Making the Case for Electric Police Cars

Savings with Superior Performance

PFC Jason Kirkner, Fleet Manager for SPD (Maryland) and Chief Michael Spaulding with Tesla Model Y — Image credit: Kerry Chaney

About

This paper was researched and written by John Kondos of Clean Energy NH (CENH) and staff of the Monadnock Sustainability Hub (MSH). CENH's mission is to promote clean energy and technologies through education and advocacy for a stronger economic future for all Granite Staters. MSH is the region's catalyst for climate solutions, and strengthens the sustainability and resilience of our region by working collaboratively to reduce greenhouse gas emissions and reach 100% clean energy. CENH and MSH partner to inspire and conduct local sustainability initiatives and actions that strengthen our shared social, economic, and environmental resilience. This includes programs and projects focused on energy efficiency, electric transportation, renewable energy, and other sustainability projects within our region.

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MONADNOCK SUSTAINABILITY HUB

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Part One: Report Summary

Clean Energy NH and the Monadnock Sustainability Hub (the Hub) have researched electric police car experiences across the United States. Individual car owners are not the only ones reaping the benefits of switching to an electric vehicle (EV); police departments across the country are adding EVs to their police fleets for good reasons. Key motivations for transitioning a police fleet to EVs include significant cost savings on fuel and maintenance expenses, superior performance, enhanced safety features, and positive health and environmental impacts. These benefits are further detailed in the following report, in addition to information on EV charging and retrofitting, and accounts of successful EV police car applications in the United States.

While most police department experiences have been with Teslas so far, the Ford Pro all-electric police pilot vehicle based on the 2021 Mustang Mach-E SUV became the first all-electric vehicle to pass the rigorous Michigan State Police 2022 model year evaluation w/ some qualifications. Additional EV models including SUVs and pickup trucks are being introduced by automakers. Chevrolet has announced a version of the E Blazer for police use will be available for reservations in the summer of 2023.

This report concludes with a list of action steps for interested parties to consider. Please reach out to the Monadnock Sustainability Hub at info@monadnocksustainabilityhub.org with questions about the report or to discuss the next steps for bringing an EV police car to your community.

Part Two: Key Drivers

2.1 COST SAVINGS

There are significant cost savings in switching from traditional internal combustion engine (ICE) police cars and SUVs to electric police cars.
Electric cars have a significantly reduced life cycle cost. The total cost of the vehicle over its lifetime, including initial purchase cost, outfitting, maintenance, operational expenses, and the residual value of the vehicle at the end of its applicable lifetime provide a lower total cost of ownership. Although the upfront cost of EVs may be higher than that of ICE vehicles, significant cost savings occur in vehicle maintenance and fueling. The higher initial EV cost has been recovered in the first or second years.

This report shows that Police EVs have saved taxpayers over $5,000 per year, per car. The Inflation Reduction Act of 2022 provides an added incentive of $7,500 available as a direct payment to municipalities, per eligible vehicle purchased.

Due to their less-complex mechanics, EVs require far less maintenance than ICE vehicles. EVs do not require oil changes or exhaust and transmission repairs. Thanks to regenerative braking—where the electric motor acts as a generator converting much of the kinetic energy typically lost when braking and decelerating back into stored energy—there is reduced wear on the brakes, meaning less frequent brake replacement. In addition to the maintenance savings, electric police vehicles have reduced maintenance downtime, yielding a more reliable fleet.

Police departments also experience significant savings on fuel costs. The reason for this is twofold: vehicle efficiency and cost of fuel. EVs are three times more efficient than ICE vehicles, converting about 77% of their electrical energy into power. ICE vehicles, on the other hand, can only convert between 12% and 30% of the energy stored in gasoline into power [15]. This means we get more power out of the money spent on fueling an EV. The overall cost of electricity is typically more than 60% less than gasoline. As of early 2023, an "eGallon" (the cost of fueling a vehicle with electricity compared to a similar vehicle that runs on gasoline) was

$1.85 in New Hampshire [16]—significantly lower than the state's average price of a gallon of gasoline ($3.37) [25].

Such maintenance and fuel savings are reflected in the experience of police departments with electric police vehicles. The Bargersville Police Department in Indiana saved $6,755 in fuel alone within 13 months of operating its 2019 Tesla Model 3 police car. With officers driving 22,000 miles on average annually [11] the department's Dodge Charger had a yearly combined gas and maintenance cost of $7,580, whereas their Tesla Model 3 had a combined electricity and maintenance cost of only $825 [1]. The Sheriff's Department in Windham, Vermont also found considerable operational savings with its Tesla Model 3—purchased in 2020—estimating that it would save about 80% of the costs of running a comparable ICE vehicle. The department found that fueling costs for its electric police car was 5 cents a mile, compared to 26-28 cents for an ICE police car with similar duties at $2.41 per gallon.

The Falmouth, ME Police Department became one of the first police forces in Maine to start electrifying its fleet, beginning their transition away from fossil fuels with a Ford Mustang Mach-E and four level 2 chargers in their fleet parking area. In Sykesville, MD, the only maintenance cost for the PD's 2022 Ford Mustang Mach E patrol vehicle in its first year has been the purchase of an additional battery to power auxiliary police equipment.

2.2 PERFORMANCE & SAFETY

Superior performance and safety are key drivers of the adoption of EVs for police use. EVs offer superior handling, quick acceleration, silence, and less downtime. EVs lack the sound of the engine, reducing exterior and interior noise. Superior handling derives from the low center of gravity due to the battery's position in the undercarriage which reduces rollover potential. The direct torque provides faster acceleration, with some EV models accomplishing 0 to 60 mph acceleration in under three seconds [20].

Tesla vehicles, which have been the electric vehicle of choice for many police departments across the country, provide industry-leading safety features and software. Such features include an advanced crumple zone—which is "optimized to absorb energy and crush more efficiently" [18]—forward collision and lane departure warnings, crash imminent braking, and dynamic brake support. Their low centers of gravity, rigid passenger compartments, and fortified battery packs prevent intrusion into the EV's batteries or cabin during a crash and reduce rollover risk [18]. The National Highway Traffic Safety Administration gave the Tesla Model 3 and Model Y a 5-Star safety rating in every category and subcategory, with the Model 3 having the lowest probability of injury of all cars the agency has tested to date [19]. Teslas are also equipped with cameras that aid in surveillance and accident prevention; for example, the Tesla Model 3 has eight 250 meter-range cameras that provide 360 degrees of visibility around the vehicle [26].

An electric engine consists of approximately 20 moving parts, compared to nearly 2,000 moving parts in a typical internal combustion engine [21]. With significantly fewer parts, and in turn less required maintenance, EVs have reduced downtime. The Fremont CA Police Department's Tesla Model S averaged about 39 days of maintenance downtime annually, compared to 66 days of that of their gas-powered Ford police pursuit vehicles [3].

Interior space, ease of installation of interior security partitions and ground clearance have been concerns expressed about early EVs for police use. These reflect the still limited current range of offerings by manufacturers. The reports of the forthcoming (late 2023) Chevrolet Blazer police version may address these better than the Ford Mach E or Tesla Y with 6” of ground clearance and relatively small interiors.

Recently Tesla and others have adopted heat pumps which are much more efficient than resistance heating, preserving driving range in cold weather. Another performance enhancement is the second trunk or "frunk" (front trunk) in EVs. This additional storage compartment enables less secure items—traffic management, safety, rescue, etc.— to be accessed while reserving the rear secure trunk for police access only items. Another benefit includes EV’s heated steering wheel and seats, comfort features not normally offered by police vehicles.

2.3 HEALTH & ENVIRONMENTAL IMPACT

Carbon Monoxide and other toxic exhaust gasses can be lethal. The lack of exhaust with EVs provides a healthier and more comfortable environment inside and outside the vehicle.

In the United States, based on 2020 data, the transportation sector contributes 27% of our overall greenhouse gas emissions [24] In New Hampshire it reaches 40% [29]. Burning a gallon of gas releases roughly 19 pounds of CO2 [5], a major contributor to climate change. EVs have a significantly lower environmental impact than traditional ICE vehicles. Depending on where the user sources the electricity to charge their vehicle, EVs can be driven entirely on clean energy.

For municipalities with carbon emission reduction goals, such as Fremont CA, transitioning police fleets to EVs is an important step towards lowering municipal carbon emissions. Fremont is committed to reducing its 2005 levels of greenhouse gas emissions by 55% by 2030 and achieving long-term carbon neutrality by 2045. Their municipal fleet's annual greenhouse gas emission impact totals about 2,000 metric tons of carbon dioxide, over half of which is attributed to police vehicles—they found a single Ford police vehicle contributed 42,198 lbs. of carbon emissions each year. Transitioning their 388 City vehicles to EV is estimated to reduce their fleet's greenhouse gas impact by 53% by 2030 [3]. Bargersville IN estimated a similar impact with their Tesla Model 3 police vehicle, which has about 60% lower greenhouse gas impact than their usual Dodge Chargers, even though about 66% of the electricity used to charge their Tesla was generated from coal [11].

Falmouth ME’s Police Department prides itself on local and regional climate leadership. They regard fleet conversion to hybrid and all-electric vehicles as critical steps to move away from fossil fuel use and advance sustainability. A municipal solar farm launched operation in March 2023 and is expected to satisfy 75% of the PD’s needs from the outset, with the intent to add capacity in the future.

Part Three: Examples of EV Police Cars

3.1 Bargersville, IN

In 2018, Bargersville, Indiana police chief Todd Bertram was looking for cost savings to address hiring needs. Fuel and maintenance were significant line items that he thought an EV might reduce. The $6,755 first-year gas and maintenance savings for a Tesla 3 compared to the Dodge Charger more than offset the initial added cost of the Tesla and charging equipment. Chief Bertram figured that the Tesla has a cost of ownership of $0.37/ mile compared to the $0.65/ mile for the Dodges, excluding the sale of used vehicles [11]. As a result, the department added three more Tesla Model 3s to its fleet [26].

Given that they purchased the Tesla Model 3 with a 120,000 mile warranty, the department expects to get six years of use out of the EV. Their usual Dodge Chargers come with a 100,000 mile warranty, which tends to last only 4.5 years [11]. Over this six year lifespan, the department expects to save approximately $38,000 with one Tesla, netting about $23,500 per vehicle when accounting for the difference in purchase price. With the four Teslas in their fleet, they are on track to save over $150,000 over these next six years [26].

In a June, 2022 update, officer Jeremy Roll said “I think it has been a great investment for us so far”. The department currently has **seven** Teslas and will be getting two more. Roll said that investment has more than paid itself off.The Teslas cost the department about $60 per month compared to the gas cars that cost more than $550 per month [27].

3.2 Westport, CT

In December of 2019, the town of Westport, Connecticut purchased a Tesla Model 3 with all wheel drive to add to its police fleet. According to Police Chief Foti Koskinas, the department's decision to add a Tesla to their fleet was motivated by environmental concerns, the Tesla's superior performance and crash ratings, and the Model 3's collision avoidance technology. Their story is a prime example of how a police department can achieve cost savings with an EV while also meeting other department and community priorities, such as their town’s commitment to achieving net-zero carbon emissions [22].

The vehicle's range is another common concern for many potential EV owners, especially in the case where the vehicle's reliability and available range are crucial. Given that the Tesla Model 3 has an average range of 310 miles—which is decreased to 200-220 miles given the way a police car is used— the Westport Police Department noted the EV provided sufficient range for two shifts per day. On average, they noted their officers drove 50 to 80 miles per shift. The department has a level two (240 volt) charger at their police headquarters for charging in between shifts [23].

In a June, 2021 report issued to the town by the EV Club of Connecticut, which promotes the adoption of electric vehicles, its analysis found, among other things, that the town will save

$12,582 in fuel alone after four years of using electricity to power the vehicle. While the purchase price for both the current and next Tesla was $52,300, that's significantly higher than the Ford Explorer, which had a purchase price of $37,000. The report data and conclusions were validated by the town's finance [30]. See Appendix A for a cost summary by year.

The EV Club of Connecticut report states it cost $38,900 to customize the Ford, compared with $14,300 for the current Tesla (thanks to one time, pilot discounts) and $30,700 for the next Tesla model, which is the relevant comparison basis used herein. One EV customization cost was the charging station at $1,000 for hardware and installation. The department is getting two shifts per day on a single charge and charging the vehicle overnight. This is assumed to be the usage pattern of future Teslas, in which case the charging equipment expense will be required for each EV procured. There could potentially be a savings opportunity in the future with a dual-port charger.

The operations and maintenance costs were calculated based on driving 23,000 miles in a year. The savings of $8,300 was due to the lower fuel costs for the electricity, along with the savings of quarterly oil/filter changes, brake servicing, and tire replacement for the Ford. From there, the savings accrue even more quickly due to ICE parts (e.g. water pump and catalytic converter) needing to be replaced, "so that by the time we get to 4 years, these savings total $31,500". This is considerably more than the purchase premium and almost as much as the purchase cost of the Ford. The savings continue to build on a year-by-year basis, the report states and, by year four, "given the lower cost of running an EV, the total cost of ownership of the Tesla pilot is projected to be $79,400, while the next Tesla is $95,800, and the Ford is $120,200."

The Westport police Tesla experience demonstrates that payback of the cost premium happened in the first year and the savings are substantial after four years. The EV also saves 23.5 tons of CO2 emissions annually. [28] The EV is expected to last longer than the ICE vehicle; if so, this increases the relative savings.

3.3 Windham County, VT

When Windham County, Vermont Sheriff Mark Anderson was ready to replace a vehicle in 2020 he was interested in evaluating an EV. When the lead time for a typical replacement stretched into 2021 compared to the ease of getting a Tesla Model 3, he was persuaded. It was ordered on 8/4/2020 and received on 10/14/2020. The vehicle was upfitted by Global Public Safety in Hudson NH and a Level 2 (240 volt) charger was installed by a local electrician. There are fast chargers in Brattleboro that can be used if needed and a policy to compensate officers for charging at home has also been developed. According to Sheriff Anderson, range has not been a problem; they can drive to the Hartford, CT airport and back to Newfane,VT. For longer hauls, however, the department is still using ICE vehicles.

Sheriff Anderson reports that after a year, they "were measuring 5 cents per mile traveled for fuel cost compared to 26-28 cents for an ICE vehicle with similar duties, at $2.41 a gallon". Tires have been the only maintenance expense. Maintenance for "another new ICE vehicle has been about $2,000." Tesla requires special tire balancing (Road Force Balancing) that costs $300 for

each balance. So every winter-summer tire changeover costs an additional $300 to balance unless they can purchase a second set of rims for the winter tires and pay $300 for each set once.

Sheriff Anderson notes that, in considering a next EV, it would likely be a Tesla Model Y because it has higher ground clearance (6”), better ergonomics for the driver and more storage for officer’s equipment.

3.4 Sykesville, MD

Reliability, cost and effectiveness were major factors in the Sykesville, Maryland police department’s decision to purchase a Tesla Model Y sedan in 2022. Chief Michael Spaulding reported the request was an easy sell with the town’s mayor, who had a focus on “going green”. Elements of design and function favoring the selection included EVs’ low center of gravity (providing stability), the model’s “unmatched” acceleration and speed, sudden stopping ability and its 5-star safety rating.

The PD’s research led them to estimate recouping the larger initial outlay by year 3, due to considerably lower maintenance and fuel costs. Chief Spaulding projected additional savings from their new patrol car remaining in service years longer than their ICE vehicles, due to EVs’ reduced wear and tear.

In January, 2023, after nearly 1 year of ownership and operation, the Chief reported that they were very pleased with their purchase decision. The only maintenance cost the PD had incurred to date was the addition of a 12 volt battery ($181), to support the demand for auxiliary police equipment.

Fuel expenses were much lower than operating an ICE vehicle, even though they were charging exclusively at a relatively expensive 3rd party’s installation at the town offices. However, since officers brought their vehicles home at night, and residential electric rates ($0.10/kWh) were less than one-third the rate they were paying for the commercial fast charger ($0.32/kWh), they were thinking about installing level 2 chargers at staff homes, with the help of the IRA’s 30% tax credit for such projects - for even greater operational savings.

Due to the Sykesville PD’s favorable experiences with the Model Y, they ordered a Ford F-150 Lightning and expect delivery in February or March 2023.

3.5 Dearborn MI

Since June 2022 the Dearborn Police Department has been utilizing a Ford Mustang Mach E as a patrol vehicle. They have been favorably impressed with its operation and lack of any maintenance expense as of early 2023. Corporal Mohamed Farhat reports the Mach E has been, “very stable, good in rain and snow; I haven’t had any issues driving the vehicle.”

They have observed that its range is greatly impacted in cold months by the need to heat the car. Its range has diminished from about 240 miles in summer to approximately 110 miles with the heat running.

The Dearborn police have been utilizing a Level 2 charger (see **4.1** below), and are interested in considering how to access a fast charger to reduce charging downtime. The higher fees for faster power may be offset by greater availability of the vehicle.

Part Four: Charging and Retrofitting

4.1 EV CHARGING INFORMATION

The most basic EV charging Supply Equipment (EVSE) is UL (Underwriters Laboratories) approved to safely supply electricity to the vehicle and provide lights to indicate when it has started and stopped charging. More sophisticated ("smarter") units are available with a variety of additional features although these increase the cost of the EVSE unit. The use of a 120 volt outlet, a Level 1 charger, will charge at up to 5 miles per hour. More appropriate is a 240 volt, Level 2 charger which ranges from 30 amp to 100 amp. These will provide about 15-40 miles per hour of charging. The next level is DC fast chargers which are rated at 50-350 kW. These are installed on high-traffic corridors and by businesses and communities that want to attract EV drivers. Fast chargers can provide 50-150 miles within a half hour depending on the capacity, and even more powerful chargers are being developed.

Financial assistance for charging device purchase and installation exists but varies by location, and the landscape is rapidly evolving. Level 2 charger hardware and installation run from $1,000- $2,000/unit although this cost decreases for multiple L2 charger installations. Currently at least one vehicle manufacturer offers Level 2 charger installation as part of vehicle purchase price. Some electric utilities pay for or underwrite charger installation. Tax credits and possibly rebates are being rolled out from recent federal legislation: the Inflation Reduction Act (IRA) and the Bipartisan Infrastructure Law (BIL). Which incentives can be accessed may depend in part on a police department's use case for their EVs. When officers bring the police vehicles home at night, home charging may make the most sense, by preventing downtime during operating hours and to take advantage of lower electrical costs for residential vs. commercial/municipal customers. Residential purchase and installation incentives can apply - currently a 30% federal income tax credit - and PDs can reimburse the difference and the (lower) power costs as fleet expenses.

4.2 RETROFITTING EXAMPLES

Westport, CT: To retrofit their Tesla Model 3 for police use, the Westport Police Department spent about $5,000 on additional lighting. They swapped out the OEM (Original Equipment Manufacturer) battery for a deep cycling 12V battery that allowed for sustained power over a long period of time. In addition, they installed a charge guard timer on the battery system that

allows officers to keep the vehicle's lights on for up to an hour without having to remain in the vehicle or wake the vehicle by hitting the accelerator. They also adapted the OEM lighting to utilize the latest traffic safety features. They worked with Whelen Engineering to complete these upgrades. They noted challenges with the vehicle's headlights, which are set to go off after 1 minute; as this is a safety issue with night time traffic stops, they are working with Tesla to override this feature. They also noted difficulty with producing a partition between the front seats and back seats, as the vehicle dimensions differ from typical patrol car partition sizes [23].

Windham County, VT: The Windham County Sheriff's Tesla Model 3 was upfitted by Global Public Safety in Hudson, New Hampshire. Because of the glass roof in the Model 3, a light bar was not possible. The vehicle has Whelen lights in the front windshield, front bumper and flashing in the fog lights. There is side lighting in the side windows, a rear deck light bar, license plate lights, and the brake/reverse flashing patterns.

Sheriff Anderson reports “The people at Global were sensitive to our desire to resell this vehicle. As such, they were able to install nearly everything without drilling holes into the vehicle. We didn't install a mobile data terminal (i.e. in-car computer) because the Model 3 is capable of accessing our computer-aided dispatch (CAD)/records management system itself”.

Global Public Safety’s New Hampshire address is 5 Executive Dr, Hudson, and they can be contacted at (603) 617-7178.

Part Five: Next Steps to Bring an EV Police Car to Your Community

As taxpayers, we’re excited by the significant cost savings of approximately $5,000 per year per vehicle for electric police cars in our communities. As citizens and parents, we are grateful for the reductions of the greenhouse gasses (GHGs) that threaten the world future generations will inherit. The 2022 Inflation Reduction Act (IRA) provides a $7,500 incentive available as a Direct Payment to tax exempt entities such as municipalities, reducing the added purchase price for an EV.
Due to the demand and supply chain issues, there can be extended wait times for certain EVs. Placing reservations at the earliest opportunity is recommended. In some cases, municipal rules for purchasing may need to be adapted to these supply chain issues.

CENH and the Hub offer encouragement and support to police departments, municipalities, and residents who are interested in bringing an EV police car(s) and/or other municipal EVs to their community. This information is summarized in a one sheet, two sided Bulletin. It is available to introduce the topic and explain why EV-Police Vehicles are smart investments. The Hub has an active EV team of EV owners who are willing to share their experiences and offer test drives. CENH provides information and support through Drive Electric NH.

Interested police/town staff or residents can contact the Hub at info@monadnocksustainabilityhub.org to discuss next steps. Interested police chiefs/officers also have the option to contact Windham County, VT Sheriff Mark Anderson for questions about his department's experience of purchasing and owning an EV police car. (Please reach out to the Hub for his contact information.) We also encourage readers to dive deeper into successful EV police car cases by exploring the references linked below.

Learn more about EV programs at www.monadnocksustainabilityhub.org.or https://www.cleanenergynh.org

Part Six: Appendices and Sources Cited

6.1 APPENDICES

Appendix A - Comparison of *2020 Tesla Model 3* actual costs with adjustments for the next EV's costs vs *2020 Ford Explorer* annual costs and savings. This includes actual and projected costs in consultation with the police and was reviewed and the conclusions are supported by the Town's Finance Department. Source: EV Club Of CT with Westport CT Police Department, [30]

WESTPORT, CT FORD EXPLORER & TESLA COSTS & PROJECTED SAVINGS				
FORD EXPLORER				
Cost	Year 1	Year 2	Year 3	Year 4
Purchase	$37,000			
Customization	$38,900			
Ongoing operation & maintenance	$10,400	$20,800	$31,400	$44,300
Total cumulative cost	**$86,300**	**$96,700**	**$107,300**	**$120,200**
TESLA MODEL 3				
Cost	Year 1	Year 2	Year 3	Year 4
Purchase	$52,300			
Customization	$30,700			
Ongoing operation & maintenance	$2,100	$6,400	$8,500	$12,800
Total cumulative cost	**$85,100**	**$89,400**	**$91,500**	**$95,800**
Savings for EV	**$1,200**	**$7,300**	**$15,800**	**$24,400**
Mileage = 23,000 per year				

In this case payback on the EV occurred in the first year and the average savings after four years is expected to be $6,100/year on a cash basis, greater if amortized. The customization savings were largely due to "the license plate reader, for a savings of $10,000 ($8,000 vs $18,000) due to taking advantage of the technology native to the Tesla". The Ford maintenance expenses rose in the later years due to replacements including the catalytic converter and water pump.

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