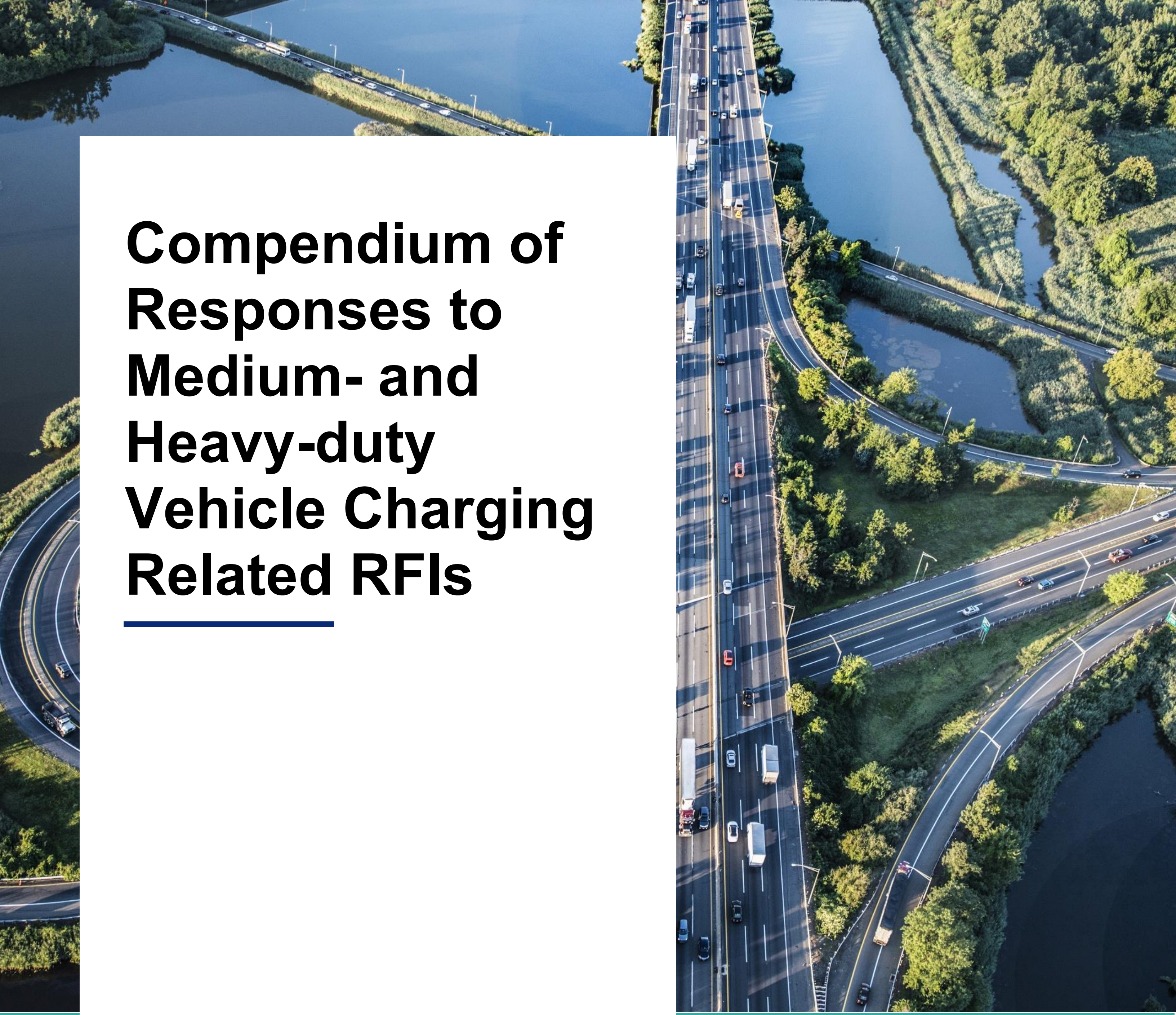

Compendium of Responses to Medium- and Heavy-duty Vehicle Charging Related RFIs

February 2026

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Introduction

This report summarizes the responses to six requests for information (RFIs) pertaining to medium- and heavy-duty vehicle charging:

1. Medium- and Heavy-Duty Electric Charging Technologies and Infrastructure Needs [U.S. Federal Highway Administration]
2. Considerations for Medium- and Heavy-Duty Electric Charging Infrastructure in NJ, CT, DE, and MD [New Jersey Department of Environmental Protection (NJDEP)]
3. Tri-State CFI RFI [California Energy Commission (CEC)]
4. Considerations for the CEC Zero-Emission MDHD Drayage Infrastructure Application for the USDOT's CFI Grant Program [CEC]
5. 2025-RFI-258 for Electric Vehicle Charging Grants [New Jersey Economic Development Authority]
6. Medium- and Heavy-Duty Zero-Emission Vehicle Public Charging [CEC]

While the majority of information is specific to public and semi-public charging stations, some components may be relevant to depot-based charging as well. These RFIs cover information that is applicable nationwide as well as information that may be specific to the jurisdictions issuing the RFIs (i.e., California, Connecticut, Delaware, Maryland, and/or New Jersey). An overview of the RFIs summarized, links to the full documents, and the topics they cover can be found in Appendix 1. A summary of the respondents can be found in Appendix 2.

This document is informational only and summarizes the responses to these six RFIs. It does not constitute an explicit recommendation or endorsement from NJDEP or any other state agency and is not tied to any individual funding program.

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Demand for Public Charging

This report summarizes the responses to six requests for information (RFIs) pertaining to public and semi-public charging stations for medium- and heavy-duty vehicle(s) (MHDV). While some components may be additionally relevant to depot-based charging, the focus of this summary is on public and semi-public charging. **While the definition of public charging varies between programs, it generally refers to charging stations that are available for use by drivers and operators of MHDVs from more than one organization.**

Respondents highlight the need for government funding to support public and semi-public charging infrastructure, particularly for small fleets who are less able to invest in costly depot charging infrastructure. While large fleets are more likely to install charging infrastructure at their own depots, they are likely to rely on public hubs to provide flexibility and support regional and long-haul travel distances.

Program Public Charging Definitions

California's Carl Moyer Program [applicable to MHDV and off-road vehicle charging]: "Available to provide fuel or energy to all members of the general public with no physical access restrictions and no necessity to enter into a contract or sign release of liability".

California's AB 2127 Report [applicable to all charging infrastructure]: "Has parking space(s)... available to and accessible by the public for any period".

California's CRITICAL PATHS Program [applicable to MHDV charging]: "All charging and refueling positions need to be the same ease-of-access for all users. If a reservation system is being used, it must be publicly accessible 24/7 and include signage describing how the reservation system works, with instructions... [the charger] must also allow drivers the option to charge or refuel without a reservation".

NEVI Minimum Standards [all charging infrastructure]: "Charging stations located along and designed to serve users of designated AFCs [Alternative Fuel Corridors] must be available for use and sited at locations physically accessible to the public 24 hours per day, 7 days per week, year-round. Charging stations not located along or not designed to serve users of designated AFCs must be available for use and accessible to the public at least as frequently as the business operating hours of the site host."

Site Design

Amenities

Respondents indicate that sites offering amenities can expect to see higher utilization rates than those without amenities, although this may be less important for depot charging and charging-as-a-service installations. The types of amenities that can be offered may be limited by local zoning restrictions, however, in some cases, charging providers can utilize amenities offered at nearby locations. As shown in Figure 1, the three most frequently reported amenities were food and drink, restrooms, and seating/ lounge areas. These were seen by the RFI respondents as the minimum essential requirements for a public charging site to provide.

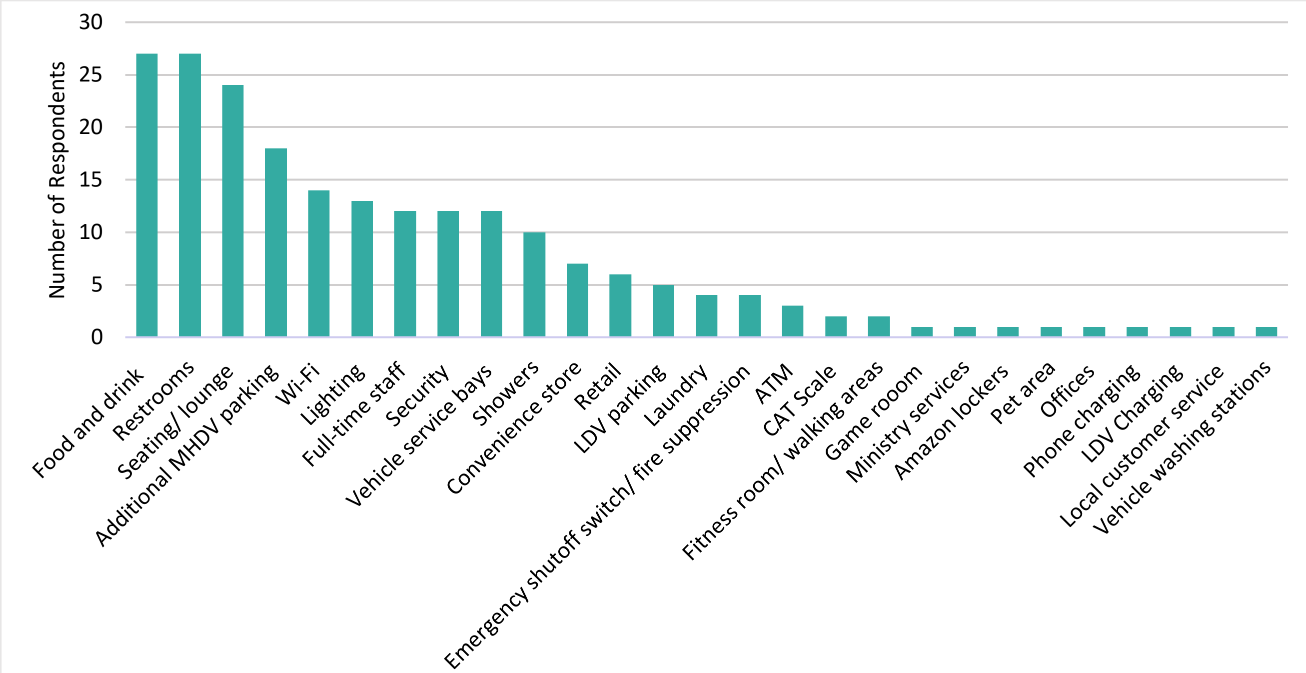


Figure 1: Preferred amenities based on responses from RFIs 1, 3, and 4.

Distributed Energy Resources (DERs)

Distributed energy resources (DERs) help provide resiliency and support disaster response, however, their impacts on cost and energization timelines are highly site-specific. DERs commonly considered in the development of charging sites for MHDVs include on-site electricity generation (e.g., solar or non-solar generation) and storage (e.g., battery storage or vehicle-to-grid). DERs can also include microgrids for reliability and resilience. Components like solar and storage are typically reported as having expected lifetimes of 25 years.

Some sites that have deployed solar and battery storage report electricity cost savings of 30-50% in the long run by reducing demand charges, or, in utility territories offering these programs, participating in markets for ancillary services like voltage and frequency regulation. In some utility territories, DERs can help reduce the magnitude of grid upgrades needed by accounting for the electricity demand they offset. In other cases, the costs of DERs are higher than the expected savings.

In many cases, adding DERs to a site increases energization timelines due to their more complex interconnection requirements. In remote or grid constrained areas, on-site electricity generation and storage can help reduce energization timelines or make sites feasible that otherwise would not be. This is particularly true with high-powered transformers and switchgears, which in recent projects have had longer lead-times.

Another key consideration for developers considering adding DERs is the large space requirements of these systems. Respondents estimate that approximately 4-8 acres of land per MW of power would be needed to support charging sites in the Northeast U.S., which may be impractical in many areas due to the population density in the region. Batteries are typically seen as having the greatest number of advantages compared to their disadvantages.

Overall, the tradeoff between costs and benefits for DERs is seen as highly site-specific, so most respondents were in favor of allowing DERs as eligible costs. They encourage funding providers to give developers maximum flexibility in determining whether to utilize DERs at their site.

Power Levels

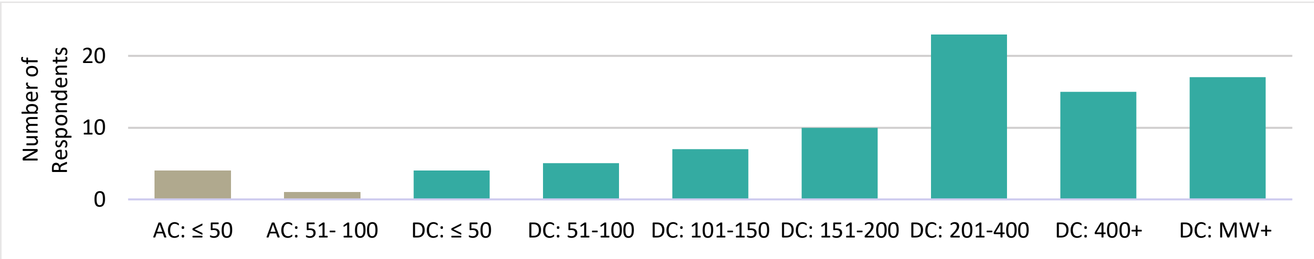


Figure 2: Power levels (kW) recommended by respondents to RFIs 1, 3, and 4.

RFI respondents indicated a variety of power levels will be needed to support electric MHDVs. While most respondents favored higher-powered DC fast chargers, a few respondents noted that AC charging could be used to support a multitude of cases, including smaller vehicles, those needing to charge overnight, or during extended driver breaks. Many respondents involved in the development of these charging sites indicated their intention to deploy megawatt or higher-powered chargers in the next few years by either installing new or upgrading existing lower-powered charging stations.

The ideal power levels are specific to the vehicle type, duty cycle, and site constraints, so respondents recommend programs are not prescriptive of the types of power levels deployed. In contrast, many respondents stated that a minimum per-port or sitewide power rating should be required, although a variety of different minimum ratings were suggested.

Pull- through vs pull-in or back-in charging

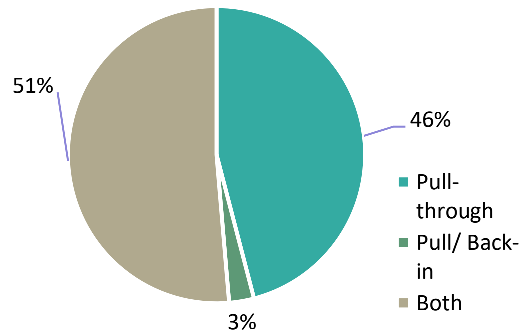


Figure 3: Percent of respondents to RFIs 1, 3, and 4 that favor the inclusion of pull-through, pull/ back-in, or both charger types.

The relative need for pull-through vs pull-in or back-in charging stalls was another common discussion point. The mix between these station types was seen as largely dependent on the vehicle types, classes, and vocations. While pull-in or back-in stalls are seen as more space-efficient and cost-effective, pull-through stalls are seen as improving safety due to reduced reversing needs and the efficiency induced by one-way traffic flows. **In general, pull-through stalls were seen by respondents as supporting more diverse vehicle types** as they allow large vehicles and those towing trailers to maneuver easily and avoid creating congestion. **To support larger vehicles and higher turnover, these sites are also recommended to have higher power levels than pull-in or back-in stations.**

Table 1: Comparison of the benefits of pull-through versus pull-in or back-in charging stalls.

	Pull-through	Pull/ Back-in
Accommodates most vehicle types	✓	X
Better for en-route charging	✓	X
Better for overnight charging	X	✓
Space efficient	X	✓
Cost effective	X	✓
Improved safety, reduced congestion, and improved circulation efficiency	✓	X
Preferred for heavy-duty (Class 7 and 8) vehicles	✓	X
Preferred for light- and medium-duty vehicles	X	✓

Mixed-use Sites

Another commonly discussed topic was the relative advantages and disadvantages of mixed-use sites (i.e., sites that allow charging for light-duty vehicles in addition to MHDVs). Respondents in favor of allowing mixed-use sites argue that they allow quicker cost recovery due to the higher near-term demand for light-duty vehicle charging compared to the demand for heavy-duty vehicle charging. They therefore argue that allowing all vehicle classes to share charging infrastructure increases site utilization and demonstrates the economic viability needed to move projects forward. Mixed-use sites provide additional convenience for fleets with mixed vehicle class operations who would otherwise need to find separate charging stations for their light-duty vehicles.

Despite these benefits, mixed-use sites are also seen as having many disadvantages, including greater permitting and regulatory complexity, higher initial investments, and the potential lack of charger availability for MHDVs (e.g., a station may be in use by a light-duty vehicle when a MHDV needs to charge). Respondents further caution that mixed-use sites can decrease safety by increasing congestion, collisions, and inefficiencies (e.g., light-duty vehicles may have different charging times than MHDVs), leading to higher risks and liabilities. **Proper site design is needed to ensure safety is maintained in mixed-use sites. This includes physically separate charging, ingress/egress, and traffic lanes for MHDVs from any light-duty vehicle traffic.**

Safety

Respondents suggested various best practices for improving charging site safety, including:

- Consider large vehicle turning radii, including those for firetrucks and other emergency response vehicles;
- Have wide driving lanes and carefully-designed circulation paths;
- Use clear signage and wayfinding markers;
- Provide overhead or other adequate lighting;
- Include bypass lanes for vehicles that need to move past one another;

- Include chargers with long cables to accommodate front and rear charge port placement (one respondent suggested an 18-feet minimum);
- Have cable management systems to ensure charging cables do not interfere with vehicle or pedestrian movement;
- Use wheel stops or bollards to protect chargers from physical damage;
- Provide separate ingress and egress points;
- Reserve dedicated space for queueing and staging (in some cases reservation-based/digital queuing systems may be most appropriate);
- Ensure there is sufficient electrical/grid capacity and load management protocols to prevent electrical overloading;
- Utilize pull-though charging stalls for larger vehicles to minimize reversing;
- Use on-site traffic directors or other staff to assist drivers with maneuvering;
- Consider use of charging stations in inclement weather, such as including canopies to protect chargers from rain and snow; and
- Provide adequate pedestrian safety features.

Some developers employ full-time staff to respond to emergencies and enhance safety.

Additional Site Design Considerations

Respondents indicated a range of preferred number of ports per site, with a relatively equal number of respondents indicating an ideal site size of less than 10 chargers, 11-20 chargers, and 21-50 chargers per site. Some respondents indicated their interest in developing sites with an initially smaller number ports and later upgrading to more ports. While fewer respondents were interested in initially installing hubs with more than 50 ports, some indicated a desire to upgrade to this level in the future. Conversely, others called for sites to be future proofed with initial deployments featuring more ports than they expect to need in the near-term.

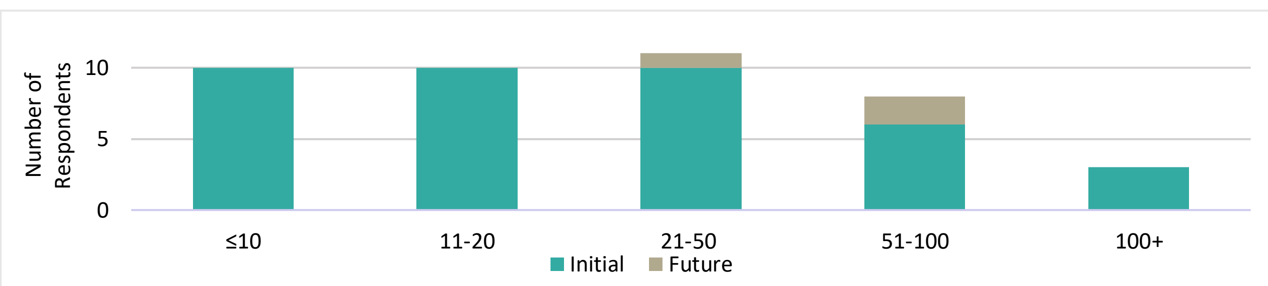


Figure 4: Number of initial and future ports per site recommended by respondents to RFIs 1, 3, and 4.

Some respondents highlighted the differences between site design requirements for medium-duty vehicles and heavy-duty vehicles, shown in Table 2.

Table 2: Differences in site design features recommended for medium-duty and heavy-duty vehicles in response to RFI 2.

Class 2b-6 (medium-duty)	Class 7-8 (heavy-duty)
Site Design Criteria • Stalls can be pull-in or back-in • There are lower power charging requirements • Stalls can be shorter **Best Practices/Designs** • Designs should be compact • Ensure charging is separate from Class 7-8 vehicles due to differing spatial requirements and so smaller vehicles do not block access to high-power chargers	**Site Design Criteria** • Stalls should be pull-through • There are higher power charging requirements • Turning radii should be larger **Best Practices/Designs** • Plan around the Megawatt Charging Standard • Distributed energy resources (DER), such as battery storage, should be integrated to reduce grid impacts • Use federal and state roadway design manuals

Regardless of the intended vehicle class, respondents recommended the following best practices for site design:

- Provide charging stations for electrified transport refrigeration units (eTRUs) in addition to the vehicles;
- Use managed or multiport charging to increase throughput and minimize overstay fees;
- Provide contactless payment options, including an automated phone number or SMS payments; and
- Create a charging experience that is as familiar and seamless as traditional fueling;

While these best practices are recommended by the RFI respondents, each site's layout must be tailored based on its geometry, expected fleet mix, traffic volume, and operational needs. Respondents emphasize that developers should have flexibility to design sites to meet the needs of the vehicles they anticipate serving at each site.

Site Selection

Station Spacing

Most RFI respondents advocated for programs not to place restrictions on the maximum space between charging hubs, arguing they can have unintended consequences by limiting the number of eligible sites, artificially increasing costs and utility upgrades needed. These restrictions additionally reduce the ability to place stations where there is the greatest need. Respondents therefore advocate for letting the market identify the ideal locations.

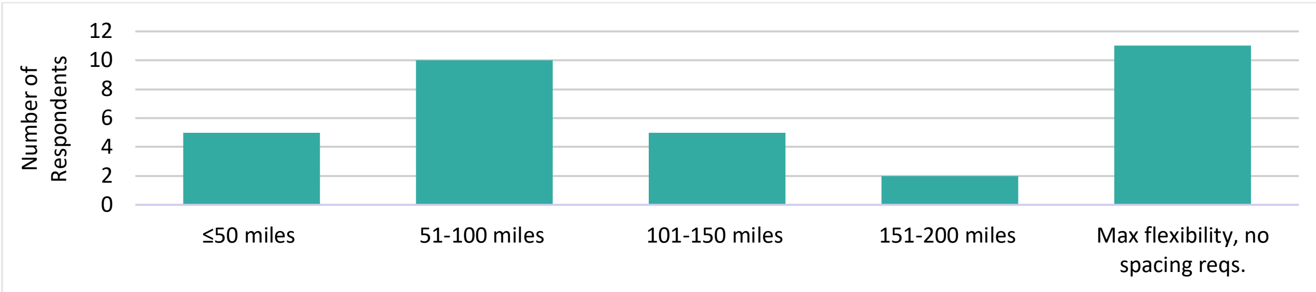


Figure 5: Recommended space between charging hubs along corridors in response to RFIs 1, 3, and 4.

Of the respondents who indicated their preference for a certain maximum distance between MHDV charging sites, the majority felt 50-100 miles was most appropriate. One respondent advocated for spacing hubs every 100 miles between cities and every 10-20 miles in urbanized areas. Others provided less-specific measurements and instead indicated that chargers should be placed at "shorter intervals than diesel stations".

Regardless of spacing, having a greater number of smaller charging hubs at more frequent intervals was seen by most respondents as preferable to having larger charging hubs at wider intervals. The relative advantages and disadvantages of these two approaches, as submitted by the RFI respondents, are summarized in Table 3. Many respondents also advocated for a hybrid network utilizing a few large anchor hubs at key freight locations with more frequent smaller stations for coverage, flexibility, and faster deployment. Others suggested the development of modular, scalable charging sites that are small upon initial deployment, but that are designed and have electric infrastructure upgrades in place for future expansion into larger hubs.

Table 3: The advantages and disadvantages of deploying smaller hubs at more frequent intervals versus larger hubs at greater intervals.

Smaller Hubs at More Frequent Intervals	Larger Hubs at Greater Intervals
Advantages • Promote range assurance and increase redundancy • Faster and easier per-site deployment • Greater operational flexibility for fleets **Disadvantages** • Higher overall costs and lower efficiency • May have lower utilization and underperformance risks • Reliability challenges • May have greater demand charges • More negotiations needed with site hosts, local governments, and/or utilities	**Advantages** • Economies of scale • Better for high-volume, commercial fleets • More amenities and integrated services **Disadvantages** • High per-site upfront costs and longer development timelines • Land use and siting challenges • Decreased range assurance and limited accessibility • Greater financial risk if adoption is slower than expected

Site Selection Criteria

Identifying 'ideal sites' that exhibit key features is typically seen as more important than meeting strict spacing requirements. Suggested selection criteria for sites are shown in Figure 6. The most frequently mentioned site selection criteria are 1) the proximity to key routes; 2) the size of available land; 3) the proximity to key freight destinations and industrial clusters; 4) the availability of utility infrastructure/ power; and 5) the distance from a highway exit. Of these, criteria 1, 3, and 5 are about ensuring accessibility for the greatest number of vehicles, thus increasing site utilization.

The second most frequently mentioned criterion was funding sites that are large enough to support charging hubs, which are estimated to require between 1 and 50 acres each. Ideal site size is highly variable and depends on factors like the expected number of trucks to be served and the use of DERs. With an estimated 2-10+ MW of power required for each site, very few locations are likely to have sufficient existing electrical infrastructure to support a charging hub. Developers often seek sites with the highest existing power availability and the lowest cost and time for site upgrades.

Distance from roadway exists/ accessibility (Criteria 5) was a topic of much discussion. Most respondents said that functional metrics (e.g., travel time) should be prioritized over spatial ones (e.g., minimum or maximum distance) to avoid being overly prescriptive and preemptively excluding ideal sites. Some respondents said that spatial metrics could still be used to create a tiered or point-scale scoring system, but should not be used to disqualify sites. Other respondents suggest that sites should be located no more than one mile from a highway exit to decrease the distance trucks need to travel out of their way to charge and to avoid increasing truck traffic through communities.

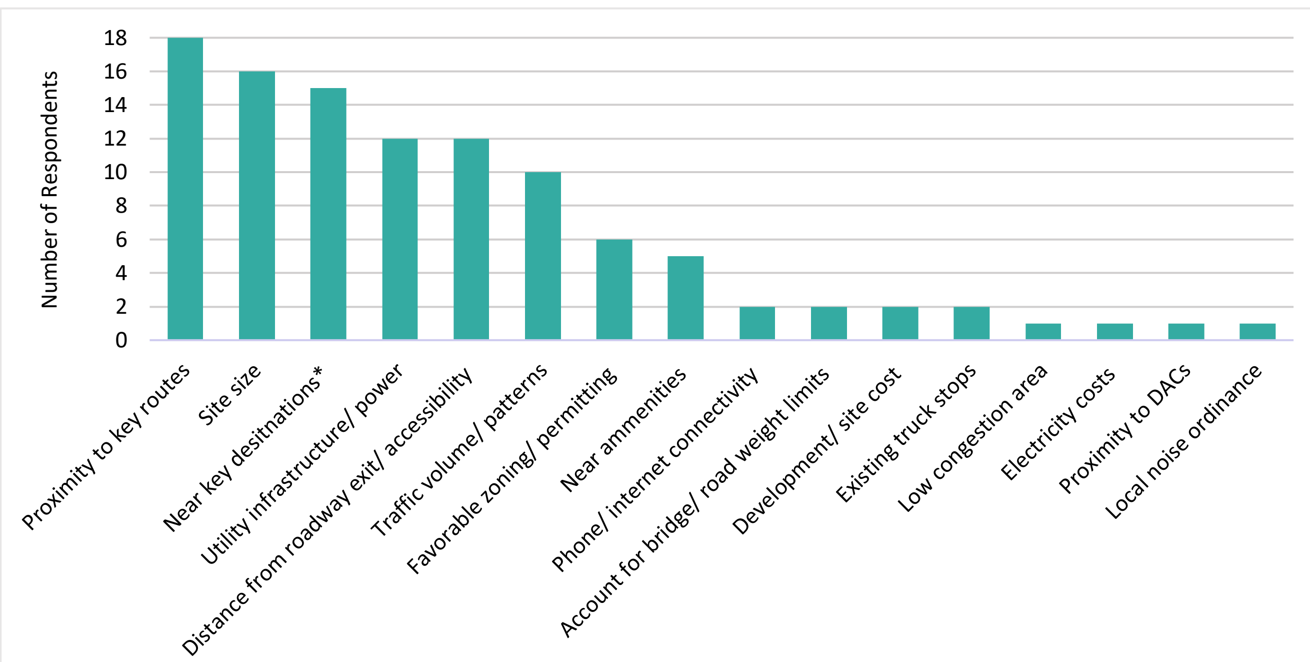


Figure 6: Key site selection criteria identified in RFI's 1, 3, and 4.
**Key origins/ destinations include depots, warehouses, distribution centers, port, and intermodal facilities.*

Respondents were mixed as to whether charging hubs should be built from the ground up or developed at existing truck stops. Existing truck stops are seen as offering quicker development timelines, fewer disruptions to existing traffic patterns, and convenience for drivers who already visit these locations. The industry-wide lack of parking facilities leads others to call for new sites to be developed to help create new parking spaces, rather than setting aside existing spaces for charging.

Cost

While the cost to develop a charging hub can vary significantly based on the number of ports, power levels, required grid upgrades, and other site-specific conditions, respondents provided some insight into the estimated development costs (Table 4). **This ranges from $110,000 per charger to $600,000 per charger, with a median cost of $290,000 per charger.** In total, respondents report sites costing between $750,000 and $30 million, with a median of $18.5 million.

Table 4: MHDV charging hub cost estimates provided by respondents to RFI 3.

Number of Chargers	Total Site Cost	Average Cost Per Charger
25	$750,000	$30,000
30	$7,300,000	$240,000
50	$10,000,000	$200,000
20	$10,000,000	$500,000
44	$14,800,000	$340,000
34	$15,700,000	$460,000
60	$15,800,000	$260,000
40	$17,000,000	$430,000
50	$18,000,000	$360,000
95	$18,500,000	$190,000
34	$19,200,000	$560,000
35	$20,800,000	$590,000
60	$21,000,000	$350,000
76	$22,000,000	$290,000
86	$23,000,000	$270,000
60	$24,000,000	$400,000
100	$25,000,000	$250,000
84	$26,000,000	$310,000
110	$30,000,000	$270,000
N/A	N/A	$110,000
N/A	N/A	$160,000
N/A	N/A	$230,000
N/A	N/A	$600,000

Upfront costs include land acquisition, charging equipment, site preparation, permitting, design and engineering, electric utility upgrades, site construction and installation, DERs, storage, project management, paving, drainage, water and sewer interconnections, site evaluation, and amenities. Ongoing costs include preventive maintenance, repairs, networking fees, energy management software, electricity charges, telecommunications, and cleanings. Respondents to RFI 5 provided estimated costs for annual networking chargers, annual maintenance costs, energy management software, and equipment repairs, shown in Table 5. Some respondents mentioned indirect costs associated with developing and operating a MHDV charging hub, including legal fees, insurance, utility coordination, and permit coordination. **They note that the financial models that have been used for supporting light-duty vehicle charging will not necessarily work for MHDV charging.**

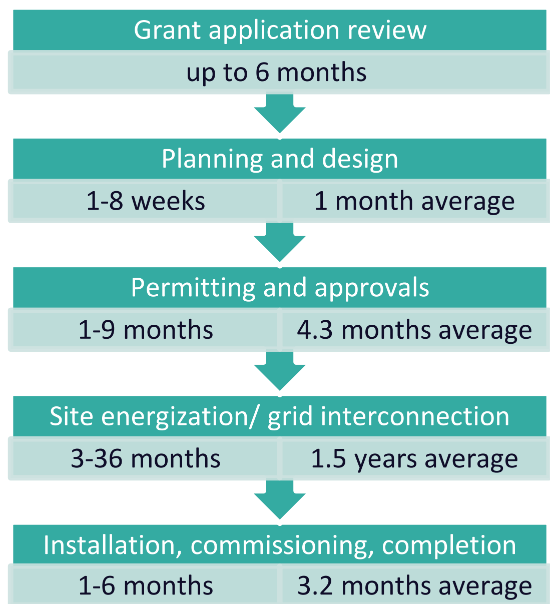
Table 5: Estimates for ongoing costs associated with MHDV charging stations as reported by respondents to RFI 5

Cost Category	Estimated Cost per Charger
Networking	$150-$300 per year
	$180-$540 per year
	$200-$1,000 per year
	$600-$2,400 per year
Maintenance	$500-$1,200 per year
	Up to $800 per year
Equipment repair (intermittent)	$500 and $2,000 per incident
Energy management software	$336 per year

Programmatic Considerations

Development Timelines

Across the RFIs, respondents provided feedback on the stages of charging hub development and estimates for the time required to progress through these phases. Most respondents stated that **the timeline to construct a large charging hub (e.g., 30-40+ ports) is typically 24–36 months whereas smaller charging hubs (e.g., under 10-15 ports) can typically be built in 12–18 months**. Respondents recommended actions to address potential delays and maximize efficiency.



Recommendations for developers:

- Engage utilities early;
- Use modular designs;
- Leverage turnkey providers; and
- Secure items with long lead-times such as switchgear, transformers, and high-power charging hardware early in the process.

Recommendations for funding agencies:

- Build timeline flexibility into grants to account for unpredictability;
- Ensure applicants have all project partners in place at the application stage;
- Incorporate timeline guarantees in contracts, but include flexibility and extensions for reasonable delays outside of the developer's control; and
- Use reward-based or milestone-based funding to incentivize rapid progress.

Maintenance and Repairs

The large power requirements of MHDV charging stations are seen as increasing the risk of failure and accelerating wear. They require more proactive maintenance, faster repair times, and higher redundancy than many light-duty vehicle chargers. Respondents felt that developers should plan to safely perform maintenance on individual chargers or components without needing to close the entire site. They also recommend the use of 24/7 remote monitoring, routine site visits (e.g., quarterly preventative maintenance checks), proactive replacement of high-wear components, regular safety checks, and stocking spare parts to help minimize charger downtime. Replacement parts for high-powered chargers have reported lead times of several months, making it essential to keep spare parts nearby.

Temporary/ Mobile Charging

In the near-term, medium- and heavy-duty vehicle charging stations will be less common and more spread out than light-duty vehicle charging stations, so ensuring these stations have close to 100% uptime will be vital. Some respondents suggest mobile or temporary chargers as a potential solution to allow continued operations during a grid outage. These solutions can also help provide charging during construction and while sites are undergoing utility interconnection to install more permanent charging. **Most respondents felt that these solutions should not be heavily utilized or used as long-term or permanent solutions for charging hubs**. However, they still provided many examples of the types of technologies that can be used, and why and when they would be. Some respondents argued that they should not be used at all, do not fall under the purview of the charging hub's responsibility, or should be used very sparingly.

Community Engagement and Considerations for Disadvantaged Communities

RFI respondents note that all projects should be guided by the knowledge and expertise of community-based organizations (CBOs) and local governments, who should be consulted throughout the planning and development process. It may be beneficial for developers to establish community advisory boards or hire CBOs to facilitate communications and provide regular updates to local community groups, chambers of commerce, city councils, councils of government, local and regional press, business, residents, municipalities, truck drivers, and fleet operators. Updates should cover topics like traffic impacts, noise, amenity availability, and employment opportunities.

Many respondents advocated for various structures to be used to incentivize the development of charging hubs in disadvantaged communities. The majority of these respondents favored setting aside a portion of funding for applications in disadvantaged communities, including suggestions of 25% and 40%. This decreases competition with applications in non-disadvantaged communities and ensures at least some funding is allocated to them. Others called for incentive programs to provide a bonus to applications for charging hubs in disadvantaged communities, including suggestions for an additional 25% funding. This incentive structure helps offset the cost of construction, permitting, or electric grid upgrades in these areas, which respondents estimate can be 20-30% higher due to their typically more urban settings. Another option suggested by respondents is to provide higher or priority scoring for applications for charging hubs in disadvantaged communities, giving these applications a higher chance of being awarded. There was an additional cohort that called for a combination of the bonus and set-aside methods.

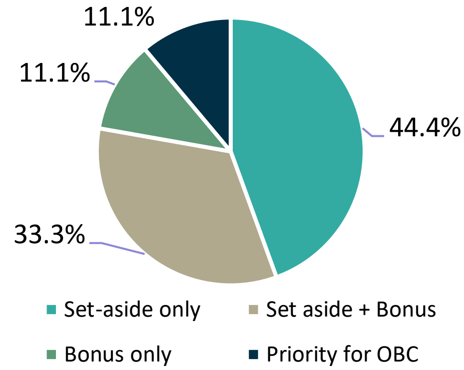


Figure 7: Percent of respondents to RFIs 1, 3, and 4 who advocated for each method of support for projects in disadvantaged communities.

Other respondents provided more detail, stating that applicants should be required to include community partnerships and local workforce commitments to receive any bonuses. In contrast, some respondents highlight that charging stations only benefit disadvantaged communities if they replace diesel fueling centers, so charging hubs in these communities should not be given preference. Regardless of their disadvantaged community status, proximity to highways should be considered to avoid channeling trucks through neighborhoods.

Corridor Segmentation

RFI 2 asked respondents about their preference for dividing incentive programs geographically into corridor segments (e.g., New Jersey Expressway Route 78 between mile x and mile y) versus allowing developers to propose sites anywhere within a state. **Two-thirds of respondents to this question expressed their support for the segmented approach**, arguing that these divisions should be determined based on:

- How much capital is available with how many sites to be built;
- The presence of major freight arteries and interchanges;
- Traffic volume;
- Existing infrastructure;
- Regional traffic flow and potential charging demand patterns;
- Logical travel distances for MHDVs;
- Grid availability; and
- Ensuring coverage in overburdened and underserved communities.

One-third of respondents wrote in favor of a statewide approach claiming it incentivizes more developers to apply and creates a more efficient application process. They also note that a statewide approach helps avoid “operational silos, misaligned objectives, and inconsistent delivery,” allowing for greater transparency and collaboration.

Operating Models

The ideal operating model and which models should qualify for public funding was commonly discussed. While the names and definitions of each operating model differ between various programs and organizations, they are loosely summarized here.

First-come-first-serve: This operating model allows any medium- or heavy-duty vehicle operator to use a charging station on a first-come-first-served basis. It is the most straightforward model providing equal and open access and a similar user experience to diesel-filling. However, it may lead to long wait times, making considerations for queueing highly important. While this operating model may be more accessible to small organizations or those with irregular schedules, it can complicate operations for organizations who rely on chargers to be available with no wait time when needed.

Reservation or appointment based: Any system where a driver or fleet can reserve a charger ahead of their arrival. Sites are open to any organization with MHDVs to make a reservation and do not provide preference to any organization(s) over others. In some cases, reservations can be made for an organization to use a charger at regular intervals or can allow for reservations on an as-needed basis. These models build confidence by reducing operational delays and queuing providing a level of predictability required by some fleets. It also allows charger utilization to be maximized. While this operating model is relatively new for truck charging, it is utilized at some truck stops during peak hour parking.

Subscription based: This operating model includes shared charging sites that are leased to more than one company who have pre-negotiated usage contracts. A subscription-based operating model could be a restricted first-come-first-served or reservation-based operating model, and may include Charging as a Service (CaaS) ownership models. It is operationally akin to shared charging depots but are owned by a third-party. This model is more commonly used at depots, warehouses, and logistics facilities, rather than sites dedicated solely to charging. This model is often preferred by fleets as it offers guaranteed charger access, supporting organizations that are unable to utilize depot charging. It also enhances site utilization and grid efficiency.

Hybrid models: Hybrid models combine two or more of the above operating models at a single site. Many respondents advocate for sites that offer both reservation-based and first-come-first-serve access. This allows a single site to meet the needs of fleets who require predictability as well as those with less predictable schedules.

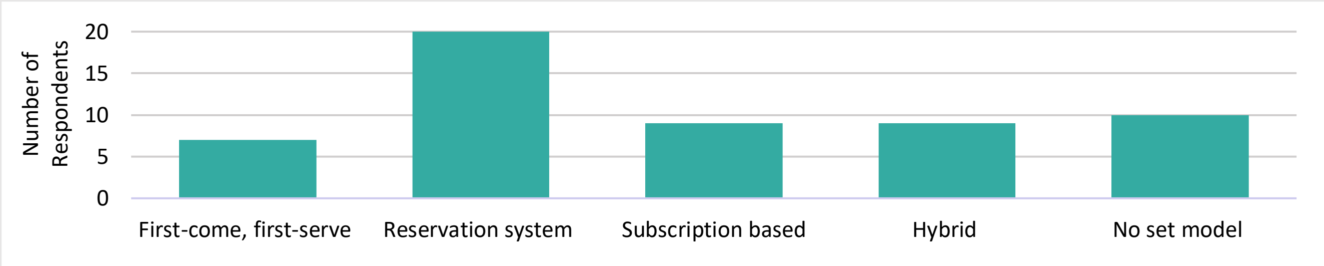


Figure 8: Operating models preferred by respondents to RFIs 1, 3, and 4.

While responses were split and **many respondents advocated for more than one operating model, reservation-based models were the most commonly advocated for single operating model**. Most respondents favored either a hybrid model of all three models or a hybrid model that is a combination of first-come-first-served and reservation-based.

Some respondents said that it is premature or not necessary to require a particular one or even combination of models, and that it will largely depend on the specific site and/or market to determine the ideal operating model. These respondents argue that no single model will work for all fleets and all locations, so it is important to have a mix of operating models in a given region.

Aligning with NEVI Minimum Standards

Most respondents were in favor of programs aligning with the National Electric Vehicle Infrastructure (NEVI) program's 97% uptime standard, creating a consistent user experience. They recommended actions that can help ensure uptime requirements are met, including utilizing:

- 24/7 remote monitoring, allowing faults to be identified in real time and resolved remotely;
- Operations and maintenance service level agreements to enforce accountability in the event of needed repairs;
- Charging station redundancy to maintain a reliable charging experience for users during service interruptions;
- Charging as a Service (CaaS) models to create a market mechanism that rewards reliability and long-term viability; and
- Performance-based Incentives to link uptime performance to funding and encourage prioritization of maintenance.

Beyond the 97% uptime requirement, respondents had mixed thoughts about whether the NEVI minimum standards should apply for MHDV charging programs. Generally, they favored those for interoperability (i.e., allowing chargers to function across different software platforms and networks), connector uniformity, payment standards (e.g., tap-to-pay), and emergency planning. Other standards were seen as needing modifications to increase their applicability to MHDV charging. This includes the need to develop unique safety and site design requirements beyond what is required for light-duty vehicle charging, finalizing the Megawatt Charging Standard (MCS), and modifying ADA compliance guidelines. There was also much discussion around modifying the NEVI pricing structures which includes idle fees and restricts the use of reservation systems. MHDVs often require longer dwell times due to their larger batteries and restrictions on hours of service for commercial drivers, causing idle fees to be misaligned with industry requirements.

Utilities and Grid

Developers emphasize the need to engage with utilities early. They call on funding agencies to provide information that can de-risk or inform early decisions regarding site selection and design including load capacity maps, upgrade timelines, and cost estimates within fixed timeframes. Developers report needing the following information from utilities:

- Circuit-level hosting capacity maps and feeder/substation capacity prior to upgrades;
- Planned upgrades, load profiles, and power quality information;
- Clear visibility into study phases, design reviews, and approvals needed for interconnection;
- Average timelines for requests by type, size, and use;
- Expected lead times for critical equipment;
- Limiting applicants to those with equipment-on-order;
- Typical upgrade requirements, average interconnection costs, demand charge structures, and commercial/industrial tariffs;
- Standard submission packages, documentation, data/technical requirements, and data formats for project submissions;
- Checklists for each stage of project development, standardized informational packets/templates, utility standards and design requirements, etc.;
- Opportunities for managed charging, demand response, and phased energization or flexible connections;
- Use of direct procurement by programs;
- Transparent utility performance metrics;
- Use of parallel processes and phased program applications;
- Grants and technical assistance; and
- Application status updates.

While many grant program administrators will not have access to this information, respondents mention that **funding agencies can provide designated utility points of contact, standardized data request templates for developers, and dedicated funding for planning and coordination efforts.** Some respondents call on funding agencies to impose mandatory response times for utilities to provide feasibility and capacity studies and to outline escalation pathways if deadlines are not met. Others discuss the need for joint planning sessions between funding agencies, utilities, developers, and fleets to identify future hub sites and corridors.

Some respondents provided time estimates for utility interconnections at a large charging hub. These range from 6 to 36 months with most minimum estimates ranging from 12 to 18 months. Respondents note that solar and storage can be used to reduce capacity upgrade needs and that modular or phased interconnections can allow some shorter-term site energization while the full build-out is in progress. Others call on the utilities to participate in proactive grid planning to anticipate charging infrastructure demand and begin investing in capacity upgrades before they become a bottleneck. While respondents suggest these various methods for reducing grid upgrade timelines, it is important to note that their use may not be a legal mechanism for funding agencies to use in some jurisdictions.

Permitting

Respondents suggest that program administrators work to encourage developers to engage with the relevant utility companies and municipalities early in the design process to increase their awareness of the project. In return, developers can provide comprehensive information packets covering land use, construction, traffic and safety assessments, preliminary utility discussions or interconnection requests, and other permit-specific details. The permitting information can include detailed surveys (topographic, utility, boundary), geotechnical studies, and lists of inspections and information on permit exceptions. Respondents encourage developers to emphasize the use of community engagement, safety considerations, and local job creation to gain public and municipal support.

While local permitting is typically outside the control of funding agencies, respondents suggested that agencies work to educate local jurisdictions about program goals and ways to expedite permitting. They call for the development of statewide templates for site plans, zoning, and ADA compliance as well as toolkits, master permit lists, and standardized zoning and permitting templates in each state.

Additional Program Design Considerations

Respondents advocated for programs to provide 3-4 months for developers to prepare applications in response to a funding announcement. The lead time allows applicants to conduct a thorough evaluation of ideal sites based on the program criteria and understand the constraints of larger complex sites where major upgrades may be needed. It also allows for greater flexibility in receiving utility feedback, which is seen as a necessary part of the application process, but which is outside of the applicant's control. Shorter application timelines increase the risk of receiving rushed or incomplete applications that are less able to meet all program goals. Other specific recommendations given for how to structure incentives were:

- Provide a detailed scoring rubric that establishes program priorities and provides flexibility;
- Use a milestone-based payment mechanism and utilization guarantees to reduce upfront costs and balance accountability with flexibility;
- Include bonus incentives for higher-powered chargers and available amenities;
- Provide funding for early demand charge relief and operations and maintenance support;
- Fund the largest, most unpredictable costs that would otherwise deter private investment;
- Reimburse a percentage of eligible project costs rather than a dollar per charger cap;
- Blend public funding and private investment to mitigate risk and ensure sustainability;
- Utilize a tiered structure based on vehicle classes served, and/or public accessibility;
- Coordinate with utilities to cover "make-ready" infrastructure;
- Prioritize sites with the highest operational impact and community benefits, such as those near ports and truck stops; and
- Ensure there is a clear and accessible pathway to apply to funding and simplify how developers can leverage multiple funding sources.

Appendix 1: Overview of Included RFIs

RFI Number	Organization	RFI Title	Topics	Number of Responses	Open Date	Close Due
1	**U.S. Federal Highway Administration**	Medium- and Heavy-Duty Electric Charging Technologies and Infrastructure Needs	EV Adoption, Site Design, Operating Models, Community Engagement, Station Spacing, Utilities and Grid, DERs, Power Levels, Uptime, Cybersecurity, Workforce, Site Selection	66	09/12/2024	11/12/2024
2	**New Jersey Department of Environmental Protection**	Considerations for Medium- and Heavy-Duty Electric Charging Infrastructure in NJ, CT, DE, and MD	Site Design, Operating Models, Temporary/ Mobile Charging, DERs, Utilities and Grid, Program Design, Corridor Segmentation, Timelines, Maintenance, Uptime	41	08/27/2025	09/30/2025
3	**California Energy Commission**	Tri-State CFI RFI	Site Design, Station Spacing, Amenities, Cost, Site Selection	33	05/10/2024	06/10/2024
4	**California Energy Commission**	Considerations for the CEC Zero-Emission MDHD Drayage Infrastructure Application for the USDOT's CFI Grant Program	Power Levels, Station Spacing, Cost, Site Design, Corridor Segmentation, Utilities and Grid, Site Selection	22	06/14/2024	06/28/2024
5	**New Jersey Economic Development Authority**	2025-RFI-258 for Electric Vehicle Charging Grants	Depot Charging Barriers, DERs, Disadvantaged Community Considerations, Cost, Timelines, Program Design	20	07/08/2025	07/30/2025
6	**California Energy Commission**	Medium- and Heavy-Duty Zero-Emission Vehicle Public Charging	Operating Models, Site Design	18	12/30/2024	01/24/2025

Appendix 2: Summary of Respondents