MAKING THE CASE FOR EV POLICE CARS

BUDGET SAVINGS WITH SUPERIOR PERFORMANCE

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CREATED BY THE MONADNOCK SUSTAINABILITY HUB

www.monadnocksustainabilityhub.org

About MSH

This report was researched and written by the MonadnockSustainability Hub (MSH). MSH strengthens the sustainability and resilience of our region by working collaboratively to reduce greenhouse gas emissions and reach 100% clean energy. We partner across all community sectors 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 issues within our towns.

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Part One: Report Summary

The Monadnock Sustainability Hub (MSH) 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.

The 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 towards bringing an EV police car to your community.

Part Two: Key Drivers

2.1 COST SAVINGS

There are significant long-term cost savings in switching from traditional internal combustion engine (ICE) police cars and SUVs to electric police cars.

Electric cars have a lower life cycle cost (the total cost of the vehicle over its lifetime, including initial purchase cost, maintenance and operational expenses, and the residual value of the vehicle at the end of its applicable lifetime) for alower 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.

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 dollar savings, this also means electric police vehicles have reduced maintenance downtime, yielding a more reliable fleet.

Police departments can 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 you're getting more power out of the money you spend on fueling an EV. The overall cost of electricity is typically 60% less than gasoline. As of 2021, an "eGallon" (the cost of fueling a vehicle with electricity compared to a similar vehicle that runs on gasoline) was $1.70 in New Hampshire [16]—significantly lower than the state's average price of a gallon of gasoline: $3.30 [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 ranged between 2 and 4 cents a mile, compared to 26-28 cents for an ICE police car with similar duties at $2.41 per gallon. A 2020 report of a Tesla Model S police car in Fremont, CA estimated that, over its lifetime, the electric police car would have an expected savings of $30,000 on fuel costs alone!

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 in the undercarriage which reduces rollover potential. The direct torque provides faster acceleration, with Tesla models accomplishing 0 to 60pm acceleration in as little as 2.4 seconds [20]. While most police department experiences have been with Teslas so far, theFord 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. Recently the Falmouth, ME Police Department became one of the first police forces in Maine to start electrifying its fleet, hosting a ribbon cutting to celebrate beginning their transition away from fossil fuels with a Ford Mustang Mach-E and four level 2 chargers in their fleet parking area.

Additional EV models including SUVs and pickup trucks are being introduced by most automakers. 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. Its low center of gravity, rigid passenger compartment, and fortified battery pack 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].

Another performance enhancement is the second trunk or "frunk" (front trunk) in EVs. This enables less secure items—traffic management, safety, rescue, etc.— to be accessed while reserving the rear secure trunk for police access only items.

2.3 HEALTH & ENVIRONMENTAL IMPACT

In the United States, the transportation sector contributes 29% of our overall greenhouse gas emissions [24]. 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].

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.

Part Three: Successful Cases 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 $6755 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]. Since then, the department has 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 four Teslas in their fleet, they are on track to save over $150,000 over these next six years [26].

3.2 Westport, CT

In December of 2019, the town of Westport, Connecticut purchased a Tesla Model 3 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 department initially purchased the Model 3 for $52,910 —which is more than the $47,000 they would typically spend on a new Ford Explorer and equipment—with an additional $5,000 spent on retrofitting additional lighting [22]. They also installed a Level 2 charger for about $450 [23]. The department estimated these higher upfront costs would be offset within the first few years thanks to savings on fuel and maintenance costs; the department estimated that it would save $0.086 per mile on fuel, which would result in almost $6,200 savings on fuel costs alone within the first three years [23]. They would also save an estimated $11,000 on maintenance costs over the first three years, avoiding the expenses of oil changes, oil filters, tune-ups, and brake changes a typical ICE squad car requires. Due to these fuel and maintenance savings, the department expected to recoup the additional upfront costs of Tesla Model 3 police car by the end of year two, and by the end of year three, it would have saved the department almost $9,000 compared to the cost of purchasing and operating a Ford Explorer [see Appendix A for details].

The vehicle's range is another common concern for any potential EV owner, 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. As noted above, the department has a level two charger at their police headquarters for charging in between shifts [23].

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 08/04/2020 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 2-4 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 more room to store deputy/patrol officer equipment, it is higher and has better ergonomics for the driver and it can be fitted for prisoner transport.

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. This is a 240 volt, Level 2 charger which is installed by a local electrician tying into a service with at least a 30 amp breaker. It will provide about 25 miles per hour of charging. The next level is fast chargers which are being 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, more powerful chargers are coming online routinely. EVs can also use a standard 120 volt outlet and obtain about 5 miles per hour of charging.

4.2 RETROFITTING EXAMPLES

Westport, CT:To retrofit their Tesla Model 3 forpolice 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 TeslaModel 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”.

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

As taxpayers, we’re excited by the significant cost savings of 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 Monadnock Sustainability Hub offers encouragement and support to police departments, municipalities, and residents who are interested in bringing an EV police car(s) (or other municipal EVs) to their community. The Hub information handout/attachment, a two page Bulletin summarizing this report, 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.

Interested police/town staff or residents can contact the Hub at ahenry@monadnocksustainabilityhub.org to discuss nextsteps. Interested police chiefs/officers

also have the option to contact Windham County, VT Sheriff Mark Anderson for questions on 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 the Hub's EV programs at www.monadnocksustainabilityhub.org.

Part Six: Appendices and Works Cited

6.1 APPENDICES

Appendix A -Details comparison of *202 Tesla Model3*vs*2020 Ford Explorer* estimated three year costs and savings. *Source: Westport CT PoliceDepartment*

WESTPORT, CT 2020 TESLA MODEL 3 | COST & SAVINGS ESTIMATES			
FORD EXPLORER			
Cost	Year 1Year 2Year 3		
Purchase	$ 37,000		
Fuel - gasoline at $2.29		$ 6,733	$ 6,733 $ 6,733
Oil changes, spark plugs, oil filters, brakes		$ 3,500	$ 3,500 $ 4,000
Rolling Cost		$ 47,233	$ 57,466 $ 68,199
TESLA MODEL 3			
Cost	Year 1Year 2Year 3		
Purchase	$ 52,290		
L2 Charging station (parts, not labor)	$ 500		
Fuel - electricity at $0.15/kwh		$ 2,143	$ 2,143 $ 2,143
Oil changes, spark plugs, oil filters, brakes			$ - $ - $ -
Rolling Cost		$ 54,933	$ 57,076 $ 59,219
Rolling Savings		$ (7,700)	$ 390 $ 8,980
Mileage = 52,925 per year			

6.2 WORKS CITED

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[22] 12/2019 - WESTPORT POLICE DEPARTMENT BUYS FIRST TESLA MODEL 3 SQUAD CAR IN CONNECTICUT (*contact for copy of Press Release)*

[23] 2020 - Town of Westport - Additional Tesla Information*(contact for copy of document)*

[24] Sources of Greenhouse Gas Emissions | US EPA

[25] 12/22/2021 -AAA Gas Prices

[26] 4/28/21 -Indiana Town PD Shifts to EVs to SaveMoney

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