

FUEL-EFFICIENT MUNICIPAL VEHICLES: 2019 BUYERS GUIDE



Introduction

New vehicle purchases represent an excellent opportunity to reduce vehicle fuel usage and increase overall fuel efficiency of municipal fleets. However, many municipal departments require heavy-duty vehicles that are able to perform specific tasks, and it is not always obvious whether fuel-efficient options are available. In addition, fleet managers and department heads tend to consistently purchase the same vehicle models when it comes time to buy a new vehicle. This can be a result of hesitation to adopt unfamiliar vehicle models, or a lack of awareness regarding the advantages of new vehicle models coming on the market.

This buyers guide provides recommendations for purchasing new municipal vehicles, including vehicle specifications to consider, where to easily search for the most fuel efficient models, and purchasing and funding resources. For categories in which only a few fuel-efficient options are available, we provide information on specific models. We also discuss fuel-efficient practices and add-on technologies that can reduce the fuel consumption of heavy-duty vehicles.

A particular emphasis should be placed on the highway department or department of public works (DPW), and the police department, during purchasing – these departments on average represent over 85% of vehicle fuel consumption for rural municipalities in Massachusetts. Fire departments also utilize heavy-duty equipment, but in smaller communities, these vehicles are deployed relatively infrequently, and contribute less to overall fuel use.

For some types of vehicles, fuel-efficient options may not yet be readily available to Massachusetts markets. You can use the resources in this guide to identify fuel-efficient vehicles as they become available, and check back on our website for an updated guide to new models in future years.

Table of Contents

ADMINISTRATIVE/LIGHT-DUTY/PASSENGER VEHICLES.....	2
SPORT UTILITY VEHICLES (SUVs)	2
PICKUP TRUCKS	2
POLICE VEHICLES.....	2
FIRE TRUCKS	2
AMBULANCES.....	2
HIGHWAY DEPARTMENT VEHICLES	2

ADMINISTRATIVE/LIGHT-DUTY/PASSENGER VEHICLES



There are a wide variety of passenger car models available for light-duty uses. These vehicles are designed to carry people and small-to-moderate amounts of equipment, and are typically used by assessors' offices, building inspectors, and other administrative departments. They can also be useful for police detective work, fire safety inspections, and highway department errands.

In smaller towns, where a single department may not require full-time use of a passenger vehicle, consider opportunities to share a small, fuel-efficient vehicle across departments, to reduce fuel use in applications such as traveling to trainings, running errands, or doing inspections.

What do I need to know when purchasing a passenger vehicle?

Consider what type of passenger car is most appropriate for the intended tasks. Most municipal staff and officials are familiar with the types of passenger cars available, including compact cars, sedans, and hatchbacks. When choosing the right model, it is important to consider the range of duties a light-duty vehicle will be performing. Consider the following:

- Will the vehicle ever be carrying more than two passengers? If not, a two-seat or mini-compact car may be sufficient.
- Is a moderate amount of equipment required for tasks the vehicle will regularly be performing? If so, a hatchback may be preferable to a sedan model.

Consider the drive train. Two-wheel drive vehicle models, whether front-wheel drive (FWD) or rear-wheel drive (RWD) are always more efficient than their four-wheel drive (4WD) and all-wheel drive (AWD) counterparts. The necessity of sending energy to four wheels instead of two makes 4WD and AWD vehicles less fuel efficient, and these vehicles are heavier, which also reduces fuel economy. In Massachusetts, many drivers jump to purchase a 4WD or AWD vehicle, because they think they will be necessary in winter driving conditions. 4WD and AWD vehicles can provide better traction to get moving from a dead stop in slippery conditions, but *Consumer Reports* found that winter tires play a more important role in safety and traction than AWD, and that AWD and FWD vehicles had the same stopping distances when equipped with winter tires. *Consumer Reports* also found that many drivers of AWD vehicles use all-season tires throughout the year, which provide much less traction than winter tires on any drive-train. Changing out tires twice a year can be a nuisance, but it is the best way to deal with winter driving conditions, and many municipal departments can perform the work in-house.

Reliable hybrid, plug-in hybrid, and electric vehicle options are available. These types of vehicles are the most fuel-efficient options currently on the market. For general information about these vehicles and how they operate, see our fact sheet, *Hybrid, Hybrid Plug-In, and Battery Electric Vehicles*. High fuel efficiency, regenerative braking, and reduced idling time means these vehicles cost less to operate and maintain than conventional vehicles; grant funding is also available to help with upfront costs.

What vehicle models do municipalities typically purchase?

A number of Green Communities have added plug-in hybrid or electric vehicles to their fleets, including the Chevy Bolt, Chevy Volt, Ford Focus, Ford Fusion Energi, and Nissan Leaf. Conventional hybrids purchased by Green Communities include the Ford Fusion, Honda Accord Hybrid, and Toyota Prius.

What fuel-efficient models are currently available?

The Massachusetts Operational Services Division (OSD) annually prepares a list of recommended energy efficient vehicles to help state fleets meet fuel efficiency standards. In 2018, OSD recommended a variety of passenger car models, including the following hybrid, hybrid plug-in, and electric options, with a fuel economy of 40 MPG or higher: Chevy Bolt, Chevy Malibu, Chevy Volt, Ford C-Max, Ford Focus, Ford Fusion, Honda Accord, Honda Clarity Plug-in, Hyundai Sonata, Nissan Leaf, Smart Fortwo Electric Drive Coupe, and Toyota Prius. **See the table on the next page for details on vehicle specifications.**

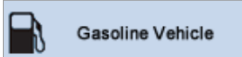



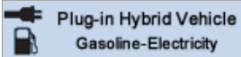








Model Year	Make	Model	Trim Level	Drive Train	Engine	Combined MPG
2018	Chevrolet	Bolt EV	LT	FWD	200hp Electric	119
2018	Nissan	Leaf	S	FWD	110 kW Electric	112
2018	Nissan	Leaf	SV	FWD	110 kW Electric	112
2018	Honda	Clarity Plug-In	Base	FWD	1.5L	110
2018	Honda	Clarity Plug-In	Touring	FWD	1.5L	110
2017	smart	Fortwo Electric Drive Coupe	Passion	RWD	Electric	108
2018	smart	Fortwo Electric Drive Coupe	Passion	RWD	Electric	108
2017	smart	Fortwo Electric Drive Coupe	Prime	RWD	Electric	108
2018	smart	Fortwo Electric Drive Coupe	Prime	RWD	Electric	108
2017	smart	Fortwo Electric Drive Coupe	Pure	RWD	Electric	108
2018	smart	Fortwo Electric Drive Coupe	Pure	RWD	Electric	108
2018	Ford	Focus	Electric	FWD	107kW Electric	107
2018	Chevrolet	Volt	LT	FWD	1.5L	106
2018	Ford	Fusion	Energi SE	FWD	2.0L	97
2018	Ford	Fusion	Energi Titanium	FWD	2.0L	97
2018	Toyota	Prius Prime Plug-in	Plug-in	FWD	1.8L	95
2018	Hyundai	Sonata	Plug-in Base	FWD	2.0L	93
2018	Toyota	Prius	Two	FWD	1.8L	56
2018	Toyota	Camry	Hybrid LE	FWD	2.5L	52
2018	Toyota	Prius	One	FWD	1.8L	52
2018	Toyota	Prius Eco	Two	FWD	1.8L	52
2017	Honda	Accord	Hybrid	FWD	2.0L	48
2018	Chevrolet	Malibu	Hybrid	FWD	1.8L	46
2018	Toyota	Prius c	One	FWD	1.5L	46
2018	Toyota	Prius c	Two	FWD	1.5L	46
2018	Ford	Fusion	Hybrid SE	FWD	2.0L	42
2018	Ford	Fusion	Hybrid Titanium	FWD	2.0L	42
2018	Ford	Fusion	Hybrid S	FWD	2.0L	42
2018	Hyundai	Sonata	Hybrid Base	FWD	2.0L	42
2018	Toyota	Prius v Wagon	Two	FWD	1.8L	41
2018	Ford	C-Max	Hybrid SE	FWD	2.0L	40
2018	Ford	C-Max	Hybrid Titanium	FWD	2.0L	40

How do I find and compare fuel-efficient models?

- On the U.S. Department of Energy fuel economy site, use the *Power Search* to search by a range of Model Years and Market Class (small cars, hatchbacks, large sedans, family sedans). The results will be sorted by combined MPG.
<https://www.fueleconomy.gov/feg/powerSearch.jsp>
- Check out the U.S. Department of Energy Fuel Economy Guide, which is published annually. Look for vehicles in the section labeled “Fuel Economy Leaders.”
<https://www.fueleconomy.gov/feg/printguides.shtml>
- Review the list of Recommended Vehicles published annually by MA OSD to help state fleets meet fuel economy standards. Passenger cars are listed under Category I. In order to make the list for Model Year 2018, vehicles were required to have a combined fuel economy of 32 MPG or higher.

- The U.S. Department of Energy fuel economy site also has a *Side by Side Comparison* option to compare specific models. See below for an example comparing 2019 Chevrolet sedans. <https://www.fueleconomy.gov/feg/Find.do?action=sbsSelect>

Compare Side-by-Side

Fuel Economy Energy and Environment Safety Specs				
Personalize Edit Vehicles	2019 Chevrolet Malibu X   1.5 L, 4 cyl, Automatic (variable gear ratios), Turbo MSRP: \$22,090 - \$31,670	2019 Chevrolet Malibu Hybrid X   1.8 L, 4 cyl, Automatic (variable gear ratios) MSRP: \$28,070	2019 Chevrolet Volt X   1.5 L, 4 cyl, Automatic (variable gear ratios) MSRP: \$33,520 - \$38,120 Plug-in Hybrid Calculator Possible Tax Break	2019 Chevrolet Bolt EV X   Automatic (A1) MSRP: \$36,620 - \$41,020 Possible Tax Break
	EPA Fuel Economy 1 gallon of gasoline=33.7 kWh Show electric charging stations near me	Regular Gasoline  32 MPG combined city highway 3.1 gal/100mi	Regular Gasoline  46 MPG combined city highway 2.2 gal/100mi  598 miles Total Range	Electricity Reg. Gas  106 MPGe combined city/highway 31 kWh/100mi  53 miles Electricity 420 miles Total Range
You save or spend* <small>Note: The average 2019 vehicle gets 27 MPG</small>	You SAVE \$1,000 <small>in fuel costs over 5 years compared to the average new vehicle</small>	You SAVE \$3,000 <small>in fuel costs over 5 years compared to the average new vehicle</small>	You SAVE \$3,750 <small>in fuel costs over 5 years compared to the average new vehicle</small>	You SAVE \$4,500 <small>in fuel costs over 5 years compared to the average new vehicle</small>
Annual Fuel Cost*	\$1,250	\$850	Electricity + Gasoline: \$700	\$550
Cost to Drive 25 Miles	\$2.07	\$1.44	\$1.01 (driving on elec only) \$1.58 (driving on gas only)	\$0.92

Purchasing: Grant Funding and Discounts

Massachusetts Electric Vehicle Incentive Program (MassEVIP)

MassEVIP is an open-enrollment grant program administered by the Massachusetts Department of Environmental Protection (MassDEP), providing incentives to eligible state and municipal entities for the acquisition of electric vehicles, zero-emission electric motorcycles, and the installation of Level 2 dual-port charging stations. To date, MassEVIP has provided 83 entities with nearly \$2.3 million in funds to acquire 267 electric vehicles and 92 dual-port charging stations. <https://www.mass.gov/how-to/apply-for-massevip-fleets-incentives>

Massachusetts Green Community Designation and Grant Program

More than half of the municipalities across the state of Massachusetts have opted to join the Green Community Program since its launch in 2010. As designated “Green Communities,” municipalities are able to receive both funding and guidance from the state in pursuit of improved energy efficiency and clean energy. Once designated, municipalities receive an initial grant of up to \$125,000 to fund energy efficiency projects in both municipal buildings and municipal fleets. Subsequently, municipalities are eligible for additional funds through competitive grant competitions, which can include financing of hybrid, hybrid plug-in, and electric vehicles, as well as electric vehicle infrastructure.

<https://www.mass.gov/guides/becoming-a-designated-green-community>

State Contract VEH98: Vehicle Purchases

The Massachusetts OSD offers a statewide contract (VEH98) to assist municipalities in purchasing vehicles. As of May 2018, the VEH98 contract offers over 500 different vehicle models to Massachusetts municipalities, at an average savings of 23% below MSRP, alongside vehicle accessories discounted up to 10%. Questions? Contact the contract manager: David Sargeant, david.sargeant@mass.gov, 617-720-3118

<https://www.mass.gov/files/documents/2019/04/12/VEH98.pdf>

State Contract VEH102: Advanced Vehicle Equipment, Supplies, and Services

This Massachusetts OSD contract offers municipalities discounts on electric vehicle charging stations, as well as other fuel-saving and environmentally-friendly vehicle accessories, including idle reduction technology. Questions? Contact the contract manager: Ted Dobbin, Edward.Dobbin@mass.gov, 617-626-7383

<https://www.mass.gov/files/documents/2018/11/09/VEH102.pdf>

SPORT UTILITY VEHICLES (SUVs)



SUVs are significantly less fuel efficient than cars, and are not the best choice of vehicle if its primary use is for transportation. However, where an SUV is needed, electric, plug-in electric, and hybrid options offer significant fuel savings over conventional models. Many fire departments and highway departments include one or more SUVs in their fleets. For SUVs for general use by administrative, fire, and highway departments, use this section. For information on SUVs specifically designed for emergency police use, see the section on *Police Vehicles*.

What do I need to know when purchasing an SUV?

SUVs are significantly less fuel efficient than cars. To reduce fuel consumption, only consider an SUV in situations where a car is not a practicable option.

Consider the drive train. Two-wheel drive vehicle models, whether front-wheel drive (FWD) or rear-wheel drive (RWD) are always more efficient than their four-wheel drive (4WD) and all-wheel drive (AWD) counterparts. The necessity of sending energy to four wheels instead of two makes 4WD and AWD vehicles less fuel efficient, and these vehicles are heavier, which also reduces fuel economy. In Massachusetts, many drivers jump to purchase a 4WD or AWD vehicle, because they think they will be necessary in winter driving conditions. 4WD and AWD vehicles can provide better traction to get moving from a dead stop in slippery conditions, but *Consumer Reports* found that winter tires play a much more important role in safety and traction than AWD, and that AWD and FWD vehicles had the same stopping distances when equipped with winter tires. *Consumer Reports* also found that many drivers of AWD vehicles use all-season tires throughout the year, which provide much less traction than winter tires on any drive-train. Changing out tires twice a year can be a nuisance, but it is the best way to deal with winter driving conditions, and many municipal departments can perform the work in-house.

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What do municipalities typically purchase?

A number of Green Communities have added hybrid models to their fleets, including the Subaru Crosstek Hybrid, Toyota Highlander Hybrid, and Toyota RAV4 Hybrid. New electric and plug-in electric models have recently become available, which are suitable for municipal fleets.











What fuel-efficient models are currently available?

The Audi e-tron, BYD e6, and Hyundai Kona are fully-electric SUVs capable of traveling 187-258 miles on a single charge, with combined fuel economy ratings of 72-120 MPG, depending on the model. The Mitsubishi Outlander, Volvo XC60 and Volvo XC90 SUVs are available as plug-in hybrids, with combined fuel economy ratings of 58-74 MPG. A number of hybrid SUV models are also available, including the Acura MDX, Nissan Rogue, Toyota Highlander, Toyota RAV4, and the Subaru Crosstek. With fuel economy ratings of 27-40 MPG, these models are more efficient than conventional SUVs, but they cannot compete with plug-in and fully electric options. When purchasing a new vehicle, ask about stop/start technology – these systems may be included as a basic or optional feature, and can reduce fuel use by about 5%.

How do I find and compare fuel-efficient models?

- On the U.S. Department of Energy fuel economy site, use the *Power Search* to search by a range of Model Years and Market Class (SUVs). The results will be sorted by combined MPG. <https://www.fueleconomy.gov/feg/powerSearch.jsp>
- Check out the U.S. Department of Energy Fuel Economy Guide, which is published annually. The section labeled “Fuel Economy Leaders” lists the top vehicles for fuel economy by market class. <https://www.fueleconomy.gov/feg/printguides.shtml>
- Review the list of Recommended Vehicles published annually by MA OSD to help state fleets meet fuel economy standards. Most SUVs are listed under Category II, but some heavy-duty SUVs may be listed under Category III.
- The U.S. Department of Energy fuel economy site also has a *Side by Side Comparison* option to compare specific models. **See below for an example comparing 2019 Mitsubishi gas and plug-in hybrid models.** <https://www.fueleconomy.gov/feg/Find.do?action=sbsSelect>

Compare Side-by-Side

Fuel Economy		Energy and Environment	Safety	Specs
Personalize	2019 Mitsubishi Outlander 2WD   2.4 L, 4 cyl, Automatic (AV-S6) MSRP: \$24,695 - \$29,845	2019 Mitsubishi Outlander PHEV   2.0 L, 4 cyl, Automatic (A1) MSRP: \$35,795 - \$41,495 Plug-in Hybrid Calculator Possible Tax Break		
	EPA Fuel Economy 1 gallon of gasoline=33.7 kWh Show electric charging stations near me	Regular Gasoline  27 MPG combined city/highway 3.7 gal/100mi  448 miles Total Range	Elec + Gas  74 MPGe combined city/highway .0 gal/100mi of gas + 45 kWh/100mi  22 miles Elec + Gas All Elec: 0-22 mi	Reg. Gas  25 MPG combined city/highway 4.0 gal/100mi  310 miles Total Range
You save or spend* Note: The average 2019 vehicle gets 27 MPG	You SAVE \$0 in fuel costs over 5 years compared to the average new vehicle	You SAVE \$1,000 in fuel costs over 5 years compared to the average new vehicle		
Annual Fuel Cost*	\$1,450	Electricity + Gasoline: \$1,250		
Cost to Drive 25 Miles	\$2.45	\$1.61 (on a single charge) ⓘ \$2.65 (driving on gas only)		

Purchasing: Grant Funding and Discounts

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MassEVIP is an open-enrollment grant program administered by the Massachusetts Department of Environmental Protection (MassDEP), providing incentives to eligible state and municipal entities for the acquisition of electric vehicles, zero-emission electric motorcycles, and the installation of Level 2 dual-port charging stations. To date, MassEVIP has provided 83 entities with nearly \$2.3 million in funds to acquire 267 electric vehicles and 92 dual-port charging stations. <https://www.mass.gov/how-to/apply-for-massevip-fleets-incentives>

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More than half of the municipalities across the state of Massachusetts have opted to join the Green Community Program since its launch in 2010. As designated “Green Communities,” municipalities are able to receive both funding and guidance from the state in pursuit of improved energy efficiency and clean energy. Once designated, municipalities receive an initial grant of up to \$125,000 to fund energy efficiency projects in both municipal buildings and municipal fleets. Subsequently, municipalities are eligible for additional funds through competitive grant competitions, which can include financing of hybrid, hybrid plug-in, and electric vehicles, as well as electric vehicle infrastructure.

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State Contract VEH98: Vehicle Purchases

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State Contract VEH102: Advanced Vehicle Equipment, Supplies, and Services

This Massachusetts OSD contract offers municipalities discounts on electric vehicle charging stations, as well as other fuel-saving and environmentally-friendly vehicle accessories, including idle reduction technology. Questions? Contact the contract manager: Ted Dobbin, Edward.Dobbin@mass.gov, 617-626-7383

<https://www.mass.gov/files/documents/2018/11/09/VEH102.pdf>

PICKUP TRUCKS



Pickup trucks are typically purchased by municipalities for use by the highway department or department of public works (DPW), and fire department, although a few police fleets include pickups as well. Electric and plug-in electric models are not yet available, and the hybrid options that are currently available do not yet offer substantial fuel savings compared to conventional vehicles. However, purchasing fuel-efficient conventionally-fueled models can provide significant fuel consumption reductions, compared to their less fuel-efficient counterparts. In addition, hybrid retrofits are available for several Ford models. Choosing a pickup that is right-sized for the tasks it typically performs is a very important way to minimize fuel consumption – manufacturers are not required to report fuel economy for large pickups (over 8,500 lbs GVWR), and therefore have little incentive to aim for fuel efficiency in their design.

How Pickup Trucks are Classified

The terminology describing sizes and classes of pickup trucks can be confusing, because government agencies, manufacturers, and retailers use different terminology, and in some cases, the terms do not provide an accurate description of the vehicle.

GVWR - One set of terminology that is consistent is the *Gross Vehicle Weight Rating (GVWR)*, which is used by the U.S. Department of Transportation (DOT) to place trucks into 8 classes. GVWR refers to the maximum allowable operating weight of a truck while driving, including the weight of the truck itself, fuel, passengers, and cargo. GVWR classes have nothing to do with what parts the truck is fitted with, the type of suspension, or what the truck looks like. They are based solely on weight. Pickup trucks fall into GVWR Classes 1-5, with most pickups falling in classes 2 and 3. Manufacturers often subdivide Class 2 into two subclasses, based on whether a truck is heavier or lighter than 8,500 lbs. For trucks heavier than 8,500 lbs, manufacturers are not required to provide an estimate of fuel economy (MPG).

Payload - In marketing and now common usage, pickup trucks are also classified by an alternative system based on “payload,” rather than total weight. Payload is the amount a truck can carry in its bed. The industry uses three classes with names that at this point have become archaic – the “half-ton,” “three-quarter-ton,” and “one-ton” trucks. These names can be confusing, because they are based on capability-levels modern vehicles have long surpassed. For example, a Ford F-150 is considered a “half-ton” truck, but most variants can carry a great deal more than 1,000 lbs in the bed.

Light-Duty versus Heavy-Duty - The terms “light-duty” and “heavy-duty” are also used to refer to pickups, but they are used differently, depending on the source. Some people refer to half-ton trucks as “light-duty,” and trucks three-quarter-ton and above as “heavy-duty.” However, others apply “light-duty” to all trucks one-ton and below, use “medium-duty” for commercial vehicles like the Ford F-550 and F-650, and call heavier vehicles, like garbage trucks, “heavy-duty.” The Massachusetts Operational Services Division considers anything with a GVWR under 10,000 lbs to be “light-duty.”

Pickup Truck Classes by GVWR

Class 1: 6,000 lbs or less – These are light, small pickups, some of which would be classified as “half-ton” trucks. The DOE Fuel Efficiency Guide classifies these vehicles as “small.” MA OSD classifies them as “light-duty.” Examples include the Nissan Frontier and Toyota Tacoma.

Class 2A: 6,001-8,500 lbs – The DOE Fuel Efficiency Guide classifies these vehicles as “standard.” Many sources refer to trucks in this class and above as “full-size” pickups. Many modern “half-ton” trucks fall into this category, including the Ford F150, Chevrolet Silverado 1500, GMC Sierra 1500, Ram 1500, Toyota Tundra, and Nissan Titan. Today these trucks tend to have an empty weight of about 5,000 lbs, payload capacities between 1,000-3,000 lbs, and towing capacities of 5,000-10,000 lbs. These trucks are generally designed with daily driving in mind, so they tend to be reasonably comfortable and handle well, even when empty.

Class 2B: 8,501-10,000 lbs - Manufacturers are not required to provide fuel economy estimates (MPG) for vehicles in this class and above. The DOE Fuel Efficiency Guide therefore does not provide listings for these types of vehicles. This vehicle class includes many of what are considered “three-quarter-ton” pickups. They tend to weigh over 6,000 lbs empty, have a maximum payload of 3,000-4,000 lbs, and towing capacity of up to about 13,000 lbs. These vehicles tend to have wider rear-view mirrors, to help see around trailers. They also tend to be stiffer than Class 1 and 2A vehicles, in terms of both driving and maneuverability. Some sources call these vehicles “heavy-duty” pickups. Examples include the Chevrolet Silverado 2500, Dodge Ram 2500, Ford F250, and GMC Sierra 2500.

Class 3: 10,001-14,000 lbs – Some sources refer to pickups in this class and above as “heavy-duty.” This vehicle class includes many of what are considered “one-ton” pickups. These trucks tend to weigh over 6,000 pounds empty, can carry their own weight again (at least 6,000 lbs) in the bed, and are capable of towing over 30,000 lbs. Most trucks labeled “350” or “3500” fall into this class, including the Chevrolet Silverado 3500, Dodge Ram 3500, Ford F350, and GMC Sierra 3500. Depending on the trim level, the Ford F-450 may fall into this class, Class 4, or Class 5.

Class 4: 14,001-16,000 lbs – Depending on the trim level, the Ford F450 may fall into this class, Class 3, or Class 5.

Class 5: 16,001-19,500 lbs – The Ford F550 typically falls into this class.

What do I need to know when purchasing a pickup truck?

Start by considering municipal needs and the existing fleet. An important first step when purchasing a new pickup truck is to carefully consider what tasks the vehicle will need to be capable of performing. Because pickup trucks are often required to perform tasks such as plowing, towing, or driving fully loaded, medium and heavy-duty vehicles may be required, but these vehicles tend to have low fuel economy. List the duties the vehicle will be expected to perform routinely, and which duties it may be required to perform occasionally. If there are heavy-duty tasks the vehicle may only be required to perform rarely, consider whether there is another vehicle in the fleet that could perform this role, or whether a vehicle appropriate for performing occasional, heavy-duty tasks could be shared with a neighboring municipality. Purchasing a vehicle that is over-sized for the tasks it regularly performs has significant consequences for municipal fuel consumption and costs.

Consider the drive train. Two-wheel drive vehicle models, whether front-wheel drive (FWD) or rear-wheel drive (RWD) are always more efficient than their four-wheel drive (4WD) and all-wheel drive (AWD) counterparts. The necessity of sending energy to four wheels instead of two makes 4WD and AWD vehicles less fuel efficient, and these vehicles are heavier, which also reduces fuel economy. In Massachusetts, many drivers jump to purchase a 4WD or AWD vehicle, because they think they will be necessary in winter driving conditions. 4WD and AWD vehicles can provide better traction to get moving from a dead stop in slippery conditions, but *Consumer Reports* found that winter tires play a much more important role in safety and traction than AWD, and that AWD and FWD vehicles had the same stopping distances when equipped with winter tires. *Consumer Reports* also found that many drivers of AWD vehicles use all-season tires throughout the year, which provide much less traction than winter tires on any drive-train. Changing out tires twice a year can be a nuisance, but it is the best way to deal with winter driving conditions, and many municipal departments can perform the work in-house. Less fuel-efficient attributes, such as four-wheel-drive, may be necessary in some vehicles and for some uses, such as plowing in winter.

Small differences in fuel economy truly matter. Pickup trucks in general have low fuel economy; small increases in fuel economy make a larger difference when fuel economy is low. Assuming travel of 1,000 miles a month, a vehicle with a fuel economy of 17 MPG saves 100 gallons of gasoline every year compared to a vehicle with a fuel economy of 15 MPG. Similarly, a vehicle with a fuel economy of 20 MPG saves 100 gallons of gas annually compared to a vehicle with a fuel economy of 17 MPG.

Hybrid options are available for light-duty pickups, but don't necessarily outcompete conventional models. Several hybrid pickup truck models are available, but the fuel economy for these vehicles is in some cases comparable to conventional vehicles, depending on the specifications of the vehicle (e.g. drivetrain, bed length, cab size). Be sure to check the MPG for the specific hybrid and conventional models you are considering, to determine the most fuel- and cost-efficient option.

Plug-in electric and electric models are coming soon. The first fully electric pickup trucks are expected to hit the market as early as late 2020. Among other companies, Ford is developing an electric version of its popular F150.

Fuel economy information is not available for large pickup trucks. In the U.S., car manufacturers are not required to provide consumers with the fuel economy ratings for vehicles with a GVWR of over 8,500 lbs. This can be a major challenge for fleet managers looking to compare fuel efficiency among vehicles, and is an additional reason to purchase smaller pickup trucks where possible.

For pickups in Class 2B and above, consider the availability of hybrid retrofits. Hybrid models of large pickups are not available for direct purchase from the manufacturer, but after-market hybrid retrofits are available for a few medium and heavy-duty pickup trucks. XL Hybrids can provide manufacturer-approved hybrid retrofits of conventional pickups for certain models of the Ford F150 and F250, with fuel savings on the order of 25%. As far as we are aware, no other after-market hybrid retrofits for pickup trucks are currently available.

What kinds of pickup trucks do municipalities tend to purchase?

A number of models are commonly purchased, including the Chevrolet 1500, 2500, 3500, S10, and Silverado, the Dodge Ram 2500, 3500, and Dakota, and the Ford F150, F250, F350, F450, F550, and Ranger. Occasionally, municipal fleets may include a Ford F750 or F800.

What fuel-efficient models are currently available?

Currently, there are at least three hybrid pickup trucks available on the market – the Chevrolet Silverado, Dodge Ram 1500, and GMC Sierra. Depending on the trim level and specifications, these trucks have a combined fuel economy of 18-23 MPG. However, hybrid pickups are not necessarily more efficient than their most efficient conventional counterparts. Certain conventional models of the Chevrolet Colorado, Ford F150, Ford Ranger, and GMC Canyon have combined fuel economy ratings of 23-25 MPG. The difference in fuel use can be considerable – for a vehicle that travels 12,000 miles per year, a truck rated for 18 MPG will use about 150 more gallons of fuel per year than a truck rated for 23 MPG, and over 180 gallons more than one rated for 25 MPG. With this in mind, it is best to check the U.S. DOE Fuel Economy site (www.fueleconomy.gov) to review the fuel economy of your selected vehicle against comparable trucks with equivalent specifications.

What after-market retrofits are available?

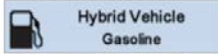

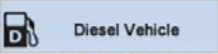






XL Hybrids (www.xlfleet.com) can provide manufacturer-approved hybrid and plug-in hybrid retrofits of conventional pickups for the Ford F150 and F250. Fuel savings are on the order of 25% for hybrids, and as much as 50% for plug-in hybrids; call the company for an estimate of fuel savings for the specific model and trim level you are considering. As far as we are aware, no other after-market hybrid retrofits for pickup trucks are currently available.

How do I find and compare fuel-efficient models?

- On the U.S. Department of Energy fuel economy site, use the *Power Search* to search by a range of Model Years and Market Class (Pickup Trucks). The results will be sorted by combined MPG. <https://www.fueleconomy.gov/feg/powerSearch.jsp>
- Check out the U.S. Department of Energy Fuel Economy Guide, which is published annually. The section labeled “Fuel Economy Leaders” lists the top vehicles for fuel economy by market class. <https://www.fueleconomy.gov/feg/printguides.shtml>
- Review the list of Recommended Vehicles published annually by MA OSD to help state fleets meet fuel economy standards. A number of pickup trucks are listed under Category II, but some heavy-duty trucks may be listed under Category III.
- The U.S. Department of Energy fuel economy site also has a *Side by Side Comparison* option to compare specific models. **See below for an example comparing a 2018 hybrid pickup with two fuel-efficient 2019 diesel models.**
<https://www.fueleconomy.gov/feg/Find.do?action=sbsSelect>

Compare Side-by-Side

Fuel Economy | Energy and Environment | Safety | Specs

	2018 GMC Sierra 15 Hybrid 2WD	2019 GMC Canyon 2WD	2019 Ford F150 Pickup 2WD
Personalize	  <p>5.3 L, 8 cyl, Automatic 8-spd</p>	  <p>2.8 L, 4 cyl, Automatic 6-spd, Turbo MSRP: \$21,400 - \$40,800</p>	  <p>3.0 L, 6 cyl, Automatic (S10), Turbo MSRP: \$28,155 - \$55,220</p>
EPA Fuel Economy	<p>Regular Gasoline</p> <p>20 MPG combined city highway 5.0 gal/100mi</p> <p>Gasoline  520 miles Total Range</p>	<p>Diesel</p> <p>23 MPG combined city highway 4.3 gal/100mi</p> <p>Diesel  483 miles Total Range</p>	<p>Diesel</p> <p>25 MPG combined city highway 4.0 gal/100mi</p> <p>Diesel  575 - 900 miles Total Range</p>

Purchasing: Grant Funding and Discounts

Massachusetts Green Community Designation and Grant Program

More than half of the municipalities across the state of Massachusetts have opted to join the Green Community Program since its launch in 2010. As designated “Green Communities,” municipalities are able to receive both funding and guidance from the state in pursuit of improved energy efficiency and clean energy. Once designated, municipalities receive an initial grant of up to \$125,000 to fund energy efficiency projects in both municipal buildings and municipal fleets. Subsequently, municipalities are eligible for additional funds through competitive grant competitions, which can include financing of hybrid retrofits.

<https://www.mass.gov/guides/becoming-a-designated-green-community>

State Contract VEH98: Vehicle Purchases

The Massachusetts OSD offers a statewide contract (VEH98) to assist municipalities in purchasing vehicles. As of May 2018, the VEH98 contract offers over 500 different vehicle models to Massachusetts municipalities, at an average savings of 23% below MSRP, alongside vehicle accessories discounted up to 10%. Questions? Contact the contract manager: David Sargeant, david.sargeant@mass.gov, 617-720-3118

<https://www.mass.gov/files/documents/2019/04/12/VEH98.pdf>

State Contract VEH102: Advanced Vehicle Equipment, Supplies, and Services

This Massachusetts OSD contract offers municipalities discounts on electric vehicle charging stations, as well as other fuel-saving and environmentally-friendly vehicle accessories, including hybrid retrofits. Questions? Contact the contract manager: Ted Dobbin, Edward.Dobbin@mass.gov, 617-626-7383

<https://www.mass.gov/files/documents/2018/11/09/VEH102.pdf>

POLICE VEHICLES



A number of major vehicle manufacturers offer vehicles specifically designed for use by police departments. These vehicles are based on models designed for everyday consumers, but include additional features appropriate for police use, such as high performance engines, reinforced suspension systems, enhanced brake pads, speed-rated tires, and high-power alternators to keep lights, radios, and other equipment running. For vehicles that may be used by police departments, but do not require modifications for police use, see the appropriate vehicle type earlier in this guide (e.g. administrative vehicles, SUVs, pickup trucks).

What do I need to know when purchasing a police vehicle?

Right-sizing the police vehicle to the duties it will be performing can make a significant difference in fuel economy. When purchasing a new police vehicle, right-sizing the vehicle to the tasks it will be performing is an important way to reduce municipal fuel usage. Choosing a hybrid over a conventionally-fueled vehicle, a sedan over an SUV, a two-wheel-drive vehicle over a four-wheel-drive vehicle, or a V6 engine over a V8 engine, are all ways to increase fuel economy. Less fuel-efficient attributes, such as four-wheel-drive, may be necessary in some vehicles and for some uses, such as accessing remote locations over rough terrain in bad weather. However, consider opportunities to separate duties, such that, for example, a highly-efficient hybrid sedan is used to perform administrative duties and patrol in good weather, while a less-efficient four-wheel-drive SUV is the primary vehicle used to respond to emergencies in bad conditions.

Small differences in fuel economy matter. Police vehicles in general have low fuel economy; small increases in fuel economy make a larger difference when fuel economy is low. Assuming travel of 1,000 miles a month, a vehicle with a fuel economy of 17 MPG saves 100 gallons of gasoline every year compared to a vehicle with a fuel economy of 15 MPG. Similarly, a vehicle with a fuel economy of 20 MPG saves 100 gallons of gas annually compared to a vehicle with a fuel economy of 17 MPG.

Consider needs for “pursuit-rated” and “special service” vehicles. In general, manufacturers apply one of two labels to their police vehicles – “pursuit-rated” models are designed for emergency driving situations and high speeds, while “special service” vehicles are designed for other kinds of police work, including prisoner transport, detective duties, and administrative activities. The “pursuit-rated” label is applied by the manufacturer, rather than an outside evaluator, but the performance of a number of pursuit vehicle models is tested each year by the Michigan State Police. Some police duties may require a “pursuit-rated” vehicle, but for departments with one or more vehicles assigned primarily to administrative or detective work, a smaller, more fuel-efficient “special service” vehicle may suffice for these duties.

Hybrid police vehicles and fuel-efficient sedans provide significant savings. Historically, most police vehicles were sedans, since these large cars provided more space for police equipment than compact cars. In recent years, however, many police departments have been opting for SUVs over sedans, and vehicle manufacturers have been discontinuing production of some police sedan models. Based on vehicle inventories from Green Communities in 2016, there is currently about a 50/50 split between sedans and SUVs in rural municipal police fleets, with a handful of towns also including a pickup truck as part of the police department fleet. SUVs offer additional space for police equipment, and may allow for easier travel over rugged terrain, or during winter driving conditions. On the other hand, SUVs use more gasoline than sedans of a comparable age. One argument some departments have advanced for replacing existing police sedans with SUVs is that new model SUVs may be more fuel-efficient than old police cars like the popular Ford Crown Victoria. In fact, EPA MPG estimates show that SUVs offer little fuel savings over the Ford Crown Victoria – for example, the 2018 Ford Explorer Police Interceptor Utility Vehicle has a combined fuel economy of 17 MPG, comparable to the 2011

Crown Vic. Newer model SUVs may have more efficient engines, which could offer some fuel savings during idling compared to older sedan models. However, it is important to recognize that certain new police sedan models continue to offer significant fuel savings over new SUV models. For example, the 2018 Dodge Charger and 2018 Ford Taurus both have combined fuel economy ratings of 20 MPG. Ford has a 2018 hybrid Police Interceptor Sedan with a combined fuel economy of 38 MPG; the 2020 hybrid and hybrid plug-in sedans are projected to have combined fuel economy ratings of at least 42 MPG. For departments that require use of an SUV police vehicle, the 2020 Ford Police Utility Interceptor is projected to have a combined fuel economy of 24 MPG.

Consider the drive train. Two-wheel drive vehicle models, whether front-wheel drive (FWD) or rear-wheel drive (RWD) are always more efficient than their four-wheel drive (4WD) and all-wheel drive (AWD) counterparts. The necessity of sending energy to four wheels instead of two makes 4WD and AWD vehicles less fuel efficient, and these vehicles are heavier, which also reduces fuel economy. 4WD and AWD vehicles are typically 1-2 MPG less efficient than their FWD and RWD counterparts. 4WD and AWD vehicles may be necessary in certain terrain, or in inclement weather, but consider use of the vehicle before purchasing a 4WD option.

Consider the engine type. The number of cylinders in a vehicle engine affects the power of the engine, and ability of the vehicle to accelerate quickly to high speeds. Most cars designed for everyday consumers utilize an engine with 4 or 6 cylinders, but due to the need for high acceleration, police sedans and SUVs are typically only available with 6-cylinder (V6) or 8-cylinder (V8) engines. Because larger engines are less fuel efficient, V8 models typically have a fuel economy 2-3 MPG lower than their V6 counterparts. While this difference may sound small, the effect on gasoline consumption annually, or over the lifetime of a vehicle, can be quite high.

“Turbo-charged” engines are one option which offer a compromise between fuel economy and engine power. Turbo-charging is a process via which additional air is added into the combustion chamber during periods in which additional power is required (e.g. in cases of fast acceleration). The effect on fuel economy is minimal. “EcoBoost” is a term Ford applies to its turbo-charged engines, which also feature direct fuel injection, which further increases power without significantly reducing fuel economy. For example, the Ford Taurus 2018 Sedan with a standard V6 engine has a max horsepower of 305, while the V6 engine with EcoBoost has a max horsepower of 365, while maintaining similar fuel economy to the standard V6 model. Certain Chevy and Dodge models also feature direct fuel injection, as well as a technology called variable valve timing, which can also increase fuel efficiency.

What vehicle models do municipalities typically purchase?

Among rural Green Communities in Massachusetts, police versions of eight vehicle models account for over 90% of municipal police fleet vehicles. These include the Chevrolet Caprice, Impala, and Tahoe, the Dodge Charger, and the Ford Crown Victoria, Expedition, Explorer, and Taurus.

What fuel-efficient models are currently available?

The Ford Fusion is a pursuit-rated, hybrid sedan police vehicle with a combined fuel economy of 38 MPG. No conventionally-fueled vehicle can come close in terms of gas mileage. There is also a plug-in hybrid version of the Ford Fusion expected to be available soon as a Special Service Vehicle, with a combined fuel economy rating of 42 MPG. Ford is also expecting release of a pursuit-rated Ford Explorer hybrid SUV, with a combined fuel economy of 24 MPG.

See Table 2, next page, for basic specifications for these vehicles, as compared to police fleet vehicles commonly purchased by Massachusetts municipalities.

How do I find and compare fuel-efficient models?

The easiest way to find out about the newest police vehicle models is to review the results from the Michigan State Police driving tests, for the most recent model year.

<https://www.michigan.gov/msp/0,4643,7-123--16274--,00.html>

As a second step, and to gather more information, we recommend following up on specific models by looking at specifications on manufacturers' websites, which often have specific sections devoted to police vehicles. Then call a local dealer to find out what is available in your region.

	Vehicle	Year	Type	Drive	Engine # cylinders, hp@RPM	MPG Combined (City/Highway)	Acceleration (0-100 MPH) seconds	Braking distance (60 MPH to stop) feet
Pursuit-Rated	Chevrolet Caprice (Police Pursuit Vehicle) <i>discontinued 2017</i>	2017	Sedan	RWD	V6, 301@6700	21 (18/26)	19.3	127
		2017	Sedan	RWD	V8, 355@5700	18 (15/24)	14.4	127
	Chevrolet Impala (Ltd Police Vehicle)	2016	Sedan	FWD	V6, 302@6800	21 (17/28)	19.5	136
	Chevrolet Tahoe (Police Pursuit Vehicle)	2018	SUV	RWD	V8, 355@5600	19 (16/23)	19.3	146
		2018	SUV	AWD	V8, 355@5600	18 (16/22)	19.8	148
	Dodge Charger (Pursuit)	2018	Sedan	RWD	V6, 292@6400	20 (18/26)	20.2	133
		2018	Sedan	RWD	V8, 370@5250	18 (16/25)	15.3	134
		2018	Sedan	AWD	V8, 370@5250	18 (15/23)	14.4	136
	Ford Crown Victoria (Interceptor) <i>discontinued 2011</i>	2011	Sedan	RWD	V8, 250@5000	17 (14/21)	24.4	142
	Ford Explorer (Police Interceptor Utility)	2018	SUV	AWD	V6, 304@6250	17 (15/20)	19.9	131
		2018	SUV	AWD	V6 with EcoBoost, 365@5500	17 (15/20)	15.6	136
	Ford Taurus (Police Interceptor Sedan)	2018	Sedan	FWD	V6, 288@6500	20 (17/25)	18.7	133
		2018	Sedan	AWD	V6, 305@6500	18 (16/22)	18.2	134
		2018	Sedan	AWD	V6 with EcoBoost, 365@5500	18 (15/22)	13.5	142
Ford Fusion (Police Responder Hybrid)	2018	Sedan	FWD	Combined HP=188	38 (36/40)	24.4	136	
<i>Ford Explorer (Police Interceptor Utility Hybrid)</i>	<i>2020</i>	<i>SUV</i>	<i>AWD</i>		<i>24*</i>	<i>17.7</i>	<i>132</i>	
Special Service	Chevrolet Tahoe (Special Service Vehicle)	2018	SUV	AWD	V8, 355@5600	18 (16/22)		
	Ford Expedition (Special Service Vehicle)	2018	SUV	AWD	V6 with EcoBoost, 375@5000	19 (17/22)		
	<i>Ford Fusion (Special Service Vehicle Hybrid Plug-In)</i>	<i>2019</i>	<i>Sedan</i>	<i>FWD</i>		<i>42 (41/43)</i>		

Table 2. Police vehicle specifications for commonly purchased and hybrid models. Data for current vehicle models was obtained from the Michigan State Police driving test reports. **Data in italics for upcoming model years was obtained from the manufacturer’s website.*

Purchasing: Grant Funding and Discounts

Massachusetts Electric Vehicle Incentive Program (MassEVIP)

MassEVIP is an open-enrollment grant program administered by the Massachusetts Department of Environmental Protection (MassDEP), providing incentives to eligible state and municipal entities for the acquisition of electric vehicles, zero-emission electric motorcycles, and the installation of Level 2 dual-port charging stations. To date, MassEVIP has provided 83 entities with nearly \$2.3 million in funds to acquire 267 electric vehicles and 92 dual-port charging stations. <https://www.mass.gov/how-to/apply-for-massevip-fleets-incentives>

Massachusetts Green Community Designation and Grant Program

More than half of the municipalities across the state of Massachusetts have opted to join the Green Community Program since its launch in 2010. As designated “Green Communities,” municipalities are able to receive both funding and guidance from the state in pursuit of improved energy efficiency and clean energy. Once designated, municipalities receive an initial grant of up to \$125,000 to fund energy efficiency projects in both municipal buildings and municipal fleets. Subsequently, municipalities are eligible for additional funds through competitive grant competitions, which can include financing of hybrid, hybrid plug-in, and electric vehicles, as well as electric vehicle infrastructure.

<https://www.mass.gov/guides/becoming-a-designated-green-community>

State Contract VEH98: Vehicle Purchases

The Massachusetts OSD offers a statewide contract (VEH98) to assist municipalities in purchasing vehicles. As of May 2018, the VEH98 contract offers over 500 different vehicle models to Massachusetts municipalities, at an average savings of 23% below MSRP, alongside vehicle accessories discounted up to 10%. Questions? Contact the contract manager: David Sargeant, david.sargeant@mass.gov, 617-720-3118

<https://www.mass.gov/files/documents/2019/04/12/VEH98.pdf>

State Contract VEH102: Advanced Vehicle Equipment, Supplies, and Services

This Massachusetts OSD contract offers municipalities discounts on electric vehicle charging stations, as well as other fuel-saving and environmentally-friendly vehicle accessories, including idle reduction technology. Questions? Contact the contract manager: Ted Dobbin, Edward.Dobbin@mass.gov, 617-626-7383

<https://www.mass.gov/files/documents/2018/11/09/VEH102.pdf>

FIRE TRUCKS



Many fire department fleets include one or more administrative vehicles, SUVs, or pickup trucks; recommendations for these types of vehicles are described in earlier sections of this guide. This section describes recommendations specifically regarding fire trucks.

What do I need to know when purchasing a fire truck?

Fuel-efficiency is rarely a consideration in fire truck design. Fire trucks are heavy, with Gross Vehicle Weight Ratings (GVWR) in excess of 8,500 lbs, which means that manufacturers are not required to report fuel economy ratings (MPG) to the EPA. Further, these vehicles are critical, life-saving equipment, designed for emergency situations. There is little market pressure to increase vehicle efficiency, and we are not aware of any fuel-efficient options.

Fire vehicles are rarely deployed relative to other municipal vehicles. Particularly in rural Massachusetts communities, fire vehicles are used rarely, compared to other municipal vehicles. This means that although fire vehicles are heavy-duty equipment with extremely low fuel economy (less than 5 MPG), they generally represent only a small percentage of total municipal fuel usage (about 8% of municipal vehicle fuel usage in Green Communities in 2016).

Limiting deployment of large fire vehicles can save fuel. Fire departments around the country have seen significant fuel savings through deployment of vehicles appropriate to the emergency response required. Many fire departments regularly respond to emergency calls that do not involve any risk of fire. If emergency response personnel have ready access to smaller emergency vehicles with the medical and life-saving equipment they need, deployment of large fire vehicles can be reduced, without in any way impacting public safety.

Idle reduction technologies can help save fuel. Fire trucks often spend long periods idling at an emergency scene. There are a number of idle management systems designed specifically for emergency vehicles available on the market. Idle management systems regulate idling based on electricity needs and maintaining appropriate charge in the vehicle battery. Auxiliary power units fueled by diesel or electricity can provide electric power while the vehicle is off. Plug-in hybrid battery systems can provide power take-off to fuel water pumps, lifts, or other equipment. Check out the compendium of idle reduction equipment on the Argonne National Laboratory site (<https://www.anl.gov/es/reference/compendium-of-idling-reduction-equipment-for-class-18-vehicles>), and look under the Medium-Duty and Heavy-Duty Vehicle columns for products appropriate for emergency vehicles. Then contact the manufacturer to identify the correct product.

AMBULANCES



What do I need to know when purchasing an ambulance?

Comparing the fuel efficiency of ambulance models can be challenging. Ambulances are heavy vehicles, with Gross Vehicle Weight Ratings (GVWR) in excess of 8,500 lbs, which means that manufacturers are not required to report fuel economy ratings (MPG) to the EPA. Manufacturers therefore have little incentive to improve the efficiency of these vehicles. Further, these vehicles are critical, life-saving equipment, which means that fleet managers are reluctant to explore new, potentially untested, technologies when making a vehicle purchase.

Idle reduction technologies can help save fuel. Ambulances may spend long periods idling at an emergency scene. A number of idle management systems designed specifically for emergency vehicles are available on the market. Electric stop/start systems regulate idling based on electricity needs and maintaining appropriate charge in the vehicle battery. These systems do not slow start times for vehicles when response workers must leave an emergency scene quickly. Check out the compendium of idle reduction equipment on the Argonne National Laboratory site (<https://www.anl.gov/es/reference/compendium-of-idling-reduction-equipment-for-class-18-vehicles>), and look under the Light-Duty, Medium-Duty, and Heavy-Duty Vehicle columns for products appropriate for emergency vehicles and ambulances. Then contact the manufacturer to identify the correct product.

What fuel-efficient models are currently available?

One hybrid ambulance option is currently available. XL Hybrids (www.xlfleet.com) has a conversion system available for Ford E-350 ambulances that is approved by the manufacturer. This system provides about a 25% increase in fuel economy.

HIGHWAY DEPARTMENT VEHICLES



Many highway department or department of public works (DPW) vehicles are heavy-duty and it can be hard to find fuel-efficient options. This section contains information about street sweepers, dump trucks, and tractors, loaders, and backhoes. We do not currently have recommendations regarding flatbed trucks, trailers, chippers, or other vehicles. Note that some highway department vehicles are built on the chassis of a pickup truck (e.g. plow trucks). For information about pickup trucks, as well as administrative vehicles and SUVs, see earlier sections of this guide.

STREET SWEEPERS

Many Green Communities that have a street sweeper vehicle report owning an Elgin Pelican Street Sweeper. We are aware of only one street sweeper available as a hybrid. Global Environmental Products reports that its new hybrid Global M4 street sweeper will reduce fuel use by 50% (<https://globalsweeper.com/products/global-m4-hybrid>).

TRACTORS, LOADERS, AND BACKHOES

Most Massachusetts highway departments and departments of public works (DPWs) own at least one tractor, loader, or backhoe, or a vehicle that combines multiple of these functionalities.

What do I need to know when purchasing a tractor, loader or backhoe?

Limited fuel economy data are available from the University of Nebraska. Because many of these vehicles have a Gross Vehicle Weight Rating (GVWR) of over 8,500 lbs, manufacturers are often not required to provide fuel economy data for these vehicles. However, the University of Nebraska does conduct testing of a wide variety of tractors, and reports fuel consumption in terms of gallons per hour and horsepower hours per gallon, as well as other specifications: (<https://tractortestlab.unl.edu/testreports>).

Manufacturers are developing a range of fuel-saving technologies for this equipment, including idle reduction systems, “power” and “economy” modes, and instrument panels to help operators track fuel efficiency.

Hybrid systems are beginning to be available. For example, John Deere offers a hybrid front loader (<https://www.deere.com/en/loaders/wheel-loaders/644k-hybrid-wheel-loader>).

Biodiesel is an environmentally-friendly choice for heavy-duty equipment. Where fuel-efficient options are limited, consider biodiesel as an option to reduce overall emissions. Most diesel vehicles do not require any modification to run on biodiesel or diesel/biodiesel blends. See our fact sheet on *Using Biodiesel in Municipal Vehicles* for more information.

What vehicle models do municipalities typically purchase?

In Green Communities reporting, municipalities rarely report the exact models of tractors, loaders, or backhoes used in their fleets. However, Massachusetts communities typically purchase from companies like Caterpillar, Case, John Deere, Komatsu, and Volvo.

What fuel-efficient models are currently available?

Tractors, loaders, and backhoes come in a range of sizes and configurations. Because municipalities use different combinations of equipment, it is difficult to recommend a specific model, and at this point in time, there is no clear leader in fuel efficiency. Instead, multiple companies are developing fuel-efficient technologies to reduce fuel consumption by the vehicles they sell. In order to find the most fuel-efficient model appropriate to your municipality’s needs, we recommend following the process outlined in the next section.

How do I find and compare fuel-efficient models?

Unless you use a tractor, loader, or backhoe in your line of work, you are likely to be less familiar with these vehicles than with vehicles commonly purchased for personal use, such as passenger cars, SUVs, or pickup trucks. We recommend following this process to identify fuel-efficient options:

- 1. Start by talking with department staff.** As a first step in identifying fuel-efficient options, we recommend consulting with highway or DPW staff to identify the necessary specifications for the vehicle to be purchased, and find out which model they are interested in purchasing, or what model the new vehicle will be replacing.
- 2. Ask the company that makes the preferred model about fuel-saving features.** Contact the company that makes the model preferred by department staff. Ask if they have any fuel-efficient features that are included as part of the standard package, or that could be included for an additional cost. Depending on the company, the name of the features may vary, but there are a variety of fuel-saving technologies that multiple companies provide. These include idle management systems that automatically put the vehicle into idle mode or shut the engine down after a certain length of time, or that reduce the amount of gas being consumed during idling. Other systems automatically tailor the power curve to the work that is being performed, or allow the operator to choose between “economy” mode for light work (such as moving mulch and snow), and “power” mode for moving heavy debris. Some vehicles come with telematics software, or have advanced instrument panels that show the operator how quickly the vehicle is burning fuel, guiding him/her towards more efficient operation. Some models have 5-speed transmissions, that allowing for efficient travel at higher speeds, which is appropriate for equipment that will be traveling under its own power between work zones and the garage location. If fuel-saving components will come at additional cost, ask about those additional costs, and what the amount of fuel savings are expected to be.
- 3. Ask the company that makes the preferred model if a hybrid option is available.**
- 4. Comparison shop across other companies.** Choose a few other companies that make comparable equipment – if you are not sure who to contact, try the companies listed above as commonly used by Massachusetts municipalities. Ask if they have a vehicle with similar specifications to the model preferred by your department, and follow the same process described above to ask about any fuel-saving, hybrid, or electric features. Komatsu has introduced a line of excavators with an electric swing arm, and it is worth asking about this feature, if purchasing an excavator. Ask for a specification sheet, if available, which includes fuel usage (gallons per hour, or horsepower-hours per gallon).
- 5. Check fuel usage data from the University of Nebraska.** Check on the Tractor Test Lab site (<https://tractortestlab.unl.edu/testreports>) to see if fuel usage data is available for the models you are considering.

DUMP TRUCKS

Many rural municipalities have at least one dump truck. Fuel-efficient options are not yet widely available, but hybrid and electric options are under development.

What do I need to know when purchasing a dump truck?

Fuel economy data are not available for most models. Dump trucks typically have a Gross Vehicle Weight Rating (GVWR) of over 8,500 lbs, so manufacturers are not required to report fuel economy (MPG). Some dump trucks are built on the chassis of pickup trucks, but these pickup truck models also typically fall into the higher GVWR classes. Fuel economy is low across the board for dump trucks. When loaded, fuel economy is typically under 5 MPG.

Hybrid and electric options are in development. A number of companies, including GE, Mack, and Kenworth, are piloting hybrid, plug-in hybrid, and electric dump trucks, but these models are not yet widely available on the market.

Idle reduction technologies may be able to significantly reduce fuel usage. Depending on the use, dump trucks may be kept idling during long periods of time while loading. Idle management systems may be appropriate to control idling periods; auxiliary power units can also power hydraulics or cabin electronics during periods when the engine is off. Argonne National Laboratory provides a vetted list of idle reduction technologies, manufacturers, and contact information, at this link: <https://www.anl.gov/es/reference/compendium-of-idling-reduction-equipment-for-class-18-vehicles>.

Adaptable equipment combinations can allow for greater versatility. If your municipality has a dedicated truck for salting the roads that does not get used in the summer, consider a swaploader for your next dump/plow truck. A swaploader allows for a salter to be switched out with a dump body. See: <https://www.swaploader.com/>

What vehicle models do municipalities typically purchase?

In Green Communities reporting, municipalities rarely report the exact models of dump trucks used in their fleets. Chevrolet, Ford, Mack, Peterbilt, and Sterling are common manufacturers used by municipalities, but dump trucks are purchased from a variety of suppliers, including American General, Freightliner, GMC, International, Kaiser, Oshkosh, and Western Star.

What fuel-efficient models are currently available?

Dump trucks come in a range of sizes and configurations. Because municipalities use different combinations of equipment, it is difficult to recommend a specific model, and at this point in time, with fuel economy data unavailable, it is not possible to identify high-efficiency models. Hybrid, plug-in hybrid, and electric models are being developed by a number of manufacturers, but they are not yet widely commercially available.

How do I find and compare fuel-efficient models?

In the current market, there is not an easy way to identify fuel-efficient dump trucks. The best option may be to determine whether idle management technologies are available and appropriate for dump trucks your municipality is considering. A listing of these technologies is available from Argonne National Laboratory (<https://www.anl.gov/es/reference/compendium-of-idling-reduction-equipment-for-class-18-vehicles>).