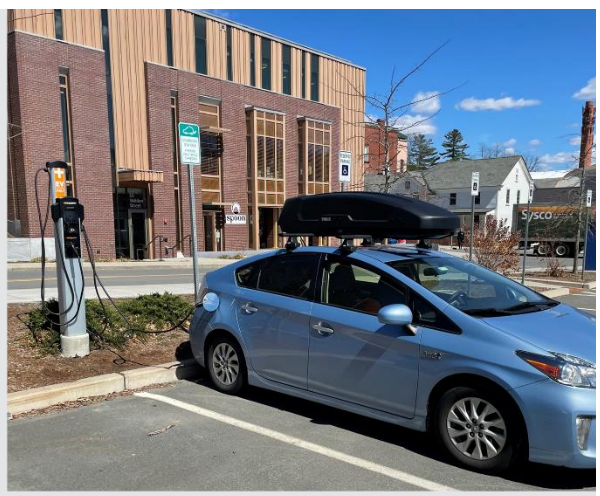
Berkshire County Electric Vehicle Charging Station Plan

Berkshire Regional Planning Commission

March 2022



BRPC
Berkshire Regional Planning Commission

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Introduction

The Berkshire County Electric Vehicle Charging Station Plan is intended to increase awareness of electric vehicle (EV) technology and advance the strategic installation of charging stations throughout the Berkshire region. The goals of this plan include:

1. Educate the reader on the current state of EVs and charging station technology.
2. Equip municipal stakeholders with the information needed to make strategic decisions regarding EV charging station investments.
3. Recommend feasible pathways to assess EV charging station need and build sustained engagement to create a comprehensive charging network throughout the county.

Impetus

This study was funded through the Berkshire Metropolitan Planning Organization's (MPO) Unified Planning Work Program (UPWP) which outlines year to year activities undertaken by Berkshire MPO staff. The substance and recommendations contained herein are the work of the authors – who are solely responsible for the accuracy of statements and interpretations in the report, and do not necessarily reflect the views of the municipalities mentioned in the document.

Planning for EV charging station implementation represents the next step in planning for tomorrow's carbon-free transportation network. The transportation sector contributes the largest source of greenhouse gas (GHG) emissions nationally (28.2%)[1], at the state level (39%)[2], and locally here in the Berkshires (43%)[3]. To address climate change, recent federal and state initiatives, commitments made by major auto manufacturers (General Motors, Ford, Volkswagen, Honda) and ride-hailing companies (Uber[4], Lyft[5]) along with the broader conversation on the future of transportation indicate a transition to electrification.

The state of Massachusetts has made ambitious commitments to reduce transportation-based emissions while incentivizing broader EV ownership. On December 30th, 2020, Massachusetts Governor Charlie Baker released the *Massachusetts 2050 Decarbonization Roadmap*[6] which, among other actions, will require 100% zero-emission light-duty vehicle sales by 2035.[7] Additionally, the state's interim *Clean Energy and Action Plan*[8] calls for increasing the number of EVs traveling on Massachusetts' roadways from the current 36,000 to 750,000 by 2030. The Decarbonization Roadmap calls for 1 million registered EVs in Massachusetts by 2030. In response to these initiatives, BRPC is taking steps to understand this evolving landscape and the implications of electrifying transportation in Berkshire communities.

Local EV and Charging Station Landscape

Based on data available on Plugshare.com, a free EV driver's app that allows users to locate public charging stations, there were 53 EV charging stations scattered throughout Berkshire County as of March 2022 (refer to Figure 2). Four (4) charging sites offer Direct Current Fast Charging (DCFC) (located in Lee and Great Barrington) and the rest are Level 2 (L2) chargers. Typically, charging station have two ports, or plugs, meaning they can charge two vehicles at once. Among the existing charging sites in the Berkshires, a total of twenty (20) DCFC ports/plugs area available and one-hundred and fifty-four (154) L2 plugs/ports area available. The heaviest concentration of stations are located in Lee, Lenox, Pittsfield, and Williamstown. The Department of Energy's Alternative Fuels Data Center also provides an interactive map displaying publicly accessible electric vehicle charging station locations.

Investments in expanding the current charging network should be driven by current and future expected demand. Unfortunately, due to system software upgrades, the Massachusetts Registry of Motor Vehicles (RMV) was unable to provide BRPC with accurate EV ownership data (baseline) for Berkshire County at the time of this report. A rough estimation was provided by the RMV that identifies approximately 3,280 EV plated vehicles, including hybrids, in the Berkshires. The true value is unknown. Without a firm baseline of local EV ownership, the task of projecting future demand is more ambiguous.

A map of EV rebates (which include rebates on battery electric vehicles and plug-in hybrid electric vehicles) by zip code (refer to Figure 1) can be accessed through the [Massachusetts Offers Rebates for Electric Vehicles]() (MOR-EV) program site. Figure 1 shows EV owners that applied for the MOR-EV rebates as of March 2022. Figure 1 lends insight into EV ownership within the county, but surely does not capture all EVs as presumably not all EV owners apply for or are aware of the rebate program. According to MOR-EV program data, 285 rebates have been issued to Berkshire County residents as of March 2022.

Figure 1: MOR-EV Rebates by Zip Code

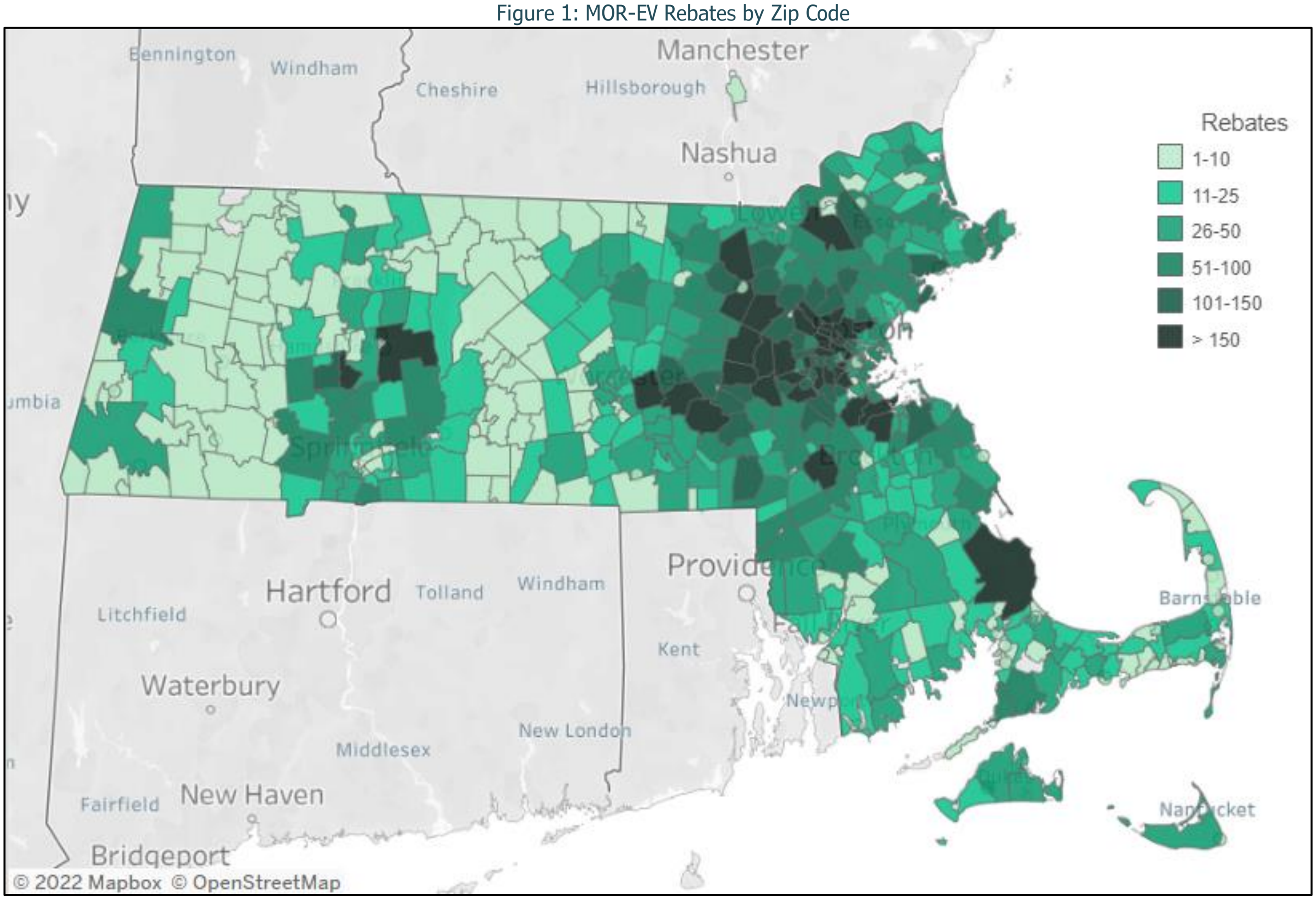
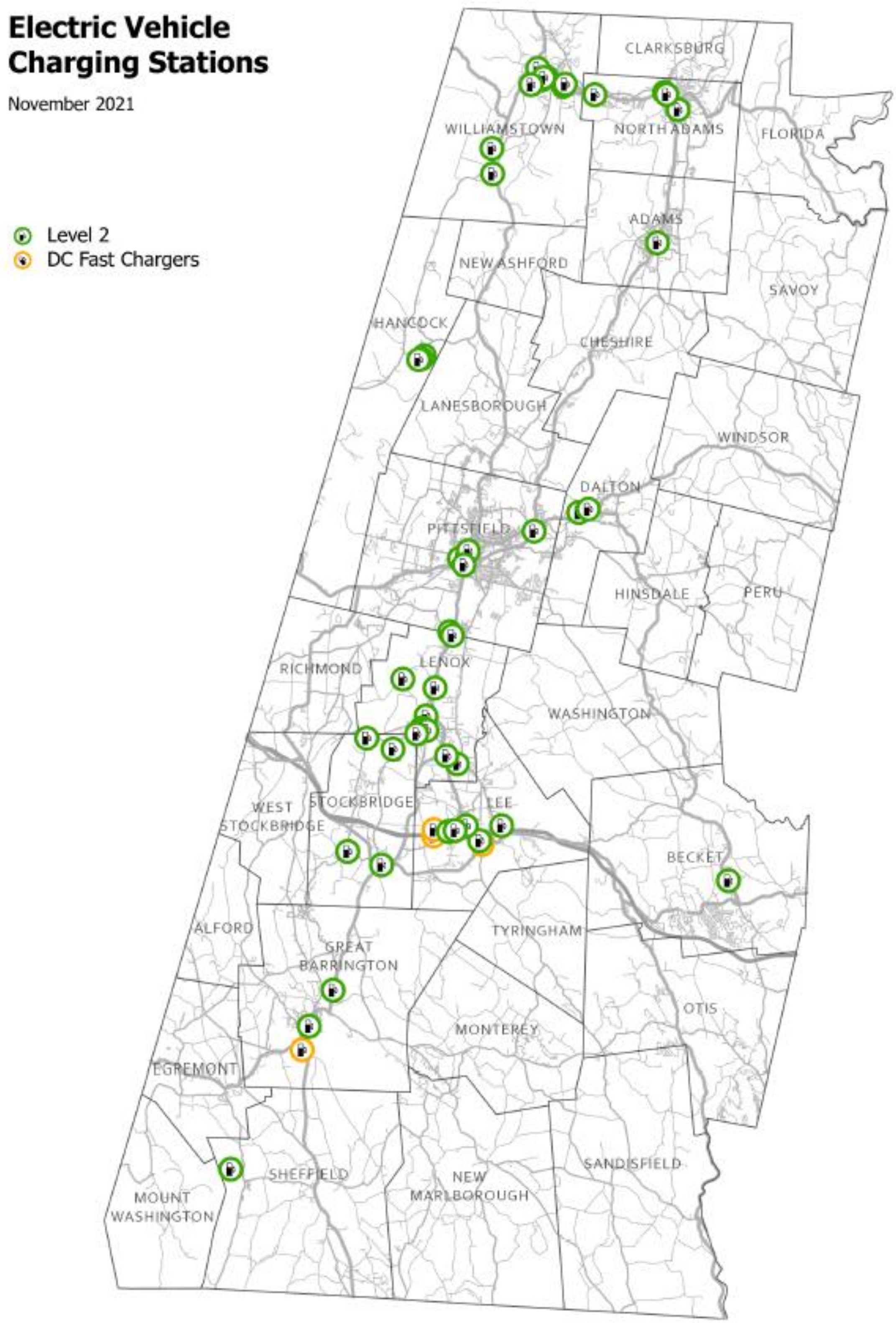


Figure 2: Accessible EV Charging Stations



Electric Vehicles and Charging Station Technology

Range -Anxiety drops off at about 300 miles of range

EV technology is rapidly maturing and promises to one day match and even exceed the cost, convenience, and performance afforded by today's internal combustion engine (ICE) vehicles. There are however several barriers that hamper more widescale market adoption. Electrify America, a subsidiary of Volkswagen (VW) tasked with investing $2 billion in a nationwide network of workplace, community, and highway chargers – has determined 'location and availability of charging stations' is the primary barrier to higher levels of EV penetration. Referred to as 'range-anxiety' – this is the fear of not being able to locate a charging station when the EVs battery is needs a charge. According to C.E.O. of General Motors (GM), Marry Barra, range-anxiety drops off at about 300 miles of range.[9]

Electric Vehicle Types

In general, there are three classes of electric vehicles. These include hybrid electric vehicles (HEVs), plug-in hybrid electric vehicles (PHEVs), and battery electric vehicles (BEVs). HEVs are more aligned with our traditional notion of ICE vehicles but have a particular architecture that allow them to achieve more range with less gas/diesel. PHEVs and BEVs take it up a notch by capitalizing on electrical power that is provided by an external source (i.e., charging station), stored in the vehicles' battery, and then used to drive the vehicle. PHEVs and BEVs require charging infrastructure, while HEVs do not.

Hybrid Electric Vehicles (HEVs)

HEVs primarily run-on gasoline or diesel but in addition have a small on-board electric motor and battery pack. The electrical system in a HEV works by deriving (electrical) power from kinetic energy that results from the driver applying the brakes and/or from the vehicles tire rotation. That kinetic energy is stored in the small battery pack as electrical energy, which can be used exclusively (in some instances) or in conjunction with the combustion engine to operate the vehicle. The ICE engine also works to generate electricity. HEVs do not require charging infrastructure, and gasoline or diesel is still the primary fuel.

Plug-In Hybrid Electric Vehicles (PHEVs)

Plug-in hybrid electric vehicles (PHEVs) go a step further than HEVs by relying on a larger on-board battery and electric motor for extended electric-only range. PHEVs still have an ICE that runs on gasoline or diesel. Depending on the specific vehicle, the fuel tank for a PHEV is typically smaller (but not drastically) compared to those of ICE vehicles. Typically, the PHEVs battery will power the first leg of the journey (approximately 30-50 miles depending on the vehicle) and when the battery is fully exhausted, the engine starts, and the vehicle acts as a normal ICE vehicle until the battery is charged again. PHEVs are perfect for individuals with short commutes to work and also provide the assurance that unforeseen or longer trips are achievable when publicly accessible charging infrastructure cannot be located. As the name implies, PHEVs require charging infrastructure.

Battery Electric Vehicles (BEVs)

A BEV, referred to in this report as EV, relies solely on an electric powertrain consisting of an electric motor, power electronics, and a battery pack. BEVs run entirely on electricity and have an internal architecture that has far few parts than a traditional ICE vehicle. The battery pack for a BEV is charged by plugging the vehicle into an electric power source.[10]

Current EVs can travel between 60 to 270 miles on a single charge, with some Tesla models exceeding 360 miles on a single charge (Tesla Model S Long Range can achieve a 379-mile range). As this technology continues to mature, we're seeing higher ranges from a single charge. The Volvo XC40 Recharge, Hyundai Ioniq, Chevrolet Bolt, Kia Niro EV, Kia Soul EV, Volkswagen ID.4, and Hyundai Kona Electric all offer around 200-250 miles of range. Other models including BMW i3, Nissan LEAF, and Mini Cooper SE don't offer as much range but should suffice for most people's daily commutes and responsibilities. For reference, EV battery capacity is measured in kilowatt-hours (kWh) – and can be thought of as the gallons of gas in your tank (in terms of a traditional ICE vehicle). On average, most electric cars can travel 3 to 4 miles on 1kWh of electricity.

Looking Ahead

Major car manufacturers have recently made ambitious EV commitments. In November 2020, General Motors (GM) said it was expediting plans to introduce electric cars and trucks over the next 5 years. GM is expected to spend $27 billion and introduce 30 electric models by 2025. In late January 2021, GM announced plans to exclusively offer EVs by 2035, phasing out production of gas and diesel light-duty vehicles including SUVs. Ford is investing more than $22 billion in EVs through 2025. In early March 2021, Volvo announced it was transitioning to EV production, and would phase out production of all ICE vehicles by 2030.[11] In late November 2021, Nissan's 'Ambition 2030' plan calls for the company to invest $17 billion in electrification over the next 5 years (including in solid state batteries) and promises 15 fully electric models by 2030.[12]

EV pickup trucks are soon to hit the market. Currently, the first, second, and third best-selling vehicle in the U.S. is a pickup. Moreover, a third of all pickup truck owners are open to the idea of electrification.[13] In the next two years, more than a half dozen competitors will be vying to make EV trucks mainstream. In addition to Tesla's Cybertruck (base price/model: $39,999/~250 miles of range), Ford is planning to roll out their electric F-150 Lightning (base price/model: $39,974/~230 miles of range) by spring 2022. Other promised EV pick-ups include Rivian's R1T (~$70,500/~300 miles of range), which is expected to be available by spring 2022; and Lordstown Motors' Endurance (~$52,500/~250 miles of range), set to be available by mid-2022.[14] Chevy has also announced an upcoming all electric Silverado pickup ($39,900) set to be on the market for 2024.

As a brief aside, EV pickup trucks boost impressive horsepower and are better at towing heavy loads. To get all that weight moving requires a lot of low-end torque, a lot of rotational force. Some engines are better than others, but electric motors seem to have an advantage over their gas and diesel counterparts. This performance edge could further push more demand for electric pickups in the coming years.

EV Charging Equipment Types

The conductors, attachment plugs, and all other equipment specifically installed to transfer energy between premises wiring and the EV, as well as the exchange of information, is referred to electric vehicle supply equipment (EVSE). Key factors affecting equipment costs include charger level, mounting, number of ports, type of cables, and data package. Factors that influence installation costs include any necessary electrical upgrades, distance to power source, number of stations (multiple stations reduces cost per station), and wall vs. free standing configuration.

Charging Levels

Currently, there are three main charging station configurations that each have their own designation, referred to as 'charging-level.' Charging level reflects the power supplied from the charging unit to the EVs battery. Charging level essentially translates to the rate at which the EVs battery will be recharged, from 30 minutes to 12+ hours for a full recharge (refer to Figure 3). Typically, the faster the charger, the more expensive it is to install and operate.

Figure 3: EVSE (Photo Source: DOER)

Charging Level	Setting	Supply Power	Representative Example
AC Level 1	Residential/ Parking Lot 5 mi/hour @ 1.7 kW	120vac/20A (16A continuous)	
AC Level 2 (minimum)	Residential/ Commercial 10 mi/hour @ 3.4 kW	208/240vac/20A (16A continuous)	
AC Level 2 (maximum)	Commercial (up to) 60 mi/hour @ 19.2 kW	208/240vac/100A (80A continuous)	
DC Level 1	Commercial up to 500v @ 80Adc (up to) 120 mi/hour @ 40 kW	208vac/480vac 3-phase (input current proportional to output power; ~20A-200A AC)	
DC Level 2	Commercial up to 500v @ 200Adc (up to) 300 mi/hour @ 100 kW	208vac/480vac 3-phase (input current proportional to output power; ~20A-400A AC)	

AC Level 1 Charging (L1)

Level 1 charging is limited to 120 volts of alternating current (VAC), and typically uses a three-pronged plug common most households. All current EVs are sold with AC Level 1 capabilities and only need a dedicated 20-amp outlet to charge. These chargers charge slowly and are generally used in home or workplace applications where EVs will be parked for long periods of time. L1 charging provides approximately 4.5 miles of additional range per hour of charging. L1 charging equipment costs can range from $400 to $1,000 and $300 to $2,000 for installation.

AC Level 2 Charging (L2)

Level 2 charging provides electric energy at either 240 VAC (typical for residential applications) or 208 VAC (typical in commercial and industrial applications). Commonly found in workplace, public, and some home charging applications, L2 chargers provide approximately 26 miles of additional range per hour at a 6.6 kWh charge rate. L2 charging is becoming quicker over time, with 20 kW charge rates possible on some vehicles and chargers (capable of supplying 50 miles of range per hour). L2 chargers compared to L1 chargers require additional hardware that can be mounted on the wall, a pole, or as a stand-alone pedestal and must be hard-wired to the electrical source. According to a 2020 report from the Rocky Mountain Institute (RMI)[15], residential L2 chargers cost anywhere from $380 to $689, and commercial L2 chargers can range from $2,500 to $4,900 for the components.

Level 3 / Direct Current Fast Charging (DCFC)

DCFC utilizes direct-current (DC) energy transfer and anywhere from 400-9000 VAC input to provide rapid recharges at heavily used public charging locations. Typically found in public commercial charging plazas and fleet charging applications, DC fast chargers provide approximately 40 miles of range in ten minutes at a 50kW charge rate. Put another way, DCFC stations

Tesla Superchargers in Lee, MA.
Photo Source: ChargeHub

Figure 4: Tesla Superchargers

can provide an 80% recharge in as little as 30 minutes – depending on the size of the vehicle's battery. DCFC capabilities are also becoming much quicker over time, with 150kW-350kW chargers now being deployed. Fast chargers require high-cost electric infrastructure upgrades and, according to RMI, can range in cost from $20,000 all the way to $150,000. The Department of Energy reports that DCFC's cost $10,000 to $40,000+ for equipment and $4,000 to $50,000+ for installation.[16]

Tesla's Supercharger Network offers DCFC for free but is only available to Tesla owners. The network covers many major travel corridors across North America. Each Supercharger fleet offers DCFC at 150kW-250kW with 350kW coming soon.

Key Factors that Determine Charging Speeds

Through the process of gathering information for this report, there appear to be several key factors that determine how fast an EVs battery will recharge (charging speed). These factors include:

- Capability of the *vehicle*
- Capability of the *charger*
- The current *state of charge* (SoC) of the vehicle's battery
- The *temperature* of the vehicle's battery
- *Other loads* in use while charging
- Battery *deterioration*

The capability of the vehicle refers to the electrical current and voltage limits of the vehicle (the amount of power the vehicle was designed to take). The amount of power your EV battery receives in a charge is defined by a unit of power called a kilowatt (kW). And power (kW) is a product of voltage (V) and current (A). Both your vehicle and the charger have voltage and current limits. When you plug in (let's say to a 100kW charger), the charger matches your EV battery voltage and delivers current. This current is limited by either the charger (capability of the charger) or the vehicle (whichever is lower). If your EV battery has a voltage limit below 500V (let's say 380V), the charger may deliver less than the maximum power available because the charger reached the maximum current limit (of 200A). In this instance, the charger delivers 76kW.

The current SoC of your vehicle's battery will also impact charging speeds. Batteries charge fastest when they are nearly empty (low SoC). Batteries don't like to be too hot or too cold. In extreme weather (hot or cold), your charge rate will be slower. If you use other loads while charging, such as cabin air, conditioning, heating, lights, or radio, it will take longer to fill your battery. Batteries can deteriorate over time and lose capacity. The normal loss of a battery's capacity is defined by the vehicle's warranty. As a general rule of thumb, when fast charging, it's a good idea to end the charge around an 80-85% SoC. This will keep your battery from getting too hot and reduce charging time – as charging speeds will be much slower as your battery is close to full.[17]

Connectors

Connectors or plugs for AC L1 and L2 charging stations have been standardized to allow owners of all EV models to utilize the same charging infrastructure. The industry standard in North America for AC L1 and L2 charging is the Society of Automotive Engineers (SAE) J1772 connector, which affords significant safety and shock-proof design elements (Figure 5).

Prior to 2013, the Japanese CHAdeMO connector was the only DCFC standard connector, available on both the Nissan Leaf and Mitsubishi i-Miev. In early 2013, the SAE J1772 connector standard was expanded to include DCFC with SAE J1772 Combo connector, available on the Chevrolet Spark, Volkswagen e-Golf, and BMW i3. Due to is slow charging speed, the SAE J1772 Combo connector was soon replaced by the Combined Charging System.

DCFC connectors include the CHAdeMO connector and the Combined Charging System (CCS), which uses Combo 1 and Combo 2 connectors to provide power at up to 350kW. Most new and soon to be released EVs available in North America will utilize the CCS for charging. Tesla uses a different proprietary connector but includes a SAE J1772 compliant adapter cable with each vehicle sold and offers adapters for CHAdeMO and SAE J1772 Combo connections for an additional cost.

SAE J1772 Combo Connector
Photo Source: The Engineer's

Figure 5: SAE J1772

Suitable Areas for Charging Infrastructure

AC L1 charging stations are most suitable for residential overnight charging or *long-dwell charging at workplaces*. Due to their low cost and lower power draw from the grid, L1 chargers are compatible with locations where EVs are parked all day, especially PHEVs that have smaller battery packs. This includes some *workplaces, commuter lots, or long-term parking at airports*. Most L1 applications are most *appropriate for home use* as they draw the amount of power supplied by a 3-pronged outlet common in most households.

AC L2 charging stations are typically accessible in *outdoor settings, public venues, and workplaces, retail establishments, municipal parking lots and garages, college campuses, hotels, and motels* – areas where an EV may be parked for 1 to 6 hours. Some L2 home charging applications are also available. L2 power requirements (240 volts) in most instances require little or no utility upgrades.

DCFCs draw considerable power and, as a project, are much more capital intensive and often require utility upgrades. DCFCs lead to increased electrical use and thus cost for the host facility. However, DCFCs are necessary for enabling inter-regional travel by EVs traveling along major highways. Moreover, as the size of EV battery packs continue to increase, fast charging will continue to play an important role in facilitating quick and convenient passenger and fleet charging. Thus, suitable DCFC sites are areas along the *Interstate, National Highway System, and typically within 1-mile of arterial exits.*

As EV adoption rates continue to increase, DC fast chargers will be effective *in densely populated areas with a high population of EVs* because they provide convenience over L2 charging (quicker) and, in theory, require a smaller footprint (less parking space) due to their ability to supply fast charges to more vehicles.

Wireless Charging

Advancements in wireless EV charging (WEVC) technology will likely provide the needed boost for more widespread EV adoption and convenient charging in the coming decades. Wireless inductive charging is already a routine feature in smartphones, laptops, electrical toothbrushes, and other household electronics. Wireless EV charge pads and accompanying adapters for select plug-in models have been available for several years.

Figure 6: Wireless EV Charging System

BMW 5-Series plug-in hybrid
Wireless Charging System
Photo Source: Green Car Reports

Inductive charging works by creating a magnetic-resonance field between a transmitting pad on the ground (which is physically connected to the grid) and a receiving pad on the underside of the vehicle. Wireless signals sent between the vehicle and the charging system initiate and stop charging. Since 2014, Plugless Power has offered wireless charge kits for the Nissan LEAF and Cadillac ELR starting at under $1,300 and kits for luxury EVs like the BMW i3 and Tesla Model S for more than $3,000.

In October 2020, the SAE announced the first global standard for WEVC, officially the SAE J2954.[18] The formalization of this standard is big news and has deep implications for the future of EV charging.

WiTricity, a company based in Watertown, MA that manufactures WEVC equipment[19] has demonstrated the benefits WEVC affords over conventional plug-in charging. For one, this model supports autonomous EV charging – as an autonomous EV need only park itself over the pad to recharge. This model supports vehicle-to-grid power flow, meaning EV's parked over WEVC pads can be tapped by the larger electrical grid to supply needed electricity during peak demand times.[20]

Lastly, it has been shown that this technology can be configured as a continuous pad that can be embedded into the ground and supply electrical charge while an EV is moving. A test road in France that includes 100m track with underlying WEVC infrastructure can supply a charge of up to 20kW for vehicles traveling in excess of 60 miles per hour.[21]

Figure 7: WEVC Equipment Embedded in Parking Stalls – Concept. Photo Source: WiTricity

Figure 8: Continuous WEVC Test Track, France. Photo Source: CarAdvice

At-Home Charging

According to the U.S. Department of Energy, over 80% of EV charging happens at home, where EV owners have set up their own chargers. New EVs typically come with portable charging equipment to allow you to plug in to any 120-volt outlet. The average daily commute of about 30[22] miles can easily be replenished overnight with an L1 charger.

Figure 9: At-Home L2 Charger. Photo Source: ChargePoint

For individuals seeking faster at-home charging times, 240-volt (L2) chargers are available for home installation. There are over 82 different L2 home charging stations designed by more than 15 different manufacturers built to fit more than 33 different EV models. Installation requires a certified electrician and units' range in cost from $500 - $700 (ChargePoint and Tesla units) with the BMW i Wallbox Charging Station coming in at just under $1,300.[23] If you charge at home, the electricity usage is added to your electric bill.

Based on the U.S. census, 2020 American Community Survey 5-year estimates, the mean commute time for Berkshire residents traveling to work is around 20.4 minutes. More than 80% use a personal vehicle to commute to work. Without knowing the exact travel distance, it is reasonable to infer that most EVs, especially newer models, can meet this requirement several times over without needing a recharge. This consideration underscores the importance of facilitating at-home charging, especially at mutli-unit dwellings (MUDs) that have traditionally lacked access to EVSE.

Planning for EV Charging Station Deployment

EV Policies and Initiatives

A Nationwide Network of 500,000 EV Chargers

On November 15, 2021, the President signed into law the Bipartisan Infrastructure Law (BIL), enacted as the Infrastructure Investment and Jobs Act (IIJA). The BIL authorizes historic investments that will modernize our roads, bridges, transit, rail, ports, airports, broadband, and drinking water and wastewater infrastructure. The BIL makes the most transformative investment in EV charging in U.S. history that will put us on a path to a nationwide network of 500,000 EV chargers by 2030 that ensures a convenient, reliable, affordable, and equitable charging experience for all users. The BIL includes a total of up to $7.5 billion in dedicated funding to help make EV chargers available to all Americans for local to long-distance trips.

The $7.5 billion comprises a $5 billion formula grant program and a $2.5 billion discretionary grant program. Once the Massachusetts Department of Transportation (MassDOT) submits an EV Infrastructure Deployment Plan (due in August 2022) to the Federal Highway Administration (FHWA), the state will be eligible to receive formula funding provided through the National Electric Vehicle Infrastructure (NEVI) Program.[24] The newly established Joint Office of Energy and Transportation will play a key role in the implementation of the NEVI Formula Program.

State-Level Initiatives

Massachusetts has prioritized EV market development support through its Zero Emission Vehicle Commission and the Mass Drive Clean Campaign. In 2013, Massachusetts joined the multi-state Zero-Emission Vehicle (ZEV) Task Force which includes signed commitments formalized through a Memorandum of Understanding (MOU) committing to coordinated actions to implement state ZEV programs. In a 2018 update, the multi-state ZEV Action Plan calls for 5 million ZEVs to be in service by 2030.

Due to Massachusetts' participation in California's ZEV mandate, numerous plug-in hybrid electric vehicle (PHEV) and battery electric vehicle (BEV) models are available to consumers throughout the state. The ZEV mandate requires major car manufacturers to offer for sale the cleanest cars available. Manufacturers with high overall sales of all vehicles, are also required to make more ZEVs.[25]

An Act Promoting Zero Emission Vehicle Adoption

In 2017, the Baker-Polito Administration signed Senate Bill 2505, *An Act Promoting Zero Emission Vehicle Adoption*. Having gone into effect in 2018, the Bill authorizes the Board of Building Regulations and Standards (BBRS) to work with the Department of Energy Resources (DOER) to promulgate regulations around ZEV charging stations for residential and commercial buildings.[26] Among other stipulations, the Bill prohibits owners of public charging stations from charging users a subscription or membership fee; requires use of payment options available to the general public; and allows municipalities and private businesses to restrict parking spaces specifically for ZEV use.

Transportation Climate Initiative (on pause as of November 2021)

In 2020, Massachusetts joined Connecticut, Rhode Island, and the District of Columbia by signing on to the Transportation Climate Initiative (TCI). TCI is a broad framework developed for the purpose of curbing GHG emissions. TCI will function like a cap-and-trade program where gasoline and diesel wholesalers operating in participating states pay the state for emissions allowances. Revenues generated would be used by participating states to pay for carbon reduction and clean transportation investments, including EV charging infrastructure. TCI will aim to reduce transportation-based emissions by 26 percent in the first decade, generating funds that will pay for climate resiliency efforts throughout the region. While the overall goal of TCI will be to reduce the far-reaching climate impacts of vehicles and fuels, Massachusetts will be particularly focused on delivering benefits to communities that are underserved by current transportation options and disproportionately burdened by pollution. However, on November 18th, 2021, Gov. Charlie Baker pulled the plug on the regional climate initiative amid evaporating support from neighboring states.[27]

EV and Charging Station Funding Programs

A diverse array of assistance is available to individuals, municipalities and private organizations that have made the decision to install EV charging stations and support broader EV adoption.

Massachusetts Electric Vehicle Incentive Program (MassEVIP)

The state's Department of Environmental Protection (DEP) created the MassEVIP program which helps eligible public entities acquire EVs and install charging stations. Several funding programs fall under the MassEVIP program and provide further financial assistance to public entities in acquiring charging infrastructure and eligible private entities to acquire and integrate charging stations into publicly accessible parking lots and parking areas of multi-unit dwellings.[28]

Type of Acquisition	Available Funding Level
BEV Purchase	Up to $7,500 per Vehicle
BEV Lease	Up to $5,000 per Vehicle
PHEV Purchase	Up to $5,000 per Vehicle
PHEV Lease	Up to $3,000 per Vehicle
ZEM Purchase	Up to $750 per Vehicle

Figure 10: MassEVIP Fleets Incentives

Direct Current Fast Charging Program (DCFC)

Under the MassEVIP program, Massachusetts DEP announced in late 2020 a new electric vehicle charging infrastructure competitive grant program – the Direct Current Fast Charging Program.[29] This program is open to property owners or managers of non-residential locations that are accessible for general public use 24 hours per day, or to educational campuses with at least 15 students on site and available to all students and staff. The program provides hardware and installation costs (up to $50,000 per charging station) as follows:

- 100% for publicly accessible stations on government-owned property,
- 80% for publicly accessible stations on non-government-owned property, and
- 60% for educational campuses.

Unfortunately, the Direct Current Fast Charging program application period closed in March of 2021.

The Workplace and Fleet (WPF) program, Multi-Unit Dwelling and Educational Campus (MUDC) program, and Public Access Charging (PAC) program represent additional funding assistance available under the MassEVIP program umbrella. A matrix of these assistance programs can be found on the state's

EVIP website.[30] These three programs provide support to install L1 and L2 chargers and have a rolling application period.

Massachusetts Offers Rebates for Electric Vehicles (MOR-EV) Program

The state's MOR-EV program[31] offers rebates of up to $2,500 for the purchase or lease of a BEV and fuel cell electric vehicles and up to $1,500 for PHEVs.

Figure 11: MOR-EV Program

Eversource EV Infrastructure Program

Eversource provides assistance to private organizations and municipal governments to install L2 and DC Fast Chargers through their EV Charging Station Program.[32] Through the program, Eversource advertises that it will cover 100% of the costs associated with infrastructure implementation and readiness. The only cost to the site-host (i.e., business or municipality) is the purchase of the physical charging station(s). It should be noted however, depending on the intended number of chargers that are planned to be installed, and the work needed to make the site ready – there is a chance the site host will have to pay additional costs to meet site requirements. This is highly situational, and those details will be provided prior to any commitments made by the prospective site host. In most instances, site hosts must be Eversource customers to take advantage of the program.

In state-defined environmental justice (EJ) communities, Eversource, in addition to paying 100% of infrastructure implementation costs, provide financial assistance (to varying degrees) to pay for the cost of the physical charging station and other electric vehicle supply equipment (EVSE).

Beyond financial assistance, Eversource provides technical assistance to prospective site-hosts by conducting a Site Development Plan. This plan is developed by engineers that visit the area and, among other tasks, conduct field measurements, assess site-needs, understand logistics required, and ultimately recommend allowable number of charging stations for the site. The Site Development Plan will determine if a site is suitable to host EV charging stations and will help clarify the costs needed to make a site ready (if suitable) and who will pay those costs.

Eversource assists in implementation of L2 dual-port chargers and DCFCs, all of which are smart chargers. Smart chargers, among other functions allow for a cap on peak-demand charges, provide user data such as number of uses, uses during different times of the day, energy drawn/used, station availability for EV chargers, and so forth. Eversource provides a [list of qualified vendors]() (manufacturers, installers, and network integrators) that are familiar with the program for installing charging stations, while meeting qualification agreement terms and conditions. At this time, no assistance is provided for the acquisition of EVs.

Figure 8: Eversource EV Infrastructure Program

National Grid EV Infrastructure Assistance Program

National Grid provides varied assistance, both financial and technical, to municipalities and private organizations pursuing the construction of L2 and DC Fast Charging stations. Again, prospective site hosts typically need to be existing National Grid customers to utilize the assistance. Here is a brief outline of the three main costs and assistance provided for identifying, planning, and constructing EV charging stations:

1. Construction Costs: Prior to construction, National Grid (most likely through vendor) will conduct a preliminary site assessment to document site needs and site suitability. In virtually all circumstances, National Grid will cover 100% of the construction costs. Among other construction costs, National Grid will pay for pulling the line from the main electrical panel up to the charging station site (site preparation). National Grid will also cover the cost of any electrical unit upgrades – if those costs are reasonably low (site-by-site basis).
2. Hardware Costs: Hardware costs cover the actual purchase of the charging stations. In most instances, National Grid will pay for 50% of the cost for the site-host (i.e., municipality) to acquire the charging stations. However, there is a possibility that National Grid will pay for 30% - 75% (75% cost covered for public charging station) of the costs to acquire EV chargers. In Environmental Justice communities that meet 2 of the 3 EJ thresholds (income, English isolation, minority), National Grid will pay for 100% of the costs associated with acquiring and EV chargers.
3. Software Costs: Software costs refer to the technology used to operate and track data from each charging port. Software costs represent the primary cost to the site host. National Grid stipulates that communities funded through their program must use the company's EV charging station software (subscription-based). The software, among other functions, allows National Grid to track EV charging data (data is also available to site-host), allows the site-host to set-up fees for EV charger usage (fees for usage can be determined by site-host) and allows site-hosts to implement 'charging policies.'

National Grid accepts applications from one municipality, or joint applications from multiple jurisdictions. The utility has also developed a qualified EVSE list.

In July 2021, both Eversource and National Grid submitted plans to invest approximately $470 million on programs to help the state reach its ambitious goals of electrifying transportation over the next decade. Together, the two utilities have set the goal of installing 14,000 new charging stations throughout the Commonwealth over the coming years (Eversource Proposal, National Grid Proposal). For public and workplace customers, both utilities would expand their existing Make-Ready Programs which cover the cost of any upgrades to the EV charging stations. Several other residential and workplace charging incentives would also be supported.[33]

Bipartisan Infrastructure Law (BIL) Formula and Discretionary Grant Programs

As mentioned, the BIL includes a total of up to $7.5 billion in dedicated funding to help make EV chargers accessible to all Americans for local to long-distance trips. This funding is separated into two distinct buckets – a $5 billion National Electric Vehicle Infrastructure (NEVI) Formula Program and a $2.5 billion Discretionary Grant Program for Charging and Fueling Infrastructure. The NEVI Formula Program will focus on funding EVSE deployment on designated Alternative Fuel Corridors (AFCs), particularly along the Interstate and National Highway System. The Discretionary Grant Program for Charging and Fueling Infrastructure is further broken into two separate funding buckets (Corridor Charging Grant Program and Community Charging Grant Program) which will focus on funding EVSE deployment along AFCs and in community areas.

Massachusetts is expected to receive around $63.5 million in NEVI program funding over the next 5-years to support EV charging network deployment and expansion. The state will also have the opportunity to apply for additional funding through the Discretionary Grant Program for Charging and Fueling Infrastructure to further support these efforts. As of the writing of this plan, the state has yet to announce how BIL funding for EV charging infrastructure will be allocated (reinvested into existing funding programs or funding new programs) and made accessible to communities throughout the Commonwealth.

Charging Station Ownership and Payment

There are several ownership models when it comes to maintaining and operating charging stations. In general, the two most common ownership models are site-host owned and third-party owned. These models seem to rely heavily on the charging network provider that supplies the equipment. For example, charging network companies such as *EVgo* or *Electrify America* own and operate their equipment and partner with site-hosts (typically through a lease) to deploy the infrastructure. In these agreements, there is typically a lot less responsibility on the part of the site-host in terms of conducting corrective and preventative maintenance. This is an example of third-party ownership model.

For comparison, the company *ChargePoint* sells the equipment to the site-host, but still manages the software on the back end. The site-host then has the option to pay for various levels of service provided through ChargePoint for charging station monitoring and maintenance. ChargePoint assists site-hosts in choosing different payment options and types – all of which will be finalized in the contract agreement. This ownership model is considered site-host owned and implies a higher level or responsibility in terms of ensuring the equipment is functional, safe, and secure. Massachusetts has rebates up to $50,000 available in Western MA to offset the cost of EV charging station implementation at workplaces (with over 15 employees).[34]

In general, for most workplace and public chargers, the site-host (property owner) will pay for the electricity and offer EV charging for free, or will charge for time of use, or charge a flat rate. Metered public charging stations are very common, in which EV drivers pay for service. Many recent examples of EV charging rate structures require users pay by the kWh.

Identifying Suitable Charging Station Locations

Several factors influence the suitability of a site's ability to host charging stations. These factors include the expected use of a prospective site, the benefit afforded to EV drivers while parked at the location, and the ease and convenience of accessing charging ports. Other factors include patterns of travel in the area, area demographics, and whether the station is public property. EV drivers often seek out locations that integrate well into their everyday routines, for example, at restaurants, stores, and entertainment venues. Offering charging stations can help businesses increase visits, keep customers for longer durations, and serve as an asset for employees and residents.

EV charging stations located at workplaces can be very successful and afford benefits for both employers and employees. Some workplace charging locations serve employees, visitors, and the public. Key examples include EV charging stations located on college or university campuses along with medical campuses. Other examples of public venues include regional transit centers (commuter lots), downtown mutli-purpose parking lots or garages, retail destinations (malls or outlets with multiple stores), and popular year-round recreation destinations.

Charging station placement dictates the ease of use by EV drivers and determines station cost effectiveness. Charging station installation costs can sometimes exceed the cost of the hardware itself, and therefore, other key factors need to be considered.

Site Preparation

All new charging station installations should a have a load analysis performed on the facility's electrical demand to determine the capacity for adding EV charging stations. Upgrading electrical service adds significant cost to installation and the shorter the distance between the electrical panel and the charging station, the better (to avoid additional costs for trenching, repair, conduit, and wiring).

Installation Guide for Electric Vehicle Supply Equipment[35] identify and diagram key siting and design issues relevant to local governments as well as developers, homeowners, businesses, utility providers, and other organizations interested in best practices.

Siting and Design Guidelines for Electric Vehicle Supply Equipment[36] highlights best practices for site selection and design. Another similar resource includes this How-To Guide: Electric Vehicle Charger Installation.[37]

Other general considerations relating to the effectiveness of a station include the path of the charging cord (to ensure it is not a tripping hazard when it use), parking lot management practices (will station pose barrier to pavement cleaning or snow plowing operations), handicap accessibility (to ensure equitable access), and signage (so EV drivers can locate station easily).

EV Charging Readiness

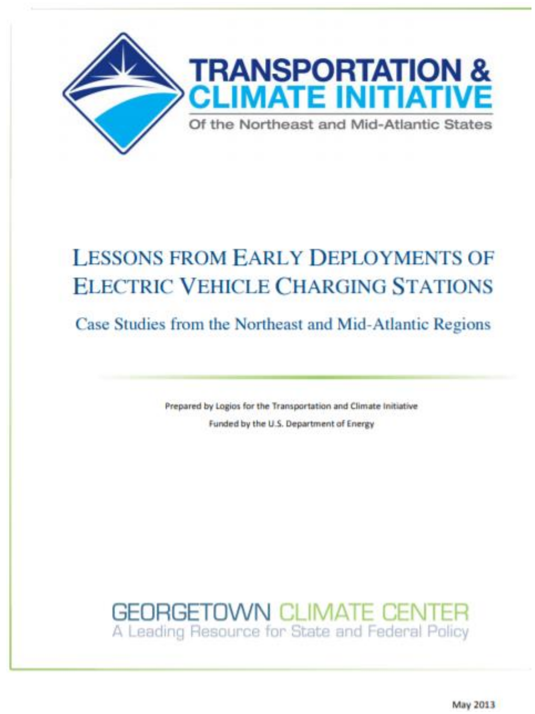
There is a wealth of publicly available resources that guide municipalities through the types of considerations that should be accounted for when planning for EV charging infrastructure deployment. In February 2022, U.S. DOT released *Charging Forward: A Toolkit for Planning and Funding Electric Mobility Infrastructure*[38], which covers EV basics, benefits and challenges of rural electrification, partnership opportunities, resources, environmental statutes and executive orders. This is a very well-rounded resources discussing the elements that should be accounted for when planning for EVSE deployment in rural areas – like the Berkshires.

Municipalities can adequately prepare for EVs and charging infrastructure installation with the following best practices guide for amending local rules and regulations to be EV-friendly. Matching the use case in different settings with the throughput will be critical. The type of EV charging infrastructure at each site should correspond with the amount of time the vehicle is likely to be parked.

As a municipality, zoning laws must permit the installation of each charging station type in an appropriate setting. A TCI document, *Lessons from Early Deployments of EV Charging Stations*[39], uncovers some related challenges and opportunities:

- In general, preparing charging sites as part of new development is more cost effective than incorporating EVSE into an existing structure. Cost of electrical system upgrades typically increase with the age of the building.
- Installations in public spaces, such as sidewalk right of way, can be administratively burdensome and formalizing clear procedures for permitting and approval will help expedite installations.
- Cords without a management system are often left spread about on the ground and may potentially become a hazard for users or the equipment.
- A careful evaluation of the possible spaces where EV charging equipment could be located and their impact on the economics of the installation should be part of the planning process before a commitment to installing the equipment is made.
- Before entering into agreements to install charging stations, prospective hosts should make sure they

Figure 13: TCI EV Charging Station Deployment Lessons


TRANSPORTATION & CLIMATE INITIATIVE
Of the Northeast and Mid-Atlantic States

LESSONS FROM EARLY DEPLOYMENTS OF ELECTRIC VEHICLE CHARGING STATIONS

Case Studies from the Northeast and Mid-Atlantic Regions

Prepared by Logios for the Transportation and Climate Initiative
Funded by the U.S. Department of Energy

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May 2013

understand who will pay for the maintenance, electricity, and other ongoing costs after installation.
- Every EV charging station installation should use certified equipment and a licensed electrician.

Other site elements to consider include:
- Location: visibility/preferred parking, parking lot management, station mounting, and wire run.
- Wire run: distance and obstructions between panel and station, need for boring/trenching.
- Electrical supply: power capacity, panel up to code, and potential use of an existing subpanel.
- EVSE: mounting type (wall or pedestal), cord management, networking, certification, and make.
- Permitting: process, cost, and local experience.
- Other: protection, signage, and maintenance.

Zoning and parking ordinances have a wide impact on how and where public charging stations are installed. Zoning rules can help determine what types of land uses are appropriate for AC L1, L2, DCFCs and how they should be sited. Parking rules dictate who is allowed to park in parking spaces adjacent to charging stations, and whether cars parked there illegally can be fined or towed. The Department of Energy has developed a useful EV deployment policy resource for zoning, codes, and parking ordinances[40] which includes a *Summary of Best Practices in Electric Vehicle Ordinances*[41] along with an example addendum from the Massachusetts City of Methuen to a preexisting ordinance to specify permissible use of EVSE in single- and muti-family dwellings and commercial or industrial zones.

Charging Station Planning Tools

EV charging station planning tools are available through different online platforms. These tools often differ in their applications for assisting in charging station network development. Moreover, these tools allow for different levels of analysis that range from identifying the number and level of charging stations required to support a given number of EVs, to recommending specific locations suitable for building out an integrated regional charging network. It must be noted that local contextual factors are often difficult to capture while using these tools, and they should be viewed as helpful guides rather than blueprints to follow.

EV Infrastructure Projection Tool (EVI-Pro) Lite

One such tool can be found on the U.S. Department of Energy Efficiency and Renewable Energy Alternative Fuels Data Center website.[42] Referred to as the Electric Vehicle Infrastructure Projection Tool (EVI-Pro) Lite, this tool provides a simple way to estimate how much electric vehicle charging you might need and how it affects your charging load profile.

This tool is excellent for understanding the number and power level of charging stations, along with workplace charging stations, needed to support a known number of EVs. However, a major shortcoming of this tool is that it only allows for analysis of Metropolitan Statistical Areas – meaning this specific analysis can only be performed for the Pittsfield Urbanized Area. Nonetheless, this tool can be useful for planning out an EV charging network starting from the densest part of the county (Pittsfield – which also happens to be geographically situated in the center of the county).

Evaluation and Development of Regional Infrastructure for Vehicle Electrification Model (E-DRIVE)

The Evaluation and Development of Regional Infrastructure for Vehicle Electrification (E-DRIVE) Model[43] (seen in Figure 14) is a user-friendly analytical tool to support planning of EV DCFC infrastructure throughout the United States. Developed by M.J. Bradley and Associates (MJ&B) in collaboration with the Georgetown Climate Center, E-DRIVE is a data driven tool that considers a variety of key metrics

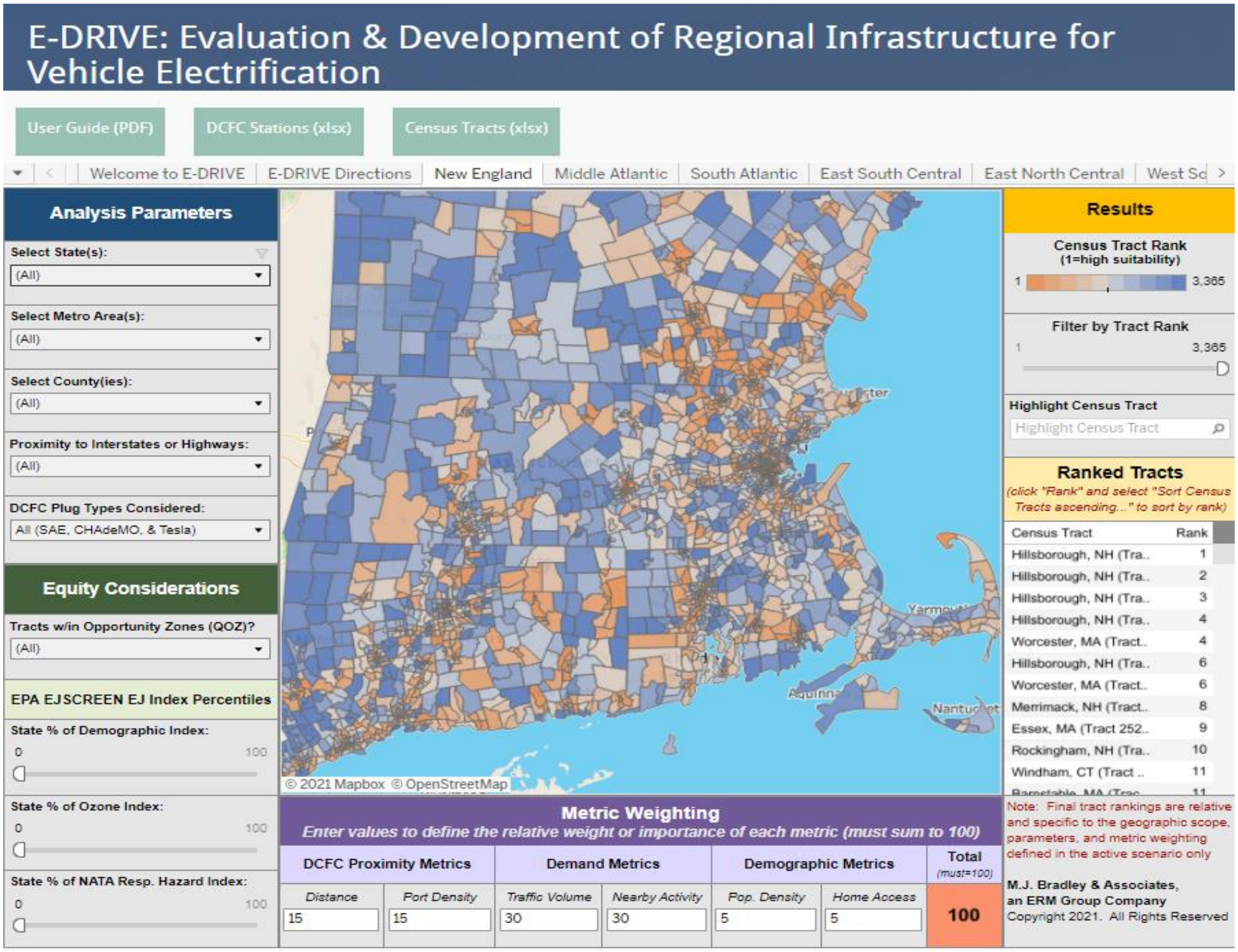


Figure 14: E-DRIVE Tool Dashboard

important for only DCFC infrastructure development including proximity to existing fast charging sites, traffic volume, nearby commercial activity, access to home charging, and other demographic and environmental indicators.

The highly customizable dashboard interface supports a diverse set of users and produces results that reflect the relative suitability of areas for infrastructure development based on regional, state, and local priorities.

The E-DRIVE tool applies the same analytical approach across all regions of the U.S. and uses federal and national-level data sources to ensure consistent data quality. The nationwide dataset utilized by the E-DRIVE Model accounts for:

- All publicly available direct current fast chargers (DCFC) in the U.S. (as of November 2, 2021)
- Effectively all non-local roadways (interstates, highways, arterials, collectors, etc.) and corresponding vehicle miles traveled (VMT).
- Over 2.8 trillion annual vehicle miles traveled (nearly 90% of national total VMT)
- Over one million commercial locations and other points of interest.
- Over 99.5% of all populated census tracts.

The E-DRIVE Model can be used for corridor analysis planning to identify potential sites along interstates and other arterial roadways as well as for filling in gaps within a town or community based on charging need. The tool allows users to toggle specific inputs and to assign specific weight to three categories including DCFC Proximity Metrics, Demand Metrics, and Demographic Metrics to account for local priorities.

Default weights reflect a scenario in which proximity, traffic volume, and nearby activity are similarly prioritized, with less significance placed on demographics. Adjusting the weights to *more heavily weight 'Demand Metrics'* (traffic volume, nearby activity) will favor sites with more nearby activity. Adjusting the weights to *more heavily weight 'DCFC Proximity Metrics' will prioritize census tracts that are far away from existing DCFC stations*. If the aim is to identify where charging infrastructure can be developed with the *intention of increasing local and community access to charging, 'Demographic Metrics' should be weighted more heavily*. Based on a webinar for how to use the tool,[44] the charging station data for the model is updated quarterly to account for new sites.

The E-DRIVE Model should be thought of as a screening tool that provides initial insight into areas that may be suitable for new fast charging infrastructure. Additional analysis, planning, and consideration of local factors may also be necessary to identify individual locations that are best suited for development. It is important to note that the model does not account for economic factors, electric utility capacity availability, individual trip data, projected travel behavior, and other elements that may impact development decisions.

Fuel-Efficient Municipal Vehicles

Based on the advancements occurring in EV technology, it is entirely feasibility that one day a variety of EVs will be available and able to perform all municipal duties requiring vehicle use. Of course, the transition of municipal fleets to EVs will take time and resources. For now, an excellent resource that can assist in efforts to reduce energy consumption from municipal vehicles can be found on the UMass, Amherst Clean Energy Extension site for Greening Municipal Vehicles.[45] Here, fact sheets, buyers guide, and funding sources are outlined for communities seeking to reduce transportation-based energy consumption and save money. Lastly, the *Fuel-Efficient Municipal Vehicles: 2019 Buyers Guide*[46] provides specific energy efficient vehicle alternatives for most vehicles that exist in municipal fleets.

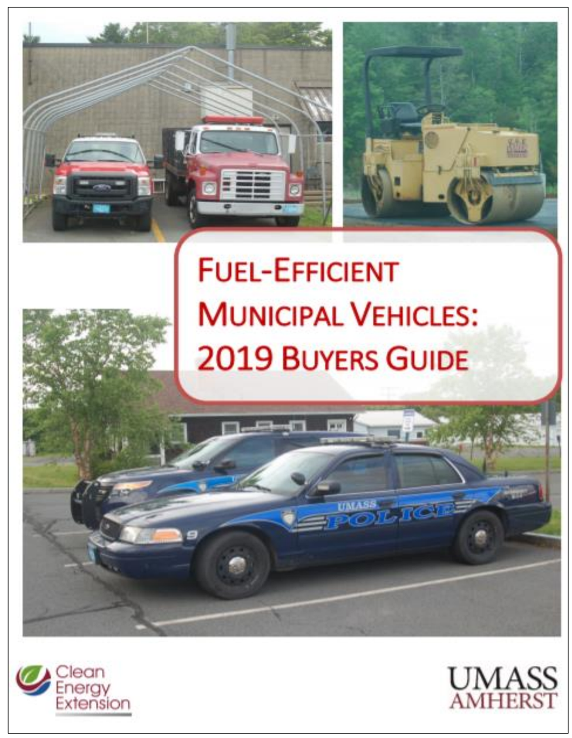


Figure 15: Fuel-Efficient Municipal Vehicles Guide

Recommendations Moving Forward

Establish EV Charging Station Working Group

Moving forward, this plan recommends establishing an EV Charging Station Working Group composed of local stakeholders from different municipalities, organizations, initiatives, and sectors regionally. Convening such a group will help to further flesh out countywide EV charging station needs and priorities by allowing for meaningful conversations between municipal officials, businesses owners (especially those with higher rates of employment respectively), organizational leaders, and EV charging station developers.

Establishing such a group can help bring further clarity to the process of EV charging station installation by sharing lessons learned. Included in the stakeholder group could be individuals from municipalities or organizations that have installed charging equipment. Sharing implementation experiences can help clarify considerations that should be accounted for in making strategic EVSE investments. Existing charging station site hosts can also speak to charging station activity trends – which could be vitally important for gauging demand and planning future network expansion. The convening of this group can serve as a forum for information exchange and sharing and can help sustain momentum for planning around this topic. Naturally, the scope of this group will continue to evolve as directed by its members.

Establish Community Liaison/Proponent(s)

One of the best ways to sustain municipal engagement and work toward meaningful change in the Berkshires is by having a local champion, individual or group, that pushes these topics at various town meetings, BMPO meetings, and other venues with exposure to town residents or staff. This plan recommends that each Berkshire municipality work to designate a municipal official that can either bring this topic to the attention of fellow town officials and residents themselves or is responsible for identifying an individual or group that can.

This plan acknowledges the reality that municipal budgets, staff, and in-house expertise are often limited. Further, it is understood that the level of commitment required and any financial obligations of participating in a state program, or private program, can alone cause hesitation on the part of municipalities. Therefore, having a local champion or group with deep knowledge about the various EVSE incentive programs, and can demystify requirements, obligations, and outline benefits of participating in these programs will go a long way.

Along the same lines, this plan encourages municipal leaders to call on their utility provider (ex., Eversource or National Grid) to provide specialized attention (i.e., consistent engagement, supplying information on this topic, and assisting municipalities through existing make-ready programs) to their communities.

Charging Stations within Municipal Borders

As mentioned, this plan recommends the formation of a Berkshire County Charging Station Working Group that will help to identify public EV charging station needs and priorities at the county level; and work to determine suitable candidates (sites) at the municipal level for potential network expansion.

Having recognized that this plan calls for this group to identify suitable sites, this plan suggests that each municipality take steps to plan for the eventual deployment of EVSE within municipal borders. This means that each municipality should think about how they might install at least one L2 or DCFC charging station in the coming years that is either available to the public, available to (future) municipal EV fleets, or both.

Of course, multiple municipalities already house L2 charging stations. For these municipalities, opportunities to expand L2 charging networks or install DC fast chargers should be explored based on current charging station usage rates. Naturally, charging station installation investments should draw on the various incentive programs discussed in this plan to off-set costs. Additionally, municipalities are encouraged to review the MassEVIP Fleets program to consider the practicality and feasibility of converting municipal fleets to PHEVs and/or BEVs, (see how Dalton, MA utilized MassEVIP program). With the evolving capabilities of EVs, EV pickup trucks, and heavy-duty EV equipment, charging infrastructure will surely benefit municipal operations (for 'behind the fence' uses) in the years ahead.

It is crucially important to understand that while this plan has outlined criteria for identifying potential suitable locations for charging station installation, it does not specifically recommend the individual placement of L2/DCFCs at one location, such as a Town Hall, versus another location. These details are highly specific to the community and charging station installation is dictated by numerous factors such as funding, feasibility, actual need, and site-level considerations. The Town of Dalton foe example chose to install a charging station at the Senior Center rather than the Town Hall due to a simpler installation process and more public parking space capacity for extended periods.[47]

With that said, special consideration should be given to municipal buildings with parking lots used by municipal employees and members of the public alike. Due to the rural, small-town nature of the Berkshires, for most communities that means looking at Town Hall lots (for public use) or in DPW lots (for 'behind the fence' use exclusively for municipal EV fleets) for potential EVSE deployment.

Engage Employment Centers and Tourist Destinations

Similarly, employment centers, tourist destinations, and parking lots or garages in proximity are all good candidates for L2 and DCFC installations. Municipalities that house tourist destinations, such as Tanglewood, Jacobs' Pillow, or the Clark Art Institute, within their borders are highly encouraged to initiate conversations with attraction destinations to coordinate and collaborate on EV charging station awareness and eventual deployment. A map outlining potential charging station locations can be seen Figure 16 which encompass town halls, employment areas, and tourist destinations. A more detailed listing of these establishments can be found in the appendix section.

With the increasing rates of EV adoption nationally, providing a robust network of EV charging stations that are strategically located will be important for EV owners passing through the county. Attracting tourists and prospective residents from major metropolitan areas such as Albany, New York, Boston, or Burlington will likely require accessible and convenient charging stations. Therefore, meaningful steps to plan for this future are highly encouraged.

Incorporate EV Readiness into New Development

After being approved by the Board of Building Regulations and Standards, the Massachusetts State Building Code requires all new construction to be built with the conduit ready for an EV charging station. Municipalities are highly encouraged to review local building codes and zoning regulations to determine if current practices hamper EVSE installation at commercial and/or residential parking areas. At a minimum, zoning laws should permit the installation of each charging station type in an appropriate setting.

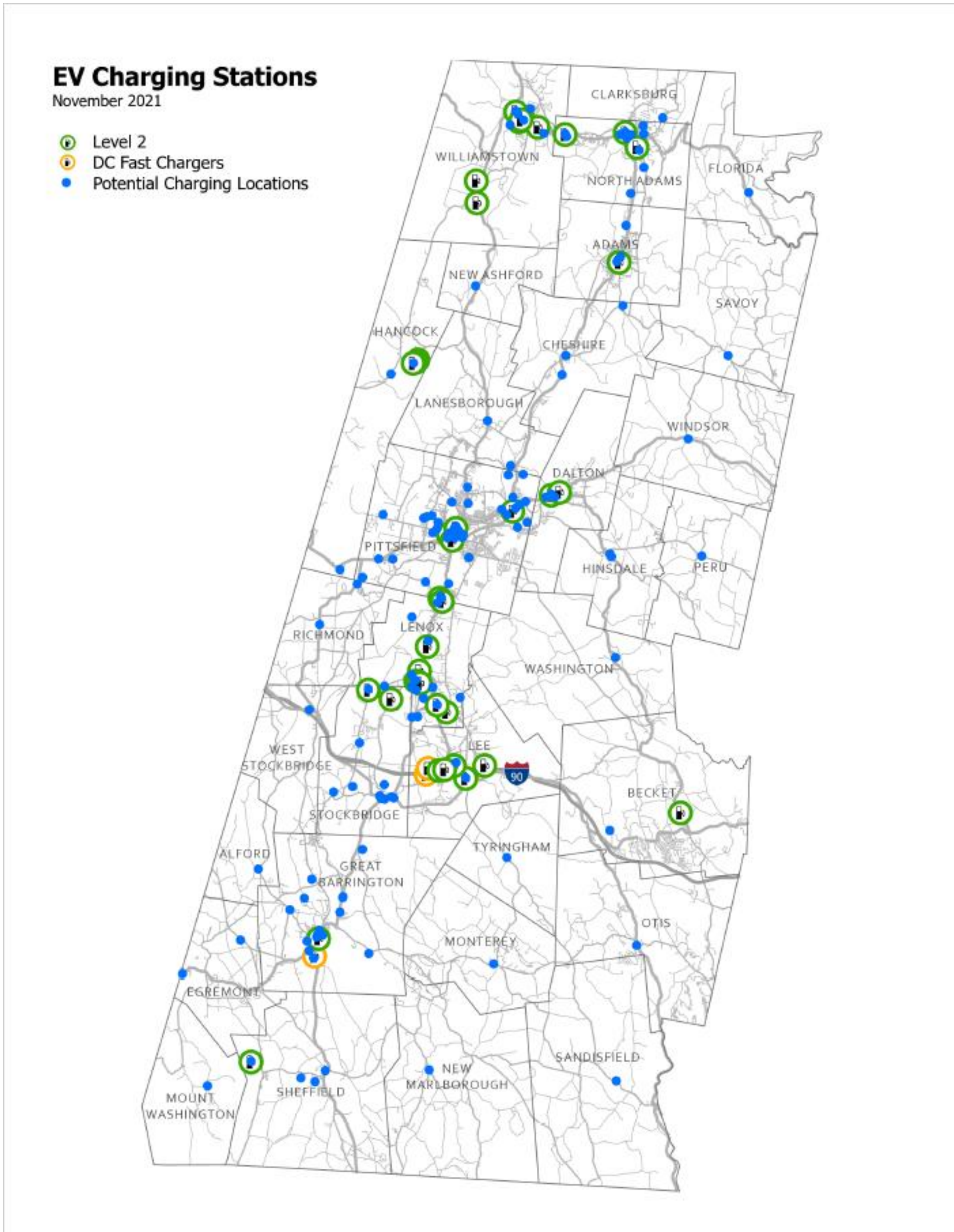
All new commercial and residential development, including multi-unit dwelling development, should take appropriate steps to ensure EV charging capacity. Additionally, municipalities are encouraged to think through the design of current or prospective EV charging sites and consider whether they facilitate potential future expansion through increasing the number of charging stalls that could be supported at the site if needed. Please refer to 'Identifying Suitable Charging Locations' and 'EV Charging Readiness' sections of this report for siting and zoning considerations related to EV charging preparations.

Berkshire Green Communities

Just over half of all communities in the Berkshires are designated by the state as Green Communities. These include, Clarksburg, North Adams, Williamstown, Adams, Cheshire, Lanesborough, Dalton, Windsor, Pittsfield, Hinsdale, Peru, Richmond, Lenox, Stockbridge, Great Barrington, Egremont, Becket, and Sandisfield. The state's Green Community grant program provides a road map and financial assistance to municipalities that 1) pledge to cut municipal energy use by an ambitious, achievable goal of 20 percent over 5 years and 2) meet four other criteria established in the Green Communities Act.

This plan highly encourages all Berkshire green communities to explore the acquisition of EVs and charging infrastructure utilizing Green Community program funding. Committees that currently meet to discuss green community matters within designated communities are well positioned to incorporate this topic into the conversation and identify potential charging sites that account for local contextual factors.

Figure 9: Existing and Potential EV Charging Station in Berkshire County



Acronyms

A	Ampere (unit of electric current)
AC	Alternating Current
BEV	Battery Electric Vehicle
DC	Direct Current
DCFC	Direct Current Fast Charger/Charging
DOE	Department of Energy
EV	Electric Vehicle
EVSE	Electric Vehicle Supply Equipment
FHWA	Federal Highway Administration
HEV	Hybrid Electric Vehicle
ICE	Internal Combustion Engine
kW	Kilowatts (power)
kWh	Kilowatt Hours (energy)
L1	Level 1 Charger
L2	Level 2 Charger
MassDOT	Massachusetts Department of Transportation
MassEVIP	Massachusetts Electric Vehicle Incentive Program
MOR-EV	Massachusetts Offers Rebates for Electric Vehicles Program
PHEV	Plug-in Hybrid Electric
SAE	Society of Automotive Engineers
SoC	State of Charge
USDOT	United States Department of Transportation
V	Volts
VAC	Volts of Alternating Current
WEVC	Wireless Electric Vehicle Charging
ZEM	Zero Emission Motorcycle
ZEV	Zero Emission Vehicle

Appendix

Appendix A: Existing EV Charging Station Locations in Berkshire County, MA

Site Host	Address	Town	Zip Code	Charging Level	Number of Plugs	Type of Plug	Power Level
Berkshire School	245 N Undermountain Road	Sheffield	01257	Level 2	2	J-1772	6.6 kW
Big Y-GB Supercharger	700 Main Street	Great Barrington	01230	DC Fast Charger	8	Tesla	250 kW
Berkshire Food Co-op	34 Bridge Street	Great Barrington	01230	Level 2	2	J-1772	-
Holiday Inn Express and Suites	415 Stockbridge Road	Great Barrington	01230	Level 2	8	J-1772	6.6 kW
Becket Town Hall	557 Main Street	Becket	01223	Level 2	4	J-1772	6 kW
Lee Supercharger	10 Pleasant Street	Lee	01238	DC Fast Charger	8	Tesla	150 kW
Big Y	10 Pleasant Street	Lee	01238	Level 2	3	1 Wall / 2 J-1772	- Wall plug / 6.6 kW J-1772
October Mountain Financial Advisers	103 W Park Street	Lee	01238	Level 2	2	J-1772	7 kW
Applegate Inn	279 W Park Street	Lee	01238	Level 2	2	1 J-1772 / 1 Tesla	- J-1772 / 8 kW Tesla
Devonfield Inn	85 Stockbridge Road	Lee	01238	Level 2	1	Tesla	6 kW
Lee Service Plaza Westbound	Massachusetts Turnpike	Lee	01238	DC Fast Charger	2	1 CHAdeMO / 1 CCS	50 kW
Lee Service Plaza Eastbound	Massachusetts Turnpike	Lee	01238	DC Fast Charger	2	1 CHAdeMO / 1 CCS	50 kW

Blantyre Hotel	16 Blantyre Road	Lenox	01240	Level 2	1	Tesla	13 kW
Cranwell Resort	55 Lee Road	Lenox	01240	Level 2	2	Tesla	8 kW
Wheatleigh	2 Emerson Lane	Lenox	01240	Level 2	1	J-1772	-
Lenox, MA	7 Hubbard Street	Lenox	01240	Level 2	2	J-1772 / Tesla	- J-1772 / 16 kW Tesla
Lenox Town Hall	6 Walker Street	Lenox	01240	Level 2	2	J-1772	-
Hamtpon Terrace Inn	91 Walker Street	Lenox	01240	Level 2	2	Tesla	16 kW
Gateways Inn & Restaurant	51 Walker Street	Lenox	01240	Level 2	2	J-1772 / Tesla	- J-1772 I22/ 16 kW Tesla
Courtyard by Marriott	70 Pittsfield Road	Lenox	01240	Level 2	2	J-1772	-
Haddad Toyota	526 Pittsfield Road	Lenox	01240	Level 2	1	J-1772	-
Brook Farm Inn	15 Hawthorne Street	Lenox	01240	Level 2	2	J-1772 / Tesla	- J-1772 / 16 kW Tesla
Mass Audubon Pleasant Valley Wildlife Sanctuary	472 W Mountain Road	Lenox	01240	Level 2	4	J-1772	6.6 kW
Kripalu Center for Yoga & Health	57 Interlaken Road	Stockbridg e	01262	Level 2	2	J-1772	-
Norman Rockwell Museum	9 Glendale Road	Stockbridg e	01262	Level 2	8	J-1772	
The Red Lion Inn	30 Main Street	Stockbridg e	01262	Level 2	2	J-1772	-
The Inn at Stockbridge	30 East Street	Stockbridg e	01262	Level 2	2	J-1772 / Tesla	16 kW
Hiltown Garden Inn	1010 South Street	Pittsfield	01201	Level 2	4	J-1772	-
Haddad Nissan	25 W Housatonic Street	Pittsfield	01201	Level 2	1	J-1772	-
Biy Y	200 West Street	Pittsfield	01201	Level 2	4	J-1772	6.6 kW

Hotel on North	273 North Street	Pittsfield	01201	Level 2	3	1 Wall / 2 J-1772	-
Flynn VW Audi BMW	600 Merrill Road	Pittsfield	01201	Level 2	2	J-1772	-
The Stationery Factory	63 Flansburg Avenue	Dalton	01226	Level 2	2	J-1772	6.6 kW
Dalton COA/Senior Center	40 Field Street	Dalton	01226	Level 2	2	J-1772	-
Jiminy Peak Mountain Resort	1 Corey Road	Hancock	01237	Level 2	4	2 J-1772 / 2 Tesla	- J-1772 / 16 kW Tesla
Wyndham Bentley Brook	Mountainside Drive	Hancock	01237	Level 2	1	J-1772	7.2 kW
Vacation Villages	276 Brodie Mountain Road	Hancock	01237	Level 2	2	J-1772	-
Topia Inn	10 Pleasant Street	Adams	01220	Level 2	1	NEMA 14-50 (Wall)	-
MCLA - Feigenbaum Center	71 Porter Street	North Adams	01247	Level 2	1	J-1772	-
The Porches	231 River Street	North Adams	01247	Level 2	2	J-1772	-
Tourists	915 State Road	North Adams	01247	Level 2	2	J-1772	-
Mass MoCA	1311 Mass MoCA Way	North Adams	01247	Level 2	8	J-1772	6.6 kW
Stop and Shop	876 State Road	North Adams	01247	Level 2	2	J-1772	
The Orchards Hotel	222 Adams Road	Williamstown	01267	Level 2	2	1 J-1772 / 1 Tesla	- J-1772 / 8 kW Tesla
Lansing Chapman Rink	76 Latham Street	Williamstown	01267	Level 2	2	J-1772	6.6 kW
Williamstown Town Parking Lot	199 Spring Street	Williamstown	01267	Level 2	2	J-1772	-
Williams Inn	103 Spring Steet	Williamstown	01267	Level 2	2	J-1772	6.6 kW

Williamstown Police Station	31 North Street	Williamstown	01267	Level 2	2	J-1772	-
Mount Greylock Regional High School	1781 Cold Spring Road	Willaimstown	01267	Level 2	5	J-1772	-
Waubeeka Golf Links	137 New Ashford Road	Williamstown	01267	Level 2	6	J-1772	6.6 kW
Fairfield Inn and Suites	430 Main Street	Williamstown	01267	Level 2	8	J-1772	6.6 kW
The Clark Museum	225 South Street	Williamstown	01267	Level 2	6	J-1772	6.6 kW
Cable Mills Apartments (Private, not public)	160 Water Street	Williamstown	01267	Level 2	1	J-1772	7.2 kW

Appendix B: Potential Locations for EV Charging Station Network Expansion

List of major employer locations in Berkshire County (Highlighted locations currently have EVSE in place).

Company name	Address	City	State	# of employees
Austen Riggs Ctr Inc	25 Main St	Stockbridge	MA	100-249
Bard College At Simons Rock	84 Alford Rd	Great Barrington	MA	100-249
Bedard Bros Chrysler Jeep Ddg	452 S State Rd	Cheshire	MA	100-249
Berkshire Bank	99 North St	Pittsfield	MA	100-249
Berkshire Children & Families	480 West St	Pittsfield	MA	100-249
Berkshire Community College	1350 West St	Pittsfield	MA	250-499
Berkshire Corp	21 River St	Great Barrington	MA	100-249
Berkshire Gas Co	115 Cheshire Rd	Pittsfield	MA	100-249
Berkshire House of Correction	467 Cheshire Rd	Pittsfield	MA	100-249
Berkshire Meadows School	249 N Plain Rd	Housatonic	MA	100-249
Berkshire Medical Ctr	75 North St	Pittsfield	MA	1,000-4,999
Berkshire School	245 N Undermountain Rd	Sheffield	MA	100-249
Berkshire Theatre Festival's	6 East St	Stockbridge	MA	100-249
Bershire Concrete Corp	550 Cheshire Rd	Pittsfield	MA	500-999
BFAIR Inc	771 Church St	North Adams	MA	100-249
Big Y	200 West St	Pittsfield	MA	250-499
Big Y	700 Main St	Great Barrington	MA	100-249
Big Y	10 Pleasant St	Lee	MA	100-249
Big Y	45 Veterans Memorial Dr	North Adams	MA	100-249
Big Y	740 Main St	Great Barrington	MA	100-249
BMC Hillcrest Campus	165 Tor Ct	Pittsfield	MA	500-999
Brien Center	333 East St	Pittsfield	MA	250-499
Canyon Ranch-Lenox	165 Kemble St	Lenox	MA	500-999
Cascade School Supplies Inc	1 Brown St	North Adams	MA	100-249
Catamount Ski	Route 23	South Egremont	MA	100-249
Cavallero Plastics Inc	1250 North St	Pittsfield	MA	100-249
Community Health Programs Inc	444 Stockbridge Rd	Great Barrington	MA	100-249
Craneville Place of Dalton	265 Main St	Dalton	MA	100-249
Crosby Elementary School	517 West St	Pittsfield	MA	100-249
Dufour Escorted Tours Inc	133 South St	Hinsdale	MA	100-249
Eagle Santa Fund	75 S Church St	Pittsfield	MA	100-249
Elder Services-Berkshire Cnty	877 South St	Pittsfield	MA	100-249
Fairview Commons Nurse & Rehab	151 Christian Hill Rd	Great Barrington	MA	100-249
Fairview Hospital	29 Lewis Ave	Great Barrington	MA	100-249
Fire Chiefs Office	74 Columbus Ave	Pittsfield	MA	100-249

Gl & V USA Inc	175 Crystal St	Lenox	MA	100-249
Guidewire Inc	34 Depot St	Pittsfield	MA	250-499
Guido's Fresh Marketplace	1020 South St	Pittsfield	MA	100-249
Haddad Toyota	130 Pittsfield Lenox Rd	Pittsfield	MA	100-249
Herberg Middle School	501 Pomeroy Ave	Pittsfield	MA	100-249
Hillcrest Commons Nurse-Rehab	169 Valentine Rd	Pittsfield	MA	250-499
Hillcrest Education	349 Old Stockbridge Rd	Lenox	MA	100-249
Hillcrest Educational Ctr	242 W Mountain Rd	Lenox	MA	100-249
Holiday Inn-Suites Pittsfield	1 West St	Pittsfield	MA	100-249
Home Depot	555 Hubbard Ave	Pittsfield	MA	100-249
Hoosac Valley Middle School	125 Savoy Rd	Cheshire	MA	100-249
Interprint Inc	101 Central Berkshire Blvd	Pittsfield	MA	100-249
Kimball Farms Nursing Care Ctr	40 Sunset Ave	Lenox	MA	100-249
Kripalu Center For Yoga-Health	57 Interlaken Rd	Stockbridge	MA	250-499
Life Care Kimball Farms	235 Walker St	Lenox	MA	100-249
LTI Smart Glass	14 Federico Dr	Pittsfield	MA	100-249
Marian Fathers-Marian Helpers	Eden Hill	Stockbridge	MA	100-249
Market 32 By Price Chopper	555 Hubbard Ave	Pittsfield	MA	250-499
Market 32 By Price Chopper	495 Pittsfield Rd	Lenox	MA	100-249
Maxymillian Technologies Inc	1801 East St	Pittsfield	MA	100-249
Miraval Berkshires Resrt & Spa	55 Lee Rd	Lenox	MA	250-499
Monument Mountain Regl High	600 Stockbridge Rd	Great Barrington	MA	100-249
Mt Everett Regional School	491 Berkshire School Rd	Sheffield	MA	100-249
Mt Greylock Extended Care	1000 North St	Pittsfield	MA	100-249
Neenah Technical Materials	1080 Dalton Ave	Pittsfield	MA	100-249
New England Newspaper Inc	75 S Church St	Pittsfield	MA	250-499
Northadams Commons Tty	175 Franklin St	North Adams	MA	100-249
Pine Cone Hill	125 Pecks Rd	Pittsfield	MA	100-249
Pittsfield High School	300 East St	Pittsfield	MA	100-249
Pittsfield Plastics Engrng Inc	1510 W Housatonic St	Pittsfield	MA	100-249
Pittsfield Police Dept Non	39 Allen St	Pittsfield	MA	100-249
Plaskolite LLC	119 Salisbury Rd	Sheffield	MA	100-249
Prairie Whale	174 Main St	Great Barrington	MA	250-499
Williams College	60 Latham St	Williamstown	MA	100-249
Price Chopper	300 Stockbridge Rd	Great Barrington	MA	100-249
Price Rite	457 Dalton Ave	Pittsfield	MA	100-249
SABIC Innovative Plastics	1 Plastics Ave	Pittsfield	MA	500-999
Shakespeare & Co	70 Kemble St	Lenox	MA	100-249
Silvio O Conte Community Sch	200 W Union St	Pittsfield	MA	100-249
Social Services Dept	73 Eagle St	Pittsfield	MA	100-249
Specialty Minerals Inc	260 Columbia St	Adams	MA	100-249
Springside Rehabilitation	255 Lebanon Ave	Pittsfield	MA	100-249

Super Stop & Shop	660 Merrill Rd	Pittsfield	MA	100-249
Super Stop & Shop	876 State Rd	North Adams	MA	100-249
Super Stop & Shop	1 Dan Fox Dr	Pittsfield	MA	100-249
Taconic High School	96 Valentine Rd	Pittsfield	MA	100-249
Tanglewood-Boston Symphony	297 West St	Lenox	MA	250-499
Target	655 Cheshire Rd	Lanesborough	MA	100-249
TD Bank	99 West St	Pittsfield	MA	100-249
Timberlyn East	148 Maple Ave	Great Barrington	MA	100-249
Undermountain Elementary Sch	491 Berkshire School Rd	Sheffield	MA	100-249
US Post Office	212 Fenn St	Pittsfield	MA	250-499
Walmart	555 Hubbard Ave	Pittsfield	MA	250-499
Walmart Supercenter	1415 Curran Hwy	North Adams	MA	250-499
Williamstown Accounting Dept	31 North St	Williamstown	MA	100-249
Williamstown Commons	25 Adams Rd	Williamstown	MA	250-499
Williamstown Public School	115 Church St	Williamstown	MA	100-249
Women Infants & Children	442 Stockbridge Rd	Great Barrington	MA	100-249
MCLA	375 Church Street	North Adams	MA	100-249
BCC	1350 West Street	Pittsfield	MA	100-249

List of tourism destinations in Berkshire County, MA.

NAME	COMMUNITY	STATE	STR_ADD1	ZIPCODE
Adams Visitors Center	Adams	MA	3 Hoosac Street	01220
Balderdash Cellars	Richmond	MA	81 State Road	01254
Barrington Stage Theater	Pittsfield	MA	30 Union Street	01201
Berkshire Theatre Festival	Stockbridge	MA	East Main Street	01262
Bosquet	Pittsfield	MA	101 Dan Fox Drive	01201
Butternut	Great Barrington	MA	380 State Road	01230
Canyon Ranch	Lenox	MA	165 Kemble Street	01240
Chesterwood	STOCKBRIDGE	MA	4 Williamsville Road	01262
Clark Art Institute	WILLIAMSTOWN	MA	225 South Street	01267
Eclipse Mill Artist Lofts	North Adams	MA	243 Union Street	01247
Edith Wharton Restoration	LENOX	MA	2 Plunkett Street	01240
Hancock Shaker Village Inc	PITTSFIELD	MA	Route 20	01201
IS183 Art School Berkshires	Stockbridge	MA	13 Willard Hill Road	01262
Jacob's Pillow Dance Festival	Becket	MA	358 George Carter Road	01223
Koussevitzky Arts Center	Pittsfield	MA	1350 West Street	01201
Miraval Berkshire Resort and Spa	Lenox	MA	55 Lee Road	01240
Shakespeare & Company	Lenox	MA	70 Kemble Street	01240
Stationary Factory	Dalton	MA	63 Flansburg Avenue	01226
Tanglewood	Lenox	MA	297 West Street	01240
The Colonial Theatre	Pittsfield	MA	111 South Street	01201
Triplex Cinema	Great Barrington	MA	70 Railroad Street	01230
Williams College Museum of Art	Williamstown	MA	Route 2	01267

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