Municipal Green Vehicle Technology

November 1, 2016

New Bedford, MA – EVIP vehicles and charging stations
<table>
<thead>
<tr>
<th>Time</th>
<th>Presenter</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00 – 9:15 AM</td>
<td>Mark Fine, MAPC</td>
<td>Welcome &amp; Introductions</td>
</tr>
<tr>
<td>9:25 – 9:32 AM</td>
<td>Megan Aki, MAPC</td>
<td>Overview of VEH102, the New Statewide Contract for Green Vehicle Technology</td>
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<tr>
<td>9:55 – 10:05 AM</td>
<td>Alison Felix, MAPC</td>
<td>Q&amp;A with All Presenters</td>
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<tr>
<td>10:05 – 11:00 AM</td>
<td>VEH102 Vendor Coffee Hour</td>
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</table>
• 101 municipalities
• 1,440 square miles
• Nearly 3.2 million residents
• 1.8 million jobs (2010 Census)
“POPCORN” QUESTIONS

1. INTEREST - Why are you interested in green vehicle technology?

2. BARRIERS - What do you see as the biggest barrier for your city/town in greening your fleet?

3. QUESTIONS - What are some questions you already have about green vehicle technology?
Fleets for the Future: Alternative fuels and electric vehicle trends

Philip Kreycik
Meister Consultants Group
MAPC Municipal Green Vehicle Technology Workshop
November 1, 2016
1. About Fleets for the Future

2. Importance of Clean Transportation in Massachusetts

3. EVs in Massachusetts
Goal: Accelerate the deployment of alt fuel vehicles (AFVs) by reducing their incremental costs and building fleet capacity to plan procurements.

Scope: Propane, electric, and natural gas vehicles

Motivation:

• Minimize emissions
• Improve air quality
• Reduce fuel costs
• Tap into domestic fuels that have less price volatility
Approach

- **Convene** regional councils, Clean Cities coalitions, and industry leaders.

- **Teach** fleets about best practices on AFV deployment, as well as vehicle procurement strategies.

- **Consolidate** bulk orders of AFVs and associated technologies.
A national partnership

fleets for the future

- Mid-America Regional Council (MARC)
  - Greater Kansas City: 1.8 million
  - Mo. and Kan. bi-state: 8.842 million

- Metropolitan Washington COG (MWCOG)
  - District of Columbia: 4.7 million
  - Suburban Md., northern Va.: 14.376 million

- North Central Texas Council of Governments (NCTCOG)
  - Dallas-Fort Worth: 6.603 million
  - Texas: 25.145 million

- Pima Association of Governments (PAG)
  - Tucson: 980,263
  - Ariz.: 6.392 million

- Metropolitan Area Planning Council (MAPC)
  - Greater Boston: 4.732 million
  - Mass.: 6.547 million

- Clean Cities Coalition outreach areas:
  - New York, Ohio, Utah, Washington
Sample vehicle types

**CNG**
- Class 4-6 trucks with utility body (e.g. Ford F450 and up)
- ½ to 1-ton pickups (e.g. Ram 2500)
- Refuse haulers (e.g. Mack, Crane)

**Propane**
- Bluebird school buses
- Delivery vehicles
- Law enforcement (Ford Explorer SUV, Ford Taurus, Chevy Tahoe, Dodge Charger)
- Ford Transit

**Electric Vehicles**
- Sedans
  - PHEV: Chevy Volt, Ford Fusion, Ford C-MAX
  - BEV: Nissan Leaf, Smart ForTwo
  - Anticipated: Chevy Bolt and Spark, Ford Focus, BMW i3
- Port vehicles
- Retrofit hybridization

Selection factors: High mileage/multiple shifts, low MPG, long idle times, high maintenance expenses, predictable routes
AFV Survey

• Will guide MAPC’s procurement
• Very short (13 questions)
  – Vehicle replacement needs
  – Infrastructure availability
  – Maintenance practices
  – Financing practices
Importance of Clean Transportation
Greenhouse gas

Transportation is the sector that produces the most GHG in Massachusetts

GHG Emissions By Sector


http://www.mass.gov/eea/docs/dep/air/climate/maghginv.xls
Growing population and rising travel demand makes clean vehicles especially important.
Greenhouse gas emissions by fuel type

Source: GREET AFLEET model, 2015
Co-benefits of electric and alternate fuel vehicles

All alt fuels

– Cleaner combustion -> Better air quality
– Diversity of feedstocks -> Price stability
– Primarily domestic feedstocks
– Higher efficiency -> Lower TCO

Electricity

– Power sector is getting greener and is already cleaner than gasoline and diesel
Fuel price volatility: a major concern for fleets

EV ~ $0.035 /mi
ICE ~ $0.12 / mi

Source: DOE AFDC
*Electricity prices are reduced by a factor of 3.4 because electric motors are approximately 3.4 times as efficient as internal combustion engines
Electric Vehicles

F4F
Existing and upcoming MA programs

VEH102: Advanced Vehicle Technology Equipment, Supplies and Services

VEH98: Selection of Environmentally Preferred Vehicles
Electric vehicles in 2016

Affordable
- Upfront cost can be mitigated by fleet discounts, tax credits
- Fuel Costs: EV ~ $0.035/mi, versus ICE ~ $0.12/mi

Sufficient range
- Rapid improvement in battery technology and cost
- Vehicles with >200 miles range are now common
- >90% of daily driving needs can be served by an EV

Reasonable charge times
- Don’t always need a full charge
- L2: 10 – 20 miles per hour of charging
- DCFC: 50 – 70 miles per 20 minutes of charging
Electric vehicles in 2016

- **Wider selection**
  - MY 2016: 11 BEV models and 15 PHEV models
  - Highly anticipated new options in MY 2017

- **Improved cold weather range**
  - Cold weather reduces efficiency of all vehicles
  - A Nissan Leaf could still get > 80 MPGe at 20° F

- **Fun to drive**
  - Some of the fastest vehicles available, exceptional torque
  - Tesla model S goes 0-60 in 3.9 seconds
Hundreds of EVs being deployed by gov’t fleets in 2016

Boston metro area is poised for more EV deployment.

Recent fleet procurements:
• NYC: 323 PHEVs
• Los Angeles: 199 BMW i3 BEVs
• Indianapolis: 250+ PHEVs & BEVs
• Atlanta: 50+ PHEVs & BEVs

More than 440 charging stations in MA.
Source: DOE’s Alternative Fuel Data Center Station Locator
Total cost of ownership for most popular municipal fleet EVs

<table>
<thead>
<tr>
<th>Make/Model</th>
<th>Nissan Leaf</th>
<th>Ford Focus</th>
<th>Chevy Volt</th>
<th>Ford Focus</th>
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<tbody>
<tr>
<td>Category</td>
<td>BEV</td>
<td>BEV</td>
<td>PHEV</td>
<td>ICE</td>
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<tr>
<td>Battery Size</td>
<td>30 kWh</td>
<td>23 kWh</td>
<td>18.4 kWh</td>
<td>2.0 L - V4</td>
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<tr>
<td>MSRP</td>
<td>$34,200</td>
<td>$29,170</td>
<td>$33,170</td>
<td>$23,225</td>
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<tr>
<td>Incremental Cost</td>
<td>$10,975</td>
<td>$5,945</td>
<td>$9,945</td>
<td>$0</td>
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<tr>
<td>All-Electric Range</td>
<td>107 miles</td>
<td>76 miles</td>
<td>53 miles</td>
<td>n/a</td>
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<tr>
<td>EPA MPG Rating</td>
<td>112 MPGe</td>
<td>105 MPGe</td>
<td>106 MPGe</td>
<td>31 MPG</td>
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<tr>
<td>Charge Time (240v)</td>
<td>8 hours</td>
<td>4 hours</td>
<td>4 hours</td>
<td>n/a</td>
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<tr>
<td>Est. Annual Fuel Cost</td>
<td>$550</td>
<td>$600</td>
<td>$800</td>
<td>$1,000</td>
</tr>
<tr>
<td>TCO/mi</td>
<td>$0.46</td>
<td>$0.42</td>
<td>$0.46</td>
<td><strong>$0.41</strong></td>
</tr>
</tbody>
</table>

Estimates are based on a local example in Colorado, where there is a state tax credit in addition to the $7.5k federal credit. Fuel costs are estimated at $0.12/kWh and $2.24 / gallon. Use assumes 12k miles per year over 10 years. Estimates will vary significantly when adjusted for specific local circumstances. TC = Tax Credit. Source: Electrification Coalition
EV group buys: Drive Electric Northern Colorado

- Pre-negotiated **group pricing** thru area dealerships
- Time-limited
- Implemented by a trusted 3rd party
How do I get involved?

• Provide input
  – MAPC Advisory Committee
  – Survey

• Review F4F guidance documents
  – AFV transition planning
  – Financing AFV procurement
  – Deploying electric vehicles
  – Deploying natural gas and propane vehicles
ALTERNATIVE FUEL ADOPTION IN MASSACHUSETTS

Public Fuel Stations

Vehicle Inventory

- Alternative Fuel Vehicles
- Electric, Hybrid and Plug-In Vehicles

<table>
<thead>
<tr>
<th>Year</th>
<th>Public Fuel Stations</th>
<th>Vehicle Inventory</th>
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<tbody>
<tr>
<td>2012</td>
<td>78</td>
<td>1,036</td>
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<tr>
<td>2013</td>
<td>126</td>
<td>930</td>
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<tr>
<td>2014</td>
<td>469</td>
<td>912</td>
</tr>
<tr>
<td></td>
<td></td>
<td>905</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2,135</td>
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<tr>
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<td>7,622</td>
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</table>
Service Category 1: Electric Vehicle Supply Equipment (EVSE), Hardware, Software, and Ancillary Services

Service Category 2: Idle Reduction Technologies for Heavy, Medium, and Light Duty Vehicles; and Heavy Duty Equipment

Service Category 3: After-market conversion technologies – all vehicle classes
ELECTRIC VEHICLE SUPPLY EQUIPMENT

**LEVEL 1**

**120V AC → LVL 1**

8-20+ hours

Overnight charging for vehicles that will travel under 40 miles during the day

**LEVEL 2**

**240V AC → LVL 2**

4-8 hours

Most practical municipal applications, can add 10-25 miles of range in one hour of charging

**480V → DC FAST CHARGER**

30 mins

Applications make most sense along highways at rest areas for a short duration charge that provides range for long distance travel

**ANTI-IDLING TECHNOLOGY**

Use of lights, radios, computers, radar and video cameras while monitoring traffic, assisting at accident scenes, writing reports, etc.

Use of lights and other accessories while idled on call, water pumping requires additional power.

Use of lighting, communications, refrigeration, life support, heating and cooling while waiting for an Emergency Call

Frequent stops for deliveries and pickups, use of heating and cooling while idling

- Power Management System
- Heat Recovery System
- Battery APU
- Battery APU
- Battery APU or Power Pack
- Electrified Parking Space
- Battery APU
- Heat Recovery System
HYBRID RETROFIT TECHNOLOGY

*Keep your favorite ride, while saving money and reducing your carbon footprint.*

Light & medium duty vehicles for retrofit or up-fit

Vehicle downtime for installation minimal – typically one day on or offsite

20-35% reduction in fuel consumption – depending on vehicle type and usage.
<table>
<thead>
<tr>
<th>VENDOR</th>
<th>Category 1</th>
<th>Category 2</th>
<th>Category 3</th>
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<tbody>
<tr>
<td>ClipperCreek, Inc.</td>
<td>√</td>
<td></td>
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<tr>
<td>EVSE, LLC</td>
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<tr>
<td>Graybar Electric Company, Inc.</td>
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<td>Verdek</td>
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<td>Voltrek, LLC</td>
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<td>eNow, Inc.</td>
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<td>Magmotor Technologies, Inc.</td>
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<tr>
<td>National Fleet Hybrids</td>
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<tr>
<td>XL Hybrids</td>
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</table>
WHAT’S NEXT?

Assess your fleet and/or community charging infrastructure needs

Identify suitable applications within your fleet for green vehicle technology

Purchase easily off the statewide contract and work with the selected vendors to arrange install.
Massachusetts’ Alternative Fuel Vehicle Efforts, Available Contracts, and Financing Opportunities
Creating A Greener Energy Future For the Commonwealth

The Department of Energy Resources - Alternative Transportation/Clean Cities

Biodiesel

EVs

Natural gas
Clean Cities’ Mission
To advance the energy, economic, and environmental security of the U.S. by supporting local decisions to adopt practices that contribute to the reduction of petroleum consumption in the transportation sector.

- Clean Cities are a resource to both public and private fleets.
- They are a catalyst to match fleets with resources needed.
- They are the go-to folks for technical resources for alternative fuels and technologies.
- It is a DOE funded program
Clean Cities are a resource to both public and private fleets.

We are a catalyst to match fleets with resources needed.

Massachusetts Clean cities coalition has meetings every 2 months featuring new technologies to reduce fuel consumption.

They are the go-to folks for technical resources for alternative fuels and technologies.
Clean Cities portfolio of alternative fuels

**Alternative Fuels**
Biodiesel (B100)
Electricity
Ethanol (E85)
Hydrogen
Natural gas
Propane

**Fuel Blends – commonly used**
Biodiesel/diesel blends (B2, B5, B20)
Ethanol/gasoline blends (E10)
Hydrogen/natural gas blends (HCNG)
Diesel/CNG
Clean Cities portfolio technologies

- **Fuel Economy**
  - Fuel efficiency
  - Behavioral changes
  - Vehicle maintenance initiatives
  - Vehicle miles traveled (VMT)

- **Hybrids**
  - Light- and Heavy-duty HEVs
  - PHEVs

- **Idle Reduction**
  - Heavy-duty trucks
  - School buses
  - Truck stop electrification

Alternative fuels - CNG – Trash trucks  Electric - School bus  Hybrid electric conversion - Light duty and MD
What is DOER up to?

• Electric school bus V2G pilot in 4 communities
• Funded CNG/Propane hybrid electric conversions and hydraulic hybrid conversions and Infrastructure projects
• Stay tuned for more funding for the differential cost of Alternative fuels
• Funded two biodiesel plants to increase local production of Biodiesel
• Manage the MOR-EV rebate program
• Assisted in the development of VEH102
• Continue to be a resource to fleets to assist in alternative fuel decision making
Clean Cities Web site
www.eere.energy.gov/ccities

Alternative Fuels & Advanced Vehicles Data Center Web site
www.eere.energy.gov/afdc

Clean Cities Coordinator Contact Information and Coalition Web sites
http://www.afdc.energy.gov/cleancities/progs/coordinators.php

Massachusetts Electric Vehicle Incentive Program web site:
www.mass.gov/eea/agencies/massdep/air/grants/massevip.html
For information on alternative fuel vehicles and the Clean Vehicle grant program contact:

Stephen Russell  
Massachusetts Clean Cities Coalition  
[www.mass.gov/energy/cleancities](http://www.mass.gov/energy/cleancities)

Michelle Broussard  
Michelle.brousard@state.ma.us

For information on the MASSEVIP program at DEP contact:

Sejal Shah  
Sejal.shah@state.ma.us
Green Vehicle Technology workshop

November 1st, 2016

Serving Public Buyers and Vendors of the Commonwealth of Massachusetts
Operational Services Division

Oversight agency of the Commonwealth within the Executive Office for Administration and Finance

- Commonwealth’s Central Procurement Agency
  - Statewide Contracts
- COMMBUYS
- Programs and Services – Supplier Diversity office
- Office of Vehicle Management
Statewide Contracts

Overview

• Contracts procured for specific commodities and services which may be used by any executive department or eligible entity.

• Established by OSD or an OSD-Designated Department.

• Follow “Best Value Procurement.”

• Every contract has a Contract Manager.

**MGL Chapter 30B**

• Cities and towns and others must follow M.G.L. c. 30B, although they may purchase from OSD statewide contracts.

• per M.G.L. c. 7, §22A and M.G.L. c. 30B, §1(c).
Contract Categories and Naming Convention

Link: Statewide Contract User Guides

CLT - Clothing and Footwear
ENE - Energy, Utilities and Fuel
FAC - Facilities Maintenance and Repair
FIR - Fire/EMS
GRO - Food and Groceries
HLS - Homeland Security
HSP - Healthcare, Lab & Dental Products
ITC - Information Technology - Hardware
ITS - Information Technology - Software & Services
ITT - Information Technology - Telecommunications
LAW - Public Safety, Law Enforcement & Protection
MED - Medical
OFF - Office, Recreation & Educational Supplies
OVM - Vehicles, Transportation & Road Maintenance
PRF - Professional Services

**VEH - Vehicles, Transportation & Road Maintenance**
VEH98 Light Duty Vehicles

Sedans – Vans – Trucks – SUVs – SSVs – PPVs

VEH98 – Light Duty Vehicles

General Tips
- 9 vehicle brands, 11 dealers
- VEH98 Base Vehicle Sheet 500+ vehicles
- VEH98 Quote Form
- Upfit existing vehicles
- Mini-bid process for vehicles not on contract
- Purchase vehicles “Off-the-Lot”

Selecting and Purchasing methods (RFR 3.6)
- Select vehicle (Base Vehicle Sheet or Mini-Bid)
- Place Order on VEH98 Form –
  - Dealer should place order and respond within 1 week, with unique vehicle identifier for vehicle.
- Delivery Requirements (Section 3.6.3):
  - Vendors have 45 day grace period.
  - Penalty – after the 45 days, $5 a day for each late day, up to 25% of the Purchase Order Total.

We want your input, feedback and let me be your resource!
VEH102 Advanced Transportation Technology

**General Tips:**
Base prices for products established
Solicit Multiple Quotes through the awarded vendors
  - Labor services
  - Lower volume discount
Municipal Modernization Action - $50,000 threshold increase

**Service Category 1:** Electric Vehicle Supply Equipment (EVSE), Hardware, Software, and Ancillary Services
Provide Electric Vehicle Supply Equipment, hardware, software and ancillary services to eligible public entities.

**Service Category 2:** Idle Reduction Technologies for Heavy, Medium, and Light Duty Vehicles; and Heavy Duty Equipment

**Service Category 3:** After-market conversion technologies– all vehicle classes
Provide after-market conversion systems modify vehicles and engines so that they can run on – or be supplemented by – fuels or technologies other than the ones for which they were originally designed.
COMMBUYYS

www.COMMBUYYS.com
Advanced Search

Search for:  

- Bid
- Contracts/Blankets

Exit

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### Results

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Massachusetts Electric Vehicle Incentive Program (MassEVIP) - FLEETS

SEJAL P. SHAH

NOVEMBER 1, 2016
WHY EVs?

- Price volatility of gasoline -- How long do you think gas prices will stay low?
- Over the lifetime of an EV, an owner can save thousands of dollars in fuel and maintenance costs.
- EVs not only decrease greenhouse gas (GHG) emissions but also significantly reduce smog forming emissions.
- Same performance as a conventional ICE (Internal Combustion Engine) vehicle.
MassEVIP: Fleets

Provides incentive funding to Massachusetts entities to acquire:

- Battery-electric vehicles (BEVs) – no ICE (Internal Combustion Engine)
- Plug-in hybrid vehicles (PHEVs)
- Level 2 dual head charging stations
MassEVIP: Fleets -- Eligible Entities

- Public Entities
  - Municipalities
  - Public Universities and Colleges
  - State Agencies

Braintree

New Bedford
MassEVIP: Fleets – Vehicle Incentives

$7,500 acquire* Battery Electric Vehicle (BEV)

$5,000 acquire* Plug-in Hybrid Vehicle (PHEVs)

*Acquire = Purchase or Lease

Fall River – Nissan Leaf (4)

Scituate – Chevy Volts (2)

$750 to purchase Zero Emission Motorcycle (ZEM)
MassEVIP: Fleets – Charging Station Incentives

- Incentive* is to acquire and install a Level 2 Dual Head Charging station
- 1-2 BEVs = $7,500
- 3-4 BEVs = $10,500
- 5+ BEVs = $13,500

*Entities must purchase at least one battery electric vehicle to receive incentive for charging station

Melrose Charging Station
MassEVIP: Fleets -- Program Requirements

- Will commit to using the vehicle in the Commonwealth for at least 36 months
- Entities must purchase at least one battery electric vehicle to received incentive for charging station
- Charging station must be publicly accessible and space used specifically for electric vehicles
EVs on State Contract VEH98

Chevrolet Volt
PHEV – 53 miles electric

Ford Fusion PHEV – 20 miles electric

Ford C-Max Energi PHEV – 20 miles electric

Hyundai Sonata PHEV – 27 miles electric

Ford Focus BEV – 76 miles electric

Nissan Leaf BEV – 84-107 miles electric

PHEV = Plug-In Hybrid Electric Vehicle
BEV = Battery Electric Vehicle
EVs NOT on State Contract

VEH98 BUT ELIGIBLE - BEVs

- **Kia Soul EV** – 93 miles electric
- **Smart For Two** – 68 miles electric
- **Mitsubishi I-MiEV** – 62 miles electric
- **VW E-Golf** – 83 miles electric
- **CHEVY BOLT** – 238 miles electric
- **BMW i3** – 81-90 miles electric
- **Mercedes Benz B250e** – 87 miles electric

**BEV** = Battery Electric Vehicle
EVs NOT on State Contract
VEH98 BUT ELIGIBLE - PHEVs

- **Toyota Prius Prime** – 22 miles electric
- **Audi A3 Sportback e-tron** – 30 miles electric
- **BMW 330e** – 22 miles electric
- **Mercedes Benz S-Class 550e** – 20 miles electric
- **BMW X5 xDrive40e** – 19 miles electric

PHEV = Plug-In Hybrid Electric Vehicle
Charging Stations

Chelmsford

Brockton

Barnstable
Through August 31, 2016, awarded ~$1.9 million:

- **57 separate entities**

- **Vehicles and Charging Stations Awarded**
  - 42 Plug-In Hybrid Vehicles (PHEVs)
  - 147 Battery Electric Vehicles (BEVs)
  - 1 Zero Emission Motorcycle (ZEM)
  - 60 Level 2 Dual Head Charging Stations
Massachusetts Electric Vehicle Incentive Program web site:
www.mass.gov/eea/agencies/massdep/air/grants/massevip.html

For information on the MASSEVIP: Fleets program contact:

Ms. Sejal Shah
Sejal.shah@state.ma.us
(617) 556-1015
Natick’s Electric Vehicle Projects
NATICK CASE STUDY
EQUIPMENT
MAINTENANCE

- Maintenance Responsibilities for 205 registered vehicles and 500+ pieces of misc. equipment
- Manages the Town’s only fuel depot
- Vehicle/Equipment Procurement
- Vehicle Insurance Claim Management
- Surplus Property Disposition
OUR FLEET

205
vehicles+

213k
gallons of fuel/year

2.3m
miles/year

$455k
fuel costs/year
MUNICIPAL EMISSIONS

TONS OF CARBON DIOXIDE EQUIVALENTS

FY 2004

345
8,698

1,229
FY 2007

345
7,803

1,397
FY 2015

345
4,463

1,063

Water/Sewer

Vehicle Fleet

Street & Traffic Lights

Buildings

7,803
4,463

2,063

916

345
1,397

1,229

8,698
GREEN INITIATIVES

- Town Policy on Purchase of Fuel Efficient Vehicles
- Fuel Additive
- Pursue Alternative Fuel Vehicles
  - Compressed Natural Gas (CNG)
  - Hybrid Electric
  - All Electric
  - Challenges
- Computerized Maintenance and Service Order System
  - GPS
  - Linked to Fuel Management System
## 2016 Ford Focus Electric

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
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<tbody>
<tr>
<td>State Contract Price</td>
<td>$26,460</td>
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<tr>
<td>MassEVIP Grant</td>
<td>-$7,500</td>
</tr>
<tr>
<td>Incremental DOER Grant</td>
<td>-$9,956</td>
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<tr>
<td><strong>Net Cost to Town</strong></td>
<td><strong>$9,004</strong></td>
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## Charging Station

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
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<tbody>
<tr>
<td>Estimated Cost</td>
<td>$13,025</td>
</tr>
<tr>
<td>MassEVIP Grant</td>
<td>-$7,500</td>
</tr>
<tr>
<td>Incremental DOER Grant</td>
<td>-$5,525</td>
</tr>
<tr>
<td><strong>Net Cost to Town</strong></td>
<td><strong>$0!</strong></td>
</tr>
</tbody>
</table>
THANK YOU

TOWN OF NATICK
WWW.NATICKMA.GOV/249/PUBLIC-WORKS

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JILLIAN WILSON MARTIN

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Q & A

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