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ELECTRIC MUNICIPAL UTILITIES AND THE TRANSITION TO A CLEAN ENERGY FUTURE

A Guide for Municipal Utility Leaders

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C. Promote Beneficial Electrification for Buildings and Transportation

Among the wide-ranging changes taking place in the power sector, one of the more striking is the opportunity for beneficial electrification: electrifying end uses historically powered by gas or oil. Beneficial electrification provides one of the biggest opportunities in the power sector today to connect customers with more affordable and cleaner resources and to improve management of the grid and reduce harm to the environment and public health. Beneficial electrification can reduce customers' costs in the long run and help make more effective and efficient use of the electric grid and is a necessary prerequisite to eliminating carbon emissions from the power and transportation sectors by replacing oil and gas combustion, especially when utilizing generation from renewable sources. For electrification to be considered beneficial, it must provide a net benefit that (1) saves customers money over the long run, (2) enables better grid management or (3) reduces negative environmental impacts.

First, electrifying end uses can reduce customers' long-run costs because most forms of electrification are more efficient than their fossil-fueled counterparts. These efficiencies decrease overall energy use and operating costs. Additionally, depending on the level of adoption of these end uses, all electricity ratepayers can enjoy these benefits through the associated system benefits, not just those who installed these innovative technologies.

Due to the flexibility of many forms of electrification in buildings — including water heating, some forms of space heating and transportation electrification via EVs — these end uses can help increase grid flexibility. Because EVs and electric water heaters are flexible in when they draw power and are used, they can function like batteries. This flexibility enables a shift in load to times when there is less demand for electricity, when electricity is cheaper or when renewable energy generation is abundant and away from times when there is greater demand and the need to draw upon more expensive and often more polluting generation resources. With the electrification of EVs and space and water heating, utilities are in a position to improve their ability to manage loads and share cost savings with ratepayers.

Beneficial electrification can help reduce environmental impacts by using less energy than fossil-fueled alternatives, by providing the ability to reduce

reliance on often dirtier resources used to serve electric system peaks and by adding the flexibility that can make the grid more capable of accommodating variable generation resources like wind and solar. A key point here is that as long as we are reducing the carbon intensity of the grid, as we have been since 1990, every electrical device powered by the grid is getting cleaner throughout its life.[106]

All of the electrification options below may benefit from incentives to encourage customer adoption. Financial incentive programs for customer adoption of EVs, electric heat pumps and electric water heaters are widely used around the country. Incentives can come from the municipal utility (typically through rebates), third-party energy efficiency providers or governmental agencies or programs (through rebates, loans or tax incentives).

One way municipal utilities can incentivize electrification is through rebates for more efficient appliances. Hutchinson Utilities Commission in Minnesota has a joint website with Bright Energy Solutions that provides information for their many rebate programs, both residential and commercial, covering multiple Energy Star appliances, air conditioning, and more — all in one convenient place.[107]

Municipality- or utility-financed early appliance retirement programs (aka "cash for clunkers") can also motivate customers to make more reasoned decisions about water heater or space heater replacement. Rather than having to make a purchase decision under duress when an appliance breaks down, customers can consider replacing aged appliances in a more thoughtful and reasoned manner. Early retirement programs can identify appliances that are nearing the end of their useful lives, and then work with customers to replace them before an emergency purchase is required.[108]

Electrification of buildings, through space and water heating, and transportation offers municipal utilities a lot of flexible load that can be shifted to accommodate renewable energy and to decrease peak load. It is also an opportunity for customers to save money on more efficient appliances and vehicles and is an important step in meeting clean energy goals and achieving the clean energy transition. Below are some options municipal utilities may consider for beneficial electrification of buildings and transportation.

1. Building Electrification Components

While we tend to think of buildings as stationary, inflexible structures, they have the potential to dynamically interact with the electric grid. Electrification of space and water heating is key to this flexibility.

a. Electrification of Space Heating

Because space heating represents such a sizable proportion of energy use in the average home, it is a key focus for electrification efforts. Electric space heating, especially with new heat pump technology, will reduce customer costs, enable better grid management and lessen environmental impact. Most space heating currently relies on fossil fuels, such as home heating oil, propane and gas. Beneficial electrification of space heating represents multiple opportunities for customers to save on their total energy bills by switching to a more efficient heating technology (depending on the housing type and region); for municipalities and grid operators to secure valuable grid management benefits; and for a significant reduction of greenhouse gas emissions.[109]

b. Electrification of Water Heating

Water heating accounts for almost 20% of residential energy bills, and put simply, today it can take far less energy to heat a gallon of water with electricity than directly with fossil fuel. Transitioning from fossil-fueled water heaters to electric resistance and heat pump water heaters is an important step in achieving a low-carbon economy. Electric water heaters also enable improved grid management through control of their energy use or charging. Electrification load is often relatively flexible for when it draws power from the grid. Generally, as long as customers can take a hot shower when desired, they do not care about when their water heater is drawing power. As a result, water heaters can

106 Roberts, D. (2017, October 27). *The key to tackling climate change: Electrify everything.* Vox. https://www.vox.com/2016/9/19/12938086/electrify-everything. For more information on beneficial electrification, see Farnsworth et al., 2018.

107 Bright Energy Solutions. (n.d.). *Hutchinson Utilities Commission.* https://www.brightenergysolutions.com/municipalities-container/mn/hutchinson-utilities-commission/

108 Farnsworth et al., 2018.

109 Shipley, J., Lazar, J., Farnsworth, D., & Kadoch, C. (2018). *Beneficial electrification of space heating*. Regulatory Assistance Project. https://www.raponline.org/knowledge-center/beneficial-electrification-of-space-heating/

serve as thermal storage of energy supplied at other times of the day, helping to balance the grid.[110] For example, the Maui Electric Company utilizes connected water heaters to prevent the curtailment of wind power.[111]

2. Activating a Grid-Interactive Building

Buildings can be made into a valuable grid resource by focusing their energy demand reductions at high-cost times or shifting load to times of day when excess renewable energy is being produced. For buildings to be grid interactive and provide value to the grid, space and water heating needs to be electrified. However, electrification alone doesn't automatically yield grid benefits. Building electrification could adversely impact the grid if those new loads are exacerbating peaks.[112] Conversely, if electrified buildings are also grid interactive through controlled technology and policy programs, they can be part of a strategy to increase energy savings, manage grid resources and integrate more renewable energy, reduce system costs and improve customer economics and productivity.

Incorporating building electrification as a valuable resource to municipal utility actions involves many of the strategies we have discussed above, including energy efficiency, demand management and rate design. A fundamental first step, however, is to ensure that building electrification programs are able to reach all utility customers. This will first require an understanding of all of the communities being served and the barriers different communities may face.

All building electrification programs face challenges such as the upfront costs of appliances, electrical upgrades and other building modifications, depending on local circumstances. One of the issues that needs to be addressed is assuring that the conversion from gas to electric will save customers money. This can be determined by comparing the total cost of an electric and gas bill with the cost of an all-electric bill. Low-income and environmental justice communities often face additional challenges.[113] As noted in *Renovating Regulation to Electrify Buildings*, "many low-income households rent rather than own their homes and therefore do not have the ability to make decisions about appliances like water heaters and stoves. Landlords, meanwhile, have little or no incentive to spend money on equipment upgrades that would only benefit renters who pay the utility bills. Therefore, creating programs that allow landlords to replace gas appliances with electric appliance and providing the landlord with the cost differential if there is one or providing a rebate could be helpful to incentivize landlords. Low-income households also tend to live in buildings that are in relatively greater need of weatherization and other basic upgrades and repairs, which can pose a challenge to electrifying their energy uses in ways that increase their home comforts and lower their bills. But without electrification, these households will potentially be left behind, relying on an increasingly unaffordable fossil gas system and bearing a larger and larger share of that system's fixed cost — while wealthier customers electrify and disconnect from fossil gas."[114] Addressing these barriers will take explicit focus.

As not-for-profit, community-owned entities, municipal utilities are uniquely situated to address many of the challenges of building electrification by working with municipal governments and without the bias toward capital investments that for-profit utilities face. To electrify buildings, municipal utilities can take the following steps:

- Ensure building electrification benefits reach everyone, including low-income customers and environmental justice communities. Doing so will require an affirmative effort to reach out to affected communities to ensure that solutions will address the specific barriers to electrification that they are facing. Working with the municipal government to target financial incentives and address coordinated efforts on energy efficiency and weatherization along with electrification may be useful.

110 Farnsworth, D., Lazar, J., & Shipley, J. (2019). *Beneficial electrification of water heating.* Regulatory Assistance Project. https://www.raponline.org/wp-content/uploads/2019/01/rap-farnsworth-lazar-shipley-beneficial-electrification-water-heating-2019-january-final.pdf

111 Lazar, J. (2016, February). *Teaching the "duck" to fly — 2nd edition.* Regulatory Assistance Project. https://www.raponline.org/knowledge-center/teaching-the-duck-to-fly-second-edition/

112 Shipley et al., 2021.

113 Environmental justice communities are communities that are disproportionately affected by pollution and other environmental hazards. Their residents are more likely to be people of color. See Mikati, I., Benson A. F., Luben, T. J., Sacks, J. D., & Richmond-Bryant, J. (2018, March 7). Disparities in distribution of particulate matter emission sources by race and poverty status. *American Journal of Public Health*. https://ajph.aphapublications.org/doi/10.2105/AJPH.2017.304297

114 Shipley et al., 2021.

- Illuminate and reveal the value that demand flexibility can provide. Because all utility systems are different due to various factors — generation mix, climate and weather, customer base and economics, among others — it is important to understand the value that electrified grid-interactive buildings can provide for a specific utility. Pilots or programs starting with municipal buildings can help illuminate the various value streams produced by demand flexibility from reducing things like peak demand, grid congestion and renewable curtailment.
- Structure rate design to communicate the system value of flexible load so customers are able to respond and receive benefits if they reduce demand at times of system stress and help utilities avoid associated costs (see Section II-B: Capture Demand Side Flexibility).
- Reassess programs and goals. Incorporating review opportunities into programs and policies can allow for reassessment and improvements in the future.

3. Transportation Electrification

Electrification of the transportation sector (cars, trucks, buses, taxis, ports, etc.) provides an opportunity to save citizens money on transport, increase local jobs and businesses, address national security concerns, improve public health and combat climate change. Real-world experience and studies show that these benefits can be achieved, but proactive policies are needed to realize the full magnitude of these benefits. Without an early and comprehensive approach, potential benefits will be lost. High levels of EV adoption with smart charging can provide benefits to all of society — not just EV owners — and the grid. The converse is also true. Inaction in this area could lead to slow penetration of EVs, problems with uncontrolled EV charging, sporadic access and forgone societal benefit.

a. Understand the Federal and State Context

Experience shows that government policies can accelerate the transition to EVs. By early 2019, 48 states plus the District of Columbia had taken action on regulation, financial incentives or market development initiatives related to electric vehicles.[115] Municipalities should maintain awareness of federal and state activities that can augment or support municipal actions on EVs, including checking:

- **Federal and state goals.** Federal funding requires certain state plans. If a state has set EV goals, municipalities may have specific EV procurement requirements or targets to build into municipal plans. If not, municipalities can take steps to create a plan of their own. If a municipality has adopted EV goals, these goals may affect the utility, both for vehicles used and the amount of vehicle charging the utility should provide and plan to provide in the future. If federal and state goals have not explicitly addressed EVs and charging infrastructure for low-income and rural communities, specific municipality and utility focus on this may compensate for gaps in state goals.
- **Federal and state incentives**. Municipalities should become familiar with state and federal incentives, both for purchase of electric vehicles and EV charging infrastructure. Municipalities can then assess gaps in incentive structure and determine in which areas to offer municipal incentives. Municipalities and the municipal utility should ensure transportation benefits are shared equally, which may require incentives particularly focused on low-income communities.
- **State building code provisions**. Updating building codes to support EV charging is important to adoption of EVs. Codes can require that new buildings be EV-ready — that is, have the infrastructure to enable installation of EV charging. Some municipalities will be able to adopt EV-ready building codes on their own if they are in a home rule state wherein the state's constitution grants municipalities the ability to pass laws or, in this case, building codes to govern themselves as they see fit, within the bounds of the state and federal constitutions. Other states only allow limited authority to local governments, and they are not able to set their own building codes. In these states, municipalities may need to work with a state building codes body to ensure adoption of EV-ready building codes. Municipalities and municipal utilities can also focus specifically on the needs of low-income communities to ensure renters and multi-unit dwellings are addressed in building code electrification plans.
- **State and third-party private EV plans**. Some states are creating statewide EV plans that may include purchase goals, infrastructure plans, and incentives.

115 Carr, A., Lips, B., Proudlove, A., & Sarkisian, D. (2019, May). *50 states of electric vehicles: Q1 2019 quarterly report.* North Carolina Clean Energy Technology Center. https://nccleantech.ncsu.edu/wp-content/uploads/2019/05/Q1-19_EV_execsummary_Final.pdf

Municipalities should also determine if any third-party private infrastructure plans would impact the municipality. Understanding state level and private EV plans, and intra-state or regional plans, particularly for EV infrastructure, can help municipalities determine the most effective EV investments for them, such as buses or light-duty vehicles. Municipalities and municipal utilities, with a better focus and understanding of their community, will also be able to assess the electrification needs that will most effectively meet the needs of low-income and rural community members.

- **Public utility commission or public service commission requirements**. Regulatory commission requirements for utility programs and EV pricing programs and any requirements on municipalities need to be ascertained. The regulatory commission authority over municipalities varies by state. In some states, the commission may have authority over all municipal utility rates; in others, the commission may regulate rates only outside municipal limits or under specific conditions, such as if there is a vote of municipal members, direct competition with another utility and so on.[116]

Understanding of the federal and state context for EV goals, planning and incentives will help municipalities determine the most effective steps they can take to support EVs that augment and expand state efforts.

Municipal governments have opportunities to take significant action on EVs and may provide leadership in advance of federal and state goals. Municipal actions can also provide guidance to customers to enable the benefits of transportation electrification. Key actions in the following areas are necessary to achieve this:

- Setting municipal goals and plans for low-income, rural, urban and heavy-duty transport.
- Electrifying municipal fleets.
- Planning for EV infrastructure development for low-income, rural, urban and heavy-duty transport.
- Ensuring benefits reach all segments of society, including low-income communities.

b. Set Municipal Goals and Plans

After determining how state goals and policies will affect them, the first step for local governments committing to EVs is to make a plan for transportation electrification. For municipalities focused on rapid decarbonization, the International Council on Clean Transportation recommends 100% EV sales for light-duty vehicles by 2035 and medium- and heavy-duty vehicles by 2040. Municipal goals and financial incentives that help make this transition happen sooner will enable faster decarbonization. Articulating a transportation electrification commitment in a local law or ordinance is optimal, but progress can be made even if initial local political support for a comprehensive plan or commitment is lacking at the start. For example, some municipalities may set EV fleet goals to meet decarbonization targets, while others may start with planning local infrastructure to enable EV parking. Local laws can mandate the development of a comprehensive municipal fleet electrification transition plan that starts with an assessment of the existing fleet and sets EV procurement schedules by vehicle class, special considerations for emergency and heavy-duty vehicles and infrastructure and maintenance investments. These outcomes can be achieved through a resolution, a statement of support or the adoption of a local law directing a transition to an all-electric municipal fleet by a certain date.[118]

Rural transportation electrification

Rural America is home to 20% of the population but almost 70% of the country's road miles. This makes electrification both hugely challenging and attractive. As noted by the U.S. Department of Transportation, "Rural residents drive more than their urban counterparts, spend more on vehicle fuel and maintenance, and often have fewer alternatives to driving to meet their transportation needs. Over the long run, EVs will help residents of rural areas reduce those costs and minimize the environmental impact of transportation in their communities."[119] But ensuring charging is available to meet rural driving needs is a challenge that coordinated policy planning among federal, state and local government will need to address. Once realized, however, rural electrification can offer individual residents lower maintenance and fuel costs and a source of power and resilience. It can also offer rural communities opportunities for economic growth, cleaner air and climate benefits.

118 Electrify NY. (n.d.). *EV municipal toolkit.* https://electrifyny.org/ev-municipal-toolkit/#1595974225040-92bfb940-320e

119 U.S. Department of Transportation. (2022, February 10). *Charging forward: A toolkit for planning and funding rural electric mobility infrastructure.* https://www.transportation.gov/rural/ev/toolkit

Comprehensive plans and goals also need to ensure equitable access to electrified transportation. Municipalities will need to work with low-income and rural communities to identify barriers and develop solutions that deliver on inclusivity goals specific to each municipality. Major barriers to electrification for low- and moderate-income communities include the higher upfront cost, lack of access to EV infrastructure or payment mechanisms and lack of outreach and education. The Greenlining Institute's Equity Toolkit articulates some of the barriers these communities face:[120]

- **Cost**. EVs have a higher upfront cost than internal combustion engine vehicles but a lower total cost of ownership over the life of the vehicle. Incentives such as sales tax exemptions, after-purchase rebates and tax credits are more difficult for low-income communities to access; however, vouchers and instant rebates that reduce upfront cost are more likely to enable a low-income household to purchase an EV. It's also important to make used electric vehicles more available to the many households that cannot afford new vehicles.[121] To ensure equitable access to electric vehicles, municipalities may want to focus first on LMI communities with fewer economic resources to ensure these communities are incorporated in the transportation electrification evolution.
- **Lack of access to charging infrastructure**. Municipalities and municipal utilities can overcome this barrier by working to ensure charger access in low- and moderate-income communities. Additionally, many LMI customers may not have smartphones or be able to afford subscription fees, common components of private charging network applications, which can constitute an additional barrier.[122]
- **Lack of awareness and customer education**. A general lack of awareness about the benefits of EVs and available vehicle purchase incentives also create barriers to adoption among lower-income households, rural populations and disadvantaged communities. Education and outreach strategies by the municipality or utility that are specifically targeted to meeting the needs of underserved communities signal a strong commitment to ensuring they are prioritized in efforts to expand access to electric mobility.
- **Specific mobility needs**. Low-income rural residents may rely more on vehicle ownership or informal ride sharing because of bad public transportation services and access. Conversely, low-income residents in densely populated cities may have less of a need to own a car to get to work or complete daily tasks but may need robust public transportation.

As noted in the last point above, transport electrification will also have different implications in rural communities. Rural communities differ in significant ways from cities, and their transportation needs differ as well. In general, rural communities have significantly less EV charging infrastructure, which is largely concentrated in major cities.[123] While other factors such as limited EV models for trucks and limited dealership networks[124] are outside municipalities' scope of influence, municipalities and municipal utilities can help increase EV charging in rural areas. Rural residents may be more likely to be physically or financially dependent on shared transit rather than private car ownership.[125] Broad and ongoing stakeholder engagement and specific outreach to these communities will help municipalities develop EV plans that meet the needs of all municipal customers.

c. Electrify Municipal Fleet Vehicles

Municipalities will need to consider their particular needs, the scope of state fleet electrification and the type of provision that will work best for their particular municipality. Fleet electrification can be achieved through various actions at the state or local level. Some jurisdictions have set goals to electrify a certain

120 The Greenlining Institute. (n.d.). *Electric vehicles for all: An equity toolkit*. https://greenlining.org/resources/electric-vehicles-for-all/

121 The Greenlining Institute, n.d.

122 Northeast States for Coordinated Air Use Management. (2020, September 21). *Expanding equitable access to electric vehicle mobility: Examples of innovative policies and programs.* https://www.nescaum.org/documents/expanding-equitable-access-to-ev-mobility-examples_9-21-20.pdf/

123 Tolbert, J. (2021, October 22). *Beyond cities: Breaking through barriers to rural electric vehicle adoption.* Environmental and Energy Study Institute. https://www.eesi.org/articles/view/beyond-cities-breaking-through-barriers-to-rural-electric-vehicle-adoption

124 Northeast States for Coordinated Air Use Management, 2021.

125 Kadoch, C. (2020). R*oadmap for electric transportation: Policy guide.* Regulatory Assistance Project. www.raponline.org/EV-roadmap

percentage of fleet vehicles by a certain date. A variation of this type is to specify a rate of purchase of electric, hybrid or alternative fuel vehicles — for example, 5% of all new motor vehicles per year.[126] Others require the purchase of an electric vehicle if the total cost of ownership is less than that of a comparable internal combustion engine vehicle. The total cost of ownership of electric versus internal combustion vehicles will vary depending upon the financial incentives for EVs, but as technology costs decrease, the total cost of EVs will also decrease. Others simply require the purchase of electric and hybrid vehicles "to the maximum extent feasible." This approach allows more discretion in determining which vehicles should be electric or hybrid and which can be internal combustion.

Burlington Electric: EV charging incentives for landlords

The Burlington, Vermont, municipal utility launched a program that gives apartment building owners a financial incentive to install chargers and make them available to the public. The primary purpose of the program is to benefit renters or residents of multi-family condo buildings. Building owners who install a smart charger receive a $1,200 incentive to cover installing. Buildings that serve low-income residents receive an extra $250, and if the charger is made accessible to the public, they receive an extra $300. In total, the incentives cover 75% of the installation cost for each charger.[127]

d. Plan for EV Infrastructure

Customer concern about the lack of available charging infrastructure is a significant barrier to electrification of the light-duty transport sector. The lack of widespread charging stations leads to a chicken-and-egg problem for EV adoption. Federal funding may provide an opportunity to promote more widespread EV infrastructure. Optimally, states would facilitate a coordinated planning process on provision of EV infrastructure among state agencies, investor-owned utilities, third-party providers, private interests and municipalities. Some states are in the process of starting or planning for this type of coordinated plan, and municipalities should check with state energy offices or other state agencies to determine whether a process exists or suggest implementing one. Regardless of whether a statewide effort exists, municipalities can plan for their own EV charging infrastructure needs and may incorporate or consult many of the stakeholders listed above.

Particular attention must be paid to low-income communities for EV charging infrastructure planning. Low- and moderate-income communities may have fewer EVs due to higher upfront cost. The state or municipality may also create policies aimed at lowering the cost for LMI customers through rebates at the time of sale that directly reduce the cost of the EV. Lack of charging infrastructure in LMI areas, perhaps as a result of there being fewer EVs per capita, would lock in the status quo and provide a significant barrier to transportation electrification. A specifically coordinated effort on the part of the municipality and utility is necessary to ensure that LMI communities have equitable access to electric vehicles and the charging infrastructure to support them. The utility also needs to be sensitive to the impact that utility-built infrastructure may have on electric rates for LMI customers. With good planning, a municipal utility can ensure that all customers receive the benefits and that costs are shared equitably, which may mean LMI customers do not pay for EV infrastructure because it would prohibitively increase costs on the customers that can least afford it. Electrification has the opportunity to provide LMI customers with clean, reliable and affordable transportation. Proactive planning now can make this a reality.

Municipalities' goals will likely guide EV infrastructure planning and needs, along with identification of gaps between what state, utility or third-party providers are planning. Municipalities may also want to think of EV infrastructure planning in phases, recognizing that EV adoption will increase. The resources at the end of this chapter provide more information on developing EV infrastructure plans, but a few considerations will help development of an EV infrastructure plan:

- Develop a plan to switch municipal internal combustion engine vehicles to EVs by a certain date.
- Develop plans for EV-powered public transportation and school buses.

126 An act relative to green communities, Chapter 169, 191st General Court, (Mass. 2008). https://malegislature.gov/laws/sessionlaws/acts/2008/chapter169

127 Thill, D. (2022, March 1). Burlington expands program that gives renters and public access to EV chargers. Energy News Network. https://energynews.us/2022/03/01/burlington-expands-program-that-gives-renters-and-public-access-to-ev-chargers/

- Assess municipality needs. Understanding EV driver and municipal demographics and existing needs will help municipalities prioritize EV charging needs. This includes specific outreach to diverse residents of a municipality. Ensuring that the benefits of transportation electrification are shared equitably will require states to consider the degree to which all customers have access to electricity as a transportation fuel, regardless of their economic and geographic circumstances.
- Plan for steady growth in EV charging infrastructure needs. State and municipal goals could spur EV growth. Although EVs are currently 2% of global sales, they are projected to grow to 24% of global sales or higher by 2030, even absent specific EV goals.[128]
- Assess gaps in existing EV charging infrastructure, ideally after consultation with state agencies, commercial third-party providers and utilities. Municipalities should also engage EV drivers, local councils, low-income communities, rural communities, public and private fleet owners and EV advocates to identify barriers and opportunities and specifically prioritize equitable access to EV charging.[129]
- Assess grid infrastructure to determine the sites with the greatest grid capacity for installing EV charging infrastructure, particularly direct-current fast chargers.
- Streamline permitting processes and identify preapproved sites. Streamlining and expediting permitting and installation of charging infrastructure can improve the business case for private EV infrastructure construction.[130] This can be further expedited by identification of preapproved sites, which may also encourage charging in locations that are ideal from a municipal grid perspective.
- Secure investment from local businesses. Communities and businesses that host public charging stations may also see economic benefits as EV drivers eat or shop while their vehicles charge.[131] Municipalities can engage local coalitions of businesses to install EV charging at their businesses and promote awareness of the business case for their investment. Strategic use of incentives can also increase charging infrastructure.[132]

e. Empower Customers Through Rate Design

Because electric vehicles do not need to be charged at the same time they will be used, they are inherently flexible and can serve as energy storage. As a result, the power system can serve this new load at cleaner and less expensive times of the day. This flexibility means that EVs can actually improve the utilization of the transmission and distribution system, shifting loads that would otherwise add to system peaks, which ultimately drive grid investment and increase cost. The need for system upgrades can be minimized if EVs are charged during off-peak periods, either through smart charging, time-of-use pricing or some combination of both.

Shifting the load to less expensive times can produce savings that customers can share in through appropriately designed electricity rates. Municipalities can develop smart charging programs and rate designs to encourage customers to charge their EVs at lower-emissions and lower-cost times of the day and year. Given that customers will typically charge their cars overnight after they get home, the customer charging time is compatible with taking advantage of off-peak pricing. (See Section III-B's discussion of rate design.)

f. Financing and Incentives

Federal funding under the National Electric Vehicle Infrastructure Formula Program is available to build out national EV infrastructure.[133] Electrification of

128 Shepardson, D. (2021, August 4). *U.S. automakers to say they aspire to up to 50% of EV sales by 2030-sources.* Reuters. https://www.reuters.com/business/autos-transportation/us-automakers-say-they-aspire-up-50-ev-sales-by-2030-sources-2021-08-04/

129 The International Council on Clean Transportation & C40 Cities Climate Leadership Group. (n.d.). *Electric vehicle charging infrastructure: A quick guide for cities* [Factsheet]. https://c40.my.salesforce.com/sfc/p/#36000001Enhz/a/1Q000000Mp2p/2r2iFhMbXlgoqFFnxWsycjub2dEp.PKxHbs0_tFHhyI

130 Hall, D., & Lutsey, N. (2020). *Electric vehicle charging guide for cities.* The International Council on Clean Transportation. https://theicct.org/sites/default/files/publications/EV_charging_guide_03162020.pdf

131 Crotty, F., Jordan, B., McFarlane, D., Sexton, T., & Simons, S. (2019). *Accelerating electric vehicle adoption: A vision for Minnesota.* Minnesota Department of Transportation, Minnesota Pollution Control Agency and Great Plains Institute. http://www.dot.state.mn.us/ sustainability/docs/mn-ev-vision.pdf

132 C40 Cities Climate Leadership Group. (2021, August). *How to build an electric vehicle city: Deploying charging infrastructure.* https://www.c40knowledgehub.org/s/article/How-to-build-an-electric-vehicle-city-deploying-charging-infrastructure?language=en_US. In Berlin, small- and medium-sized businesses can get a 50% subsidy for building public charging stations.

133 U.S. Department of Transportation. (2022, February 10). *President Biden, USDOT and USDOE Announce $5 Billion over Five Years for National EV Charging Network, Made Possible by Bipartisan Infrastructure Law.* https://highways.dot.gov/newsroom/president-biden-usdot-and-usdoe-announce-5-billion-over-five-years-national-ev-charging#:~:text=The%20program%20will%20provide%20nearly,Formula%20Program%20is%20%24615%20million

transportation is a multisectoral effort and provides benefits across the energy, transport and building sectors, as well as environmental and health benefits. Municipalities can think broadly in terms of how these costs and benefits are paid for and shared. Although transportation electrification is often thought of as an expense that is worthwhile to support because of the public benefits it can yield, municipalities can also think of targeted use of electrification (transportation and otherwise) as a means to reduce costs they would otherwise face. Targeting is possible in a number of areas:[134]

- Air quality is a significant concern in many regions, and transportation-related emissions are a main contributor to regional pollution. Targeted transportation electrification in these areas can address air quality issues, often at a lower cost than other options. Federal funding is also available for air quality improvement through transportation projects. The Congestion Mitigation and Air Quality Improvement Program is one element of the Federal-Aid Highway Program that provides a funding source for states, local governments and transit agencies to fund transportation projects and programs that help meet the requirements of the Clean Air Act and help reduce regional congestion in transportation networks.[135]
- State efforts to spur job growth generally focus on building things for public benefit, such as hospitals and roads that provide construction jobs and tax breaks for corporations relocating to a state. In cooperation with states, municipalities can provide EV incentives and infrastructure as a method to increase local jobs or focus on encouraging EV manufacturing and related industry jobs throughout the state.
- Private investment is a largely untapped source of funding for EV charging infrastructure. Installing charging infrastructure at retail locations allows EV owners to power up while shopping, eating and resting, as well as providing local business owners with an additional marketing tool and a revenue source.
- Additional federal funding may also become available through further efforts on infrastructure. Local governments with existing EV plans may be better situated to apply for and receive federal money when it becomes available.[136]

Recognizing the wide range of benefits that EVs can provide, jurisdictions around the world have provided direct financial support to encourage the electrification of transportation. Municipalities with specific EV goals may wish to provide financial incentives to encourage equitable EV adoption. Best practices for structuring EV incentives include:

- Applying incentives at the point of purchase.
- Making incentives simple, transparent and understandable.
- Making incentive programs durable.

134 Kadoch, 2020.

135 U.S. Department of Energy & U.S. Department of Transportation. (2016). *Guide to federal funding, financing, and technical assistance for plug-in electric vehicles and charging stations.* https://www.energy.gov/eere/vehicles/downloads/guide-federal-funding-financing-and-technical-assistance-plug-electric

136 See Electrification Coalition. (n.d.). *Federal funding guidance for cities.* https://www.electrificationcoalition.org/work/federal-ev-policy/federal-funding-guidance-for-cities/

Useful Resources on Transportation Electrification

Atlas Public Policy. (2021, November). *Dashboard for Rapid Vehicle Electrification (DRVE).* https://atlaspolicy.com/dashboard-for-rapid-vehicle-electrification-drve/. DRVE is a powerful tool that equips users with decision-relevant information on the financial viability and environmental impact of light-, medium-, and heavy-duty vehicle fleet procurements across an entire fleet.

American Public Power Association. (n.d.). *Exploring Electric Vehicle Rates for Public Power*. https://www.publicpower.org/topic/electric-vehicles

Brinker, C. (2019, June 20). *A New Model of Energy Codes in Home Rule States.* Southwest Energy Efficiency Project. https://www.swenergy.org/a-new-model-for-energy-codes-in-home-rule-states.

Electrification Coalition. (n.d.). *Federal Funding Guidance for Cities.* https://www.electrificationcoalition.org/work/federal-ev-policy/federal-funding-guidance-for-cities/

ElectrifyNY. (n.d.). *Appendix 1: Sample Ordinance.* https://electrifyny.org/ev-municipal-toolkit/#1565755774604-d3373363-c491. Sample ordinances and policy guidance for local policies related to electric vehicles. Some of the templates may be from state legislation but can be amended to apply to a municipality.

The Greenlining Institute. (n.d.). *Electric Vehicles for All: An Equity Toolkit.* https://greenlining.org/resources/electric-vehicles-for-all/

Hall, D., & Lutsey, N. (2020). *Electric Vehicle Charging Guide for Cities.* The International Council on Clean Transportation. https://theicct.org/sites/default/files/publications/EV_charging_guide_03162020.pdf

Kadoch, C. (2020, February). *Roadmap for Electric Transportation: Legislative Options.* Regulatory Assistance Project. https://www.raponline.org/wp-content/uploads/2020/03/rap-roadmap-electric-transportation-legislative-options-2020-february.pdf. This guide and legislative kit contains state legislation, all of which can be amended to apply to a municipality.

Northeast States for Coordinated Air Use Management. (2020, September 21). *Expanding Equitable Access to Electric Vehicle Mobility: Examples of Innovative Policies and Programs.* https://www.nescaum.org/documents/expanding-equitable-access-to-ev-mobility-examples_9-21-20.pdf/

Office of Energy Efficiency & Renewable Energy. (n.d.). *Energy Standard and Code Determinations.* https://www.energycodes.gov/

U.S. Department of Transportation. (2022, February 10). *Charging Forward: A Toolkit for Planning and Funding Rural Electric Mobility Infrastructure.* https://www.transportation.gov/rural/ev/toolkit