us. It's going to be very competitive to get."

D, Small Fleet

- Larger customers need more people with EV experience to manage projects, fleets, and charger maintenance, but grant funding can sometimes not cover the cost of hiring and training more people.

> "It is the cost of insuring an electric truck, hiring employee drivers, onboarding them. It's changing our mindset from working with a diesel truck or an independent contractor to now working with an employee, hiring more people. I mean, this required a lot of resources to get this going."
>
> *R, Small Fleet*

- EVs and charging represent a new paradigm in how fleets and building managers operate, and it can seem complicated.

> "...between the acronyms and the jargon and stuff that you kind of have to learn on your own...a lot of this stuff could be simplified for a lay reader like myself."
>
> *D, Small Fleet*

Utility Processes

- Smaller fleets may not always know what utility programs they are eligible for (Forum)
- Some utility programs require a commitment to a certain number of EVs, chargers, and power usage to receive grant funding but do not allow flexibility to account for longer lead times of vehicle acquisition that can delay projects.

> "How do we guarantee we're going to have X amount of vehicles on the ground, drawing X amount of power when those vehicles aren't even available yet? You can't buy an electric VAC console or truck. They don't make one. They don't know when they're going to make one."
>
> *D, Municipal Fleet*

- Some utility funding may not allow consideration for future planning for increased demand beyond the contract timeframe, which could reduce the number of future construction projects.

> "… they wouldn't give us more power than what we would sign the contract for…under the [utility program], you can only put in what you're going to use in the next five years. So we couldn't say, 'well, listen, at 10 years, we're going to need this.' They said, 'Come back to us a year before the five years is up and talk to us about doing another project.' The typical…project is four years from funding. So, once you have an account code with a budget you can expect it to take four years to be done. So, I'd have to start that in a year in order to have the construction done by the end of year five."
>
> *D, Municipal Fleet*

- There can be limited visibility as to how much some utilities will charge for work they have to complete until the project has already started. This makes upfront budgeting challenging and can derail projects.

> "Some might say, 'yep it needs an upgrade and that's going to be at the expense of the customer'. It's hard to get a number…they'll be like 'to be determined at the site."
>
> *T, EV Consultant*

- There can be frustration around timely communication and knowing where to go for what.

> "You know, the utility companies are always at every single conference [saying], 'you must engage us right away'. You don't make it easy for people to find you or who to talk to or anything like that. So, it definitely is a hurdle and that's across the United States. Unless you know somebody that will tell you that specific utility's processes, the average customer is not going to know, or even contractors."
>
> *T, EV Consultant*

- A single point of contact (SPOC) often helps with this, though not always, as in situations where the contact is backlogged. Related, it can be time-consuming to stay on top of short-staffed utilities in general.
- Lead times can be long for processing applications, getting work orders issued, and getting the work executed on the part of the utility, which can add delays to a project timeline.
- Variation in how utilities operate across the country is a challenge for electricians/contractors who work with multiple utilities.
- Some small or independently owned property owners may not always be aware of billing impacts, specifically the impact of demand charges.
- Mixed reviews for utilities that use third-party consultants to implement programs: if they do not operate efficiently, they can be seen as middlemen that increase processing times vs. helpful intermediaries.

> "…[utility 1] has done a great job. …they have funds that are out there and they're educating, and they use [consultant 1], which is a great company to work with, and their program is very easy. [utility 2] does not offer programs for the public at all. Then, [utility 3] works with [consultant 2], not an easy process at all."
>
> *T, EV Consultant*

- Some utilities offer design services to their customers as part of their programs, which was viewed as a good thing; however, smaller customers, or those new to the TE world, may not have enough knowledge to know if it's appropriate to commit to some of the program terms.

External (Non-utility) Processes

- Permitting timelines was cited as a challenge, often due to limited AHJ staffing.

- Projects that require city permits or easements incur an additional layer of frustration when utility companies do not interact directly with these entities. The customer often has to serve as the intermediary, and preferences were expressed for all parties to come together on the needs and solutions in a more efficient manner.
- There is limited real-world data on energy use per type of vehicle or mileage rates for short and long-haul distances, as well as how vehicles would be used in real-life circumstances beyond just mileage, all of which is required for business planning.

> "…in reality we run in a diverse topography. We run on the very hottest days and we run on the very coldest days which …can be below freezing. So, when you layer over those operation constraints, it starts to dramatically change the true miles of operation between charging. So those factors influence how far a bus can realistically go before it either needs to be swapped out with a different bus or needs to go through a full charging experience."
>
> *J, Municipal Fleet*

> "Stop focusing on mileage range, nobody cares about that. Focus on fuel burn per day and then you need to convert that into kilowatt hours of energy… Can it run that air compressor for four hours and can it run that crane for two hours? Can it run the inverter onboard that's running skill saws and drills and things like that? Can it run that stuff for another two hours in a single day?"
>
> *D, Municipal Fleet*

- Some EVSE providers may require higher volumes than a small fleet or other customers may need, limiting technology options.
- It can be a challenge to have charging equipment repaired in a timely manner for various reasons, including limited repair and maintenance staff, which can be exacerbated in some cases by proprietary software requiring repair by the EVSE provider only.

> "One time...40% of our chargers offline because we could not get the manufacturer to come out and perform... and they made it proprietary."
>
> *J2, Municipal Fleet*

- Workforce development can be a challenge, as people are not being taught EV maintenance in school and training programs. Companies often rely on training provided by OEMs or EVSE providers, and staff gain knowledge and experience over time. However, turnover can be a problem as newly trained staff are in high demand and can be recruited for other higher-paying jobs.

> "[EV experience] is really hard to recruit for and once you train somebody up they become a target for people poaching..."
>
> *J, Municipal Fleet*

Supporting Disadvantaged Communities (DACs)

Outside of municipalities, one-third of the fleet businesses interviewed operate in disadvantaged communities. None of these business owners shared having to overcome challenges specific to operating in a disadvantaged community.

For MFH, the challenges shared related to costs and prioritizing the installation of chargers over other capital improvement projects.

- The infrastructure in disadvantaged communities can be old and outdated, meaning there tend to be additional barriers and costs to projects compared to other communities, such as the need for significant electrical upgrades to the building panel, the need to repave the existing parking lot, etc.
- Some MFHs operating in disadvantaged communities highlight the struggle to figure out a revenue structure that covers the cost of use and maintenance without passing the costs on to their low-income residents.

> “...we don't have the money, and then there's the additional costs added ongoing.”
>
> *C, MFH*

- Small MFHs and MFHs operating in disadvantaged communities share a similar struggle with justifying the cost of installing EV chargers when there are other building needs that are deemed higher priority by residents, building managers, and building owners.

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January 2025

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