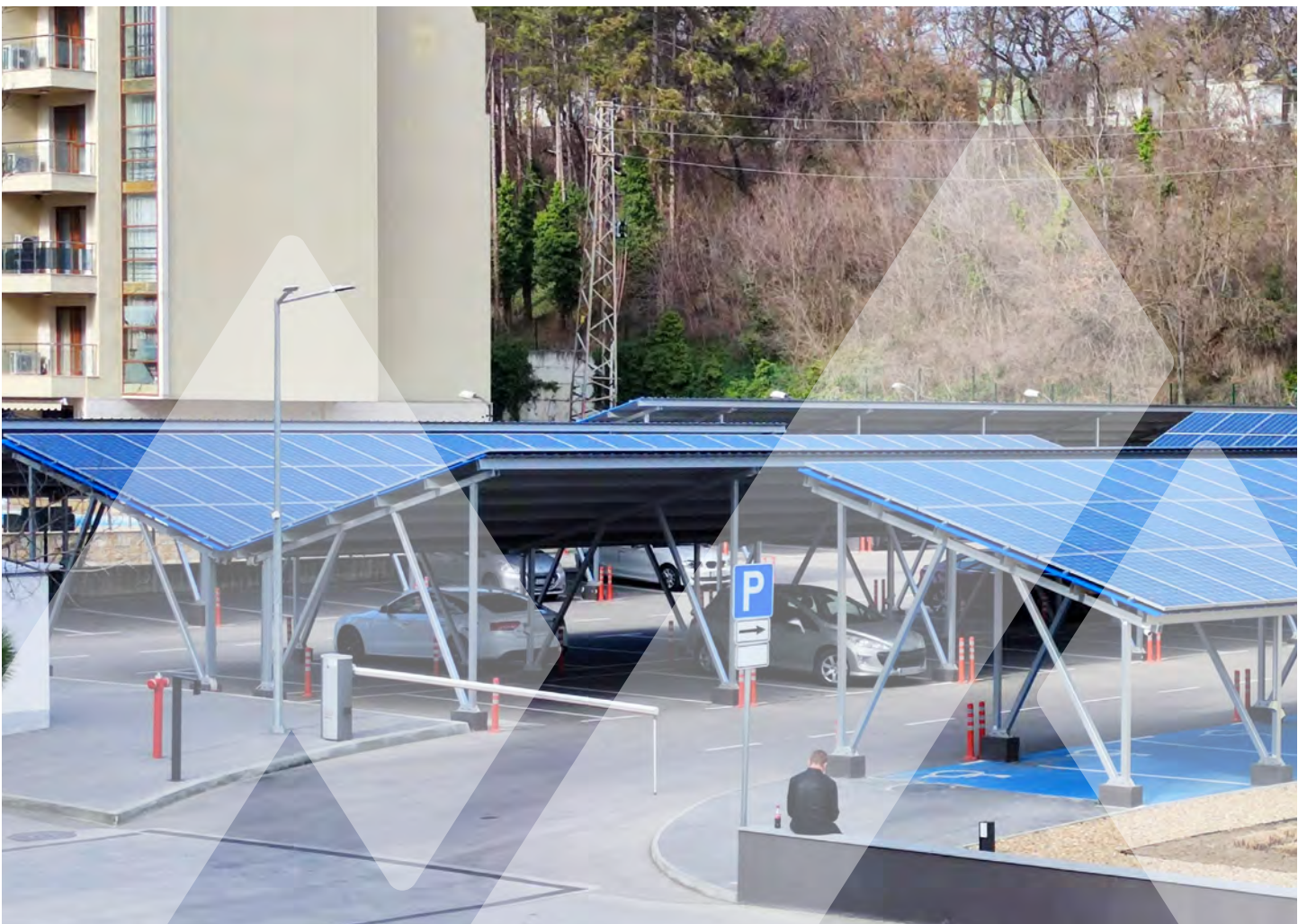# Plugging into Mobility Needs at Lower-Income Multifamily Housing

How to develop electric mobility and charging solutions that reflect community priorities

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Acknowledgments

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About RMI

RMI is an independent nonprofit, founded in 1982 as Rocky Mountain Institute, that transforms global energy systems through market-driven solutions to align with a 1.5°C future and secure a clean, prosperous, zero-carbon future for all. We work in the world's most critical geographies and engage businesses, policymakers, communities, and NGOs to identify and scale energy system interventions that will cut greenhouse gas emissions at least 50 percent by 2030. RMI has offices in Basalt and Boulder, Colorado; New York City; Oakland, California; Washington, D.C.; Abuja, Nigeria; and Beijing.

Executive Summary

The Infrastructure Investment and Jobs Act and Inflation Reduction Act have unleashed a wave of funding to deploy electric vehicle (EV) charging infrastructure in the United States. At the same time, state and local governments have begun reforming building codes, parking regulations, and other relevant policies to incentivize or require both public and private EV charging. Although these actions have helped increase charging access, such access largely remains concentrated in localities where EV ownership is already high, which are overwhelmingly higher-income census tracts with single-family housing. Meanwhile, lower-income residents of multifamily properties face substantial EV charging access gaps. Failure to locate chargers and electric mobility (e-mobility) options near lower-income multifamily housing perpetuates transportation inequities. For electric passenger, shared, and e-micromobility options to gain widespread acceptance and adoption, charging infrastructure and e-mobility must be accessible where people live, work, and recreate.

Recognizing that over 40% of people living in America's 100 largest cities reside in multifamily housing,[1] and that lower-income residents of multifamily properties face a disproportionate number of challenges in accessing charging infrastructure, RMI collaborated with the cities of Atlanta, Phoenix, and Portland (Oregon) to launch this Multifamily Charging Accelerator Project. This pilot aimed to identify charging solutions that align with the transportation needs of residents in lower-income multifamily housing in each city. As part of this project, RMI constructed a cooperative process with city partners and community groups to engage residents in on-site assessments and capacity-building discussions. With input from building management and insight from residents about their mobility priorities, the RMI team generated site-specific charging recommendations for each multifamily housing community.

This report describes the community engagement process, tailored solutions developed by the team, and efforts to abate the cost of new infrastructure to avoid passing it on to lower-income residents or building management. As a result, this report contains scalable, replicable solutions; lessons learned; and recommendations for policymakers, utilities, and other stakeholders for prioritizing equity in the e-mobility transition, including:

- **Prioritize community needs and engagement:** The residents' user experience needs to be central to charging solutions. Community engagement coupled with knowledge sharing is critical to meeting residents where they are.

- **Foster affordability:** Incentives for electric vehicle supply equipment (EVSE), panel upgrades, charger make-ready programs, and installation are critical to transportation electrification success in lower-income communities. Incentive frameworks developed in collaboration with housing authorities and multifamily housing providers help ensure funding can be leveraged for charging improvements.

- **Plan and implement complementary mobility solutions:** E-mobility options and charging solutions in lower-income communities should be introduced in tandem. EV adoption is still nascent among lower-income households, and e-micromobility and shared e-mobility options such as electric bikes (e-bikes) and EV carshares stimulate interest and the need for charging. Moreover, such modes help connect communities to other multimodal and public transport options outside their neighborhood.

- **Form meaningful and inclusive local partnerships:** Collaboration among city officials, utilities, housing authorities, charging providers, multifamily building management, and local community-based organizations is key to planning and implementing viable charging solutions; such engagement helps ensure the long-term viability of a project and that it will best cater to community needs.

- **Design for the local context, emphasizing affordability and reliability:** Consider charging installation location and corresponding panel capacity before choosing a specific charging solution. A charging solution's operational costs and maintenance must be considered to ensure the charging equipment is reliable in the long term.

- **Ensure affordable charging for lower-income households:** Work with the local utility and charging provider to ensure that charging pricing models factor in income levels and provide sustainable charging costs for the community.

- **Develop an incremental change approach:** While working toward systemic policy and funding advances for charging infrastructure access, seek to implement short- to medium-term actions through grants and partnerships. This can include identifying transport connectivity needs, mapping grid capacity, identifying charging needs, and conducting resident engagement so when funds do become available, a solution can be advanced more seamlessly.

Project Background and Laying the Groundwork for EV Charging in Lower-Income Multifamily Housing

RMI's Multifamily Charging Accelerator Project aimed to identify transportation needs and tailor charging solutions for residents of lower-income multifamily housing. Acknowledging the crucial role of charging infrastructure in enabling smooth e-mobility, RMI's focus for this project was to highlight and tackle disparities in charging access, especially in lower-income multifamily residential buildings where charging options are frequently lacking. Failing to bridge this gap could exacerbate transportation inequalities. To ensure broad acceptance of e-mobility options, charging infrastructure must be available in every community. Through this project, RMI partnered with the three cities, working with building managers and residents to streamline the deployment of chargers, whether for e-bikes or EVs, to provide tailored charging solutions that meet the needs of each community.

Charging Access Gaps in Lower-Income Multifamily Housing

For EVs to be ubiquitous and convenient, charging must be available where people live, work, and drive. Today, approximately 80% of EV charging occurs at home;[2] however, this statistic primarily represents users who reside in single-family homes. Over 40% of people residing in America's 100 largest cities live in multifamily housing.[3] But residents of multifamily housing often do not have the ability to charge at their buildings or within their neighborhoods because there are limited or sometimes no chargers. The lack of chargers is due to limited parking, complicated approval processes, and costly electrical upgrades required for their installation. Compared with installing a charger at a single-family residence, installing charging infrastructure for electric modes of transportation at or near multifamily housing can be particularly challenging:

Single-family homeowners can simply elect to make electrical upgrades to their homes, whereas owners of multifamily housing likely need special approval to complete upgrades.

Tenants and owners of multifamily housing likely do not evenly share the benefits of EV infrastructure and electrical upgrades. Landlords tend to shoulder the installation and maintenance costs but do not directly benefit from the added infrastructure, leading to an underestimation of its value.

Parking limitations can also restrict where chargers can go. EV chargers usually occupy dedicated parking spaces, which can lead to conflict between residents and building management over space allocation.

Retrofitting buildings to add EV charging is significantly more challenging and costlier than building EV readiness into new development, especially if retrofitting necessitates added electrical capacity and transformers, panel improvements, or trenching in parking lots. In addition to triggering costly building upgrades, adding charging as a retrofit can make it difficult to separate the cost of charging from the building's overall utility bill.

From the outset, RMI's Multifamily Charging Accelerator Project focused on addressing charging access gaps in lower-income multifamily housing by identifying and addressing the complexities of retrofitting and installing charging infrastructure at such properties.

Key Considerations for Developing Equitable Charging Access

Chargers are often placed where charging services can generate the most profit rather than where they are most needed to reduce pollution or address public transportation gaps. Proactive planning is necessary to ensure chargers are distributed equitably in lower-income areas, ensuring that the benefits of charging infrastructure development and electrification are more evenly shared.

At the outset of the project, RMI identified key considerations that would enable this project to prioritize equitable access when designing and identifying charging solutions for lower-income multifamily housing. These considerations included:

- **Community-driven solutions:** RMI engaged with city staff, utilities, charging service providers, and managers and residents of multifamily buildings to discuss potential charging solutions and implementation pathways.

- **Cost burden:** An essential aspect of lower-income multifamily housing is affordability, so it was important for this project to consider:

  o How the costs of installation and necessary upgrades would be distributed across stakeholders

  o What levers could be used to maintain affordability and prevent rent increases after EV chargers are installed

- **Electrical capacity:** Older buildings providing lower-income multifamily housing tend to have limited panel sizes and transformer capacity that require upgrades to accommodate the installation of EV chargers. These upgrades can also be lengthy. Consequently, RMI sought to collaborate with utilities from the project's launch.

- **Environmental justice and income levels:** Household income, air quality, and local health data are vital metrics for gauging community needs and identifying disproportionate impacts. For instance, air pollution often correlates with proximity to highways or heavy road traffic, typically affecting lower-income communities and communities of color. These communities often also incur disproportionately high transportation costs vis-à-vis household income. Through this project, RMI used these considerations to identify communities that would benefit the most from lower transportation costs and less ambient tailpipe pollution.

- **Local transportation gaps and characteristics:** A community's transportation needs depend on factors such as commute distances, access to reliable transit, and distance from transit stops, to name just a few. Additionally, the area's prevalent transportation modes, such as personal cars versus bicycles, dictate the kind of charging solutions required. This project sought to tailor charger siting and type to support community needs, local travel patterns, and transit connectivity.

- **EV charging access**: The density of charging sites in an area provides a direct measure of access to EV charging. This project sought to complement existing city charging deployment efforts and prioritize locations lacking charging access.

- **Safety:** Given the public-facing nature of chargers at multifamily housing, theft, vandalism, and personal safety must be considered within the local context. Principles of crime prevention through environmental design were considered and discussed with communities.

- **Parking and land use:** Because installing chargers at multifamily housing may reduce the number of parking spaces available to residents, limited parking can forestall their interest in EV charging. When conceptualizing charging infrastructure, RMI and partners sought to account for parking considerations and accessible parking spaces.

- **Solution utilization:** A charging solution should be useful to residents. However, determining and guaranteeing a certain utilization level can be challenging, especially if lower-income households do not already own or drive electric cars. Nonetheless, to ensure that lower-income communities are not left behind, charging infrastructure needs to be preemptively planned and installed in these communities. Thus, this project sought to consider complementary options such as EV carshare charging, e-micromobility charging, and other partnerships to maximize community benefits and utilization.

- **Reliability and ease of use:** New and unfamiliar technology is often cumbersome for building managers and residents to operate. Thus, it was central for this project to consider ease of use and convenience and to be clear with stakeholders responsible for maintaining the charger to ensure reliability.

By making these design considerations central to the project, RMI sought to illustrate how charging implementation challenges and considerations can be effectively managed and how local contexts can be considered to develop holistic charging solutions. This approach enabled the RMI team to advance progress toward the long-term goal of providing more inclusive charging access in lower-income neighborhoods with multifamily housing.

City Partnerships

The project's key objective was to drive implementation. RMI aimed to achieve this by partnering with three major US cities: **Atlanta**, **Phoenix**, and **Portland**. These cities were selected to represent a variety of demographic characteristics, transportation needs, and existing public incentives across the nation.

The sustainability offices of all three cities expressed a strong interest in expanding transportation electrification and infrastructure. Each had either submitted federal funding applications for community charging or encouraged its state department of transportation to prioritize disadvantaged communities in its EV infrastructure deployment plans. However, their funding for charging infrastructure options was limited, with most resources directed toward city-owned initiatives rather than being tailored to multifamily housing. Each city recognized accessible charging in underserved communities as a pivotal metric of the success of transportation electrification. See *Appendix C: Mobility and Charging Incentives* for a detailed list of incentives, broken out by electric mode, including public, local utility, and other incentives.

Exhibit 1 highlights different incentives to support EV charging from the utility companies in Atlanta, Phoenix, and Portland. Atlanta's and Phoenix's utility incentives are modest compared with Portland's, which provides greater incentives for charger rollout in lower-income multifamily housing and disadvantaged communities than the other two cities. Despite offering fewer incentives than utilities in Phoenix and Portland, Georgia Power's Make Ready Infrastructure Program comprehensively offsets a large amount of a charger's up-front cost.[4] In all three cities, some incentives were previously introduced as pilots, but they were not extended beyond the pilot phase; see *Appendix C: Mobility and Charging Incentives* for more details. Pilot programs are useful in understanding the need and demand for incentives but

cannot solve systemic access issues. It is essential to plan for funding to be available over a longer period to see gradual uptake and impact. The Multifamily Charging Accelerator Project has also facilitated city-to-city knowledge-sharing sessions, which can inform future implementation initiatives.

Exhibit 1 Utility incentives for EV charging in three cities (as of April 2024)

City	Entity	Residential EV Charging Incentives
Atlanta	Georgia Power (investor-owned utility)	• $200 rebate per Level 2* (L2) charger for residential Georgia Power customers • ≤100% of electrical work to support charger installation (minimum of six chargers required) • Prioritizes funds for publicly accessible charging that serve the public good (e.g., affordable housing, adjacent to a park or school)
Phoenix	Arizona Public Service (APS) (investor-owned utility)	• No incentives available for residential customers
Phoenix	Salt River Project (public-owned utility)	• $250 per port rebate for residential L2 chargers • $4,000 per port rebate for multifamily housing to install L2 and $20,000 per port rebate for government and nonprofit customers to install a direct current fast charger (DCFC)** • Additional $1,000 rebate per station for L2 chargers and $5,000 per station for DCFC installed at a multifamily property in a Justice40 disadvantaged community***
Portland	Pacific Power (investor-owned utility)	• <100% of the planning costs for deploying electric transportation technology and projects • ≤$4,500 rebate per port installed at multifamily properties (≤75% of total costs and ≤12 ports)
Portland	Portland General Electric (public-owned utility)	• ≤$2,300 rebate per port installed at multifamily properties • ≤$1,000 additional rebate for lower-income applicants enrolling in Portland General Electric's EV Smart Charging Program • ≤$5,000 additional rebate for electrical work for lower-income applicants if charger requires breaker or electrical panel upgrades

Notes:
* L2 chargers provide higher-rate alternate current charging through 240- or 208-volt residential or commercial electrical service. It can take 4 to 10 hours to charge an EV from empty to 80% on an L2 charger. The typical power output of an L2 charger is 7 to 19 kilowatts.

**DCFC is rapid charging infrastructure designed to charge a battery EV to 80% in 20 minutes to 1 hour. DCFCs are also referred to as L3 chargers.

*** A Justice 40 disadvantaged community is defined by the government and qualifies to receive at least 40% of the overall benefits from federally funded climate and infrastructure development programs.

RMI Graphic. Source: RMI analysis

In addition to leveraging existing incentives to drive implementation, RMI collaborated with city staff to integrate lower-income multifamily housing charging access into their broader initiatives and complement their ongoing efforts. RMI also aimed to utilize the city partners' networks to identify neighborhoods and locations with high demand and potential for charging infrastructure, prioritizing them for the projects.

Intentional Site Selection for Resident Engagement

One of the multifamily housing sites visited in Atlanta to understand where best to locate a charger.

Central to the Multifamily Charging Accelerator Project was introducing EV charging access where it would elevate a community's wider mobility. To achieve this, RMI and city partners investigated these questions:

- Where can adding or improving electric transportation options and EV charging address broader community mobility needs?

- Where can charger placement create organic demand for private and shared EVs?

- Where has the city or other stakeholders already prioritized increasing mobility access, such as through earmarked funding that can eventually support residents' selected solutions?

Answers formed the basis for determining which neighborhoods, and which lower-income multifamily housing communities within them, to engage with in exploring EV charging solutions.

Site Selection Methodology

This section details how the project sought to identify and prioritize specific neighborhoods across a variety of factors to promote efficient, accessible charging and mobility connectivity. RMI's site selection analysis was based on the factors in Exhibit 2.

Exhibit 2 **Local characteristics checklist for prioritizing sites for charging solution deployment**

Socioeconomic Background

• Household Income

• Justice40 Status

Accessibility

• Public Transit Access

• Transportation Cost as a Share of Household Income

• Food, Services, and Recreation Access

• Access to EV Charging Stations

• Access to Other Shared Modes

Grid Characteristics

• Local Substation Capacity

• Utility Territory

Scale of Impact

• Residents per Square Mile

• Number of Multifamily Units

• Air Quality and Other Environmental Indicators

RMI Graphic. Source: RMI analysis

Specifically, RMI established the following process for identifying lower-income multifamily housing communities with a high likelihood of interest in EV charging:

Dive into the data.

To identify areas of focus, RMI used a variety of metrics to understand the distribution of demographics, income levels, housing and transportation costs, and transportation access in each city. Candidate areas were those with an annual median household income (AMI) 75% or less of the AMI of the city, and with high transportation costs coupled with a lack of reliable transit and limited access to EV chargers. A summary of these findings for each city along with the areas identified is provided in Exhibit 3.

Along with household income, RMI looked at both local and federal maps pinpointing areas experiencing systemic inequities where new infrastructure and services should be prioritized, given factors such as income, race, ethnicity, and air quality. RMI identified transit deserts and under-connected areas, such as communities greater than two miles from transit stops and those from where commutes to the city center are considerably longer via public transportation than personal vehicles. Data mapping platforms and validation by local partners helped determine where shared public transport was least frequent and poorly connected to essential destinations. RMI used EV charging availability resources and websites within each city to locate EV chargers, which, when layered with population, indicated areas with the fewest chargers per resident and potential user.

Exhibit 3 Characteristics of candidate multifamily housing communities

	Candidate communities	Household Income and Average Housing Cost	Transportation and Energy Affordability	Transit Access	Charging Access
Atlanta	Just southeast of downtown, near I-85 and I-20	• Atlanta AMI = ~$70,000 • AMI in subject communities = <$56,000 • Subject communities spend 25%–45% of their household income on housing	• ~70% of households in Atlanta spend 15%–22% of their household income on transportation • Subject communities spend 2%–4% of their household income on energy	>1 mile from the rail line or >½ mile from the bus line	Charging is concentrated in downtown, midtown, North Atlanta, and East Atlanta, in areas where household income is higher than in subject communities
Phoenix	Central to south-central Phoenix, the North Highway Corridor along I-17, and northwest Phoenix	• Phoenix AMI = ~$65,000 • ~30% of Phoenix households have an AMI <$37,000, including subject communities • Subject communities spend 25%–50% of their household income on housing	• Most Phoenix households, including those in subject communities, spend >25% of their household income on transportation • Subject communities spend 3%–6% of their household income on energy	> ½ mile from the light rail line	Charging is concentrated in the central Phoenix downtown area and in neighboring municipalities such as Scottsdale and Tempe where EV adoption is higher than in lower-income areas around the city center
Portland	East Portland, past 82nd Avenue	• Portland AMI = ~$80,000 • AMI in subject communities = <$55,000 • Subject communities spend 24%–35% of their household income on housing	• Subject communities spend ~20% of their household income on transportation • Subject communities spend 3% of their household income on energy	On average >40 minutes to get to the city center via any form of public transportation	There are more charging stations in the city compared with other metro areas. Very few are in East Portland, especially compared with the western suburbs

RMI Graphic. Source: **US Department of Energy**

Portland's protected bike lane and shared light rail–passenger vehicle roadway

Identify local initiatives that prioritize equitable transportation access.

RMI inquired where the city, local utility, advocacy, or community-based organizations had prioritized expanding community charging access. This approach allowed for taking advantage of existing initiatives and established community relationships, increasing the likelihood of residents engaging and developing future charging solutions as part of project implementation. This also increased the chances of public funding, utility incentives, or other financial support programs being available to reduce the cost of new infrastructure to building owners and management.

Generate a potential site list with local stakeholders.

RMI conducted multiple exploratory meetings with stakeholders including city partners and local utilities at various stages of site selection to confirm insights gleaned from the team's analysis. These meetings helped identify multifamily residential properties in these areas that might be keen to integrate charging solutions into their communities. RMI also sought information from affordable housing network agencies on properties and organizations that had previously shown interest in EV charging projects.

Validate each site's interest and engage with residents.

RMI made final site selections by connecting with managers of lower-income multifamily properties, which we were referred to by city partners and local community organizations and their networks. These included affordable housing providers, government-owned subsidized housing, and properties known to support lower-income seniors, recent immigrants, or other vulnerable groups. Building managers circulated flyers containing project information, which were also shared at local community events.

Utilizing Stakeholder Engagement to Drive Charging Solutions

Phoenix's regular extreme heat

From exploratory discussions to charging implementation, RMI strived to ensure stakeholders in each city were informed about the project and driving decision-making. The main objectives of stakeholder engagement were to understand the local context and to recognize that one-size-fits-all solutions would not work across different geographies.

Additionally, this process was intended to serve as a blueprint for subsequent projects, from gathering resident input to designing inclusive charging infrastructure. Establishing connections with a wide variety of stakeholders also provided an opportunity to make different participants within the decision-making process aware of one another's work and obtain their buy-in from the beginning.

Key stakeholders were consulted during exploratory discussions and site selection, as shown in Exhibit 4. Their respective roles and responsibilities were established as a framework to align expectations and provide structure for setting goals and timelines for project participation.

Exhibit 4 Stakeholders and their roles and responsibilities

Stakeholder	Identified Key Roles and Responsibilities
City departments (sustainability, transportation, and housing authorities)	• Connect RMI team with community-based organizations and staff from other organizations. • Participate in regular meetings. • Identify potential funding sources for charging solutions. • Help identify and select top charging solution alternatives for partner sites.
Community-based organizations	• Connect RMI team with potential multifamily housing partners. • Help engage with residents of multifamily housing communities about interest in EVs and EV charging.
Utilities	• Share data on site and grid capacity and constraint. • Detail electrical upgrade costs the utility will and will not cover. • Explain utility-supported make-ready programs, including site eligibility, enrollment, and cost coverage process/limitations. • Identify areas within the city best suited to add charging in the next one to three years.
Regional and state agencies	• Identify available or potential sources of funding to support EV charging projects at multifamily housing. • Create EV supportive building codes and performance standards. • Pursue interagency approaches to solving disconnects between transportation and housing. • Design roadways to be more inclusive and protective of electric micromobility.
Building owners and management	• Identify preferred charging options and locations. • Share details regarding site characteristics and conditions of buildings, including on-site and nearby parking, electrical capacity, and distance to the nearest transmission line.
Multifamily housing residents	• Share trip patterns, distances, and charging preferences (EV/e-bike/electric scooter [e-scooter], on-site, curbside, circulator buses). • Share wider unmet transportation needs.

RMI Graphic. Source: RMI analysis

RMI's role included:

- Facilitation of all meetings, workshop design, and project-related public engagement

- Coordination of decision-making across stakeholders and engagement process

- Planning and outreach to building owners, managers, and residents

- Analysis of utility data and recommendation of areas of focus

- Preparation of charging recommendations and project handbook

Conducting Site Walks and Resident Engagement

In Atlanta, Phoenix, and Portland, RMI brought together residents, building managers, city and utility partners, and other stakeholders for site visits of multifamily housing communities. These visits provided an opportunity to understand how new EV options and charging infrastructure could be deployed at each site, including:

- Residents' transportation needs

- Off-street and adjacent street parking capacity

- Potential logistical issues with adding EV charging to the electrical load

- Potential locations on the property where charging could be added

- Potential safety measures, like lighting, needed to make charging accessible

Because there is no one-size-fits-all solution, information gained from site visits enabled RMI to think through each site's unique needs and ensure each site's decision makers were engaged in the process.

Atlanta

Engagement with the Atlanta Mayor's Office of Sustainability and Resilience and collaboration with local agencies such as Atlanta Housing (AH) were essential. From the project's outset, AH staff assisted in identifying multiple potential charging locations and prioritizing those that would best serve residents and the broader community.

RMI also engaged Georgia Power, the local utility, and Impact Energy, a local charging installation provider, to preemptively check available capacity and understand applicable local incentives to defray charging installation costs.

RMI partnered with EVNoire, SWTCH, and Bird to present e-mobility and charging opportunities to residents and understand their needs and concerns.

The RMI team also worked closely with each site's building management to utilize a standing monthly community meeting to speak with residents and learn about their transportation needs. Atlanta-based representatives from EVNoire, an EV advocacy and education organization, shared their experiences owning and operating EVs, addressed residents' questions, and offered real-life examples of how EVs meet their mobility needs, such as the practicalities of charging an EV during a road trip through Georgia.

Hertz also attended the events, bringing EVs available for short- and long-term rental for everyday customers and rideshare providers in the Atlanta area. This provided residents the opportunity to look at and sit in an EV, some for the first time. Residents asked Hertz questions about EV driving performance, safety, and technical features.

A local representative from Bird, an e-micromobility company operating in 16 countries, brought two e-scooters for residents to ride and explained its subsidized service offerings. This provided residents the opportunity to explore an electric mode other than a passenger EV.

Finally, SWTCH, a manufacturer and supplier of charging infrastructure, brought a charger to the site. Having a physical asset at the event allowed residents to better understand charger functionality and connection. The involvement of EVNoire, Hertz, Bird, and SWTCH helped empower residents by providing them with accessible information and tangible examples of e-mobility technology.

Phoenix

RMI worked closely with the City of Phoenix Office of Sustainability to identify and engage stakeholders, including the local electrical utility Arizona Public Service (APS), the city's Housing Department, and Dunlap & Magee, a city-contracted building management company for city-owned affordable housing properties. As the property owner involved in the project, the city played a critical decision-making role in siting and approving EV charging solutions at each identified site. Engagement with these stakeholders also helped identify potential funding sources for charging solution deployment.

Although APS does not have a make-ready or similar program to support charger installation at lower-income properties, its support has been crucial from project inception. APS representatives helped estimate grid capacity requirements at each site to support charging infrastructure, electrical upgrades
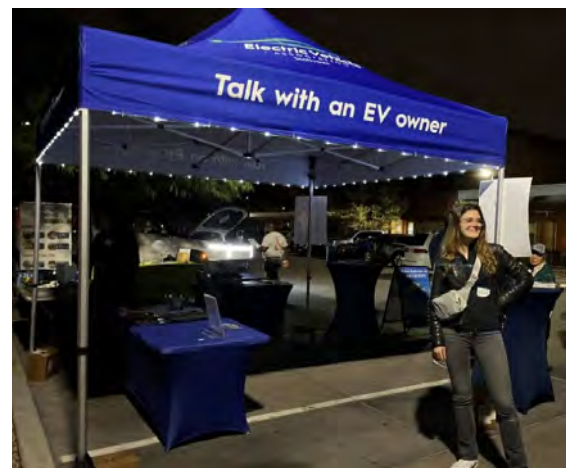
In Phoenix, members and volunteers from the local nonprofit EV association, Valley of the Sun Electric Vehicle Association, and local utility, Salt River Project, attended outreach events and shared their hands-on EV knowledge.

required for added charging, associated costs, and lead times. APS representatives also demonstrated a sample L2 charger at the resident events, allowing attendees to experience and learn about the infrastructure firsthand.

At community outreach events, the City of Phoenix's Street Transportation Department was present to highlight micromobility services including shared bike, e-bike, and e-scooter programs. They hope to use insights from the events to inform and expand local program efforts and service areas.

Members and volunteers from the local nonprofit EV association, Valley of the Sun Electric Vehicle Association, and another local utility, Salt River Project, also attended outreach events and shared their hands-on EV knowledge. They brought to the events personal EVs of various sizes and price points, as well as e-bikes and electric motorcycles for residents to see. Residents were able to take rides and speak with the owners about their EV experience in a Southwest climate.

WattLogic, a locally headquartered energy and charging solutions provider, also attended the community events and offered their ideas for possible charging options. To ensure the resident engagement events were inclusive of Latino residents, RMI partnered with Unlimited Potential, a local community-based organization, to provide translation services. Unlimited Potential's participation helped the project team better connect with residents and invite their participation in a survey in Spanish.

Portland

RMI, the City of Portland Bureau of Planning and Sustainability, Portland Clean Energy Community Benefits Fund (PCEF), and Central City Concern (CCC) collaborated on the Portland project. PCEF is a voter-backed initiative that invests in community-led projects to slash emissions while building climate resilience and economic opportunity. CCC is a local housing and healthcare provider. Together, the team collaborated on identifying areas in the city where EV charging might be beneficial to lower-income multifamily housing residents as well as potential funding sources for future charging installations. This group also organized and ran a community engagement event.

In Portland, RMI teamed up with Central City Concern, a local housing and healthcare provider, BIKETOWN, local utilities, and Platt Auto Group.

At the event, two city representatives spoke with building management and residents about the Portland Clean Energy Fund and other unique opportunities that could support their priorities. A local EV champion from OpConnect, which provides fleet, property, and facility managers with cloud-based software to streamline charging payment processing, scheduling, and maintenance, also attended.

Platt Auto Group brought a Chevy Bolt EV to the event. The presence of several BIKETOWN e-bikes and a docking station also added to the event's draw. Three Lyft personnel signed residents up for memberships in BIKETOWN FOR ALL, which provides free electric bikeshare access to Portlanders eligible for public benefits. Finally, a volunteer representative from Portland General Electric (PGE) used the event as a unique learning opportunity to help inform the utility's expansion of its initiative to increase charging access at multifamily properties.

Outreach to Residents

In the three cities, each community engagement event was held at the end of the workday. Building managers posted flyers announcing the event in common areas and on residents' doors. RMI and its partners set up tents in resident parking lots, served food from local restaurants, ran a coloring station for kids, and shared EV-related information through conversations, posters, and tangible EV experiences. The range of e-mobility options, from passenger EVs to e-bikes, drew resident interest, while staff administered surveys to better understand residents' daily transportation needs and trip patterns. Residents also indicated their willingness to utilize electric transportation options and charging should they become available.

Additional scenes from RMI outreach events in Atlanta, Phoenix, and Portland.

Identifying Resident Needs to Inform Charging Solutions

In addition to understanding the differences and similarities in stakeholder entities and built environments across Atlanta, Phoenix, and Portland, it was important to gain insights into how residents experience transportation in their cities. RMI designed a resident survey (see *Appendix B: Resident Survey Questions and Insights*) to not only consider which charging solutions would best fit the needs of residents but also to understand if and how residents would interact with different charging and mobility solutions.

Key takeaways from survey results

✓ Residents across all three cities used multiple modes of transportation for different needs (e.g., walking short distances to nearby grocery stores, driving for school drop-offs or family visits, using public transit because they do not own a car or when their car is broken, and using app-based rideshare services at a discounted rate for doctor visits).

✓ Personal or family-owned cars were the primary mode of transportation in Atlanta and Phoenix.

✓ In Portland, public transit (including MAX bus and rail) was the most common mode of transportation.

✓ Commute times of 45 minutes or less were most common across all three cities.

✓ Longer commutes (more than one hour) were usually caused by traffic or infrequent public transit.

✓ Portland's BIKETOWN bikeshare system of 2,000 e-bikes at over 200 stations made the use of e-micromobility in Portland considerably more accessible than in Atlanta and Phoenix.

✓ Many residents in Atlanta and Phoenix relied on family and friends to access grocery stores, health services, and leisure activities.

✓ Atlanta and Phoenix sites had a large number of senior citizens, and many considered their electric wheelchairs as a mode of transportation. Some used cars that could accommodate their nonmotorized wheelchairs when traveling.

✓ All residents expressed an interest in and willingness to try electric vehicles. Many said they were genuinely excited about the technology.

Understanding Mobility Patterns

In addition to understanding travel patterns and commute times, RMI captured how residents interact daily with transportation. RMI designed the survey, detailed in *Appendix B: Resident Survey Questions and Insights*, to dive deeper into factors that may cause long commutes, why residents make certain transportation choices, whom they connect to through transportation, and their questions about transportation electrification. While documenting current challenges provides insight into what should change for residents when charging and e-mobility solutions are offered, capturing what is currently working well (i.e., "positives") informs what residents would like to see continue and improved upon through transportation electrification (see Exhibit 5).

Exhibit 5 Current transportation challenges and positives

	Atlanta	Phoenix	Portland
Current Transportation Challenges	• Traffic, speeding, and pedestrian safety are a concern. • Public transit can be unreliable (e.g., long MARTA wait times).	• Car dependence and heavy traffic contribute to pedestrian and driver safety concerns. • Unreliable service and insufficient bus connections are two other concerns.	• Single-occupancy vehicles are much more convenient than public transit (i.e., commute times on public transportation are long, so many use high-cost, app-based ride-hailing services instead). • BIKETOWN presence in the neighborhood is limited compared with the city overall.
Current Transportation Positives	• Residents can walk to a nearby bus stop. • Many residents' health insurance pays for Uber rides to doctor visits. • MARTA bus service and MARTA Mobility provide Americans with Disabilities Act compliant paratransit service, at discounted rates, to anyone unable to ride on or disembark from regular MARTA transit services.	• Residents have ample parking. • Residents regularly use multiple transportation modes thanks to nearby bike lanes.	• Residents feel safe walking in the neighborhood. • Residents can access BIKETOWN and TriMet for free through the services' equity programs.

RMI Graphic. Source: RMI analysis

Residents shared additional concerns and considerations that they feel are integral to their everyday relationship with transportation. These insights help provide a more complete picture of how their day-to-day transportation story goes beyond which electric mode they will choose in the future.

For example, it is critical for cities, housing providers, and transportation agencies to consider how charging infrastructure and mobility solutions will not only support multifamily housing residents' access to jobs, education, and health, but also support staff such as maintenance workers and nurse aides who provide services to residents. Below are solutions and considerations that would improve residents' daily transportation experience and make the utilization of proposed charging solutions more seamless for multifamily housing communities:

Age, physical ability, and income can greatly influence mode choices and should help inform subsequent solutions for transportation challenges.

Ensuring efficient pay systems and sufficiently lit streets is essential to making charging infrastructure safe and accessible for residents.

Installation of security measures can discourage charger vandalism and vehicle break-ins in parking lots at multifamily buildings.

Improved road safety, such as protected bike lanes and pedestrian infrastructure, is needed for residents to successfully and confidently use e-micromobility solutions.
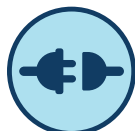
Residents are interested in EVs but wary of charging infrastructure. They have range anxiety and concerns about vehicle performance and charging uncertainty during extreme weather events. Education is an essential component of addressing such concerns and promoting e-mobility. The corresponding benefits of e-mobility can also be communicated through educational efforts.

Informational campaigns can help inform residents about what transportation options are feasible for extreme heat and weather conditions.

Communities and their residents should be at the forefront of planning for mobility and charging solutions. Based on the resident survey feedback, it is evident that residents are enthusiastic about transportation electrification and eager to see chargers installed at their residences. At the same time, charging solutions are not transportation solutions. For transportation needs to be more fully addressed, charger installation should be deployed with e-mobility options.

City-Specific Charging Solution Pathways

Utilities and housing authorities were brought together to create partnerships and understanding of each stakeholder's role in providing new electric transportation services.

In addition to understanding residents' transportation requirements, the process of determining suitable charging solutions for each site involved gaining insight into local stakeholders' priorities, funding sources, available parking, and electrical constraints specific to each location. Following are descriptions of the solution frameworks that RMI applied in each city.

Atlanta

Community-Driven Multifamily Charging Solution: **Three dual-port L2 chargers installed curbside, adjacent to the multifamily housing community and across the street from a neighborhood park.**

Atlanta is committed to finding a charging solution for residents at the identified lower-income multifamily building that would also benefit the broader community. After several meetings and site walks with AH staff, the team proposed a solution location along the curbside, given on-site parking constraints. Because the proposed site is located within a historically underserved area that has a high volume of EV traffic and given its location near a park and public services, siting a charger there would benefit neighborhood residents and the larger community.

The project could also qualify for Georgia Power's Make Ready Infrastructure Program, which covers electrical upgrades and installation.[5] If the project qualifies for the program, approximately 85% of implementation costs would be covered through Georgia Power incentives. The remaining cost would need to be covered by AH or the city.

After several consultations, AH ultimately determined that, given its budget constraints, charging was not a high enough priority and the curbside charging project would not yield enough direct benefits for it to provide financial support.
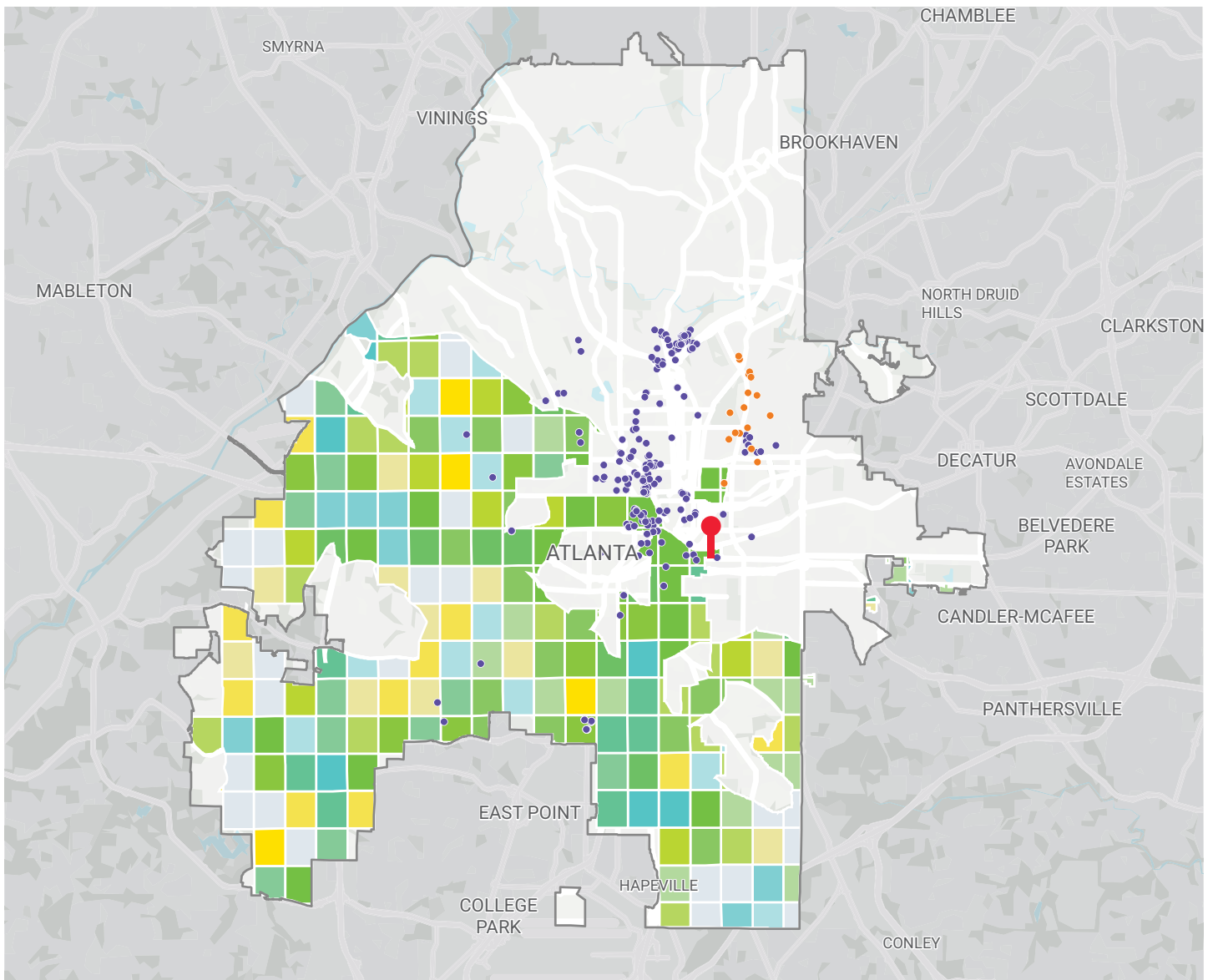
Subsequently, the city began working to identify funding or public–private partnerships to cover the remaining 15% of the costs and initiate the project. Recognizing the strategic importance of providing charging for lower-income multifamily buildings and the expressed resident need and community interest in charging in this location, even without AH support, the Mayor's Office of Sustainability and Resilience is continuing to prioritize the identified location. The City of Atlanta is working with the Atlanta Department of Transportation (ATLDOT), which owns the public right-of-way where the chargers would be placed, to explore a **no-cost land lease** for the installation site. Because the city does not currently have a budget to fund this specific charging solution, it is working with private charging providers, which would own and operate the chargers in a **concession contract model with a per-charge fee**. However, provisions must be made to ensure this fee does not price out residents and community members.

This project represents one of the first charging solutions designed explicitly for and to be intentionally located near lower-income multifamily housing in Atlanta. Additionally, the project would be the first community-focused curbside charging project in an ATLDOT right-of-way. When completed, it will serve as a flagship project to further prioritize charging in lower-income neighborhoods with multifamily housing. It will also be part of the city's larger effort to improve charging access connectivity by accelerating and supporting the installation of 250 new charging ports by 2025, especially in lower-income communities with low access to charging.

Atlanta has sought to proactively improve charging access, passing an EV Readiness Ordinance, developing citywide connectivity mapping, and prioritizing charging access in lower-income communities through direct install, grants, and innovative partnerships.[6] The city's charging map (see Exhibit 6) shows the city-owned and publicly accessible charging stations deployed as of August 2023. The project area indicator in the south-central portion of the map represents the region this charging project would service. The city aims to increase charging accessibility in areas where residents live, work, and commute. Exhibit 6 depicts the existing locations of chargers and how they correlate with EV usage.

Exhibit 6 Atlanta EV use relative to public charging access

Legend:
- L3 EV charging stations (orange)
- L2 EV charging stations (purple)
- Project area (red)
- Atlanta

Bivariate legend:
- Low-High / Both High → EV concentration
- Both Low / High-Low ↑ Dwellings

Source: **Mayor's Office of Sustainability and Resilience**

The city's efforts to strategically map and plan charging access, as well as the partnerships it has formed with ATLDOT, the Atlanta Regional Commission, and organizations such as Hertz, Uber, and EVNoire, underscore its commitment to identifying and providing greater charging access to lower-income multifamily housing.

The Importance of Working in Partnership with Housing Providers

A pivotal step in deploying equitable charging solutions is actively engaging with housing authorities and providers. Even when other stakeholders, such as city officials and utilities, make funding and resources available, housing authorities and owners are usually the final decision makers for whether a charging solution is installed in lower-income multifamily housing communities.

Common concerns related to implementing charging solutions at lower-income multifamily housing include:

1. **Seemingly high up-front costs** of installing chargers and lack of funding

2. **A perception of low demand for charging** resulting in low utilization, and sites being unable to recuperate the installation cost

3. **Concerns regarding higher electricity bills** due to an increase in energy consumption from chargers

4. **A reduction in already limited parking** when some spots are designated for EV charging

5. A perception that charging solutions **fail to meet residents' acute transportation needs**

Charging is a novel technology that demands clear communication with all stakeholders, particularly those unfamiliar with some of the technical nuances. While the challenges mentioned are valid, there are also opportunities to surmount them and address misconceptions. Proactive collaboration with building managers, landlords, and housing providers through knowledge sharing, partnership, and capacity support presents a viable pathway to address and resolve such concerns. Below are a few ways in which the Multifamily Charging Accelerator Project sought to overcome the identified concerns:

1. **Offset up-front costs:** The costs of charging and the promotion of charging access can be funded through utility incentives, state initiatives, and strategic partnerships with charging providers. Additionally, civic bodies should explore providing cost-of-living waivers that include charging and mobility connectivity measures. These avenues represent a way to mitigate expenses for housing providers and residents.

2. **Develop solutions that complement charging to initiate demand:** Partnering with EV carshare providers can alleviate the need for residents to own their own vehicles, enhance connectivity, and provide captive charging demand.

3. **Customize charging fees to offset electricity bills:** Chargers can vary fees for different users. Housing providers can charge a nominal fee to recoup electricity costs or allow residents to charge for free during a set time while the public has to pay to charge. By working with the charging installation provider, building managers and housing providers can find a path forward to ensure their electrical costs are covered.

4. **Overcome parking space concerns:** Explore curbside charging and other parking delegation strategies, such as those elaborated in the Portland subsection of *City-Specific Charging Solution Pathways* on page 29.

5. **Prioritize resident needs:** Affordable housing and accessible transportation are essential for supporting livelihoods, and transportation is critical in providing comprehensive solutions. Residents of lower-income multifamily housing consistently expressed a desire for improved last-mile transportation options and showed an interest in accessible charging as they consider transitioning to EVs. Out of the 23 surveys conducted for this project, none of the respondents opposed the installation of charging infrastructure. Moreover, over 70% responded affirmatively, indicating both interest in and perceived benefits of having charging solutions installed at their residences.

Partnering with housing providers is crucial for delivering community-centric charging solutions that receive support from building management and residents. Effectively communicating the direct benefits of charging solutions, including their integration with other transportation options, and addressing any questions related to transport, electrical engineering, and civil works are crucial for successful deployment. Tailoring solutions to site constraints and residents' needs through proactive partnership and coordination is key to building confidence and securing buy-in from both housing providers and residents. With the advent of transportation electrification, transportation connectivity truly begins at home.

Phoenix

Community-Driven Multifamily Charging Solution: **Two dual-port L2 chargers installed in parking spaces at two city-owned lower-income multifamily housing communities, coupled with increased access to shared e-micromobility services through upcoming service expansion.**

The City of Phoenix has committed to pursuing charging infrastructure deployment at city-owned lower-income multifamily housing communities. Exhibit 7 provides a summary of where these assets are currently deployed. The proposed sites, located near high-traffic corridors, are not easily accessible to major public transport routes, and some do not fall within the city's current micromobility program boundaries. The city recognizes that providing access to charging infrastructure will support existing and future EV drivers, as well as create an opportunity for an EV carshare program to be implemented at these sites, reducing the cost burden on residents of owning a vehicle.

Exhibit 7 Public charging locations in Phoenix relative to multifamily housing
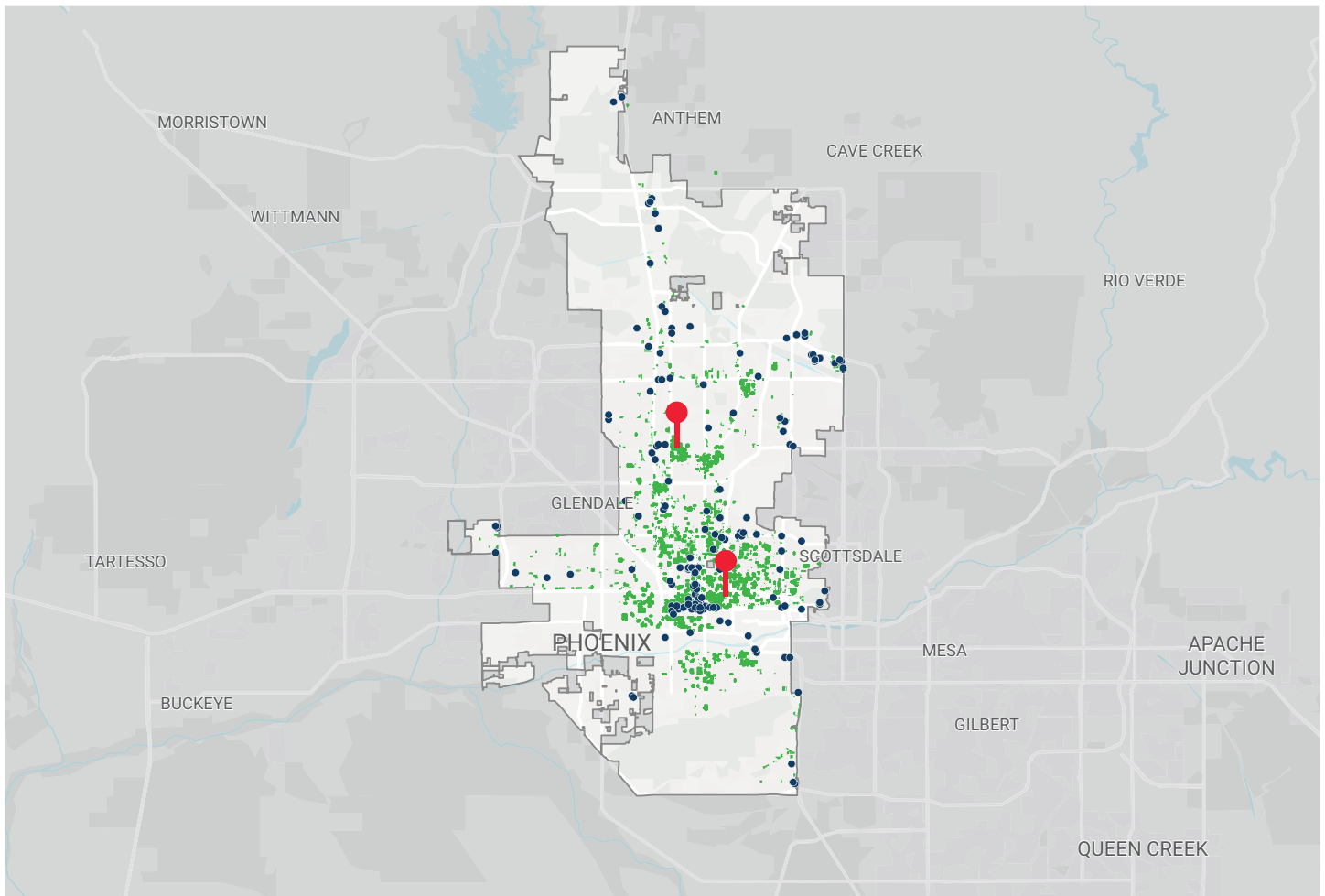
● EV charging stations   ■ Multifamily housing   📍 Project area   Phoenix

Note: While chargers are distributed throughout the city, this map indicates that the current set is not sufficient to serve the scale of multi-family communities.

Source: **Maricopa County Electric Vehicle Charging Locator Map**

This solution would incur two major costs: the cost of the charging equipment and the cost of upgrading electric service at the sites to support it. Depending on the level of service being provided, these upgrades can be significant, leading to total solution costs of up to $50,000 per site.

Although the chosen project sites are at city-owned affordable housing properties, the city could not use internal funds for these charging solutions. The Housing Department had other priorities for its limited available funding and stepped back from direct involvement and investment in the charging solutions.

This part of the funding puzzle is not unique to Phoenix. Rather, it spotlights that the success of similar e-mobility projects depends on **financial support from federal and philanthropic sources, which is critical where state and utility programs are not abundant**.

Because no state, utility, or city funds are available to cover up-front project costs, including charger procurement, installation, and electric infrastructure upgrades, the city has committed to acting on this charging solution pathway by including a request for funds for this project in its applications for the 2024 Climate Pollution Reduction Grant and the Gila River Indian Community Grant.[i] If it receives grant funding, the city may either own the charging infrastructure at the sites, or use its existing relationship with Blink Charging to install and operate the charging stations.

A related implementation pathway is for the city to contract with a service provider to deploy an **EV carshare and a charging site concession agreement**, with one vendor deploying EV carshare vehicles while a charge point operator contracts to own, operate, and maintain the on-site charging infrastructure. The city is exploring the business and operation models of successful carshare providers and will soon release a request for proposals from carshare program providers. Special consideration will be given to the pricing structure of such a program to ensure it is affordable for residents and that program costs do not translate into higher rents or amenity fees.

Along with charging and e-mobility solutions, adding a solar canopy at each of these parking sites was strongly recommended to deliver co-benefits relevant to multifamily housing communities. Specifically, APS's Solar Communities Program, which supported the installation of solar canopies over parking lots at lower-income schools and multifamily housing communities, was originally explored as a potential opportunity to cover the cost of providing solar power and shaded parking as well as upgraded electrical service to support EVSE installation. However, regulatory limitations on the program would not allow for cost coverage for EVSE make-ready programs. In addition, the Arizona Corporation Commission, which regulates APS programs, voted to discontinue the solar program in early 2024.

Although there is no program in APS territory that can support the joint installation of solar and EV charging, the hope is that future programs will permit recipients to stack cost-sharing benefits to "dig once" when completing electrical upgrades for solar parking canopies and EV charging. This would offer a unique opportunity to capitalize on an abundant natural resource in the "Valley of the Sun" while optimizing project efficiencies.

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i   The US Environmental Protection Agency's Climate Pollution Reduction Grant is a federal program providing funds to states, local governments, tribes, and territories to implement projects to reduce carbon emissions, including transportation projects. The Gila River Indian Community Grant is a state proposition providing funding to municipalities to promote public safety and transportation connectivity.

While the city works to implement EV charging at multifamily housing communities, resident input also suggested that access to e-micromobility would help meet many residents' current transportation needs. The City of Phoenix's Department of Street Transportation has committed to using this report's findings to identify boundaries in an expansion study to better meet transportation needs. The city's Shared Micromobility Program is working to expand its offerings beyond existing service areas and along the extended light rail corridor.[7] This expansion would help to bridge the gap in public transport access, especially for lower-income multifamily housing communities such as those that participated in this project.

Deploying e-Micromobility Options with Charging to Enhance Connectivity

The most popular EV model in the United States and global markets is the e-bike. In 2022, over 280 million electric mopeds, scooters, motorcycles, and three-wheelers were on the road worldwide versus 20 million electric cars and 1.3 million commercial electric buses and heavy-duty trucks.[8]

E-Micromobility solutions not only have the potential to alleviate transportation gaps and cost burdens but also may be better suited to meet specific mobility needs of residents of lower-income housing communities, providing enhanced connectivity to public transit modes. For example, Lyft has found that 89% of its e-micromobility trips have been directed to connect with transit.[9] With intentional planning and partnership, cities can create much stronger linkages between lower-income multifamily housing communities, e-micromobility, and transit.

For instance, the City of Phoenix launched its permanent Shared Micromobility Program in 2023. As part of the city-managed program, program vendors Lime and Spin have to offer options for individuals with disabilities and reduced rates to individuals receiving government assistance. Lime and Spin also must deploy 30% of their fleet within the city's designated Equity Zones, where historical disinvestment has resulted in a lack of transportation and economic opportunity. Discounted rates are also automatically applied for trips that begin in Equity Zones. The city is seeking to expand program service areas and is actively engaging with communities to determine where e-micromobility would be most utilized.

One important takeaway from engagement with residents of lower-income multifamily housing is their concern about where e-micromobility can be safely used. E-micromobility is currently restricted in many low-speed areas and on nonmotorized paths such as trails and canal banks, making it difficult for riders to locate separate, safe spaces. Also, because these modes travel at speeds that can be competitive with cars and faster than non-electric or "acoustic" bicycles, it would be ideal to create **protected, dedicated travel lanes for e-micromobility** rather than encouraging cooperation with cars or acoustic bikes. As the popularity of e-micromobility grows, states are working to define requirements for licensing, registration, and regulation. This process will continue to develop as states distinguish rules for pedal-assisted e-micromobility and self-propelled, throttle-assisted e-micromobility. As this happens, built space will need to adjust to make room for equitable, safe operation of all transportation modes.

Portland

Community-Driven Multifamily Charging Solution: **One dual-port L2 charger (with future installation of additional rooftop solar photovoltaic [PV] panels to offset charging costs) and operation of a community EV carsharing program.**

Portland, through the Oregon Department of Transportation (ODOT) and local funds including the PCEF, has a variety of resources to help scale transportation electrification, especially for underserved communities. The main concern with adding new charging is not covering its cost but rather introducing it without an accompanying EV prioritized for resident use. RMI and CCC agreed that piloting **a resident carsharing program with EV charging could help address residents' ad hoc trips**, from doctors' visits to grocery runs, as well as sometimes speed up commutes compared with public transportation.

RMI, Portland Bureau of Planning and Sustainability, and CCC researched and spoke with a number of carshare providers, and ultimately partnered with ZEV co-op (see *Community EV Carshares to Enhance Mobility Access*). CCC decided that before investing in a carshare, it needed a better understanding of residents' likely usage, so it applied for a PCEF planning grant to fund a study.

In the meantime, CCC is working to **accelerate transitioning its fleet to EVs and will explore providing those EVs to CCC residents when staff are not using them, such as on weekends. CCC is also exploring deploying a charging solution that will work with the project site's existing electrical capacity**. The potential PCEF funds will also be used to compare the costs and benefits of different carshare operating structures. Under one structure, ZEV co-op and Mobility Development Solutions, a national carsharing platform, would own and manage the EVs at CCC properties, with CCC subsidizing residents' access. Under another structure, CCC would own the EVs and chargers, and ZEV co-op would provide the user platform, personnel to manage the carshare, and vehicle maintenance for a monthly service fee.

ODOT offers financial incentives to support EV charging deployment in targeted communities, covering up to 75% of installation costs, up to $5,500. CCC is considering applying to ODOT's next round of Community Charging Rebates Program to finance an L2 charger. RMI also explored **cost-sharing solutions, including how installing rooftop solar could offset the charging cost**. The building already has several PV panels and ample unused roof space; however, ODOT cannot cover panel costs. PGE confirmed one new charger should not trigger any electrical upgrades.

RMI proposed placing the charger outside the ground-level utility room, which houses the central electrical panel, to minimize any boring or digging expenses inherent in EV charging trenching. That spot would also become the reserved postal service space. The spot currently designated for postal delivery, directly outside the building's entrance, could be repurposed as an additional accessible parking space, which residents said was needed.

Portland's primary first- and last-mile service is BIKETOWN e-bikes. BIKETOWN intends to expand coverage in outer Portland boroughs, including where the project site is located. Personal bikes would also be an asset for many residents seeking to reach the nearby TriMet stop or even city center. Building management will consider **making residents aware of Portland's upcoming e-bike rebate** program once it is available and work to provide safe e-bike storage and charging at the building.

Community EV Carshares to Enhance Mobility Access

Electric transportation and shared mobility options can reduce emissions and local air pollution. In the United States, EVs produce 60%–68% fewer emissions than internal combustion engine vehicles. Through smart charging, EVs can reduce emissions an additional 18%.[10]

However, owning a personal vehicle — whether gas, diesel, or EV — is expensive. The average American car costs approximately $1,074 per month.[11] Carshares offer a much more affordable alternative to personally owned vehicles. RMI estimates the average monthly cost of a carshare membership ranges from $50 to $90 — significantly less than the cost of owning a personal car.[12] A variety of carshare entities operating today, including private entities and cooperatives, are working to expand the number of carshare vehicles and EVs in disadvantaged communities.

CCC, which owns and manages several multifamily housing residences in Portland, is exploring operating a community EV carshare. Many of its residents commute to downtown or suburban jobs via public transportation, which from Northwest Portland takes on average 30 to 40 minutes longer than traveling by car. Several residents shared that they rely on relatively expensive Uber and Lyft rides or friends and family to drive them rather than take public transportation.

Residents' mobility needs and expressed preferences make a strong case for introducing a community carshare. To ensure the usefulness and utilization of charging, this project sought to identify how an EV carshare could operate at Portland multifamily housing communities. After considering Zipcar's model and GoForth's community EV carshare model,[ii] the project team and CCC pursued a partnership with the ZEV co-op, a Washington-based, equity-focused community carshare. ZEV co-op works with sites to provide more affordable rental rates and priority access to lower-income residents. CCC is working on an application for a planning grant from PCEF to develop its carsharing concept further and quantify the project's community benefit and impact in more detail.

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ii   GoForth community charging served as a practical model for how to implement EV carsharing at lower-income housing sites.

Recommendations for Scaling People-Centric, Equitable Charging and Mobility Solutions

The key to achieving equitable EV charging solutions for lower-income multifamily housing residents is to engage directly, listen, and let resident insights drive transportation solutions. The following are recurring themes that must be at the core of accessible and affordable charging solutions.

Prioritize community needs and engagement: Charging solutions must be tailored to meet residents' and communities' acute transportation and mobility needs. Any proposed solution should be based on their input. Conducting resident surveys and creating space to have open dialogues with residents about e-mobility opportunities, charging, and their transport needs should be a central part of project research and inform solution design.

Community education and addressing community members' questions and concerns are also essential components of engagement for raising awareness and fostering acceptance of e-mobility as a transportation solution. By bringing chargers, EVs, e-bikes, and e-scooters to the sites during resident engagement meetings, the team was able to address misconceptions, and residents were able to ask questions as well as visualize how these technologies could work to meet differing transport needs. Basic educational awareness about what an EV is, how chargers work, and how charging a vehicle is similar to and different from charging other devices was central to opening communication channels and developing mutual understanding with residents. This enriched the engagement process and helped inform the charging solutions identified following these conversations.

Foster affordability: Determine how public incentives, such as civic, state, utility, and federal grants, and other creative solutions can be used to defray the cost of installing and using charging infrastructure. Incentives can also be used to offer e-mobility options that eliminate the need for and cost of personal vehicle ownership. (See *Appendix C: Mobility and Charging Incentives* for examples found in this project.)

Additionally, it is important to recognize that making charging rates affordable ensures that lower-income residents have equitable access, reducing their overall transportation expenses and potentially improving the economic viability of EVs.

Design for the local context and emphasize reliability: Close coordination with the local utility to assess power capacity and ideal charging placement can significantly reduce costs. It is important to strategically consider the location of charging solutions and their interconnection with nearby panels and electrical systems to avoid unexpected expenses later. Factors beyond cost, such as parking constraints, should also be considered. Installing curbside charging near multifamily housing can address concerns about competing for resident parking spaces while providing access to both residents and the wider community.

Operational functionality must be a primary consideration as well. Functionality, durability, user friendliness, ease of repair, and long-term reliability of chargers are critical, particularly in community spaces. These factors should be built into the selection of and contracting process for a charging solution.

Form meaningful and inclusive local partnerships: Actively involve local community organizations, building management, and community members throughout the engagement process to ensure community perspectives are a central focus in charging solution identification. Doing this will help foster trust while addressing technological concerns and effectively contextualizing the solution.

Additionally, explore strategic partnerships between public agencies and private businesses that can offer funding, donations, or discounted services to ensure that the best technology available (both in terms of charging and mobility) can be affordable to lower-income communities. Exhibit 8 offers examples of partners that can enhance mobility services to multifamily housing residents.

Exhibit 8 Activating partnerships to advance charging solutions

Entity	Services
Utilities	• Capacity planning and technical assistance for charger placement • Make-ready programs for charger installation • Electricity cost coverage or discounted EV rates • Flexible funding for solar projects that include EV charging infrastructure
Charge point operators	• Public–private partnerships to deploy infrastructure or maintain charging assets
Maintenance and charging installation providers	• Maintenance and installation by an EVSE-certified electrician (e.g., certified by the Electric Vehicle Infrastructure Training Program) to ensure proper connectivity with the electrical panel or transformer • Charging equipment maintenance contracts with specialized services so site personnel are not responsible for maintaining chargers
Local community-based organizations	• Technical support, existing knowledge base of transportation electrification access advocacy
EV carshare providers	• Short- and long-term EV rental or carshare programs could provide affordable options for residents to experience EVs and mobility solutions when other means are not conducive to their needs
E-micromobility providers	• App-based e-micromobility services often provide discounted rates for lower-income communities • Form partnerships to locate stations near lower-income multifamily housing communities, providing access to those who cannot afford other means of transportation and do not have frequent access to public transportation

RMI Graphic. Source: RMI analysis

Implement complementary mobility solutions: Where possible, combine charging solutions with EV carshare and e-micromobility charging to improve transit connectivity and reduce the need for individuals to own and maintain personal vehicles. This benefits both transportation users and infrastructure owners, ensuring that the infrastructure is utilized effectively.

Develop an incremental change approach: While working toward systemic policy changes and funding availability to further access to EV charging for residents of lower-income multifamily housing, seek to implement short- to medium-term mobility and charging solutions through grants and strategic partnerships (see Exhibit 9 for examples). Through the following listed actions, projects can seek to make incremental changes to move toward the long-term goal of providing charging access in lower-income neighborhoods:

- *Technical capacity support:* Socialize and explain project electrical, hardware, installation, and operating costs to key project stakeholders.

- *Educational resources:* Provide community members with clear resources for available local, regional, and federal incentives.

- *Stakeholder engagement:* Identify EV carsharing organizations, charging providers, and local transportation departments to explore opportunities for collaboration.

- *Grant funding assistance:* Identify strategic funding opportunities to further the planning or development of charging infrastructure and transportation electrification.

- *Community engagement and documentation:* Work to clearly document community needs and interest in charging and transportation access and include these communities more efficiently in future connectivity expansion plans.

- *Community-driven solutions:* Identify change levers and pathways to unlock future charging implementation by starting with a pilot project and adopting an incremental change approach.

Exhibit 9 Opportunities to drive incremental access to charging

Exploring Needs and EV Options	Bridging Gaps	Committing to Scaling Solutions
Building Management • Survey residents about transportation needs to gain an understanding of the types of solutions that have the largest impact. **City Officials** • Conduct workshops on the types of charging infrastructure incentives available and how to access them. • Apply for grants immediately if applicable. **City Officials, EV Providers, and Building Management** • Host events for residents to provide hands-on experience with EVs, e-bikes, and e-scooters. • Identify how a tailored charging solution approach can meet needs. • Offer weekly shuttles to the grocery store or other places residents frequent using electric modes.	**Local and State Officials and e-Mobility as a Service (eMAAS) Providers** • Partner with EV carshare or car rental businesses to offer discounted rates to lower-income households (focusing on multifamily housing residents). • Partner with Lyft, Lime, or other micromobility companies to install docking stations next to multifamily housing communities. **Building Management and eMAAS Providers** • Invite app-based e-mobility personnel to introduce vehicles and apps to residents to bridge technology gaps. **City Officials, eMAAS Providers, and Charging Providers** • Run workshops to inform residents on EV operability. • Provide informational pamphlets on where residents can charge.	**Local and State Officials and Utilities** • Develop a utility incentive program that provides make-ready funding and support. **City Officials, Utilities, and Building Management** • Untangle cost burdens by determining and agreeing on cost distribution across relevant stakeholders. • Create frameworks for building a network of charging solutions across as many lower-income multifamily housing communities as possible. **Local and State Officials** • Create EV-supportive building codes and performance standards • Build road infrastructure to expand e-micromobility access for diverse residents (i.e., protected bike lanes). • Establish long-term funding that is targeted toward providing charging solutions for lower-income multifamily buildings and encourage cross-stakeholder collaboration.

RMI Graphic. Source: RMI analysis

Appendices

Appendix A: Cost Estimates for Installation

Exhibit A1 outlines how at-home charging often proves the most affordable charging option, detailing charging costs at home, at a public L2 charger, and at a public DCFC.

Exhibit A1   ## Charging type and expected charging cost for EV drivers

Charging type	Cost per kilowatt hour (kWh)	Range and battery size	Cost for full charge
At-home (charger type agnostic)	$0.017–$0.23	150-mile range 40-kWh battery	$0.68–$9.20
L2	$0.20–$0.30	150-mile range 40-kWh battery	$8.00–$12.00
DCFC	$0.36–$0.48	150-mile range 40-kWh battery	$14.40–$19.20

RMI Graphic. Source: **Georgia Power**; **California Air Resources Board**; *electrek*

Across each city, RMI worked with local utility providers to provide detailed cost estimates for a charging solution's capital and operational expenditure. Exhibits A2 and A3 show detailed cost estimates for the proposed solution in Atlanta, the cost of installing three dual-port chargers along the curb, and the cost of adding a transformer and panel. These figures contextualize upgrading costs; however, every project is different, and the site location and grid capacity will significantly impact the total cost.

Exhibit A2   **Capital cost of charger installation**

Capital cost	Approximate cost
Electrical infrastructure (new transformer, power cabinet, wiring, trenching)	$135,000
Charging hardware (three dual-port chargers, networked chargers)	$5,000
Connecting the chargers to the network and providing that connectivity	$1,000
Charger plugs	$3,000
Installation	$6,000
Civil work striping and signage	$3,000

RMI Graphic. Source: RMI analysis

Exhibit A3   **Operational costs of chargers**

Item	Approximate operational cost
Monthly electrical costs for charging use	$600 in total for use of all ports
Average expected monthly maintenance cost	$60

RMI Graphic. Source: RMI analysis

Appendix B: Resident Survey Questions and Insights

RMI used surveys to gain insights into residents' mobility needs across the Atlanta, Phoenix, and Portland sites. The survey was used as a method to guide conversations with residents to get a holistic view of the residents' mobility experience. Focusing on their experiences enabled the charging solutions to be people centric. The surveys also provided an opportunity to identify EV awareness and education needs.

The following questions were asked of residents:

1. Do you consent to taking a quick survey with me?

2. Do you have any questions before we start?

3. If applicable, what kind of transportation do you use to get to work and/or for personal trips? How long does it take to get there?

4. Do you feel safe from cars when walking or riding a bike in this neighborhood?

5. Do you face any challenges in your day-to-day travel to work or other places you need to be?

6. Have you heard of electric cars, electric bikes, electric scooters/mopeds?

   If yes,
   - A. Have you driven/ridden in one?
   - B. Would you be interested in using one occasionally or for your daily needs?

   If no,
   - A. Would you like to learn more about electric transportation options?
   - B. What kinds of questions do you have about it?

7. What challenges do you anticipate with using an electric car, bike, scooter, or moped for your current and future transportation needs?

8. If electric cars were available here at your building to be used by residents and/or if chargers were installed on site or along the street to charge electric cars, bikes, scooters, or wheelchairs, could you envision yourself using that equipment either now or in the future?

9. Is there anything else you'd like to share with us?

Structuring conversations with residents (based on the method depicted above) allowed RMI to identify charging solutions. For example, if residents were using multiple modes of transportation, this could indicate that solutions do not need to be limited to installing EV charging and can incorporate other mobility solutions for shorter commutes. Alternatively, if quantitative data suggested that residents mostly use public transit but face long commute times, RMI and relevant stakeholders could consider offering charging solutions that cut commute times. Examples include offering charging solutions for e-bikes or e-scooters that connect residents to other transportation systems. Quantitative insights from the three cities were integral to understanding resident trip patterns and needs, to determine how charging solutions could best fit resident transportation needs, interests, and goals.

Appendix C: Mobility and Charging Incentives

RMI collected information on shared mobility, e-mobility, and EV charging incentives available to residents and businesses in each city. Where possible, RMI also prepared informational flyers that were distributed to residents and building management during site visits. Exhibit A4 summarizes incentives by city. Such an assessment can help identify where additional funding is needed to make charging and mobility solutions more accessible and affordable for residents of lower-income multifamily properties.

Exhibit A4 **Tracking EV-related incentives available in each Multifamily Charging Accelerator Project City**

Region	Incentive Type	Incentives
Federal	**Electric Cars**	• The federal Clean Vehicle Credit offers ≤$7,500 in tax credits to buy a new or preowned EV.
Atlanta	**EV Charging**	• The State of Georgia provides a ≤$2,500 tax credit per EV charging station. • Georgia Power's Make Ready Infrastructure Program covers up-front costs for public-facing or public-serving fleet chargers, and manages charger design, installation, ownership, and maintenance. Chargers must be open to the public or for public fleets. Installation must also be for ≥6 L2 charger ports or ≥1 DCFC.*
	Electric Cars	• Georgia offers ≤$2,500 to switch from a gas-powered to alternative fuel vehicle. • Hertz has partnered with Uber and Lyft to offer EV rentals for ride-hailing providers; EV rentals range between $310 and $380/week, plus taxes and fees.
	E-bikes and E-scooters	• Atlanta's e-bike rebate, released in early 2024, offers lower-income residents a $1,500 rebate for a standard e-bike and $2,000 for a cargo e-bike (non-income-qualified residents can receive $500 for an e-bike and $1,000 for a cargo e-bike). • Supplemental Nutrition Assistance Program (SNAP) or Medicaid recipients or residents of Atlanta's federally subsidized housing qualify for Lime and Bird's access program, offering three rides per day for $5 a month.
Phoenix	**EV Charging**	• Salt River Project offers a $250 per port rebate for residential L2 chargers; a $4,000 per port rebate for multifamily housing to install L2; and a $20,000 per port rebate for government and nonprofit customers to install a DCFC. It also offers an additional $1,000 rebate per station for L2 chargers and $5,000 per station for DCFC installed at a multifamily property in a Justice40 disadvantaged community.
	Electric Cars	• Arizona's Alternative Fuel Vehicle (AFV) license tax offers AFVs registered in the state $4 for every $100 in assessed value.
	E-bikes and E-scooters	• Lime and Spin, operators of the Phoenix Micromobility Program, provide discounted e-bike and e-scooter rentals through their access programs to lower-income households receiving government assistance.**

Region	Incentive Type	Incentives
Portland	**EV Charging**	• ODOT's Community Charging Rebates Program offers ≤$5,500 per charging port at publicly accessible spots or multifamily buildings and ≤$3,500 at workplaces (both at ≤75% of eligible project costs). • The Oregon Community Renewable Energy Grant Program funds local governments, tribal entities, districts, and consumer-owned utilities to plan and develop community renewable energy and energy resilience projects, including EV charging stations. • PGE offers a ≤$2,300 rebate per port installed at multifamily properties and an additional ≤$1,000 rebate for lower-income applicants enrolling in PGE's EV Smart Charging Program. • Pacific Power offers ≤$4,500 per port (≤75% of total costs and 12 ports per site) at multifamily buildings.
	Electric Cars	• The Oregon Clean Vehicle and Charge Ahead Rebate program offers low- and moderate-income residents ≤$7,500 on the purchase or lease of a qualifying EV (≤$2,500 for non-qualifying residents). The rebate was temporarily suspended in May 2023 due to oversubscription. • GoForth Electric CarShare offers Oregon members ~$5/hour carshare rentals, plus free, self-service EV test drives before becoming a member. Free2Move and Zipcar have a larger EV coverage in Portland but at less competitive rates then GoForth's community carshare.
	E-bikes and E-scooters	• Residents receiving government assistance qualify for a free helmet and BIKETOWN membership, which does not charge for the first 60 minutes of a ride and charges $0.05 per minute thereafter.

Notes:

* Information about the Make Ready Infrastructure Program is available on **Georgia Power's website**.
** Information about the Shared Micromobility Program is available on **City of Phoenix's website**.

RMI Graphic. Source: RMI analysis

Endnotes

1 Alessandra R. Carreon et al., *Increasing Equitable EV Access and Charging: A Path Forward for States*, RMI, October 2022, **https://rmi.org/insight/increasing-equitable-ev-access-charging/**.

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