ELECTRIFYING EMERGENCY RESPONSE

Lessons from Cary, NC's Electric Fire Truck

Environmental Defense Fund

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Executive Summary

The town of Cary, North Carolina manages a diverse fleet, including 750 vehicles within a total fleet of 1,450 assets[1]. Cary recognizes the benefits of adopting zero-emission transportation, putting the first electric vehicle into their operations in 2012. Since then, Cary has continued deploying EVs into their fleet as part of their commitment to sustainable transportation. In 2025, the town took a substantial leap in leadership with the deployment of an electric heavy-duty fire truck — the first to debut on the East Coast.

Electric vehicles deliver benefits for fleets including environmental, economic and performance advantages over traditional fuel vehicles including eliminating fossil fuel consumption, cutting harmful emissions, providing cost savings, offering better fuel efficiency and requiring less maintenance. For Cary, deploying a Pierce Volterra electric fire truck also provided a strategic opportunity to prove that electric technologies could meet the demanding operational requirements for their emergency response vehicles. This deployment allowed the town to evaluate the feasibility of using battery electric heavy-duty vehicles for additional mission critical uses in the future. The data collected through this initiative will inform future decision-making and zero-emission deployments for Cary, and those findings are summarized here for other fleets planning the transition to electric vehicles.

Cary's primary goal for this deployment project was to identify a reliable electric alternative for a public fire safety vehicle that could be incorporated into their fleet with minimal operational changes. This document serves as an implementation playbook and details the actions Cary took to put their first electric fire truck into service.

[1] Cary manages fleet assets including light-duty vehicles, medium- and heavy-duty vehicles, as well as off-road vehicles and maintenance vehicles used for Cary's Parks and Recreation areas.

The following key sections provide a play-by-play of the implementation areas involved in the project:

- Project financing
- Utility coordination and charging
- Vehicle deployment
- Training program
- Original equipment manufacturer support

This document identifies the five key implementation steps Cary took for successful HDEV deployment and describes strategies that can be replicated to secure future success. These insights provide lessons relevant for other municipalities and heavy-duty fleets, demonstrating how HDEVs can be thoughtfully integrated into mission critical fleet operations through deliberate planning, stakeholder engagement and a focus on operational reliability.

Financing Without Delays

Fire trucks have longer lead times compared to other vehicles due to their specialized nature, lower overall purchase volume and increased need for vehicle customization to meet the operational needs of different agencies and departments. According to the Fire Apparatus Manufacturers' Association, fire apparatus orders increased more than 40% between 2021 and 2023 due to supply chain disturbances that occurred during the COVID-19 pandemic. The cost of labor and materials also rose during this time and combined with production delays resulted in higher cost estimates from manufacturers to account for future uncertainty. Together, these factors extended delivery timelines and created procurement challenges for municipalities needing to replace critical public safety vehicles.

Upfront costs of medium- and heavy-duty electric vehicles have historically been higher than those of their diesel counterparts. To help offset these costs and accelerate progress toward total cost of ownership parity, many fleets utilize incentive and grant programs aimed at advancing the zero-emission vehicle market. While this was also a consideration for Cary, the town had an urgent need for a new fire truck which was a significant operational challenge since projected delivery timelines for a new diesel vehicle were much longer than the electric option Cary ultimately selected.

Rather than pursue a time and resource intensive grant application process, Cary purchased the Pierce Volterra with money that the town allocated through a capital improvement program. This approach allowed the town to move forward within an existing capital planning framework while avoiding delays associated with external funding cycles. By leveraging capital improvement funding, Cary demonstrated one potential option for fleets to manage the upfront cost of electric vehicles when operational timelines or service needs require faster action.

The decision shaved one year off the expected delivery time that Cary would have incurred if they opted for a diesel fire truck and allowed Cary to put the electric fire truck into operation sooner. "Given the compressed timeline and the availability of approved capital funding," shares Chris Parker, assistant fire chief, "moving forward without grant funding allowed Cary to secure the vehicle without delaying deployment or compromising service readiness."

While many fleets depend on incentives to help finance electric vehicle and infrastructure projects, this financial hurdle is expected to become less intimidating over time. A report by Energy Innovation and the International Council on Clean Transportation found that HDEVs

are not only anticipated to reach cost parity with diesel trucks but may undercut diesel as the more affordable option by 2030. In the near-term however, Cary's experience highlights the importance of exploring multiple financing pathways, including capital planning, to align electric vehicle deployment with operational readiness. To make this easier for fleets seeking funding, EDF prepared a free resource that guides fleets through the grant application process.

Plan Early, Power Faster

Preparing a site to support vehicle charging requires organized planning among utilities, contractors, charging equipment providers and vehicle manufacturers. Utility coordination is a critical best practice for fleets pursuing electric vehicle deployment, particularly for MHDEV applications. Depending on the fleet's energization needs, there can be delays or restrictions based on what the utility is able to provide within a certain time frame. Proactive engagement and consistent coordination with the utility allows fleets to identify potential limitations, align project schedules and reduce the risk of utility-side deployment delays. Proactive collaboration can also help fleets evaluate rate structures and other mechanisms, like flexible interconnection programs, that may influence long-term charging costs and reduce energization timelines.

In the case of Cary, the architecture and engineering firm initially confirmed a short delay for the transformer installation, but after a conversation with Duke Energy, the utility was able to immediately accommodate Cary. "Due to our working relationship with the utility company, we were able to step in and help have the transformer set earlier than originally scheduled," says Sara Caliendo, energy manager. Despite these advantages, the energization and commissioning process for Cary took approximately six months to complete. This timeline reflects equipment procurement, vendor coordination, infrastructure work and charger commissioning activities.

Cary's existing facility conditions simplified portions of the deployment. The site had sufficient electrical capacity to support charger installation, avoiding the need for major service upgrades. Parker emphasizes the importance of early site assessments, advising fleets to confirm available power capacity or identify required upgrades before advancing procurement decisions. Identifying opportunities like this helps fleets limit potential project delays and reinforces the value of maintaining active communication channels with the utility.

The charging infrastructure design also required careful consideration to ensure capability with fire station operations. Parking areas for fire apparatus have unique constraints including

clearance, frequent vehicle movement and elevated risk of incidental equipment contact. Pedestal-mounted chargers, while common in many other EV charging applications, can introduce physical obstructions, increase the likelihood of vehicle strikes and create cable management challenges in high-activity environments for emergency response crews.

For this project, Cary worked with charger manufacturer ABB to install a 150-kilowatt ceiling-mounted charger to mitigate these risks. The charger charges the truck at a rate of about 1% per minute and only uses between 10-15% of battery power after being deployed on two to three medical calls. For other fleets, Cary's charger selection highlights an important deployment insight: If charging infrastructure can be successfully integrated into the highly constrained and mission-critical environment of a fire station apparatus bay, similar approaches can be adapted to support other operationally demanding fleet applications.

Integrating EVs into Daily Operations

Deploying a fleet of MHDEVs is a multifaceted process that involves detailed research and planning to minimize risks and ensure effective implementation. Cary conducted extensive research to identify a truck that would meet their needs for performance and reliability and would merge seamlessly with existing operations. For other fleets with mission-critical applications like fire apparatus, these planning activities are particularly important to ensure new technologies integrate reliably with existing response protocols and service expectations.

For fleets considering electrification of specialty or high-reliability vehicles, deployment planning should extend beyond vehicle selection to include operational workflows, maintenance readiness and facility interactions. Cary's experience underscores that vehicle performance alone does not determine success; integration with existing systems and procedures is equally consequential.

To facilitate integration with the existing fleet, Cary intentionally chose to keep the design of the Volterra as close to its conventional fleet counterpart as possible to make the transition easier for operators and to lessen the impact on operations. Vehicle layout, controls and functional systems were specified to align closely with existing apparatus. For fleets looking to replicate Cary's success, this approach can reduce transition complexity for operators and preserve procedural consistency within emergency response operations.

The Pierce Volterra exceeded Cary's operational expectations once it was out in the field, with operators citing usability, performance and improved cab environment contributing to the vehicle's positive reception. "The truck is not only comfortable and intuitive to work in, but it has also earned our full confidence in its performance," shares Justin Chamblee, fire engineer.

Beyond vehicle functionality, Cary observed operational characteristics of the electric fire truck that positively affected the fire service environment. Reduced vehicle noise supported clearer on-scene communication, while the absence of tailpipe emissions eliminated a source of localized exhaust exposure during operation. These attributes have particular relevance for Cary's firefighters, who are regularly exposed to dangerous smoke inhalants in their work and don't have the added worry of consuming exhaust emissions while operating an electric vehicle. The truck is also quieter, which allows for better communication across their team, and the interior cab stays cooler after responding to calls which aids in the firefighters' recovery and rest. By deploying an electric fire truck, Cary is able to take care of the people who take care of their community.

Training Builds Confidence

Comprehensive training is crucial to the effective deployment of electric trucks and helps fleets operate new vehicle technologies safely and reliably. For municipalities operating public safety vehicles like Cary, not only is it imperative for the workforce assigned to the truck to undergo training, but all qualified drivers should have training and familiarity with the electric fire truck in case of an emergency. Many EV original equipment manufacturers offer training to educate customers on vehicle systems and operational best practices. Pierce, Cary's vehicle manufacturer, provided a fleet course for three of Cary's fleet mechanics who are assigned to fire apparatus.

Thorough training programs like what Cary's fire staff underwent equip operators with essential skills and knowledge, ensuring operators understand how to safely operate and maintain the electric fire apparatus, while also providing cost saving strategies by teaching the skills needed to optimize energy efficiency. "The training program included a comprehensive vehicle overview, along with driving and pumping components. This process was intentionally not fast paced, allowing individuals time to see the technology firsthand and build confidence in the truck," explains Parker.

Cary has three shifts of fire department personnel and ran training sessions across shifts over multiple days allowing operations to continue uninterrupted. The program included a ride and drive course for the operators to gain firsthand experience maneuvering the truck and familiarizing themselves with the operational characteristics of a battery-electric vehicle. The drivers also participated in a course covering operational differences for charging the new truck compared to how a diesel truck is typically fueled. Municipal fleets can use structured training and hands-on experience to integrate electric vehicles into existing operations while addressing questions and concerns among personnel.

Manufacturer Support

The average length of a heavy-duty electric vehicle deployment project varies depending on factors such as vehicle type and availability, the scale of the deployment, resource accessibility and overall project goals. EDF analysis of public deployment announcements identified an average window of 18-24 months for fleets to procure an MHDEV. That timeline doesn't include other project phases such as initial analyses or charging infrastructure installation. As a result, successful deployments often rely on strong collaboration with OEM partners over the course of the project.

During this process, fleets collaborate with OEMs to ensure the vehicle and chargers are built to specification, perform as expected and are delivered according to schedule. Cary lists transparency, clear communication and ongoing support as direct benefits of working with manufacturers like Pierce and ABB that have demonstrated a commitment to ensuring successful MHDEV deployments.

It's essential for fleets to select dependable project partners and establish clear communication and troubleshooting pathways with manufacturers. This will continue post-deployment, as fleets will maintain coordination with the vehicle and charger OEMs to ensure the equipment is functioning properly and address any problems. The long-time relationship Cary established with Pierce provides additional confidence to the fleet as the vehicle OEM has remained engaged in supporting the vehicle deployment and performs upgrades to Cary's fire truck as their processes and software evolve.

"Throughout the process, Pierce demonstrated their support by taking us to their research and development facility to see the technology and engineering firsthand, allowing us to ride in one

of their EV pumpers already in testing, giving us access to their team to ask questions and flying staff in to provide training and troubleshoot issues as they arose," says Parker.

"During the commissioning phase, we encountered some issues, but ABB sent a technician to troubleshoot and resolve the problems with the charger itself," says Caliendo. "Since then, the ABB charger has been reliably charging the EV fire truck without any issues."

In some cases, fleets have an opportunity to shape the development of emerging vehicle technologies by working closely with the vehicle manufacturer. This collaboration can benefit a fleet by ensuring vehicles have specifications needed to meet vehicle operational needs, something of particular importance for a demanding use case like a fire apparatus. Electric fire trucks are still relatively new to the industry, which put Cary at the forefront of helping to develop standards with OEMs, document performance and shape electric vehicle adoption within the fire service.

Cary's experience highlights the importance of dependable coordination with vehicle and charger manufacturers when deploying zero-emission vehicles. By selecting responsive manufacturers and maintaining clear coordination throughout deployment and ongoing operations, Cary was able to address challenges quickly and move forward with confidence. Looking ahead, the fleet also trusts that the equipment will continue to be supported and maintained, even in demanding applications like fire service. This is an approach other municipalities can replicate as they procure and operate electric vehicles in their own fleets.

"At the end of the day, relationships matter, and the long-standing relationships we have maintained over the years had a direct impact on the success of this process," says Caliendo.

Conclusion

Sustainable transportation is a primary pilar in Cary's Sustainability & Climate Action Strategy, and incorporating the Pierce Volterra electric truck into their fleet meets the town's operational need for a functional public safety vehicle that contributes to Cary's emission-reduction goals and commitment to leading by doing for other organizations. "The response has been overwhelmingly encouraging and many who see the truck have expressed interest in exploring similar solutions for their own municipalities," says Marie Melendez, communications manager.

For the town of Cary, project financing, utility coordination and charging, vehicle deployment, training and manufacturer support were key implementation areas they carefully navigated, resulting in the successful integration of an electric fire truck into the town's operations. These implementation areas, though key to Cary, may differ slightly for other fleets depending on factors such as vehicle type, use-case, geographical environment and weather conditions. With careful planning, decisions that support operational resiliency and active stakeholder engagement, fleets can achieve similar accomplishments.

The insights gained from this project offer valuable lessons to other municipalities and fleets operating heavy-duty vehicles as they illustrate a path forward for electrification through documented real-world application. Learnings from pilot deployments also help to inform decision-making for scaling and continuing the transition to zero emission. "This deployment and real-world performance give us conviction to continue evaluating electric options across our fleet. It also demonstrates that local governments don't have to choose between reliable operations and environmental responsibility," says Danna Widmar, assistant town manager.

For organizations with zero-emission fleet aspirations, free resources like EDF's Fleet Electrification Solution Center offer support and guidance for transitioning to electric vehicles.