National Electric Vehicle Infrastructure (NEVI) Program
Deployment Plan for Massachusetts

massDOT
Massachusetts Department of Transportation

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1.0 Introduction

This National Electric Vehicle Infrastructure (NEVI) Program Deployment Plan (referred to as the "NEVI Plan") is the framework for Massachusetts to expand its electric vehicle (EV) highway fast charging network through the National Electric Vehicle Infrastructure Program established by the Infrastructure Investment and Jobs Act (IIJA). Consistent with the intent of the NEVI Program, this plan focuses on direct current fast charging (DCFC) infrastructure serving long-distance travel corridors, specifically Massachusetts' federally designated EV Alternative Fuel Corridors.

1.1 Overview of the Plan and its Development Process

The Massachusetts Department of Transportation (MassDOT) developed this NEVI Plan in accordance with the Federal Highway Administration (FHWA) NEVI Program Guidance, issued on February 10th, 2022.

To develop this NEVI Plan, MassDOT:

- Undertook significant stakeholder and public engagement, including to members and/or representatives of disadvantaged, underserved, and rural communities.
- Performed a corridor demand, gap, and needs analysis to compare existing and projected supply and demand for direct current fast charging (DCFC) infrastructure on major highway corridors.
- Performed an economic analysis to identify potential costs and revenues associated with DCFC network build-out.
- Identified priority zones for NEVI program investment based on a gap analysis, economic analysis, and other prioritization considerations, including equity.

MassDOT also drew upon previous MassDOT analyses on the state of the electric vehicle market, scenario-based forecasts for charging demand, and site-specific analysis for provision of DCFC infrastructure for long-distance travel. Development for this plan has also been informed by recent MassDOT survey work to quantify driver refueling behavior and preferences on long-distance trips in the Commonwealth.

1.2 Dates of State Plan for Electric Vehicle Infrastructure Deployment Development and Adoption

This plan must be submitted by MassDOT to the Joint Office of Energy and Transportation no later than August 1, 2022. The IIJA provides no further process requirements beyond the submission of a plan for MassDOT to access NEVI funds. However, MassDOT understands that FHWA intends to approve plans that each state submits and that FHWA anticipates this will occur no later than September 30, 2022.

This plan contains a schedule for the use of NEVI funds for Federal Fiscal years 2022-2026 as outlined in Section 6.2. The timing of when these funds are used will depend on a range of factors

including publication of final federal standards for charging equipment, equipment availability and lead times, construction season timing, environmental permitting, and the final details of a procurement approach.

MassDOT will update the financial schedule in this plan via ongoing changes to the Statewide Transportation Improvement Program (STIP) as implementation of this plan progresses and uncertainties over NEVI program rules and requirements are resolved.

The STIP is updated annually and reflects how MassDOT expects to utilize anticipated federal funds over a five-year period. Upon completion of the solicitation process, MassDOT will amend the STIP to include any programmed, NEVI-funded projects. The STIP and STIP actions are published for public comment and available on the MassDOT website.

2.0 Regional and State Agency Coordination

During plan development, MassDOT participated in virtual meetings with staff from neighboring State Departments of Transportation (DOTs) to ensure that the Commonwealth's approach for NEVI-funded DCFC was consistent with a well-functioning national DCFC network.

MassDOT also participated in virtual meetings of the EV Practitioners Working Group organized by the American Association of State Highway and Transportation Officials (AASHTO). During these meetings, MassDOT staff coordinated with representatives from State DOTs to learn how other states were approaching plans for NEVI program investments.

MassDOT also participated in virtual meetings organized by the Joint Office of Energy and Transportation with primarily Northeast region State DOTs and FHWA staff. During these meetings, MassDOT staff engaged with other State DOT and FHWA staff to provide updates on NEVI plan development, ask and respond to questions regarding NEVI program plans, and review challenges and opportunities for NEVI investments.

MassDOT intends to continue these conversations as this plan is implemented to ensure continued coordination and information sharing with other State DOTs.

Throughout the development of the plan, there was ongoing coordination and communication between the MassDOT Office of Transportation Planning (OTP) and the Executive Office of Energy and Environmental Affairs (EEA). EEA staff provided support to the development of this plan via review of key deliverables, including public and stakeholder engagement materials, analysis methods and results, and the draft NEVI Plan. Collaboration between MassDOT and EEA helps to ensure that the plan recommendations are consistent with other Commonwealth priorities, policies, and programs. As discussed in Section 6.4, investment of NEVI formula funds would represent only one small part of the Commonwealth's policy framework for increasing electric vehicle uptake.

3.0 Public and Stakeholder Engagement

MassDOT developed and implemented a Public Engagement Plan (PEP) to gather input from the general public, underserved communities, and other key stakeholder groups. The PEP outlined the public and stakeholder engagement strategies to help ensure that this plan achieves an equitable and fair deployment, distribution, and use of DCFC infrastructure on highways throughout the Commonwealth.

MassDOT consulted with stakeholders to identify existing EV charging infrastructure, potential funding opportunities, and best practices for contracting and deployment. MassDOT also solicited public feedback to better understand public awareness, need, and preferences for highway DCFC infrastructure including locations and attributes. Outreach methods included a publicly available website comment portal and stakeholder survey, online roundtables, focus groups, interviews, and a statistical survey.

Stakeholder groups included utility companies, EV service providers, transportation planning and public transportation agencies, workforce development organizations, chambers of commerce, community-based organizations, and members and/or representatives of rural, underserved, and disadvantaged communities. The feedback, recommendations, and challenges to program success identified through the stakeholder engagement process are integrated throughout this plan.

3.1 Stakeholder Engagement Approach

MassDOT targeted a wide range of stakeholders through multiple engagement avenues, including:

- **Project website portal and stakeholder survey:** The stakeholder survey targeted a wide group of stakeholders within Massachusetts that included local, state, and tribal governments; metropolitan planning organizations; regional transit agencies; EV supply equipment and service providers; electric utility providers; chambers of commerce and workforce development organizations; and community-based, environmental justice and environmental protection organizations. This survey was distributed to approximately 250 organizations, promoted via MassDOT social media and was available to interested parties and the general public on the project website. The stakeholder survey requested input on topics that included plan vision and goals, benefits of highway DCFC and how to target these benefits towards disadvantaged communities, best practices for contracting, and strategies for efficient DCFC infrastructure deployment. MassDOT received approximately 40 responses from the stakeholder survey.
- **Online roundtables**: MassDOT facilitated three online roundtables with 14 participants from 12 community-based organizations, environmental justice, and environmental protection organizations, and rural metropolitan planning organizations (MPOs). One roundtable included staff and members of organizations representing rural communities and concerns. Two roundtables included participants from environmental justice, environmental protection, and community-based organizations. Topics included perceived social, environmental, and economic benefits of EVs and DCFC on highways; barriers for disadvantaged communities; and NEVI plan vision and goals.

- **Focus groups:** The project team conducted two focus groups each with seven to nine members of the public from designated environmental justice (EJ) communities[1] and communities identified through the interim federal definition of Justice40 communities. This outreach supports the incorporation of the perspectives and needs of these communities into this plan. Topics focused on perceived benefits of EVs and fast charging on highways, long-distance range confidence, and barriers to adopting and using EVs.
- **Interviews with EV service providers and electric utility providers:** The MassDOT team facilitated nine interviews with EV service providers and electric utility providers servicing Massachusetts. Interview topics included ongoing DCFC infrastructure initiatives; prioritization, barriers, consumer demand, and economics of public-access DCFC infrastructure on highways; and views on public-private partnership approaches and how to best allocate funding between capital and operating expenses.
- **Statistical survey:** MassDOT also deployed a statistical survey to the general public of Massachusetts. The survey collected responses from a statistically valid sample of approximately 500 Massachusetts residents with valid driver's licenses who make at least one long-distance trip (greater than 100 miles) in a year. Questions in this survey covered topics such as barriers to EV adoption, range confidence for making long-distance trips in an EV; desired amenities at recharging locations; and preferred highway fast charging experience.
- **Request for Information (RFI) on current and planned corridor DCFC deployment**. MassDOT issued an RFI targeted at DCFC charging network providers to identify planned and existing DCFC along relevant highway corridors. This effort filled gaps in information on the Alternative Fuel Data Center website and informed modeling undertaken for this plan.

MassDOT staff also maintained and monitored a project email account that was provided as a contact on the MassDOT NEVI Plan page on Mass.gov.

Future Planned Engagement

As described above, MassDOT has undertaken an intensive, multi-faceted approach to seeking input from stakeholders in order to inform both the content of this plan and the implementation activities that will follow submission of the plan by FHWA.

Informed by this stakeholder engagement, this plan outlines a comprehensive approach to the use of FFY22-FFY26 NEVI formula funds to deploy fast charging stations along alternative fuel corridors.

Following submission of this plan and the confirmation of pending federal standards for charging stations, MassDOT intends to move to implementation. MassDOT anticipates that future public engagement will be limited to that necessary for the completion of a solicitation process, providing updates on implementation progress, and updating the programming of NEVI formula funds in the STIP (including public comment period).

[1] https://www.mass.gov/info-details/environmental-justice-populations-in-massachusetts

4.0 Plan Vision and Goals

MassDOT is targeting the use of federal NEVI program funds in a way that meets current and projected demand for EV charging along highway corridors in Massachusetts; ensures a financially sustainable approach towards public investment in EV charging; and considers a range of public-private partnership and charging infrastructure technology options. This plan sets the following vision for EV charging infrastructure in the Commonwealth:

> *The Commonwealth's vision is to establish a financially sustainable, equitable, and complete network of NEVI-funded fast-charging stations that supports travelers in taking long-distance trips in electric vehicles with confidence. The process to build out and maintain a reliable charging network will be a transparent and competitive process, and will be complementary to other ongoing federal, state, and local initiatives supporting EV adoption.*

The plan sets four goals, along with associated performance metrics and 5-year targets, as shown in Table 1. The vision, goals, and metrics reflect consideration of stakeholder input as obtained through the public and stakeholder outreach described in Section 3.0. Contracting arrangements will be written to include requirements for data collection and reporting to support tracking of these metrics, as further described in Section 12.0. In addition to these metrics, MassDOT will also consider re-administering the project statistical survey to periodically track how Massachusetts drivers feel about range confidence, the top barriers to EV adoption, and the highway fast charging experience.

Table 1: Goals, Performance Metrics, and Targets

Goal	Performance Metric	5-Year Target
Completeness – Major highway corridors important for long-distance trip making will have regular opportunities for travelers to recharge electric vehicles.	Electric vehicle Alternative Fuel Corridors in Massachusetts, with gaps of more than 50 miles between 4 x 150 kW port DCFC stations located no more than 1 mile from highways, expressed as percentage of total miles of electric vehicle Alternative Fuel Corridors designated in 2022.	0%
Financial sustainability – Charging stations will become financially self-sustaining as soon as feasible after the initial investment of NEVI program funds and matching funding sources.	Percent of installed stations receiving public investment 5 years from final station commissioning.	0%
Reliability – DCFC stations will be readily available to travelers on Massachusetts' long-distance travel corridor network, including its designated Alternative Fuel Corridors.	Average "uptime" of chargers, measured over one year at a site level.	97%
Equity – Disadvantaged communities will have access to DCFC for long-distance travel that meets or exceeds the access to DCFC of non-disadvantaged communities.	Ratio of % of state's population in EJ communities that are within 5 miles of a zone served by NEVI-funded DCFC to the % of non-EJ community population within 5 miles of those zones	>1.0

5.0 Existing and Future Conditions Analysis

5.1 Massachusetts Geography, Terrain, Climate and Land Use Patterns

The Commonwealth of Massachusetts spans from hilly and higher terrain near the Appalachian Mountains to flat coastal plains along the Atlantic Coast. Western Massachusetts has a higher elevation with mountains and rolling hills leading into the Pioneer Valley. Western Massachusetts is suburban and rural, with a lower density of Interstate and state highways. Land use, development, and transportation patterns change while traveling through central Massachusetts and into eastern Massachusetts as the terrain becomes more rolling and elevation decreases. There is a higher density of state highways, Interstates, and population in eastern Massachusetts. Boston, Massachusetts' largest city, is located along the Massachusetts Bay. Eastern Massachusetts is largely coastal, with many bays, beaches, and rocky coasts along its shorelines. The Cape Cod peninsula and nearby islands to the southeast are among the region's top tourism destinations.

The climate in Massachusetts is considered a humid mid-continental climate experiencing hot and humid summers and cold, snowy winters. Summers are warm and average temperatures in July range from the upper 60s to mid-70s (degrees Fahrenheit), with the western part of the Commonwealth being cooler than the eastern portion. Winter temperatures vary more on average, with average temperatures in January spanning from low 20s to the 30s (degrees Fahrenheit). However, temperatures in Massachusetts have risen by almost 3.5 degrees Fahrenheit over the last century, with an increasing number of warm nights.[2]

Massachusetts receives on average between 45 and 55 inches of precipitation annually.[3] Severe weather events in Massachusetts include extreme precipitation and flooding, severe storms, drought, and hurricanes. Massachusetts most recently experienced extreme drought in 2016-2017 and 2020. The coastline of Massachusetts is particularly vulnerable to damage from nor'easters and tropical storms and hurricanes traveling up the Atlantic coast. Seven hurricanes made landfall in Massachusetts between 1900 and 2020, including Superstorm Sandy in 2012. Riverine flooding has also been a problem in parts of the Commonwealth. In 2011, Hurricane Irene led to significant flooding of the Deerfield River in western Massachusetts and associated infrastructure damage. If current trends affecting Massachusetts' climate continue, changing oceanic and atmospheric conditions could lead to an increase in frequency of tropical storms, extreme precipitation events, and rising temperatures. Many areas in coastal Massachusetts, including Cape Cod and Greater Boston, are also susceptible to sea level rise.

[2] https://statesummaries.ncics.org/chapter/ma/

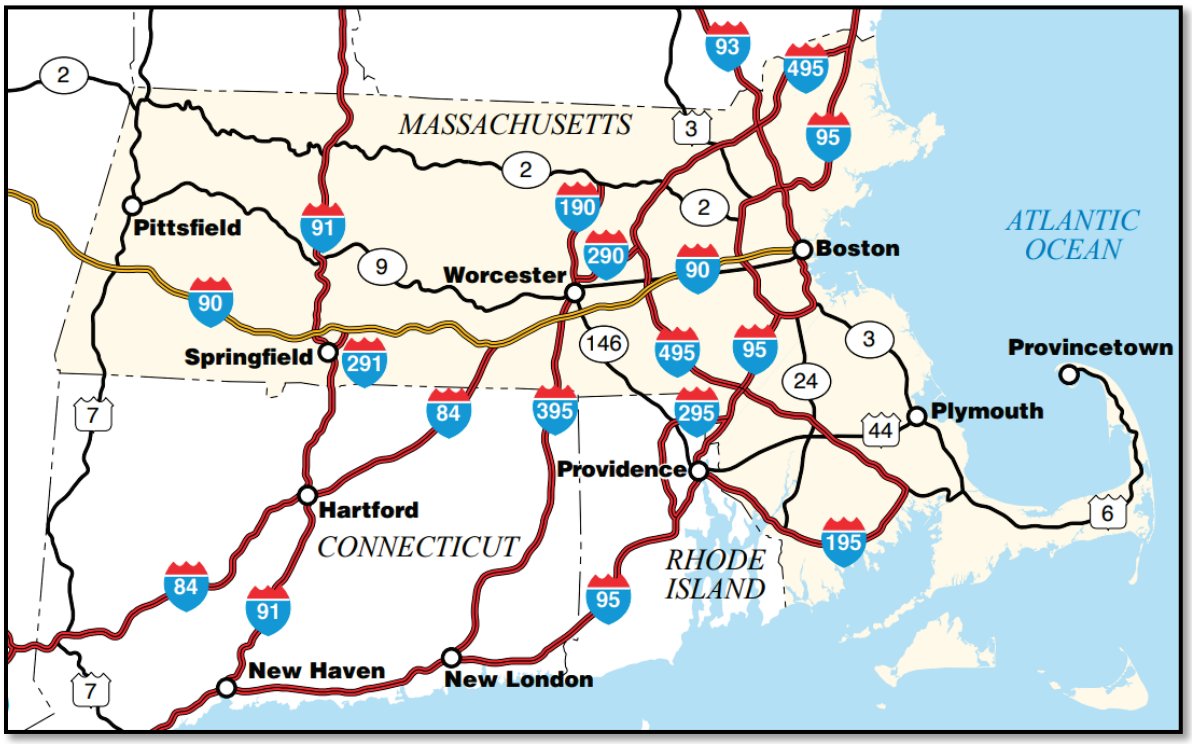
[3] Ibid.

5.2 Massachusetts Infrastructure and Development

Infrastructure and Transit

MassDOT is responsible for maintaining over 9,500 lane miles of pavement throughout the Commonwealth, primarily on Interstates, other freeways, and arterial roads. State-owned roads, which comprise 13 percent of all roads in Massachusetts, carry over half of all vehicle-miles traveled. Figure 1 illustrates the Interstates, U.S. routes, and primary state routes on the highway system in Massachusetts.

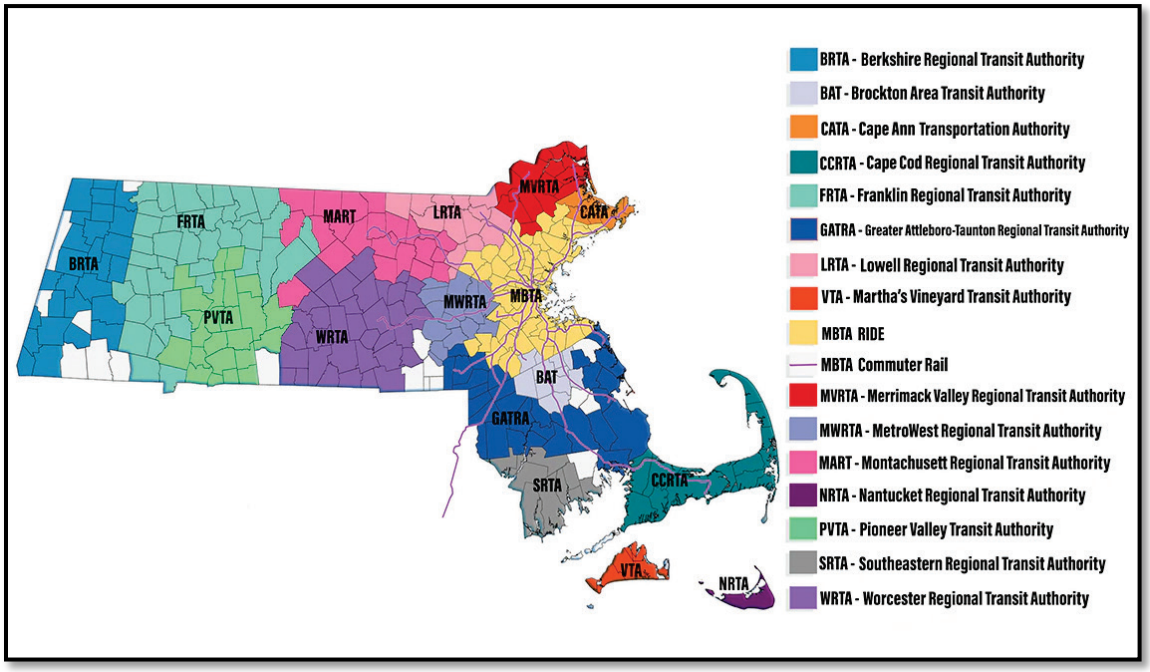
Figure 1: Highway System in Massachusetts



Source: Massachusetts Department of Transportation.

The Massachusetts Bay Transportation Authority (MBTA) provides transit service to riders in the Greater Boston and beyond area via buses, light and heavy rail, and commuter rail. Throughout Massachusetts, the 15 Regional Transit Authorities (RTAs) provide public transit for residents and visitors in most Massachusetts municipalities (as shown in Figure 2), serving over 26 million passenger trips annually. The MBTA has established a goal to convert bus fleets to zero-emissions vehicles by 2040 through strategic investment and replacement. Initiatives will include updating bus maintenance facilities to accommodate battery electric buses and related charging infrastructure, and integrating charging stations throughout bus networks.[4]

Figure 2: Regional Transit Authorities in Massachusetts



Source: Commonwealth of Massachusetts, 2021.

Alternatives to driving for long-distance travel via surface transportation modes are available but limited in their geographic reach. Currently, Amtrak provides daily service from Boston to Springfield and Albany, and more frequent service along the Northeast Corridor connecting to Providence, RI and Portland, ME. Intercity bus services are provided along a number of corridors by Peter Pan Bus Lines, Greyhound Lines, Concord Coach, and Plymouth & Brockton.

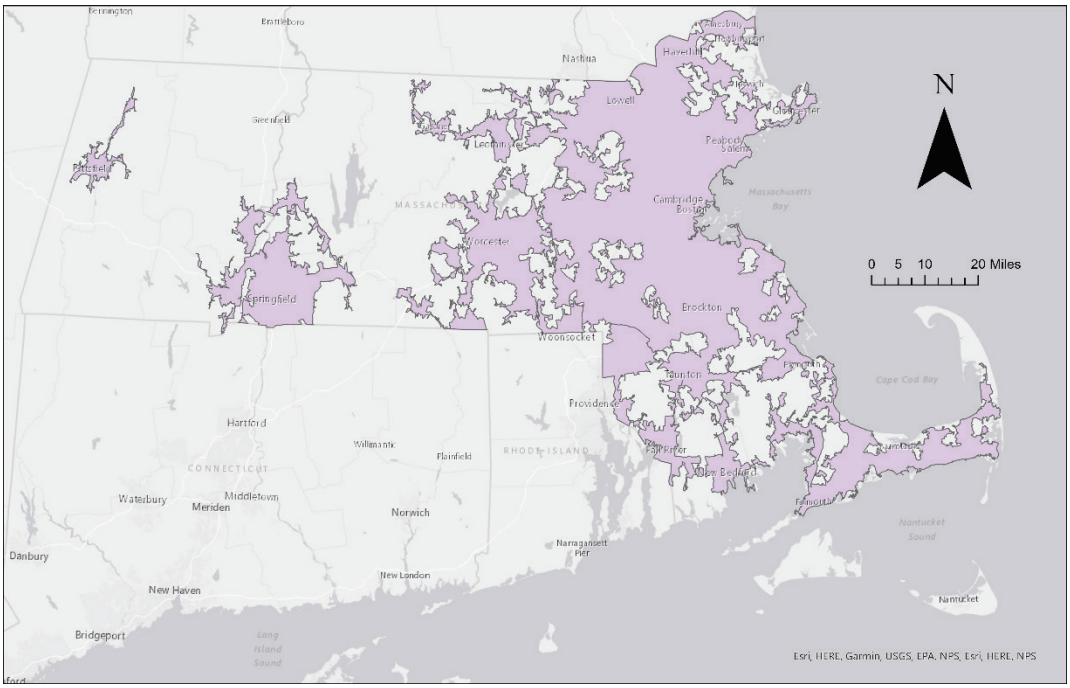
[4] https://www.mbta.com/projects/bus-electrification

Urban Development and Utility Territories

Over half of the Commonwealth's seven million residents live in the Greater Boston metropolitan area, including almost 700,000 people in the City of Boston and hundreds of thousands in neighboring urban municipalities such as Cambridge, Somerville, Brookline, Medford, and Chelsea. There is a much greater density of road infrastructure, land use development, and public transportation services in the Greater Boston area than in the central and western portions of the Commonwealth. Many of the roads in the Greater Boston area operate at or near capacity at peak times, with significant congestion within the I-95/Route 128 corridor.[5]

Massachusetts is also home to 26 "Gateway Cities" – midsize urban centers that anchor regional economies around the Commonwealth. The second largest city is Worcester, located in central Massachusetts near the confluence of I-90, I-190, and I-290. The third largest city is Springfield in the Pioneer Valley of western Massachusetts, near the interchanges of I-90, I-91, I-291, and I-391. Additionally, the Cape Cod region experiences heavy seasonal congestion during summers as a recreational destination with its beaches, islands, and other tourism sites. Figure 3 shows the urbanized area boundaries in Massachusetts.

Figure 3: 2010 Urbanized Areas in Massachusetts

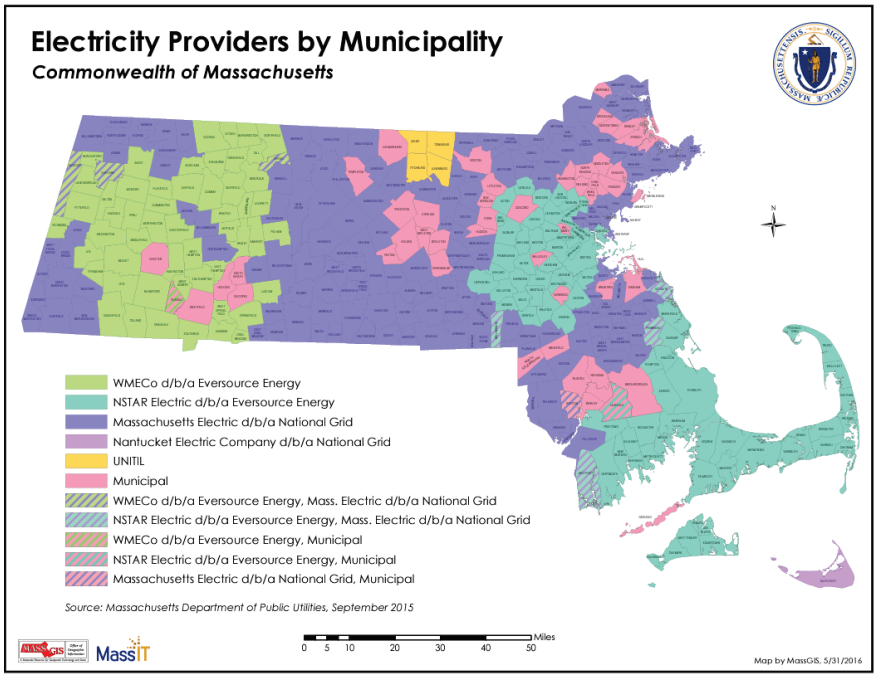


Source: U.S Bureau of the Census

[5] https://www.mass.gov/service-details/congestion-in-the-commonwealth

The Commonwealth is served by three investor-owned utilities, Eversource, National Grid and Unitil, along with numerous municipal wholesale electric companies. Figure 4 shows the service territory of these utilities.

Figure 4: Massachusetts Utility Service Territories



Source: MassGIS

Travel Patterns

Over 87 percent of households in Massachusetts own a car. According to the 2020 American Community Survey 5-Year Estimate, over 68 percent of workers (aged 16 and older) statewide drive alone to and from their place of employment. However, travel by personal vehicle is more common in central and western Massachusetts. While only 65 percent of workers drive alone in the Boston metro area, over 77 percent of workers drive alone in both the Springfield and Worcester metro areas.

A 2018 MassDOT analysis of travel patterns within the Commonwealth found that a significant majority of vehicle trips made in Massachusetts are trips shorter than 50 miles (over 97 percent on average). Just two percent of trips are between 50 to 100 miles, and one-half percent of trips are 100 miles or greater. Over 50 percent of trips are shorter than three miles.

Active transportation options such as walking and biking provide crucial first- and last-mile links to other mobility options. According to the 2021 *MassDOT Bicycle and Pedestrian Update*, 21 percent of all trips in Massachusetts are under one-half mile, and 57 percent of all trips are under three miles. Of those half-mile or shorter trips, 95 percent are made by pedestrians. However, the majority of short trips in Massachusetts are still made by personal vehicles, which are used for 80 percent of all trips between zero and three miles.

Freight

Freight moves through Massachusetts by highways, rail, seaports, airports, and pipelines. The freight industry experiences challenges with congestion and bottlenecks on key highway routes connecting intermodal hubs in Massachusetts. Additionally, there is a lack of sufficient truck parking and service facilities.[6] This Plan focuses on supporting the establishment of a DCFC network for use by light-duty vehicles traveling long distances, with the assumption that electric trucks will be initially and primarily served by depot charging. Massachusetts will monitor evolving electric truck technology and the potential for public charging use by medium- and heavy-duty vehicles.

MassDOT anticipates more clarity on the anticipated role of electric heavy-duty vehicles in moving freight and specific EV charging needs by November 2022, when USDOT is directed by the IIJA to designate EV charging corridors that identify the near- and long-term need for, and the location of, electric vehicle charging infrastructure to support freight and goods movement.

Transportation Electrification

Electric Vehicle Projections

Data from the Massachusetts Registry of Motor Vehicles indicate that about 1 percent of passenger vehicles registered in Massachusetts are electric, including 0.6 percent all-electric and 0.4 percent plug-in hybrids, as of April 2022. Adoption rates vary considerably by city/town, and all-electric vehicle adoption rates are as high as 3 percent or more in some of Boston's western suburbs.

While EVs currently represent a small share of the light-duty vehicle fleet in Massachusetts, the Commonwealth is pursuing a range of policies to accelerate EV uptake through the Clean Energy and Climate Plan as discussed in Section 6.4.

National and regional projections that were reviewed for this analysis show a wide range of potential light-duty EV adoption rates. These projections for EV market shares in 2030 range from a low of about 5 percent, from the U.S. Department of Energy's Annual Energy Outlook Reference Case, to a high of 25 percent, from the National Renewable Energy Laboratory's Electrification Futures Study – Medium scenario. Other recent projections are in the range of 10 percent. This includes state-level projections by Independent Systems Operator (ISO) of New England, which were developed in 2021 to support electricity grid load forecasting. ISO-New England forecast projections are used as the baseline assumption in the analysis conducted to support the development of this plan.

Current U.S. sales data indicate that about 70 percent of new EV sales are Tesla vehicles. Furthermore, Tesla has established its own, proprietary EV charging network. The analysis that was conducted to support this plan modifies projected charging demand to account for Tesla vehicles and the Tesla proprietary fast charging network.

[6] https://www.mass.gov/files/documents/2018/09/04/Freight%20Plan508.pdf

Highway DCFC

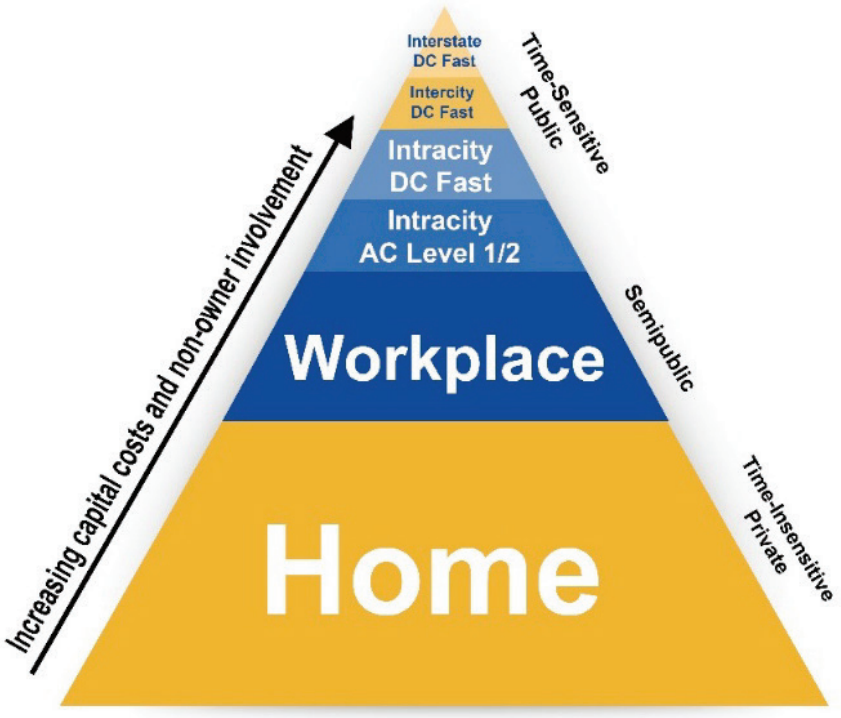
Direct current fast charging (DCFC) stations can charge an electric vehicle to 80% charge in 15-30 minutes. It is anticipated that fast charging events on corridors will continue to only be a relatively small percentage of all EV charging events and that most charging events will take place at drivers' homes or workplaces, as indicated in Figure 5.

While other factors such as EV price and EV range are more important barriers to EV adoption, provision of highway DCFC may play a meaningful role in accelerating EV uptake—in the statistical survey, 50% of respondents ranked 'availability of charging on or adjacent to highways' as one of the top five barriers to them purchasing an electric vehicle.

Drivers are currently not very confident in the availability of highway DCFC in Massachusetts. In the project survey, respondents were asked "If you were to drive an electric vehicle (EV) on a long-distance trip (greater than 100 miles) on major highways in Massachusetts, how confident are you that you would be able to recharge this EV at a publicly accessible refueling station before running out of charge?" Only 19% of respondents said that they were "very confident" or "fairly confident." A majority of respondents (53%) indicated that they were "slightly confident" or "not at all confident" that they would be able to recharge an EV when they needed to do so on a long-distance trip.

Data from the Alternative Fuels Data Center (AFDC) show that there are currently about 173 publicly accessible DCFC charging ports in Massachusetts, including 133 providing a power level of at least 150 kW. This sum excludes Tesla fast chargers, which are a proprietary network.

Figure 5: EV Charging Infrastructure Categories



Source: MassDOT, adapted from The National Academies Press

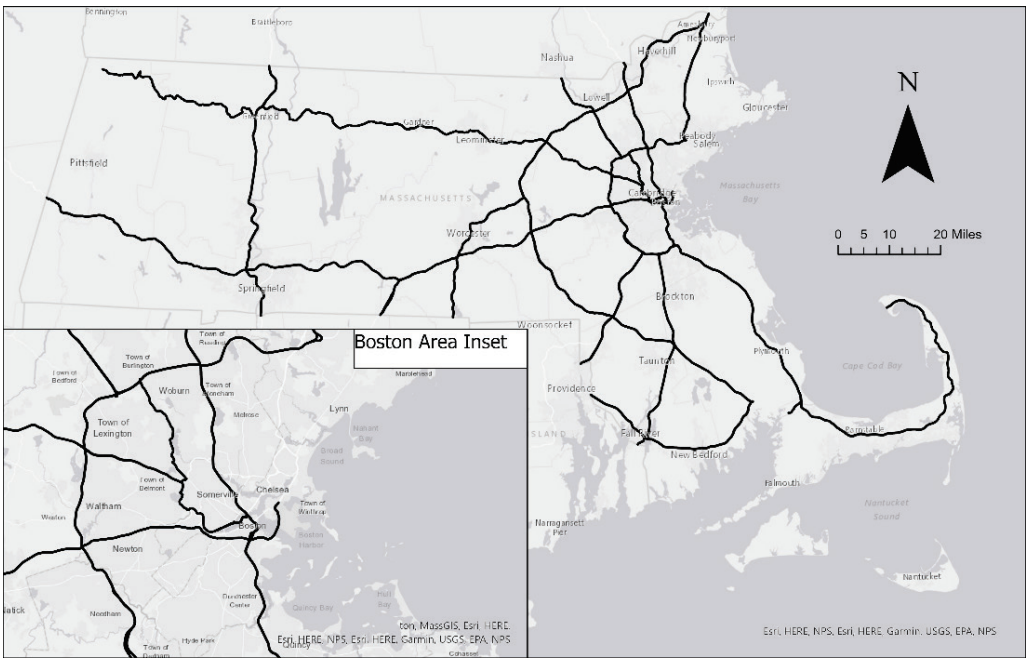
5.3 Alternative Fuel Corridor Network

The EV Alternative Fuel Corridor (AFC) network across the Commonwealth is made up of nine Interstates, two U.S. Routes, and three State Routes designated as EV AFCs through Rounds 1-6 of the AFC program. The total length of designated EV AFC roadways is approximately 847 miles.

The majority of AFCs are corridors running north-south, with a higher density surrounding the Greater Boston area, including I-93, I-95, I-495, and US-3. I-91 serves as the primary north-south AFC in western Massachusetts. I-84 and I-395 are Round 6 designations that increase north-south connectivity between Connecticut and I-90 in central Massachusetts. I-90 is the primary east-west AFC connecting western and central Massachusetts and the Greater Boston area. Round 6 designations of U.S. 6, SR-2, and SR-24 extended the EV AFC network to Western Massachusetts, Southeastern Massachusetts, and the Cape Cod region.

MassDOT does not anticipate submitting additional nominations for EV Alternative Fuel Corridors until the needs of the currently designated corridors have been served through investments under this program. MassDOT's Round 6 nominations were specifically selected on the basis of a range of effectiveness, equity, and efficiency criteria to enable MassDOT to consider NEVI investments in areas where DCFC provision will enable Plan goals to be achieved. The EV AFC network of corridors (from Rounds 1-6) forms the basis for implementation of this plan.

Figure 6: EV Alternative Fuel Corridors in Massachusetts[7]



[7] AFC endpoints displayed throughout the MassDOT NEVI Plan are not exact. Please refer to FHWA website.

5.4 Locations of Existing and Planned Charging Infrastructure Along AFCs

Data on the locations and characteristics of existing DCFC infrastructure along the state's designated and proposed AFCs was obtained from the Alternative Fuels Data Center in May 2022. In addition, three private entities responded to a Request for Information (RFI) issued by MassDOT for sites that were planned, which was defined as under construction or with a construction contract.

Of the 173 existing DCFC ports across the Commonwealth and the DCFC ports identified as planned, there are approximately 70 high-power (>150kW) ports serving demand on the EV AFC network. These existing and planned sites are not all NEVI-compliant—some have fewer than four 150kW CCS ports and some are greater than a one-mile drive from one of the travel directions on the adjacent EV AFC.

The existing and planned sites with 150kW publicly accessible[8] charging ports that are within a one-mile driving distance[9] of an EV Alternative Fuel Corridor are shown in Figure 7, on the following page. Guidance from FHWA establishes 150 kW charging ports as a minimum requirement for NEVI funded stations and MassDOT has used this as the cut-off point for including stations in DCFC supply baseline and forecasting. This guidance also establishes that NEVI funded DCFC must be within one mile of the highway.

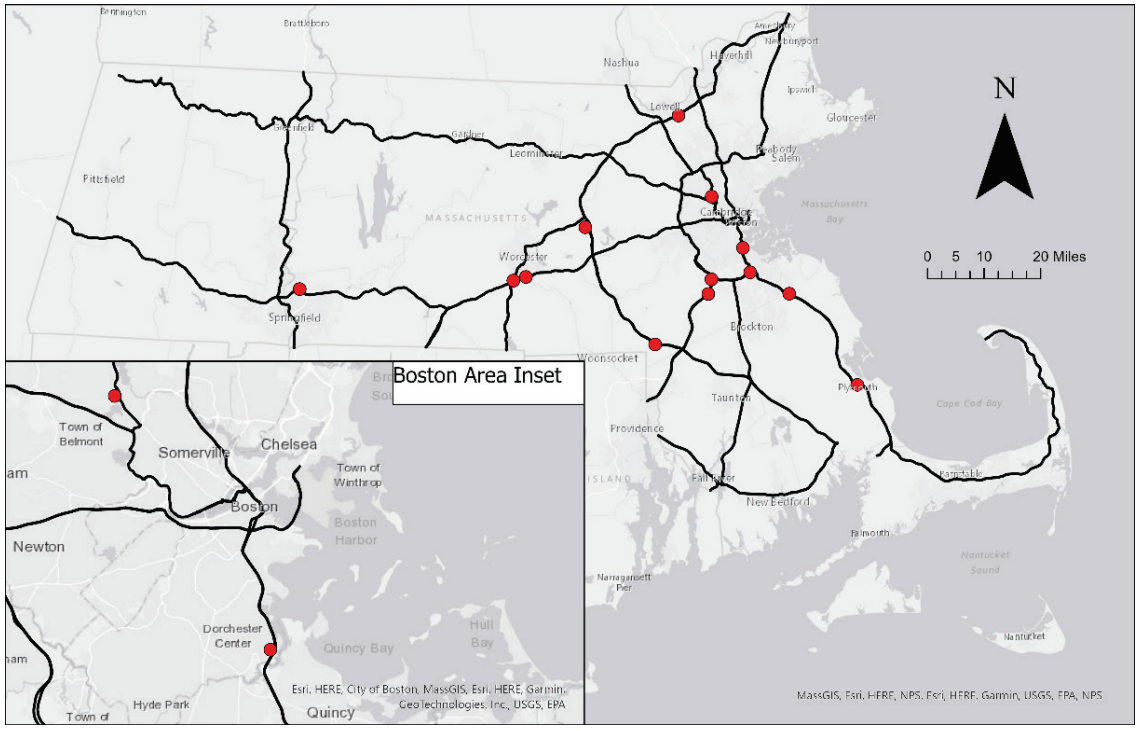
The majority of existing highway DCFC services are found in the Boston region and in central Massachusetts, near Worcester. This infrastructure is more limited in the western part of the Commonwealth along Interstate 90, the entirety of State Route 2, southeastern Massachusetts, Cape Cod, and the North Shore.

As further explained in Section 6.1, the extent to which these DCFC stations are considered towards providing coverage and meeting demand in the project analysis depends on the number of 150 kW CCS ports present and whether they are within one mile of the highway in both directions of travel. For purposes of serving EV AFC demand, a DCFC site that falls within one driven mile of only one travel direction of an EV AFC (rather than of both directions) is counted 50% towards serving demand.

[8] The proprietary Tesla Supercharger network is not considered publicly accessible for this analysis.

[9] Of at least one travel direction on the roadway.

Figure 7:Existing and Planned DCFC Stations with 150kW Ports Serving the AFC Network



Source: AFDC and RFI responses

5.5 Known Risks and Challenges

The stakeholder outreach conducted for this plan provided considerable insight into the risks and challenges to the NEVI program's success, and also suggested potential solutions. Table 2 provides known risks and challenges to success of this program and summarizes potential solutions that MassDOT will consider to minimize or eliminate those risks and challenges.

Table 2: Risks, Challenges, and Solutions

Risk/Challenge	Discussion	Potential Solutions
Rapidly evolving technology in the EV/EVSE sector.	Charging port, vehicle, and software technology are likely to change and advance.	Require compliance with open-source standards.
Supply chain constraints and cost increases for charging and electrical equipment.	Limited domestic production lines for Buy-America Act compliant equipment. Providers are seeing delays of certain equipment, such as transformers, of up to 18 months. Simultaneous national demand to build charging sites because of NEVI and other programs is expected to increase costs and create labor shortages and longer wait times.	Encourage service providers to have a strategy to ensure supply chain continuity. Structure solicitation to encourage bidders to engage utilities early in site selection and design so that utilities can work to procure needed hardware.
Availability of skilled labor for installation and maintenance.	Supply of electricians is currently adequate, but there are questions about availability of skilled information technology workers for addressing DCFC station system configuration and networking issues.	Encourage selected industry partner or partners to monitor the supply of skilled workers and work with relevant state agencies to identify programs that could be expanded or other training resources that might be needed.
Utility infrastructure/ electrical grid capacity.	Capacity constraints and needs will be highly site-specific and could dramatically affect capital costs. Massachusetts utilities are able to fund some "make-ready" work.	Allow flexibility in station siting along the EV AFC network to allow bidders to minimize potential grid connection/upgrade costs.
Uneconomical electricity pricing as a result of demand charges.	Demand charges are noted as one of the most significant factors affecting site economics and potential investor return on investment. (Commonwealth regulators are currently reviewing utility-led proposals to reduce demand charges for lower-utilization sites).	Encourage on-site energy storage to minimize demand charges and stress on the electrical grid.
Failure of private partners to reliably maintain and operate charging equipment.	Funding for capital costs only, without adequate support or requirements for long-term maintenance, could lead to equipment neglect.	Contracting provisions that provide requirements and incentives for reliable operation and long-term maintenance, while providing for adequate return on investment.

Risk/Challenge	Discussion	Potential Solutions
Charging stations with low utilization rates and return on investment due to low demand.	Some sites may be uneconomical to operate for many years, but are nevertheless needed to provide a network with adequate geographic coverage that eliminates any range anxiety and serves all communities.	Structure contracts to provide for return on investment across a broad set of sites, including profitable and unprofitable locations. Require selected industry partner to include plans for DCFC financial sustainability in response to solicitation, which may include on-site energy storage in low-utilization areas where demand charges are applied.
Charging site vandalization, both physical security and cyber security risks.	Site placement, design, co-location, and on-site security measures can all help minimize security risks.	Encourage security-conscious site design. Contracting provisions to ensure compliance with US DOT and MassDOT standards for cybersecurity.
Higher than anticipated demand and utilization rates.	Longer queuing times lead to consumer frustration which could pose a barrier to EV adoption.	Monitor demand year-by-year and report on utilization to support a well-functioning market for DCFC investment. “Future-proof” sites by making it easier to expand capacity when it is economical to do so. Station pricing that reflects costs of DCFC provision.

6.0 EV Charging Infrastructure Deployment

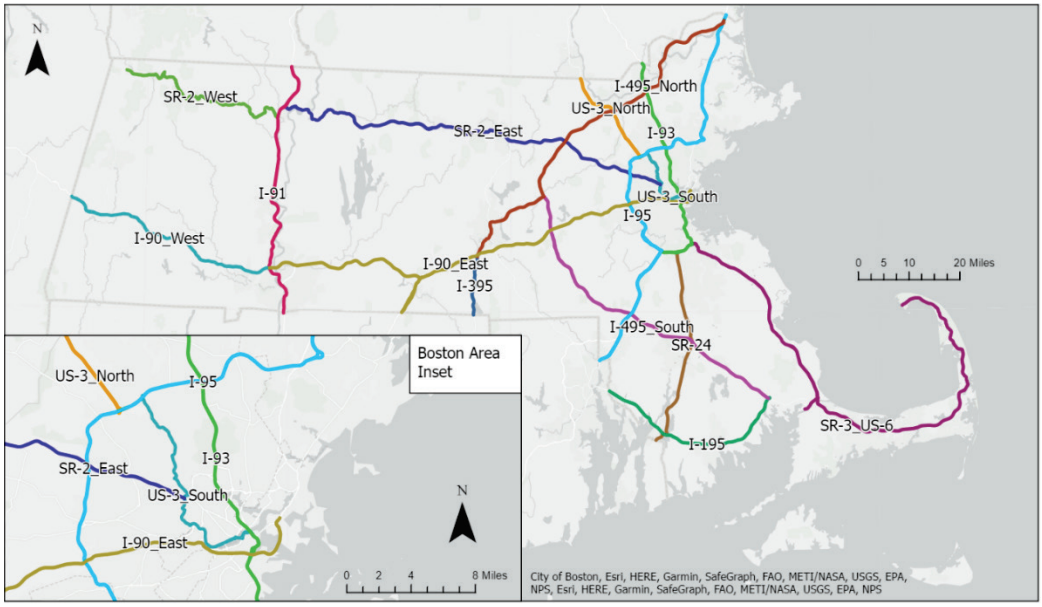
6.1 Deployment Strategy Development

As documented in this plan, MassDOT will follow a two-stage approach to deployment of NEVI DCFC infrastructure on EV Alternative Fuel Corridors:

- NEVI formula funds will first be used to eliminate 50-mile gaps on the EV alternative fuel corridor network in Massachusetts to ensure a complete network.
- Additional NEVI funds will then be used to focus on zones within the AFC network where there is the most unserved demand, with higher priority given to zones with high percentages of environmental justice communities.

The stage of investing to meet demand is based on the concept of electrification zones, continuous subsets of the alternative fuel corridor network defined based on similar long-distance trip charging demand characteristics. The map of these zones is shown in Figure 8.

Figure 8: Electrification Zones



Source: MassDOT

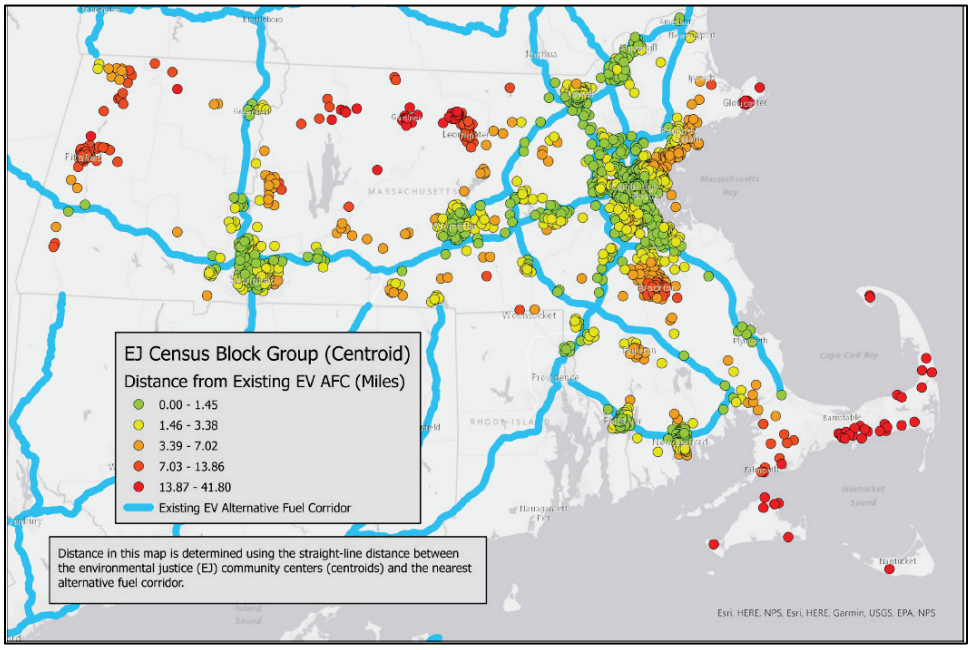
By using this zoned approach, rather than specifying the exact locations of NEVI-funded infrastructure in this plan, MassDOT can both ensure that investments are located where they will be effective at supporting range confidence and also provide flexibility for a private partner to identify and propose sites that meet the many conditions needed to successfully host NEVI DCFC.

Equity

Prior to the development of this plan MassDOT submitted additional electric vehicle alternative fuel corridor nominations as part of the FHWA 2022/Round 6 Request for Nominations.[10] MassDOT's Round 6 EV AFC submission was intended to significantly enhance the ability of this plan to address equity, by allowing investments in environmental justice communities that were among the furthest from existing alternative fuel corridors.

MassDOT conducted a geospatial analysis that identified the EJ communities in Massachusetts that were farthest from existing EV AFCs, as shown in Figure 9. The National Highway System (NHS) highways that MassDOT ultimately nominated in Round 6—particularly Route 2, Route 24, and U.S. 6—were selected in part because they served these EJ communities.

Figure 9: EJ Communities by Distance from Round 1-5 EV AFCs



Source: MassDOT.

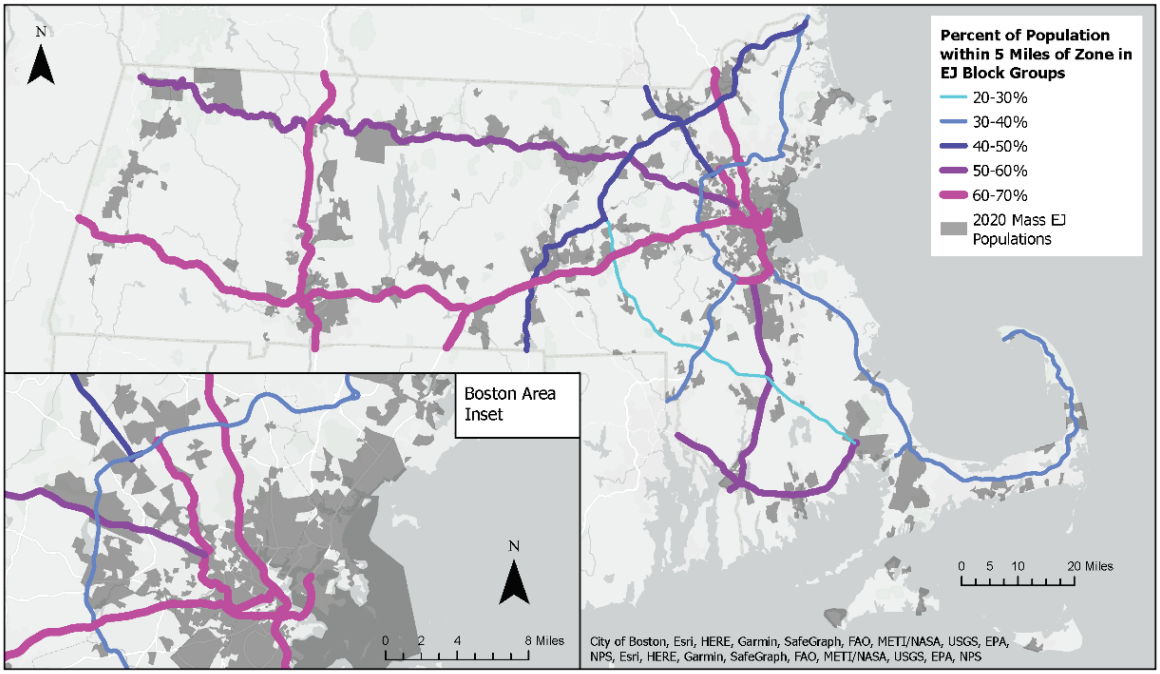
MassDOT's Round 6 EV AFC nominations also extend alternative fuel corridors through rural communities that fall outside the Commonwealth's urban boundaries.

The establishment of a statewide corridor network with consideration of proximity to environmental justice and rural communities means that equity is inherent to a coverage-first approach to deployment. The first phase of this plan will ensure that communities across the Commonwealth are served by corridors with EV charging infrastructure that enable long-distance trip making.

10 https://www.fhwa.dot.gov/environment/alternative_fuel_corridors/nominations/2022_request_for_nominations_r6.pdf

MassDOT has also integrated equity into the way it will prioritize addressing underserved demand for long-distance trip making. MassDOT has analyzed each electrification zone that makes up the alternative fuel corridor network and ranked these according to the ratio of EJ block group population to total population within five miles of the zone. Figure 10 indicates the percentage of population that falls within EJ communities within this five-mile buffer by zone.

Figure 10: Percent of Population in EJ Communities by Electrification Zone



Source: MassGIS and U.S. Census.

This ranking of zones according to this metric is shown below in Table 3. As explained further below, this ranking will be combined with a ranking of the projected demand for fast charging in each zone to determine an overall ranking to guide deployment after 50-mile gaps have been filled.

Table 3: Environmental Justice Community Population by Electrification Zone[11]

Equity Rank	Electrification Zone	% of Population Within EJ Communities
1	US-3_South	67%
2	I-90_East	64%
3	I-90_West	64%
4	I-93	63%
5	I-91	60%
6	SR-24	59%
7	SR-2_East	57%
8	I-195	52%
9	SR-2_West	50%
10	I-395	50%
11	I-495_North	50%
12	US-3_North	42%
13	SR-3_US-6	38%
14	I-95	35%
15	I-495_South	23%

Filling Coverage Gaps

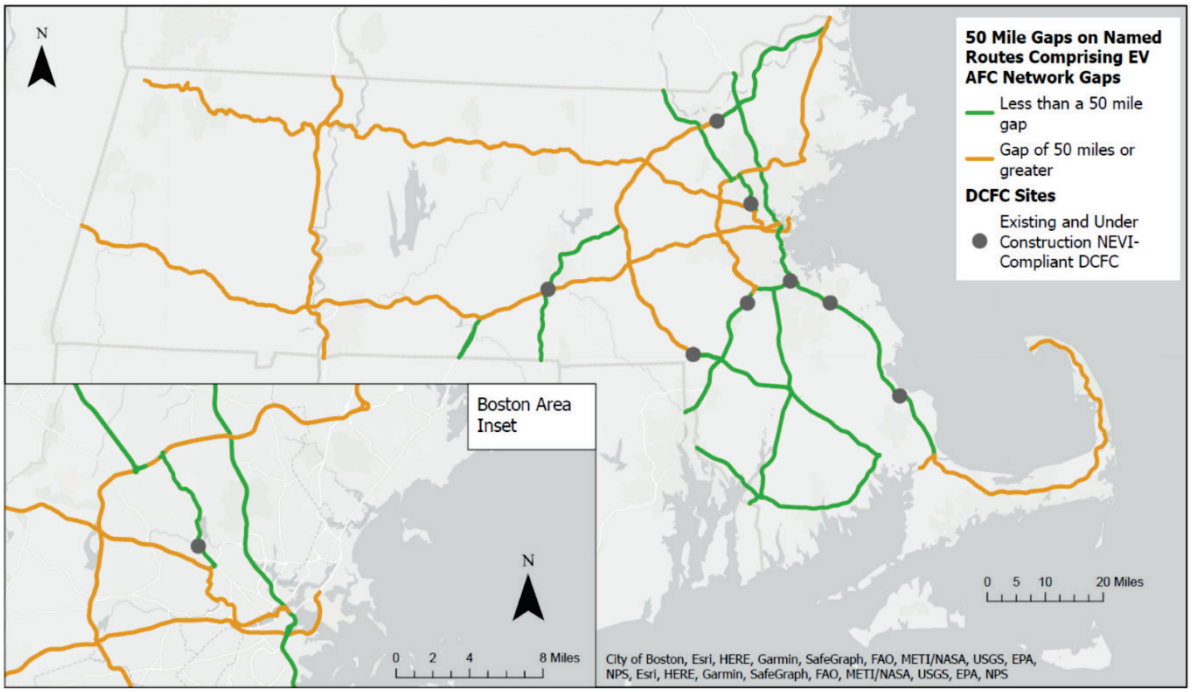
Existing DCFC infrastructure as well as planned DCFC infrastructure (those under construction or with construction contracts, as disclosed by private providers and found within the Alternative Fuels Data Center database) was inventoried.[12] The number of ports needed to fill 50-mile gaps and meet demand in each electrification zone was estimated in 2025, 2030, and beyond.

[11] See Figure 8: Electrification Zones

[12] A Request for Information (RFI) was publicly issued to providers of EVSE infrastructure in April 2022 to request information on existing DCFC sites and sites under construction or with a construction contract. The information requested included site location, number of ports with a power level of at least 150 kW, and whether the site was an expansion of an existing site. Three providers responded to the RFI. Sites under construction or with construction contracts are included as “existing” DCFC in this plan.

Figure 11 shows the location of existing and under construction (including those with construction contracts) DCFC stations providing four 150 kW or higher ports that are no more than one mile from both directions of an AFC highway,[13] along with gaps of 50 miles or more between stations providing at least four 150 kW ports.[14]

Figure 11: NEVI-Compliant DCFC Supply and EV AFC Network Gaps



Source: MassDOT.

MassDOT's priority in this plan is filling gaps that exist on the highway network within Massachusetts. For those EV AFCs that extend into neighboring states for which there is a greater than 50-mile gap in NEVI-compliant stations on the named route, MassDOT anticipates that many of these gaps between states will be filled by stations that are built to meet demand or by stations built on EV AFCs in these neighboring states. MassDOT will provide neighboring states with information on specific site locations when those are selected during program implementation to aid in planning to close cross-state gaps on the national NEVI network.

[13] The technical analysis included a site verification analysis for existing and under construction DCFC locations. The maximum one-mile "distance from the highway" is measured from the points at which the exit ramp leaves the mainline, and at which the entrance ramp joins the mainline, for both directions of travel.

[14] Gaps are measured along a single roadway (numbered route). Numbered routes with a length of less than 50 miles in Massachusetts are not shown as having a gap.

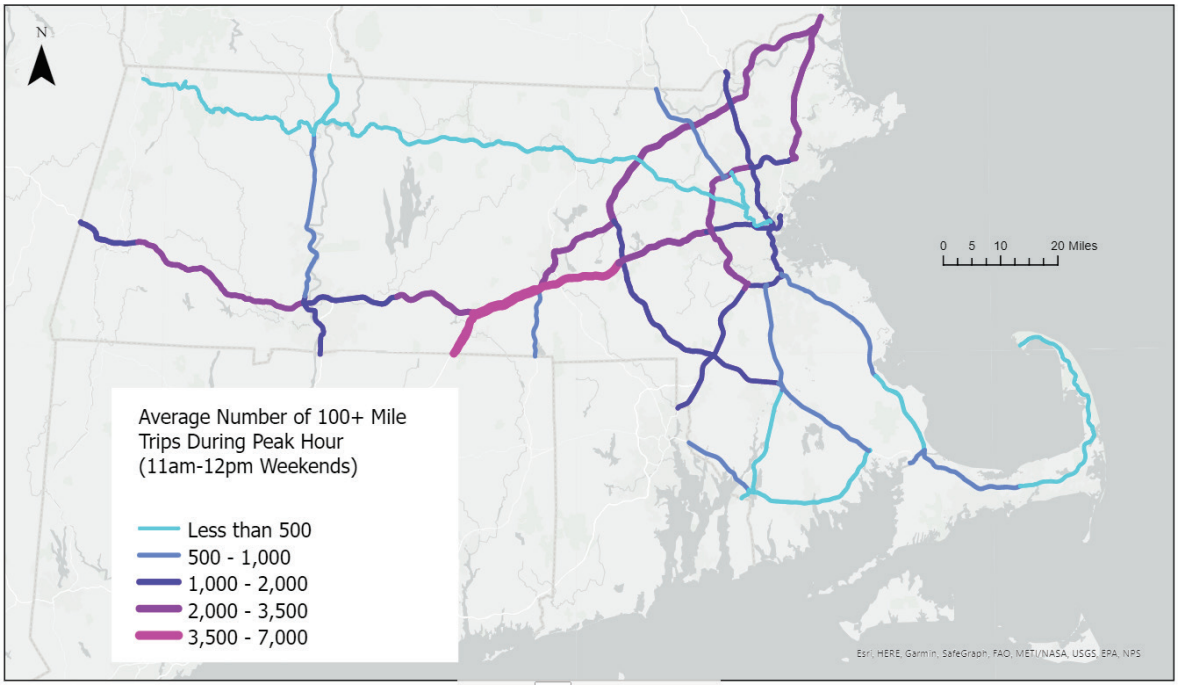
Meeting Demand

In order to analyze demand for corridor DCFC charging, Alternative Fuel Corridors were divided into segments of approximately 10 to 30 miles in length, and existing and future DCFC demand patterns on each segment were evaluated. The analysis considered total traffic volumes and length of trips in zones, as well as projected levels of EV market penetration and charging utilization in five-year increments from 2025 through 2040. Segments were aggregated into continuous "electrification zones" based on similarities in demand characteristics. A total of 15 electrification zones were defined covering the entirety of the designated EV AFC network.

On long trips, drivers are more likely to need corridor fast charging. Figure 12 illustrates the relative level of demand expected on each AFC segment, as measured in total trips greater than 100 miles in length using the segment during the peak hour of each week. Traffic data shows that this peak hour is 11 a.m. to 12 p.m. on weekends (Friday through Sunday). The highest demand segments are on the Massachusetts Turnpike (Interstate 90) and I-84 between I-495 and the Connecticut border. The next highest segments include I-290 and I-495 from Worcester to the Maine border, I-95 from Maine to Canton, and the Mass Pike west of Springfield.

The demand gap analysis found that approximately 44 150kW DCFC ports currently exist or are planned within a one-mile driving distance of both directions of an EV AFC. Another 25 ports are within one mile of one direction, but not both directions, of an EV AFC.

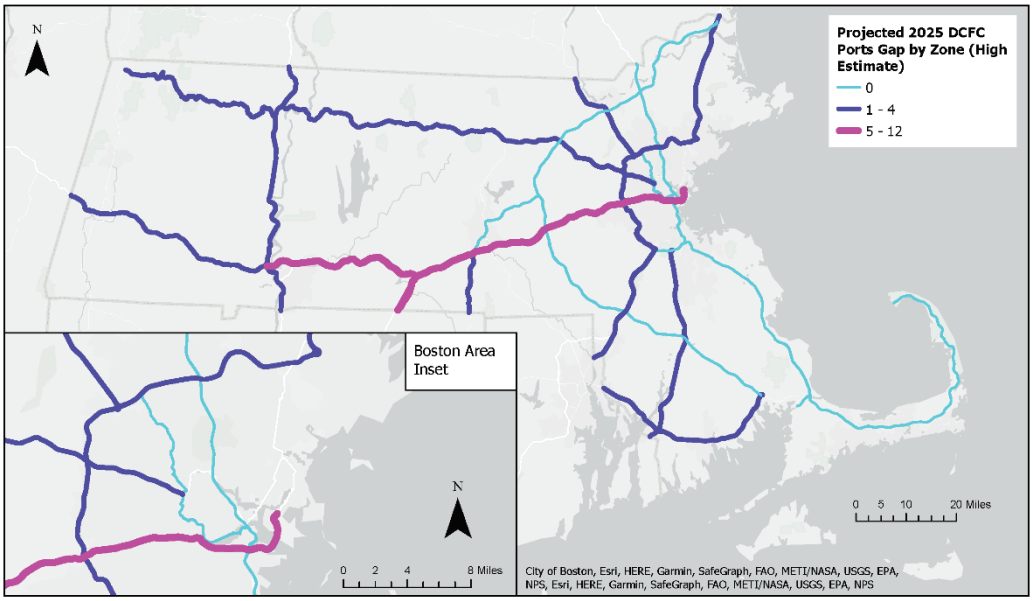
Figure 12: AFC Network Corridors by Volume of Long-Distance Trips



Source: StreetLight Analytics and MassDOT

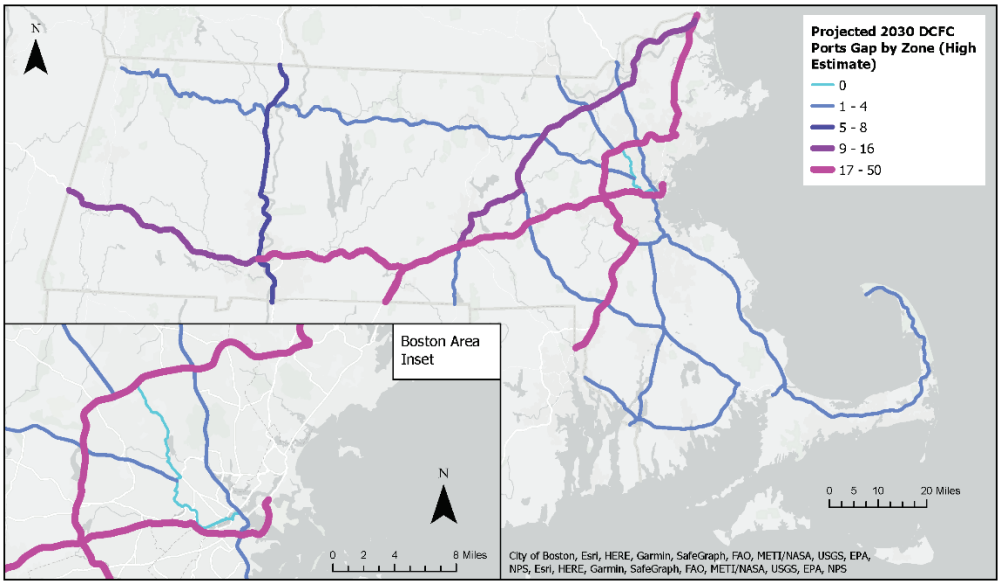
Figure 13 and Figure 14 show the gap between projected demand (need) and existing supply (which includes planned DCFC stations and estimated NEVI stations needed to fill gaps) by electrification zone, at projected 2025 and 2030 levels of demand.

Figure 13: Projected 2025 DCFC Gap by Zone



Source: StreetLight Analytics and MassDOT

Figure 14: Projected 2030 DCFC Gap by Zone



Source: StreetLight Analytics and MassDOT

Table 4: Estimated Charging Demand by Electrification Zone

Demand Rank	Electrification Zone	2021 avg daily 100+ mile trips	2021 avg daily 50-100 mile trips	2025 EVs public charging daily	2030 EVs public charging daily
1	I-90_East	32,331	45,643	168	750
2	I-495_North	26,257	37,069	102	454
3	I-90_West	21,187	29,911	49	219
4	I-95	16,167	22,824	75	335
5	I-495_South	11,603	16,381	39	173
6	I-93	11,323	15,985	27	119
7	I-91	7,074	9,987	20	89
8	US-3_North	6,858	9,683	8	34
9	I-395	5,539	7,819	3	15
10	I-195	5,056	7,138	10	47
11	SR-3_US-6	4,876	6,884	27	123
12	SR-24	4,653	6,568	10	43
13	SR-2_East	2,462	3,475	11	48
14	SR-2_West	586	827	1	6
15	US-3_South	468	661	0	2

Final Zone Ranking

The final overall ranking for the electrification zones was determined by combining the demand rank and equity rank. For ties, U.S. Interstates were given priority over non-Interstates. Two ties remain.

Table 5: Final Overall Ranking of Electrification Zones

Electrification Zone	Overall Rank	Demand Rank	Equity Rank
I-90_East	**1**	1	2
I-90_West	**2**	3	3
I-93	**3**	6	4
I-91	**4**	7	5
I-495_North	**5**	2	11
US-3_South	**6**	15	1
I-95	**7**	4	14
I-195	**7**	10	8
SR-24	**8**	12	6
I-395	**9**	9	10
I-495_South	**10**	5	15
US-3_North	**11**	8	12
SR-2_East	**11**	13	7
SR-2_West	**12**	14	9
SR-3_US-6	**13**	11	13

6.2 Deployment Strategy Overview

A high-level economic analysis was performed to estimate capital and operating costs per installed port and estimate what level of network build-out could be achieved with NEVI funds. Given the potential wide variability in costs depending on site-specific factors, a more refined analysis may be conducted for potentially suitable MassDOT locations as part of implementation of the NEVI program.

Conservative estimates of capital and operating costs[15] suggest that the five years of NEVI program funding should be capable of funding approximately 92 ports. This is anticipated to enable MassDOT to build a NEVI-compliant DCFC network with no gaps greater than 50 miles along all existing EV AFCs, as well as part or all of the additional build to meet projected 2025 demand.

The number of stations that can be built towards meeting 2025 demand will depend on actual construction and operation costs. Higher than estimated costs may mean that not all of the 2025 demand gap can be filled, and MassDOT NEVI investment will proceed in the electrification zones by overall rank order. If capital and maintenance costs are lower than projected, or if a higher than required capital cost-share can be offered by private partners, additional ports may be built to further help meet 2025 or post-2025 projected demand in other zones.

The demand projections suggest that meeting 2030 demand will be well beyond the reach of MassDOT's NEVI formula funds. This means additional investment would be needed from the private sector to meet this demand. By signaling a clear approach to investment, this plan allows other investors in the DCFC market to reduce the risk of unexpectedly duplicating publicly supported investments.

[15] This projection assumes the use of NEVI funds to cover operating and maintenance costs for five years of each station's operation.

The DCFC sites and ports needed to fill 50-mile gaps are shown in Table 6, with a range shown to indicate that the number of sites and ports needed to satisfy the 50-mile gap requirement may depend upon site placement.[16] Each NEVI-compliant DCFC *site* will have four DCFC *ports*.

Table 6: Estimated Ports Needed to Eliminate 50 Mile Gaps

Electrification Zone (Non-Ranked)	Additional DCFC sites to fill 50 mile gaps	Additional DCFC ports to fill 50 mile gaps
I-90_East	2 - 3	8 - 12
I-495_North	1	4
I-90_West	2 - 3	4 - 8
I-95	1 - 2	4 - 8
I-93	0	0
I-495_South	1	4
I-91	1 - 2	4 - 8
I-195	0	0
I-395	0	0
US-3_North	0	0
SR-3_US-6	1 - 2	4 - 8
SR-24	0	0
SR-2_East	2 - 3	8 - 12
SR-2_West	0 - 2	0 - 8
US-3_South	0	0
Total	**10 - 18**	**40 - 72**

[16] Some of the electrification zones are made up of continuous segments of more than one EV AFC (e.g. the I-90_East zone includes I-84) and other electrification zones are made up of only a portion of an EV AFC (e.g. the I-90_West zone comprises only the western part of Interstate 90).

Table 7 displays the overall ranking of electrification zones with the number of new DCFC ports needed to meet unmet demand in these zones in 2025 and 2030. In this table, the “ports gap” is the difference between the number of ports estimated to be needed to meet demand (in 2025 and 2030) minus the sum of the number of existing/planned DCFC ports[17] and the estimated number of NEVI ports to be deployed to fill 50-mile gaps in the AFC network. The “ports gap” estimate for 2025 and 2030 is provided as a range, with the lower value assuming that no sites deployed to achieve 50-mile coverage along an AFC route fall outside electrification zones with demand shortfalls, and the higher value assuming that coverage sites are placed in a way that leaves certain electrification zones with demand shortfalls unserved. Because DCFC projects built with NEVI funds must have minimum of four 150kW ports per site, the numbers in the "2025 ports gap” column are presented in increments of four.

Table 7: Estimated Ports to Meet 2025 and 2030 Demand

Overall Rank	Electrification Zone	2025 ports gap	2030 ports gap
1	I-90_East	0 - 12	38 – 50
2	I-90_West	0 - 4	8 – 16
3	I-93	-	4
4	I-91	0 - 4	0 – 7
5	I-495_North	-	6 – 10
6	US-3_South	-	-
7	I-95	0 - 4	12 – 20
7	I-195	4	4
8	SR-24	4	4
9	I-395	4	4
10	I-495_South	-	0 – 4
11	US-3_North	4	4
11	SR-2_East	0 - 4	0 – 4
12	SR-2_West	0 - 4	0 – 4
13	SR-3_US-6	-	0 – 4
	Total	**16 - 48**	**84 - 139**

The above overall zone ranking reflects the sequence in which MassDOT will seek to fill demand gaps via investment of NEVI funds, once 50-mile gaps in the AFC network have been addressed. MassDOT understands that there are a range of real-world factors that could impact site development timelines, including utility connections, equipment lead times, construction delays, and unanticipated site-specific costs or challenges. As such, the actual site build order may be influenced by these factors during implementation.

[17] Existing/planned ports serving only one direction of travel on an electrification zone are given half weight compared to ports serving both directions.

Table 8 and Table 9 provide illustrative programs for the use of NEVI funds for construction of DCFC infrastructure, by year. Table 8 shows a program conservatively assuming the high levels of build-out required to fill 50-mile gaps and additional demand. Table 9 shows a program assuming lower levels of build-out required to fill 50-mile gaps and a midpoint estimate to meet additional 2025 demand beyond the demand served by stations filling these gaps.

Table 8: Illustrative DCFC Build Using NEVI Funds (High Estimates of Port Requirements)

Year of NEVI funds (FFY)	Number of ports built	Description
2022 – 2023	44	Build to fill 50-mile gaps on all Interstate AFCs
2024	28	Build to fill 50-mile gaps on all non-Interstate AFCs
2025	20	Build additional ports to meet 2025 demand in highest-ranked zones
2026	-	With projected cost levels, remaining NEVI funds will cover operating and maintenance expenses. If costs are lower than projected, additional ports will be built to meet 2025 demand working in zone rank order.

Table 9: Illustrative DCFC Build Using NEVI Funds (Low Estimates of Port Requirements)

Year of NEVI funds (FFY)	Number of ports built	Description
2022 – 2023	40	Build to fill 50-mile gaps on all AFCs
2024	32	Build additional ports (16) to meet 2025 demand in zones, plus additional 16 to meet post-2025 demand in highest ranked zones
2025	20	Build additional ports to meet post-2025 demand in next highest ranked zones
2026	-	With projected cost levels, remaining NEVI funds will cover operating and maintenance expenses. If costs are lower than projected, additional ports will be built to meet post-2025 demand working in zone rank order.

6.3 Funding Sources

Massachusetts is anticipated to receive approximately $55-$60 million in NEVI formula funds through FFY 2026. The required non-Federal match for these funds is 20 percent.

MassDOT will consider the inclusion of cost-sharing requirements in contracting with private entities to build and operate DCFC funded through the NEVI program. MassDOT recognizes that not all sites on the AFC network will be profitable, especially in the early years when demand is still ramping up. The anticipated contracting approach will include coverage for segments with higher and lower demand levels and potential costs, spreading potential risk and supporting an overall positive financial return for the selected private partner or partners.

6.4 State, Regional, and Local Policy

MassDOT's investment in fast charging along highways using Massachusetts' NEVI formula funds would represent a small part of a much wider policy effort to increase electric vehicle uptake in Massachusetts.

Policy Support for Zero Emission Vehicles

Massachusetts' Executive Office of Energy and Environmental Affairs (EEA) leads the development of climate policy in the Commonwealth and is responsible for the Clean Energy and Climate Plan. This is a periodically updated plan that includes a focus on accelerating electric vehicle uptake in order to meet Massachusetts' climate goals. MassDOT has been extensively consulted by EEA during their development of the Clean Energy and Climate Plan. The latest iteration of that plan contains policies that NEVI formula fund investments will complement. Key provisions include:

- Promulgating regulations that would implement California's "Advanced Clean Cars II" regulation that will require continued growth in zero-emission passenger vehicle sales, until ZEV sales reach 100% of all passenger vehicle sales by 2035. Massachusetts was the first participating state to endorse this goal and will promulgate the next round of regulation by the end of 2022.
- Implementing California's Advanced Clean Trucks Rule that imposes mandatory sales requirements on truck and bus manufacturers beginning with model year 2025.
- Improving the existing state electric vehicle program (MOR-EV) to make it more equitable and cost-effective. The Commonwealth will look to establish a point-of-sale rebate, as well as a new additional incentive for low- and moderate-income residents and high mileage drivers.
- Continuing an incentive for electric medium- and heavy-duty vehicles, MOR-EV Trucks, which provides purchase incentives for medium- and heavy-duty vehicles in Massachusetts.
- Implementing a program to support electrification of the "vehicles for hire" fleet segment, including expanded incentives, support for infrastructure, and outreach and education.
- Developing a model building code for municipalities that requires make-ready charging in all new commercial and residential buildings.

Massachusetts also has requirements in state law to support a well-functioning EV charging market that would apply to NEVI charging stations in Massachusetts. These include requirements that owners and operators of public EV charging stations that require payment must provide payment options that allow access by the public. These laws also prohibit requiring a subscription fee or membership to use public charging equipment and require owners and operators of public EV charging stations to provide information to the U.S. Department of Energy's Alternative Fuels Data Center.

The transition to renewable electricity in Massachusetts will also reduce overall emissions associated with EVs as DCFC infrastructure is powered by an increasingly decarbonized electricity grid. State programs that support renewable energy such as the Solar Massachusetts Renewable Target (SMART) Program and the Massachusetts Clean Peak Energy Standard can be used to fund projects such as solar generation systems that are complementary to NEVI projects.

Utility Regulation and Incentives

Utility regulation influences at least three major areas related to DCFC infrastructure viability: demand charges, make-ready work, and equipment incentives.

Utility demand charges were identified by several stakeholders as one of the top barriers to making highway DCFC stations financially viable. The preliminary economic analysis conducted during the Plan development process and past MassDOT experience with DCFC operations also highlight demand charges as a barrier to DCFC viability. This is an acute problem at lower DCFC utilization rates, but increasing utilization of charging stations will improve the economics of stations where demand charges are in place.

In Massachusetts, rate structures, including demand charges, are regulated by the Department of Public Utilities and vary by utility. In Massachusetts, demand charges currently range from about $7 to $33 per kW for the two major investor-owned electric utilities. These utilities operating in the Commonwealth have jointly filed for a proposed reduction in demand charges for EV charging sites, where the demand charge is substantially reduced at lower utilization levels. If approved, this improves the prospects for NEVI funded stations becoming financially sustainable.

"Make-ready" programs were also noted as an important incentive that utilities can offer. Make-ready programs include planning, design, and construction for electricity grid infrastructure upgrades needed to serve DCFC stations. These may include items such as trenching, dedicated service meters, conduit, and wiring. In Massachusetts, utility rate structures and program designs have been approved that allow utilities to offer and fund make-ready work. The existence of these programs was noted by some stakeholders as a favorable condition in the Commonwealth to minimizing the need for other programs (such as NEVI) to fund work on the utility side of the meter.

Massachusetts utilities have also been approved to offer incentives for level 2 and DCFC charging equipment purchase and installation at businesses, multi-unit dwellings, workplaces, and fleet facilities. This funding of other parts of the EV charging hierarchy shown in Figure 5 would complement the NEVI program's investment in corridor fast charging along major highways.

7.0 Implementation

7.1 Implementation Overview

The approach outlined in Section 6.0 describes MassDOT's intention to first provide NEVI-funded DCFC to minimize or eliminate any gaps greater than 50 miles on named routes comprising the EV AFC network within Massachusetts and to then pursue a zone-based approach to prioritizing areas for NEVI investment, based on projected demand and equity considerations.

Following submission of this plan, MassDOT will begin to implement the NEVI program in Massachusetts. This will first determine the inclusion of which (if any) NEVI-compliant MassDOT locations will be utilized for locating NEVI-funded DCFC stations.

MassDOT owns a number of sites that are publicly accessible and in close proximity to alternative fuel corridors. Using these sites may reduce site costs of the NEVI program and simplify implementation. However, there are a range of considerations that will need to be addressed including recent interpretations of federal regulations and competing transportation needs at these sites.

MassDOT is restricted by 23 U.S. Code § 111 from charging a fee for electricity at any location on the U.S. Interstate right-of-way, except for pre-existing MassDOT commercial service plazas, which are exempt from this restriction. This effectively prevents the development of economically viable electric vehicle charging on a range of otherwise well-located sites (e.g. Interstate rest areas).

In addition, FHWA has indicated that using NEVI Formula Program funds to construct EV charging stations on toll roads on the Interstate System (i.e. the Massachusetts Turnpike) federalizes these toll roads for purposes of Interstate access and the toll revenue use restrictions under 23 U.S.C. 129(a)(3), if the site is located within the Interstate right-of-way. These restrictions limit MassDOT's ability to invest NEVI funds in the MassDOT sites that are likely to be the most attractive for DCFC provision.

During implementation, MassDOT will develop a solicitation process. During NEVI Plan development, MassDOT sought input from stakeholders on contracting mechanisms and best practices. This section of the plan outlines proposed general approaches to contracting with private entities for corridor-level DCFC provision.

During this plan development FHWA issued an extensive set of proposed regulations including detailed standards for NEVI DCFC station technology and reporting requirements. A solicitation process will not be able to begin until these standards are finalized and FHWA approves this plan.

7.2 Anticipated General Contracting Approach

MassDOT intends to partner with a private entity to construct, maintain and operate DCFC equipment to serve long-distance travel corridors in Massachusetts, through a competitive solicitation process. There are a range of options for public-private partnership structure, which will be determined during plan implementation.

MassDOT has a preference for a single contractor approach for implementation. This approach will maximize administrative efficiency, including the Commonwealth's ability to ensure a private partner complies with federal reporting requirements. A single contractor solicitation also simplifies the AFC network coverage approach described in Section 6.2, which would be difficult to coordinate with multiple private partners. This would not necessarily preclude multiple subcontractors and/or site hosts from participating.

MassDOT may decide to choose a different contracting approach for MassDOT owned sites and privately owned sites.

7.3 Potential Solicitation Criteria and Contract Requirements

MassDOT sees benefit in including the following provisions in a competitive solicitation and contracting process.

- **Performance-based reimbursement:** Given the importance of DCFC station availability for reducing range anxiety, the reliability challenges experienced by early DCFC deployments, and a proposed federal obligation to ensure long term operability, MassDOT will consider making some, or all, payments to a private partner contingent on DCFC station uptime.
- **Capital cost sharing:** MassDOT will consider the inclusion of solicitation criteria that favor potential partners that share capital costs.
- **Maintenance and fixed operating cost sharing:** MassDOT will consider contract(s) that provide an agreed upon amount of NEVI funds per year per charger for maintenance.
- **Variable operating cost sharing:** MassDOT anticipates that variable operating costs and revenues will be spread across the entire network of NEVI-funded DCFC equipment operated by the selected partner(s). MassDOT will consider differences in projected utilization levels across zones or sites when evaluating bids and negotiating contract terms. MassDOT will consider the most appropriate contracting provisions related to risk-sharing between public and private entities as specific contracting language is developed.
- **Interoperability:** MassDOT will consider requiring equipment compliance with Open Charge Point Protocol (OCPP) in order to ensure seamless handoff, should ownership of the equipment change at any point during its lifetime.
- **Site requirements:** MassDOT may develop site requirements which may include factors such as accessibility, and presence of amenities and safety features. MassDOT may also consider potential site vulnerabilities to coastal and riverine flooding, sea level rise, and severe storms. The overall set of sites to be developed must meet applicable federal and state NEVI program requirements, including the minimization or elimination of any gaps greater than 50 miles on named routes comprising the EV AFC network in Massachusetts and complying with the maximum site distance of one mile from the applicable EV AFC.
- **Site utilization and management:** MassDOT anticipates evaluating proposed pricing structures to encourage the efficient utilization of NEVI-funded sites in a manner that supports serving long-distance travel as the highest priority use of these sites.

- **Supply chain reliability:** MassDOT anticipates asking bidders to describe their procedures to ensure reliability in their supply chains and minimize potential delays in delivery due to supply chain disruptions.
- **Maintenance and reliability:** As an evaluation factor, MassDOT anticipates asking bidders to describe their procedures to ensure DCFC site uptime that meets or exceeds federal standards, including how they will ensure DCFC operation during all weather conditions, including heavy rain, snow, and ice events and high winds and procedures for detecting and remedying incidents of equipment malfunction or damage.
- **Futureproofing:** MassDOT will consider contract provisions that support site futureproofing to allow expansion for growing demand and higher power levels.
- **Technology:** MassDOT will encourage power sharing and battery storage technologies that minimize recharging times and/or reduce overall operating costs. These technology options can help to minimize utility demand charges and the stress of DCFC charging on the electrical grid.
- **Utility Coordination:** MassDOT anticipates asking bidders to confirm they have coordinated with utilities to understand grid capacity at their proposed sites and to identify opportunities to use existing distribution network capacity or to connect to existing transmission lines where they pass near NEVI-compliant sites.
- **Additionality:** MassDOT will consider requirements that bidders on this solicitation not receive funding from other state or federal programs to help ensure that NEVI program funds only go towards building DCFC stations that would not have been built without program funds.
- **Disadvantaged business enterprise (DBE) participation:** Including DBE goals as part of procurement helps to ensure that members of disadvantaged communities benefit economically from the NEVI program.
- **Data collection and reporting:** MassDOT will consider data reporting requirements that support the efficient and reliable operation of the NEVI network and enable MassDOT to evaluate program success based on defined metrics. MassDOT does not anticipate including data reporting requirements that are more stringent or periodic than those required by applicable federal regulations**.**
- **Additional requirements and standards:** Other contracting requirements and standards will be included to ensure compliance with all federal and state requirements related to cybersecurity, payment methods, resilience, and interoperability standards.

Detailed solicitation language will be developed following approval of this plan, finalization of federal standards for NEVI-funded DCFC equipment and reporting, and ongoing clarification of the application of federal regulations to the NEVI program. Final contract provisions may change through negotiation with the selected service provider.

7.4 Implementation Timing

The use of NEVI formula funds by federal fiscal year is illustrated in tables 9 and 10. This does not, however, indicate the year in which charging stations would be built.

The release of a solicitation for a private partner will depend on factors that include:

- The timing of FHWA approval of this plan.
- The timing of FHWA issuing final standards for charging stations and other requirements that would need to form part of a MassDOT solicitation.
- Resolving outstanding clarification of the application of existing federal rules that are needed for MassDOT to finalize a solicitation process and contract provisions.

The timing of commissioning of NEVI stations will depend on factors that include:

- The availability of DCFC charging stations that meet forthcoming FHWA standards and FHWA's Buy America requirements. Stakeholders have advised MassDOT that there is not yet volume production of Buy America compliant DCFC stations.
- Lead times for this DCFC and other essential equipment. Stakeholders have advised MassDOT that lead times for DCFC station components are currently as long as 18 months.
- Site-specific factors, including NEPA approvals and the need for utility easements and make-ready investments.

8.0 Civil Rights

MassDOT is committed to comply with all State and Federal civil rights laws and ensure nondiscrimination in all of its programs and activities. MassDOT strives to ensure that no person shall be discriminated against in the deployment, use, or distribution of benefits of NEVI Program-funded EV charging infrastructure on the basis of race, color, national origin, sex, age, disability, low income, Limited English Proficiency, or other applicable protected characteristics. This includes legislative acts applying to entities receiving federal funds, including Title VI of the Civil Rights Act of 1964 and the Civil Rights Restoration Act of 1987. MassDOT also complies with the Americans with Disabilities Act (ADA) and Section 504 of the Rehabilitation Act by ensuring that individuals with disabilities receive the same rights and opportunities as others to participate in and have access to NEVI program benefits and services.

In cases where MassDOT distributes federal aid funds to other governmental entities, MassDOT will include Title VI language and require compliance with applicable civil rights regulations and accessibility standards in written agreements. Similarly with Requests for Proposals and contracts with private or non-profit sector entities such as consultants, contractors, and vendors, MassDOT will incorporate language ensuring compliance with Title VI, ADA Accessibility Standards, and other civil rights provisions in all contracting documents. MassDOT will also monitor for compliance and perform required reporting in accordance with U.S. Department of Transportation regulations.

9.0 Equity Considerations

Equity was one of MassDOT's key considerations throughout Plan development. MassDOT sought to engage with disadvantaged community members and organizations through multiple outreach methods. In addition to engaging with disadvantaged groups, all stakeholder outreach methods included equity considerations as a topic.

When considering National Highway System roadways to nominate as EV Alternative Fuel Corridors during the FHWA Round 6 nomination cycle, MassDOT developed and utilized a range of equity criteria to help identify the highest priority roadways to nominate as EV AFCs. Several of the corridors that were nominated pass through environmental justice (EJ) communities in Massachusetts and enable MassDOT to consider NEVI DCFC investments on roadways that serve these communities.

9.1 Identification and Outreach to Disadvantaged Communities in the State

Engagement with disadvantaged communities and equity considerations were at the forefront of stakeholder and public engagement in developing this plan, as described in Section 3.0. MassDOT used multiple outreach methods to solicit feedback and input from disadvantaged community members, environmental justice organizations, rural organizations, and other community-based organizations. To help identify disadvantaged communities, MassDOT used both the *Electric Vehicle Charging Justice40 Map* and the Commonwealth's definition of an environmental justice (EJ) population.

The Justice40 map shows that many of Justice40 communities in Massachusetts are located in urban centers such as Pittsfield, Springfield, Worcester, and Boston. MassDOT also made use of the state's EJ population definition in order to capture disadvantaged communities in more suburban and rural regions of the state and to be consistent with other state and regional programs and policies (including long-range transportation planning and programming) considering these defined EJ communities.

Massachusetts defines a community as an "environmental justice population" if the Census block group meets one or more of the following criteria:

1. Annual median household income is not more than 65 percent of the statewide annual median household income;

2. Minorities comprise 40 percent or more of the population;

3. 25 percent or more of households lack English language proficiency; or

4. Minorities comprise 25 percent or more of the population and the annual median household income of the municipality in which the neighborhood is located does not exceed 150 per cent of the statewide annual median household income.

MassDOT facilitated two focus groups with members of disadvantaged, underserved, and environmental justice communities in Massachusetts. Recruitment targeted members of communities identified by the *Electric Vehicle Charging Justice40 Map* and Massachusetts' criteria for an environmental justice population.

MassDOT also conducted three virtual roundtables. This included one roundtable focused on entities representing rural issues in Massachusetts, including staff from rural Metropolitan Planning Organizations (MPOs) and community-based groups in rural areas, and two roundtables including participants from environmental protection and environmental justice organizations and community-based organizations across the Commonwealth.

Administration and evaluation of the project statistical survey also ensured adequate demographic representation of disadvantaged population groups.

9.2 Process to Identify, Quantify, and Measure Benefits to Disadvantaged Communities (DACs)

The goal and principal direct benefit of DCFC sited along highway corridors is the reduction in range anxiety and associated increased ability for community members to benefit from electromobility. This includes the ability of households to make trips to and from their communities in electric vehicles and for goods and services to be delivered to and from their communities using electric vehicles.

In the outreach conducted to develop this plan, stakeholders expressed strong support for serving disadvantaged communities as part of building out charging networks.

For this plan, benefits to disadvantaged communities will be evaluated considering access and proximity to corridors planned for DCFC infrastructure. As noted in Section 4.0, this metric is the ratio of the percentage of the Commonwealth's EJ Community population within five miles of a NEVI-served zone to the percentage of the Commonwealth's non-EJ Community population within five miles of a NEVI-served zone.

In addition to the mobility benefits, stakeholder input raised a range of indirect benefits that may occur due to DCFC investment:

- Generation of business, jobs, and income for disadvantaged community member-owned businesses nearby, such as restaurants or stores.
- Supporting and growing tourism, such as visitor information locations and emerging tourism destinations.
- Improved air quality and reduced noise along corridors.
- Disadvantaged community member involvement in building, supporting, or maintaining DCFCs.
- Increased awareness and understanding of electric vehicles and driving range confidence, supporting adoption of EVs.

In addition to potential indirect benefits stakeholder input noted possible adverse impacts from DCFC investments:

- Gentrification could drive up the prices of land, or rents, near DCFCs.
- Valuable public green spaces could be taken by DCFCs causing negative environmental impacts such as heat islands.
- Investment in charging stations could divert attention from investing in other transportation modes that could serve disadvantaged communities.
- Additional infrastructure needed to improve the electrical grid, such as additional substations, could adversely affect property values or quality of life.

MassDOT expects these indirect community impacts to be modest to minimal for corridor-based fast charging, since most sites are expected to be located adjacent to major highways (e.g., at rest areas or service plazas), or at commercial properties near those highways. By encouraging the use of existing grid capacity and storage technologies, MassDOT seeks to minimize the need for additional electricity infrastructure and associated community impacts.

The locations where NEVI formula funds can be invested are heavily restricted (sites must be less than a one-mile drive from a designated alternative fuel corridor and have 600 kW of grid capacity). However, this is not the case for other IIJA funds supporting electric vehicle infrastructure. In particular, the IIJA provides $1.25 billion that can be used for community EV charging and other alternative fueling infrastructure in publicly accessible locations, such as parking facilities at public buildings, schools, and parks. MassDOT encourages FHWA to consider the potential indirect community impacts identified by Massachusetts stakeholders above when making decisions about these discretionary funds.

The project focus groups and roundtables with members and/or representatives of disadvantaged (including EJ, Justice40, and rural) communities confirmed that the price to own or lease an EV is one of the most significant barriers to adoption. While not part of this plan, programs and policies that lower barriers to EV ownership for low-income households would enhance the equity benefits of NEVI program investments as many disadvantaged community members are unlikely at this point to be able to afford to own or lease an EV. As noted in Section 6.4, Massachusetts is pursuing a range of programs that lower barriers to EV adoption.

9.3 Benefits to DACs through this Plan

A geospatial analysis shows that 48 percent of the population that live within five miles of an EV AFC live in EJ communities, compared to 45 percent of the total Massachusetts population that live in EJ communities.

Because NEVI program funds will be invested on an EV AFC network that serves EJ populations at a higher rate than the state average, and because demand investments will be prioritized on a ranking that includes equity, it is not anticipated that the phasing of NEVI corridor development will create any negative equity impacts. MassDOT will be reporting on a metric measuring benefits to EJ communities as described in Section 12.0.

10.0 Labor and Workforce Considerations

The construction and operation of NEVI-funded DCFC stations in Massachusetts will require a skilled workforce to build, operate, and maintain DCFC infrastructure. That workforce includes electricians who are qualified to commission and maintain DCFCs. Additionally, non-electrician operations and maintenance labor will be essential to repair non-electrical infrastructure components, as well as payment and operating systems. Trade schools, technical institutes, and vocational schools can act as training programs for electricians, EV service technicians, and maintenance workers.

Stakeholders participating in the outreach for development of this plan did not identify any significant limitations on the supply of skilled electricians to commission and maintain DCFCs. They noted that the recent growth of the solar industry has helped to increase the supply of licensed electricians. However, the potential need for training for information technology workers to address DCFC station system configuration and networking issues was identified.

The Massachusetts Executive Office of Labor and Workforce Development (EOLWD) manages the Commonwealth's workforce development and labor departments to ensure that workers, employers, and the unemployed have the tools and training needed to succeed in the Massachusetts economy. Within this office, the MassHire Department of Career Services oversees the Massachusetts network of MassHire Career Centers that assist businesses in finding qualified workers, and providing job seekers with career guidance as well as referrals to jobs and training. The MassHire program includes 16 regional Workforce Boards and 29 Career Centers serving the needs of job-seekers and businesses throughout the Commonwealth. Massachusetts also has 148 secondary and postsecondary vocational and technical institutions, including 45 with electricity programs. A total of 23 entities registered in the Commonwealth provide Electric Vehicle Infrastructure Training Program (EVITP) training.

In addition, the Department of Higher Education (DHE) supports and coordinates economic and workforce development initiatives across Massachusetts' 29 public college and university campuses to align training, certificate, and degree programs with the workforce needs of the Commonwealth's growth and emerging industry sectors.

MassDOT will work with the selected industry partner(s) to monitor the supply of workers with skills needed to support construction and maintenance of NEVI program DCFC infrastructure. If shortages are identified, MassDOT will consider the need to work with the EOLWD and DHE to identify programs that could be expanded or other training resources that might be needed to ensure an adequate workforce that supports timely construction and repair of NEVI program DCFC facilities.

MassDOT understands that FHWA is considering imposing additional workforce licensing and certification requirements for station installation, operation, and maintenance through rulemaking. MassDOT encourages FHWA to consider the implications for labor supply.

11.0 Cybersecurity

Comprehensive and proactive cybersecurity measures are essential to give EV drivers the confidence that EVs are a feasible and secure transportation technology, as well as assurances to DCFC operators and owners. Possible cybersecurity threats may include, but are not limited to, viruses or hacking of EVs or DCFCs, service disruptions, and data and privacy breaches. MassDOT acknowledges that threats and risks to EV infrastructure may evolve over time.

Requests for Proposals and contract documents with private or non-profit sector entities who construct, own, operate, and/or maintain DCFC infrastructure will require entities to implement appropriate cybersecurity countermeasures and comply with industry standards. This may include contractual provisions requiring a cybersecurity management plan and regular monitoring, risk assessments, and software updates. Cybersecurity countermeasures include security software and firmware, protocols to handle sensitive data, point of sale security, and secure data transmission protocols. Cybersecurity requirements will also address network preservation to isolate corrupted DCFC infrastructure and limit impacts to the network system. Additionally, MassDOT will consider physical security, such as station design and on-site cameras, to promote cybersecurity by preventing threats in-person.

12.0 Program Evaluation

Section 4.0 of this plan sets a series of performance metrics that will be used to evaluate the NEVI program deployment in Massachusetts. MassDOT will also conduct an overall program evaluation following the commissioning of the final AFC NEVI station. For each performance metric, Table 10 indicates the source of the metric and its reporting timeframe or frequency.

Table 10: Reporting of Performance Metrics

Performance Metric	Source	Reporting Frequency
Electric vehicle Alternative Fuel Corridors in Massachusetts, with gaps of more than 50 miles between 4 x 150 kW port DCFC stations located no more than one mile from highway exits (if applicable), expressed as percentage of total miles of electric vehicle Alternative Fuel Corridors designated in 2022.	MassDOT analysis.	Conclusion of program.
Percent of stations operating five years after installation of last NEVI-funded DCFC station with public investment required.	Contract provisions; private partner reporting.	Conclusion of program (5 years after commissioning of final AFC NEVI station).
Number of stations deployed per federal dollar invested.[18]	MassDOT analysis.	Conclusion of program.
Average “uptime” of stations, measured over one year at a site level.	Private partner (station operator) reporting.	Annual following commissioning of first station.
Ratio of % of state’s population in EJ communities that are within 5 miles of a zone served by NEVI-funded DCFC to the % of non-EJ population within 5 miles of those zones	MassDOT analysis.	Conclusion of program.

[18] This evaluation was requested by FHWA guidance.

13.0 Discretionary Exceptions

MassDOT is not requesting any discretionary exceptions in this plan from the requirement that charging infrastructure is installed every 50 miles along that State's portion of the Interstate Highway System within one travel mile of the Interstate, as provided in the EV AFC request for nominations criteria.

Appendix A. Acronyms

AASHTO	American Association of State Highway and Transportation Officials
ADA	Americans with Disabilities Act
AFC	Alternative Fuel Corridor
AFDC	Alternative Fuels Data Center
CCS	Combined Charging System
DAC	Disadvantaged Communities
DBE	Disadvantaged Business Enterprise
DCFC	Direct Current Fast Charger
DOE	United States Department of Energy
DHE	Massachusetts Department of Higher Education
DOT	Department of Transportation
EEA	Massachusetts Executive Office of Energy and Environmental Affairs
EOLWD	Massachusetts Executive Office of Labor and Workforce Development
EJ	Environmental Justice
EV	Electric Vehicle
EVITP	Electric Vehicle Infrastructure Training Program
EVSE	Electric Vehicle Supply Equipment
FFY	Federal Fiscal Year
FHWA	Federal Highway Administration

FY	Fiscal Year
IIJA	Infrastructure Investment and Jobs Act
kW	Kilowatt
MassDOT	Massachusetts Department of Transportation
MBTA	Massachusetts Bay Transportation Authority
MPO	Metropolitan Planning Organization
NEPA	National Environmental Policy Act
NEVI	National Electric Vehicle Infrastructure Formula Program
OTP	MassDOT Office of Transportation Planning
PEP	Public Engagement Plan
RFI	Request for Information
RTA	Regional Transit Authority
SMART	Solar Massachusetts Renewable Target Program
STIP	Statewide Transportation Improvement Program

Appendix B. Additional Public and Stakeholder Engagement Materials

This appendix summarizes high-level themes that emerged from stakeholder engagement outreach methods: stakeholder survey, online roundtables, focus groups, interviews, and statistical survey. Table 11 below lists the stakeholder groups by outreach method.

Across all stakeholder engagement, stakeholders saw many benefits of DCFC deployment on the highway network in Massachusetts. Benefits include increased range confidence, greater awareness leading to accelerated adoption of EVs, opportunities for equitable access and economic development, and reduced emissions and improved air quality resulting from fewer internal combustion engine vehicles on roadways. However, stakeholders highlighted other issues as requiring coordination and planning to address, such as consistent reliability and availability of DCFC stations, high purchasing and maintenance costs of EVs, supply chain issues, and barriers to EV adoption in underserved and disadvantaged communities.

Stakeholders also emphasized the need for clear oversight, regulations, and guidance during any procurement process. They noted that the NEVI program should consider and complement other

ongoing initiatives performed by federal, state, and local governments, the private sector, community-based and nonprofit organizations, and other groups.

Table 11: Outreach Methods by Stakeholder Group

Stakeholder	Outreach Methods
Members of general public (Massachusetts residents) with valid driver's licenses who make long-distance trips	Statistical sample survey
EV supply equipment (EVSE) and service providers, including: AppleGreen Electric Chargepoint Electrify America EVgo Shell ReCharge Tesla	Interviews (for those listed), stakeholder survey (for a broader range of EVSE providers)
Utility service providers, including: • Eversource Energy • Massachusetts Municipal Wholesale Electric Company • National Grid Energy	Interviews (for those listed), stakeholder survey (for a broader range of utility service providers)
Representatives from rural MPOs and organizations: Berkshire Regional Planning Commission Cape Cod Commission Central Massachusetts Regional Planning Commission Hilltown Community Development Corporation Montachusett Regional Planning Commission Quaboag Valley Community Development Corporation	Online roundtables (for those listed), stakeholder survey (for a broader range of organizations)
Representatives from environmental justice, environmental protection, and community-based organizations: • Acadia Center • Alliance for Business Leadership • Coalition for Social Justice • Conservation Law Foundation • GreenRoots • MASSPIRG	Online roundtables (for those listed), stakeholder survey (for a broader range of organizations)
Members of environmental justice (EJ) and Justice40 communities	Focus groups
Metropolitan and Regional Transportation Planning Organizations	Stakeholder survey
Responsible emergency/disaster preparedness coordinators	Stakeholder survey
Tribal governments	Stakeholder survey
Public transportation agencies	Stakeholder survey
Port and freight authorities	Stakeholder survey
Massachusetts Chamber of Commerce and regional/local chapters, labor organizations, and private entities	Stakeholder survey

B.1 Stakeholder Survey Themes

The stakeholder survey targeted a wide range of stakeholders, including government agencies, MPOs, EVSE and service providers, utilities, and non-profit and community-based organizations. Topics for the survey focused on plan vision and goals, equity considerations, highway segment prioritization criteria, program monitoring, public-private coordination, and program deployment.

Overall, stakeholders viewed equitable and efficient location prioritization of DCFC sites as a key strategy to plan for and monitor the NEVI program's success in Massachusetts. A range of responses supported distributing DCFC sites throughout the highway network to provide coverage that reduces driving range anxiety for EV drivers.

Stakeholders also expressed that charging site placement in underserved areas should be prioritized. Stakeholders were in favor of locating DCFCs where community members could access them or benefit from any revenue generated from EV drivers stopping at nearby businesses to charge their vehicles. Stakeholders also cited rural and western Massachusetts communities as priority zones, due to limited existing highway DCFC coverage.

The reliability and availability of DCFC stations were reported as potential major challenges that could impede program success. Stakeholders identified the need for real-time and frequent data collection, monitoring, and sharing for DCFC stations. Stakeholders also raised concerns about cybersecurity, the use of DCFC operators' proprietary or sensitive data, and potential burdens of reporting requirements for DCFC operators/owners. Supply chain issues, component shortages, and long delivery delays were also highlighted as potential impacts to construction timelines for DCFC sites.

Stakeholders generally expected the program to be implemented via public-private partnership with an emphasis on the public sector providing guidance and oversight rather than direct involvement in construction or operation of DCFC. Many stakeholders believed that the private sector should be responsible for DCFC site operations. Additionally, several stakeholders emphasized that MassDOT should serve in a coordination role, leveraging existing initiatives, resources, and partnerships with other government agencies and private organizations. Stakeholders pointed to key negotiation points in a public-private partnership that included responsibilities and requirements for data sharing, cybersecurity, infrastructure upgrades, maintenance, subsidies for operating DCFCs, permitting, and expected timelines for procurement, construction, and operations.

B.2 Interview Themes

MassDOT interviewed two groups of stakeholders for this plan: EV supply providers and electric utility service providers. These interviews primarily concerned detail on ongoing related initiatives, site prioritization and operations, public-private partnerships, and best practices for DCFC provision.

EV Supply Equipment and Service Providers

Providers relayed that they typically use their own data and methodology to inform DCFC site selection, with considerations such as visibility, safety and security, availability of on-site amenities, site host support, and electrical grid capacity. They noted that sites should serve both through traffic and local traffic to maximize utilization.

In providers' experience, site hosts are often willing to assist with funding, as site hosts benefit from increased vehicle traffic. However, providers stated that capital subsidies may still be needed, as it may take ten years or greater for initial investments to pay off. Providers seek long-term contracts that spread costs and risks across multiple charging sites, since high-performing sites can subsidize low-utilization sites. However, many still support serving lower-utilization sites to support full network build-out and to increase range confidence for EV drivers.

Providers expressed preference for a competitive procurement process with clear criteria. Selection criteria should reward potential partners who offer to exceed the non-Federal capital cost share. Some favored solicitation selection criteria prioritizing service providers with methods to limit supply chain disruptions, such as diverse supplier networks and onshore warehousing. Others noted the importance of provisions and requirements to ensure adequate budgeting and planning for maintenance and data reporting in the long term.

Providers emphasized the need to define requirements for measuring DCFC reliability and utilization. They also described how station uptime and utilization may be measured at many different levels, such as station, site, network, and at differing time increments, noting advantages and disadvantages with each measurement approach.

Providers also suggested build-at-risk provisions and Buy America Act waivers, and early releases of Requests for Information as methods to help accelerate the timetable for building DCFC once contracted. They identified the need for early and ongoing coordination with utility providers, municipalities, and potential site hosts.

Utility Service Providers

Utilities have a variety of programs to support transportation sector electrification that could complement the NEVI program. Existing make-ready programs are concluding but utilities are awaiting approval for the next phase of EV support programs. The programs will potentially support 100 percent of utility make-ready costs, plus costs on the public side of the meter depending on the use case. The utilities have also filed a proposal for an alternative for commercial rate demand charge reduction for EV charging sites, with the reduction higher at lower levels of utilization and phasing out at utilization levels over 15 percent. Municipal utilities often set rates that are lower than rates set for investor-owned utilities, which may be advantageous to the siting and pricing of charging stations.

Utilities noted the importance of early coordination among the state, service providers, and utilities. The sooner utilities can learn about locations and sizes of charging sites, the sooner they can start the process of any upgrades needed to ensure their distribution systems can support the site requirements. Utilities have maps of grid capacity that can help in station siting. Utilities noted that upgrade/interconnection costs will vary widely depending on the capacity of existing service, distance to a trunk with adequate power, and other site-specific requirements (e.g., if tunneling is needed). They also highlighted transformer and other equipment shortages have led to delays in building out some sites.

Utilities also identified the need to accommodate both current and future electricity demands at DCFC sites, including load distribution upgrades. They cited challenges in estimating long-term needs, and noted the inherent risks in choosing to "future-proof" by building out electrical grid capacity in anticipation of uncertain future demand. Another challenge the utilities relayed is that

sites require significant maintenance over time, and therefore companies must plan on supporting operations and maintenance costs. Additionally, utilities highlighted that upfront capital expenses for charging sites are large and this carries risks.

B.3 Online Roundtable Themes

Overall, roundtable participants saw the NEVI program as an opportunity to connect and coordinate with other initiatives with complementary visions. Initiatives and broader goals that participants cited included accelerating EV adoption and access amongst disadvantaged communities, as well as transportation sector decarbonization.

Roundtable participants noted that EJ community members are less likely to be able to afford an EV and that ensuring other benefits of highway DCFC was important until EV ownership becomes more widely attainable. Participants identified potential opportunities for economic development by siting DCFCs in or near EJ communities. Participants also highlighted a preference for a transparent and fair solicitation process in which disadvantaged, minority-owned, and EJ-owned businesses can compete for DCFC construction and operation contracts.

Participants generally saw many positives in expanding EV charging infrastructure on highways, including increased driving range confidence, greater awareness of EV ownership benefits, economic development opportunities, and reduced emissions and improved local air quality.

B.4 Focus Group Themes

Focus group participants, who were all from environmental justice (EJ) or Justice40 communities, expressed an openness to owning EVs if barriers such as high price points, access to charging, and maintenance costs could be addressed. Participants discussed potential benefits of EV ownership, which included potential lower vehicle ownership costs (citing recent increases in the price of gasoline); keeping up with technological development; lowering personal environmental impacts; and achieving better health outcomes for individuals and communities. Focus group participants expressed interest in trying out an EV before buying, potentially through rideshare or car rentals. Several participants noted the importance of educating drivers about the differences in how to operate an EV versus an internal combustion engine vehicle.

However, no participants were currently comfortable taking long trips in EVs due to perceived lack of charging infrastructure coverage and difficulty finding charging sites. Highway signs, GPS, and specialized phone applications were suggested as methods to identify EV fueling opportunities. Participants indicated that when they stop on long-distance trips, they will use restrooms, take short walks, buy food and drinks, and take care of pets—they noted that DCFC sites on highways should enable them to continue to do activities like these, but also noted that 15-30 minute EV recharging times were potentially concerning for safety and convenience purposes.

Participants identified issues that could represent barriers to personally owning an EV, including:

- Limited driving range/battery range
- Ability to charge in different housing and work situations
- High price points to purchase, maintain, and insure EVs

- Availability of replacement parts and qualified mechanics, as well as ease and costs of repairs
- Unpredictability of future electricity costs

B.5 Statistical Survey Themes

The statistical survey used a representative sample of the Massachusetts public, limited to residents with valid driver's licenses who make at least one long-distance trip (greater than 100 miles) in a year. The objective of the survey was to better understand the general public's preferences and thoughts on electric vehicle ownership and fast charging.

Few respondents were considering buying or leasing an EV in the next year: only 22% of respondents indicated that they were, while 43% said they were not and 34% said they were not sure. Younger adults were more likely to consider buying or leasing an EV, with 38% of those ages 25-34 saying yes, while only 11% of those aged 55 and older indicating that they were considering buying or leasing an EV.

Survey respondents were asked to rank their top five barriers to buying or leasing an EV. These reasons included EV range limitations, recharging time, charging availability at home, charging at other destinations or adjacent to highways, and battery lifespan and warranty. Cost to purchase an EV was the predominant barrier overall, ranked as the number one barrier by 27% of all respondents and ranked in the top five by 71% of respondents. Limitation on electric vehicle range was the second most important factor (15% identified this as their top barrier), followed by availability of home charging (9%), recharging time (9%), and availability of charging at other destinations (8%). Availability of charging on or adjacent to highways was ranked as the top barrier by 7% of respondents. This was more important than battery lifespan (6%), brand and model availability (6%), operating costs (6%), and vehicle performance (5%).

The survey also asked respondents about the value they place on highway DCFC station characteristics and refueling location amenities. Respondents considered the ability to use a DCFC station immediately without waiting (availability) as the most important characteristic when on a major highway on a long-distance trip. The speed of charging was the second most important characteristic, followed by reliability. Charging prices were considered the least important of the four characteristics.

Respondents consider publicly accessible restrooms and adequate lighting as important amenities at a refueling location (83% and 77% rated as "very important" or "fairly important", respectively). Respondents also value the ability to make purchases such as drinks or food at refueling locations (65% rated as "very important" or "fairly important").

Respondents are generally not confident about finding a charging site location on a long-distance trip, with over half of respondents expressing they were only "slightly confident" or "not at all confident" that they would be able to find a recharging location for an EV when needed on a trip that was over 100 miles long. 28% were "somewhat confident," and only 19% were "very confident" or "fairly confident."