

Electric Vehicles 101

Vermont Energy & Climate Action Network

Energizing Vermont Communities

www.vecan.net

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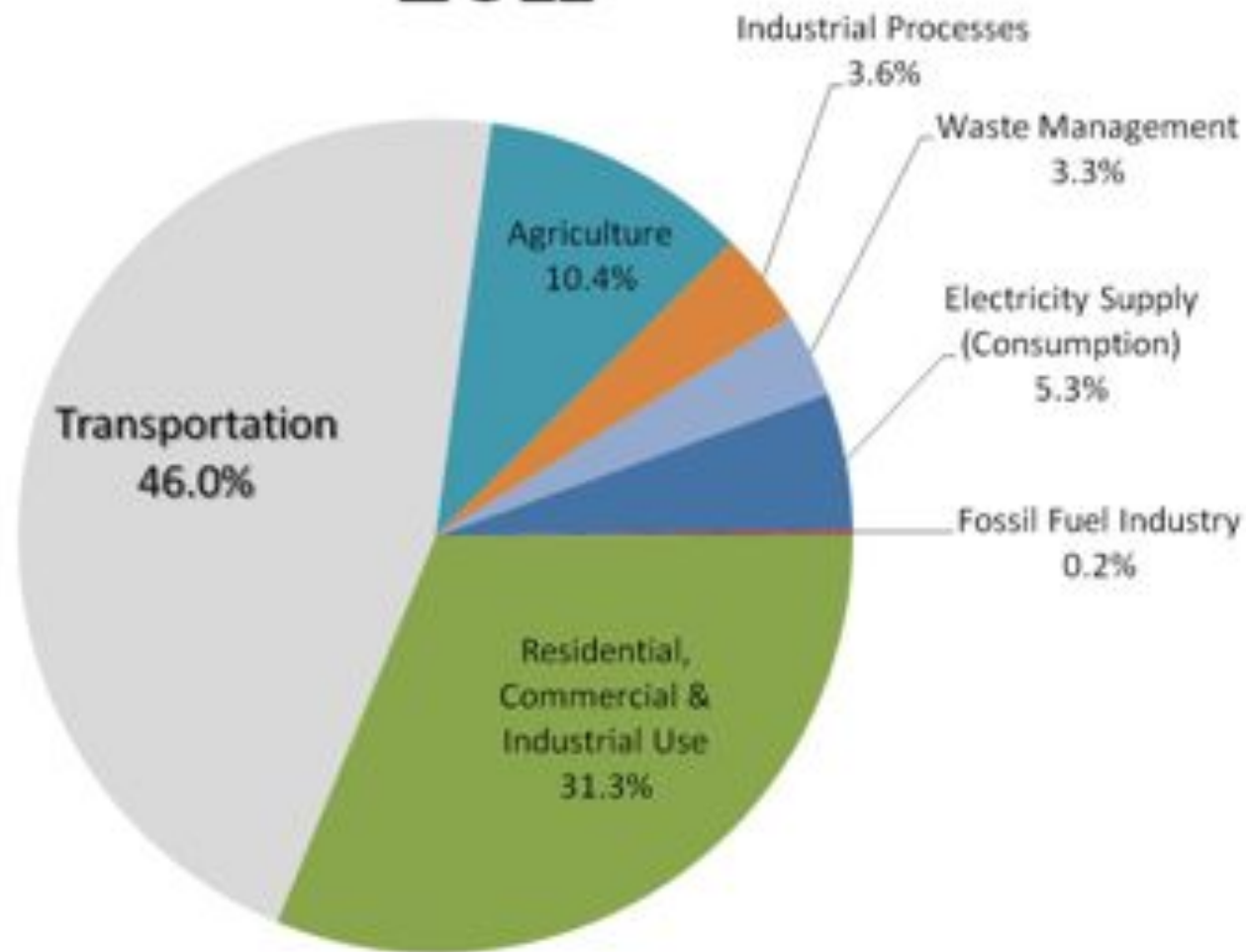
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Overview

1. What is an Electric Vehicle?
2. How do EVs charge?
3. What is the status in Vermont
4. Energy and Climate benefits

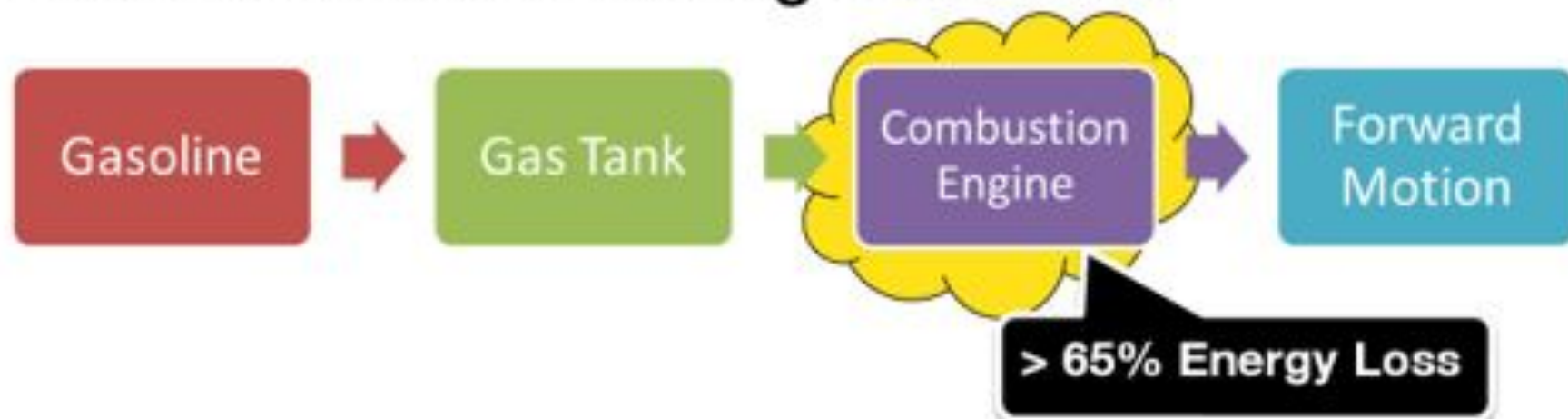


Vermont Greenhouse Gas Emissions 2011



Vehicle Technology Comparison

Internal Combustion Engine Vehicle



Plug-in Electric Vehicle



Untested Technology?



Outdoor Curb-Side Charging Port



Indoor charging stations



Types of Electric Vehicles

- **Hybrid Vehicles – Do Not Plug-In**
 - Powers the vehicle using the engine, electric motor, or both
 - Electric motor uses energy stored in batteries charged by the engine and regenerative braking
- **Plug-in Hybrid Vehicles**
 - Both an internal combustion engine and electric motor that recharges from the electric grid and allows the vehicle to drive on electricity alone
- **All Electric Vehicles**
 - Powered solely by electricity



Electric Vehicles Available

Plug-in Hybrid



Electric Vehicles Available

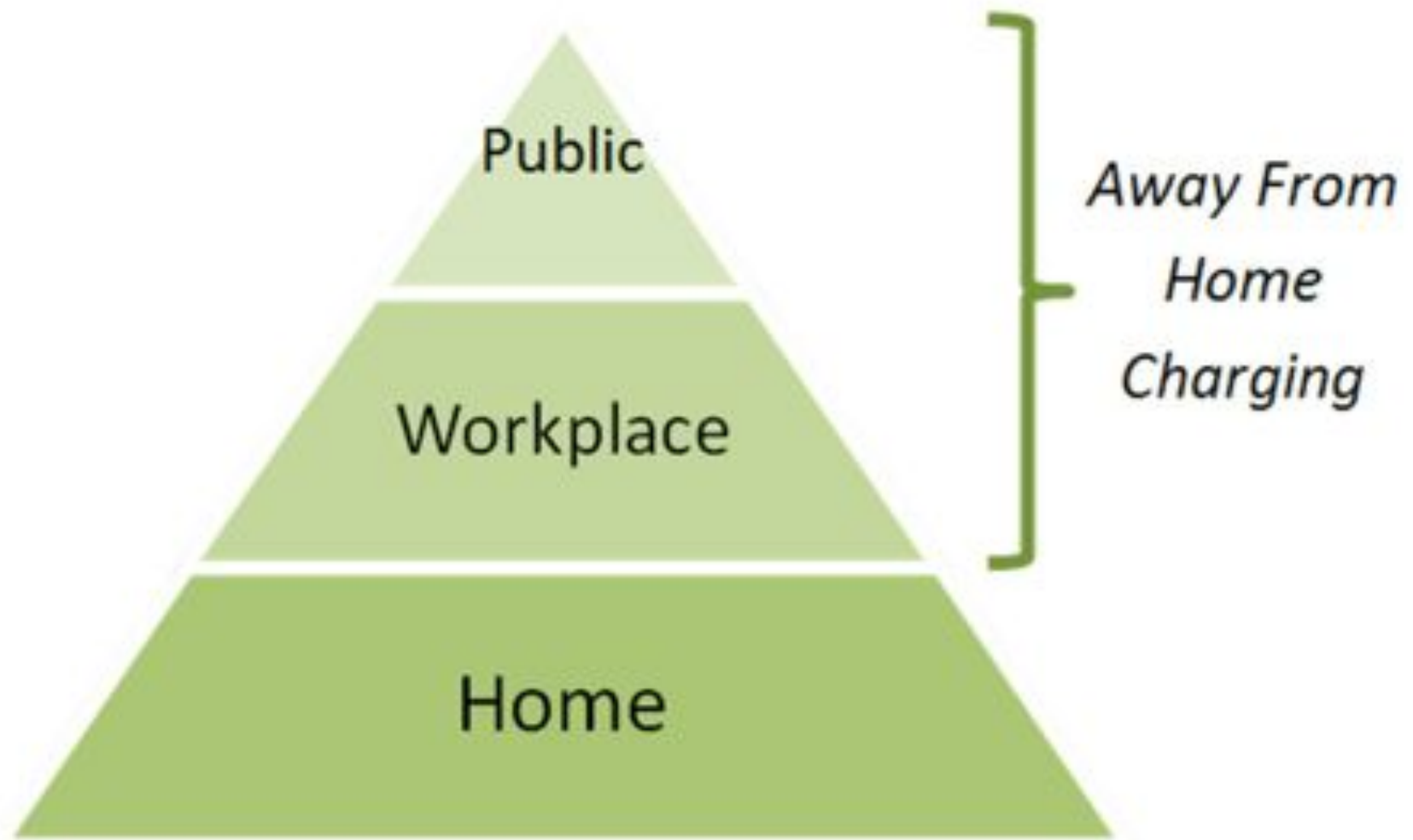
All Electric



Automaker Offerings

OEM	Current EVs	Upcoming Models	Goals/Targets
BMW	ActiveE Fleet (AEV)	i3 (AEV/PHEV), i8	
Chrysler / Fiat	500e (AEV)		
Ford	Focus (AEV), Fusion (PHEV), C-Max (PHEV)		10-25% of 2020 sales electric
GM	Volt (PHEV), Spark (AEV)	Cadillac ELR (PHEV), Cruze (PHEV)	10% of 2020 sales electric, hybrid
Honda	Fit (AEV), Accord (PHEV)		
Hyundai		Sonata (PHEV)	
Kia		Soul (AEV)	
Mercedes	Smart ED (AEV)	B Class E-Cell (PHEV)	
Mitsubishi	i-MiEV (AEV)	Outlander (PHEV)	20% electric and hybrid by 2020
Nissan	Leaf (AEV)	e-NV200 (AEV), Infinity LE (AEV)	10% of 2020 sales electric
Tesla	Roadster , Model S (AEV)	Model X (AEV)	N/A (all electric)
Toyota	Prius Plug-in (PHEV)		30% of 2020 sales electric and hybrid
VW / Audi / Porsche		E-Golf (AEV), A3 E-tron PHEV, Panamera PHEV, 918 PHEV	

EV Charging



Charging Equipment

Level 1 charging
120V



Level 2 charging
208/240V



DC fast charging
480V

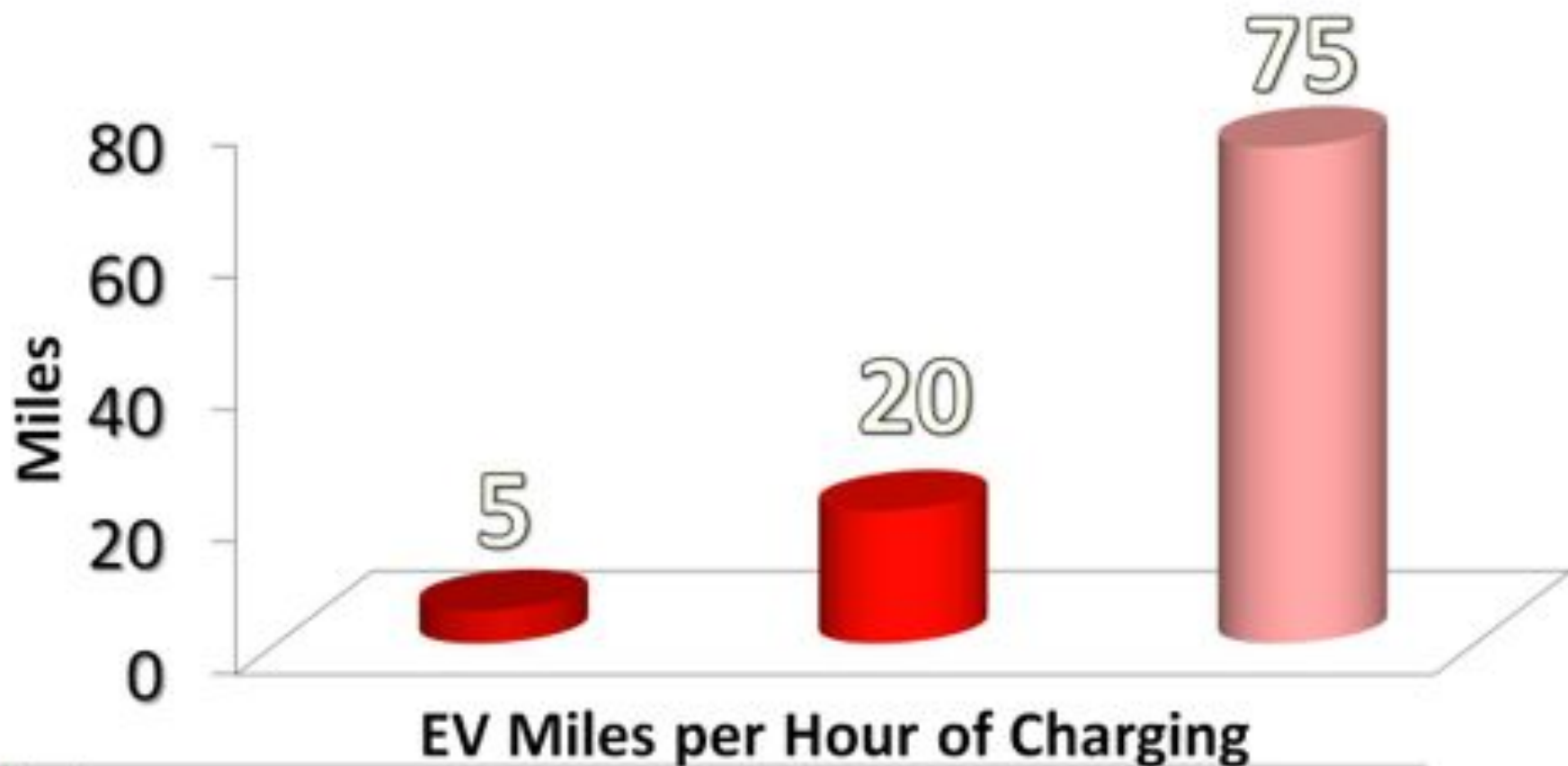


Charging Speed

Level 1 charging
120V

Level 2 charging
208/240V

DC fast charging
480V



Charging Site Selection Criteria

	Level 1	Level 2	DC Fast
Charge Duration	6-10 hours	1-3 hours	15-30 minutes
Typical Users	<ul style="list-style-type: none">Employee parkingLong term commuter parking	<ul style="list-style-type: none">Commercial areaShoppingBusiness	<ul style="list-style-type: none">Long tripsConvenience
Desirable Characteristics	<ul style="list-style-type: none">SecurityTransit ServiceWorkplaces	<ul style="list-style-type: none">Transit servicePedestrian facilitiesShopping, services, etc.	<ul style="list-style-type: none">Amenities at the charging site (food, coffee, Wi-Fi)
Priority Locations	<ul style="list-style-type: none">Park and ride lotsLong term parkingCommunities where EV ownership is more prevalent	<ul style="list-style-type: none">Parking in downtowns, village centers, shopping centers	<ul style="list-style-type: none">Near high volume roadways

Public EV Charging Equipment



Waterbury



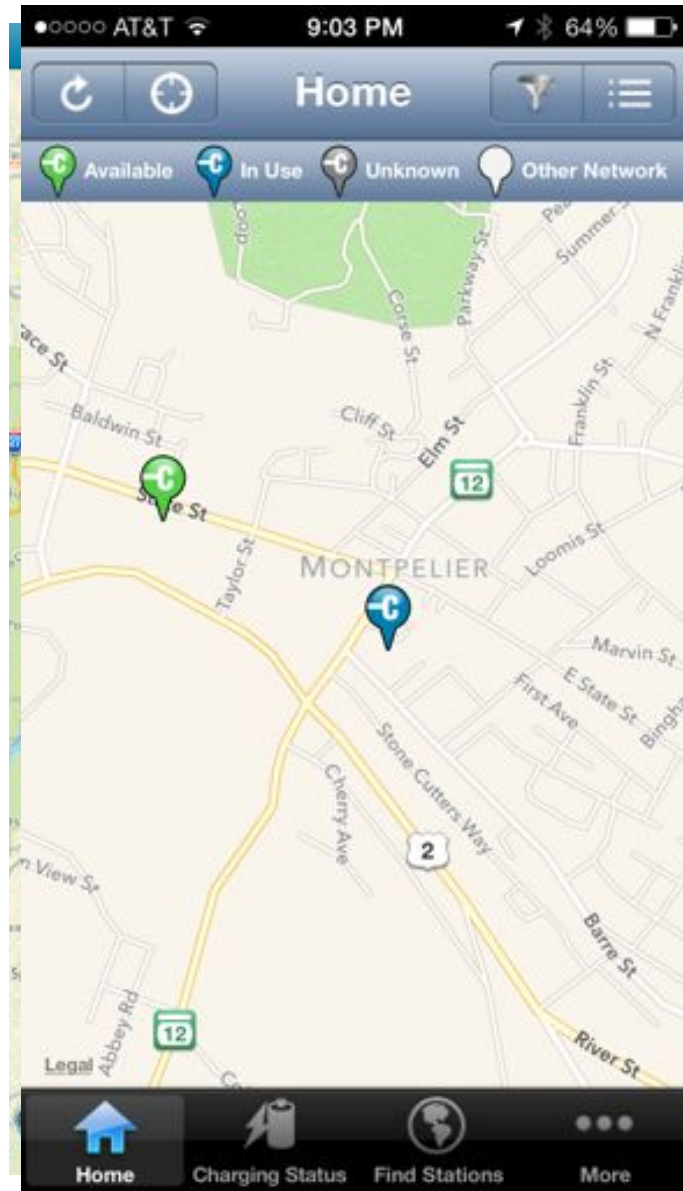
S Burlington



Montpelier

Public Charging Stations

PUBLIC CHARGING STATIONS





Policy

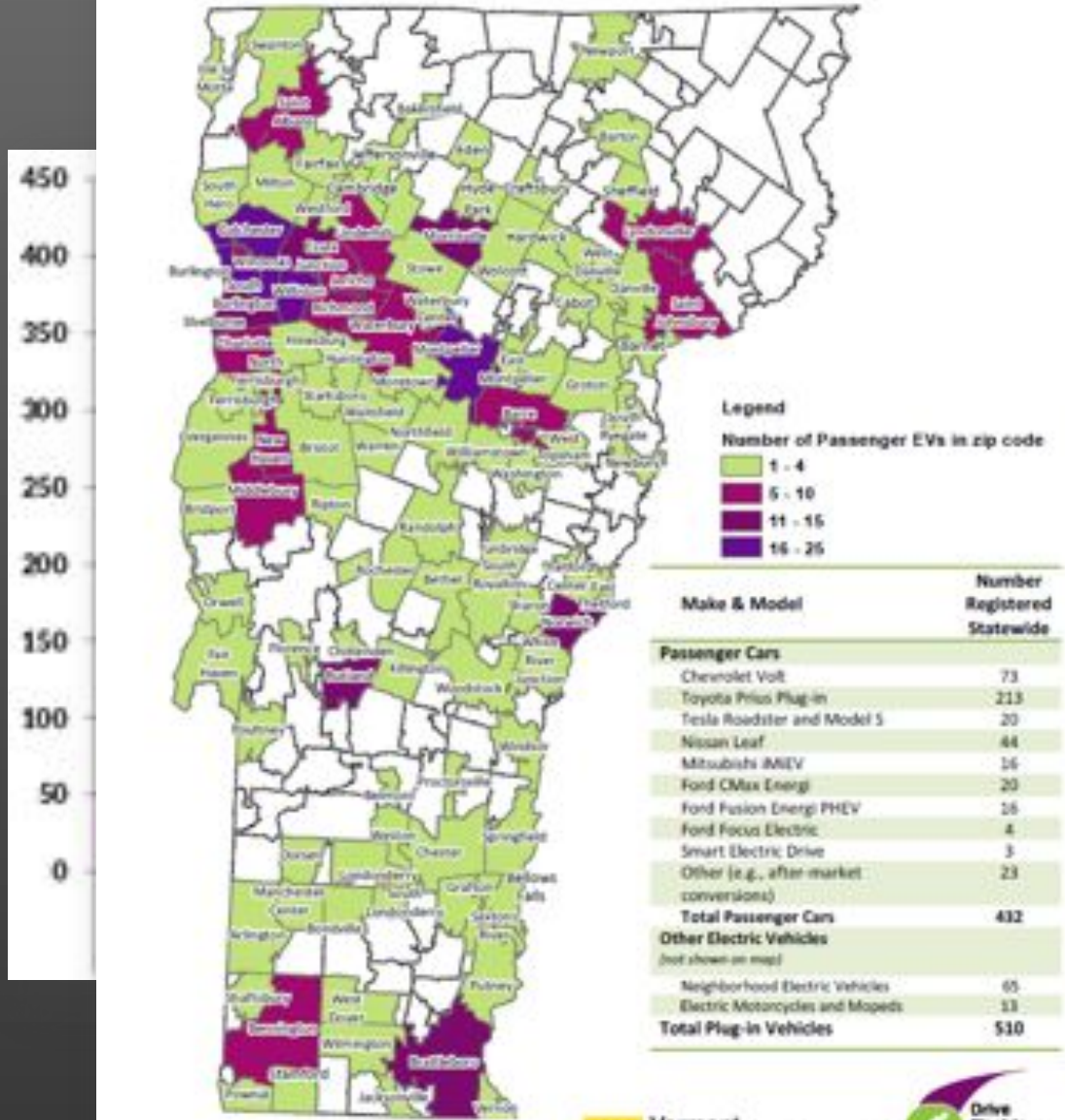
Marketing & Education

Infrastructure



Electric Vehicles Registered in Vermont

As of October 2013

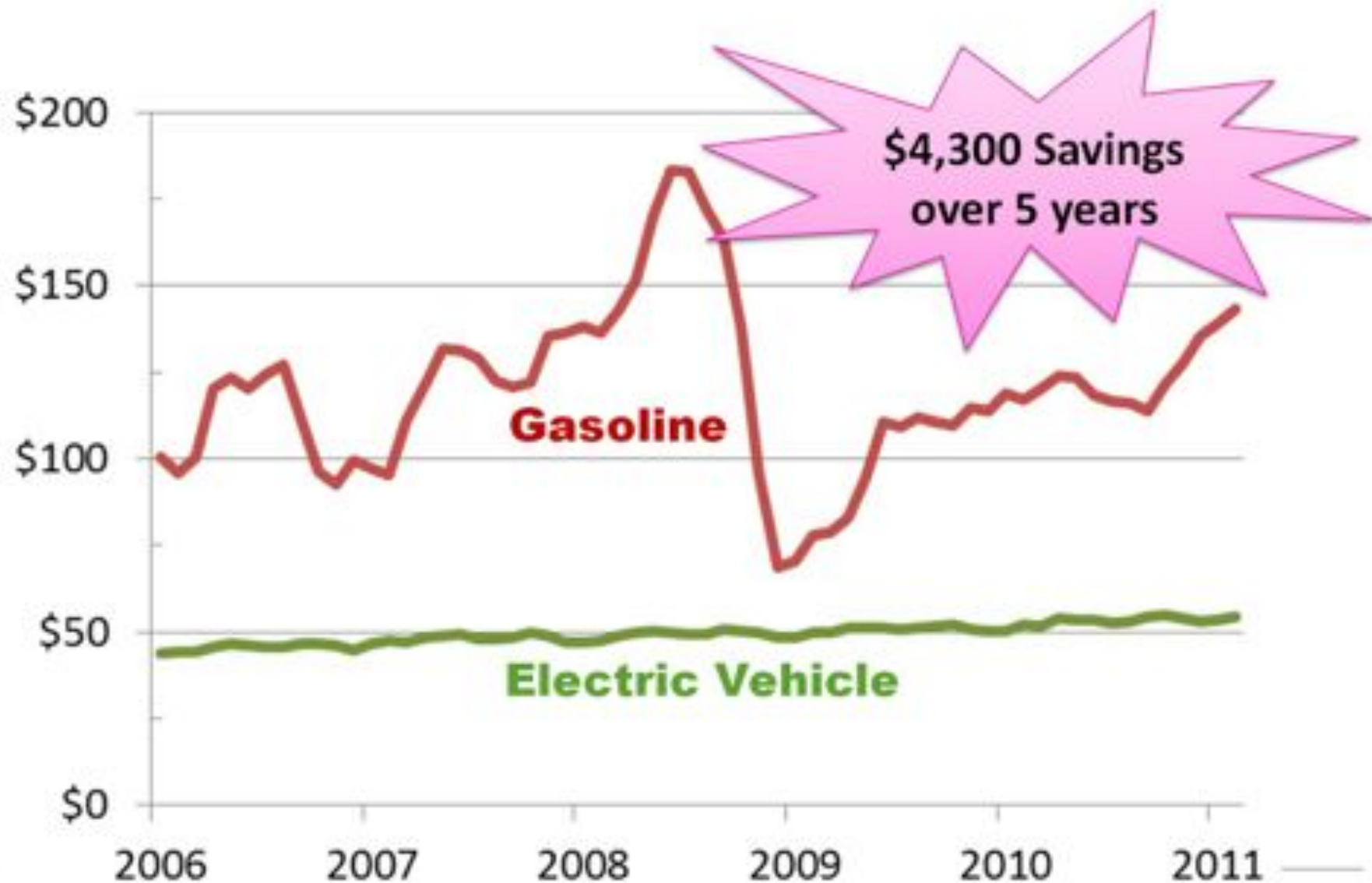


Benefits

- Save money
- Great performance
- Reduced emissions
 - AEVs have no tailpipe
 - “Well-to-Wheels” Benefits
 - Health Benefits
- Batteries
 - Reusable for storage
 - Recyclable components
- Potential grid support services

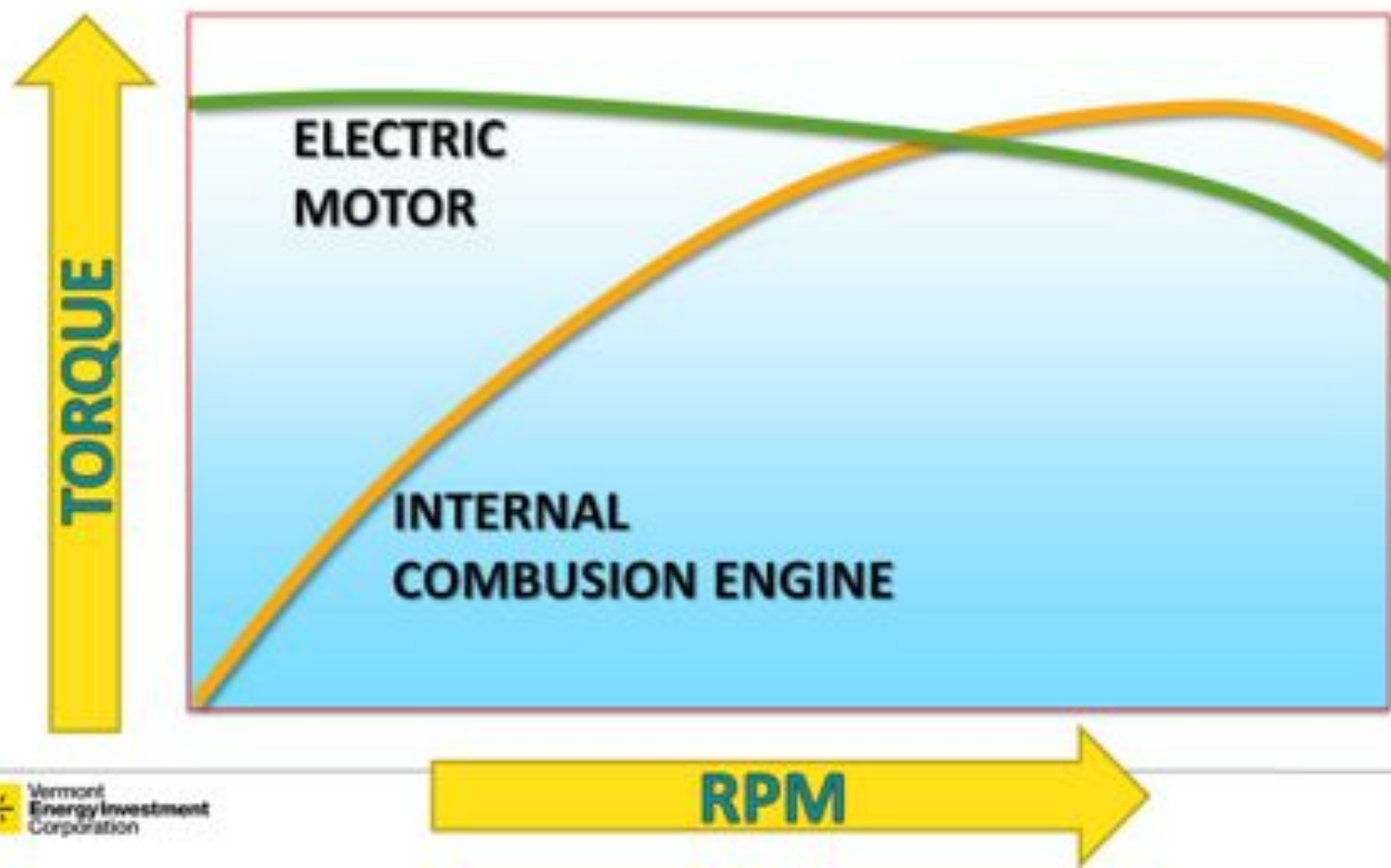


Monthly Transportation Energy Cost

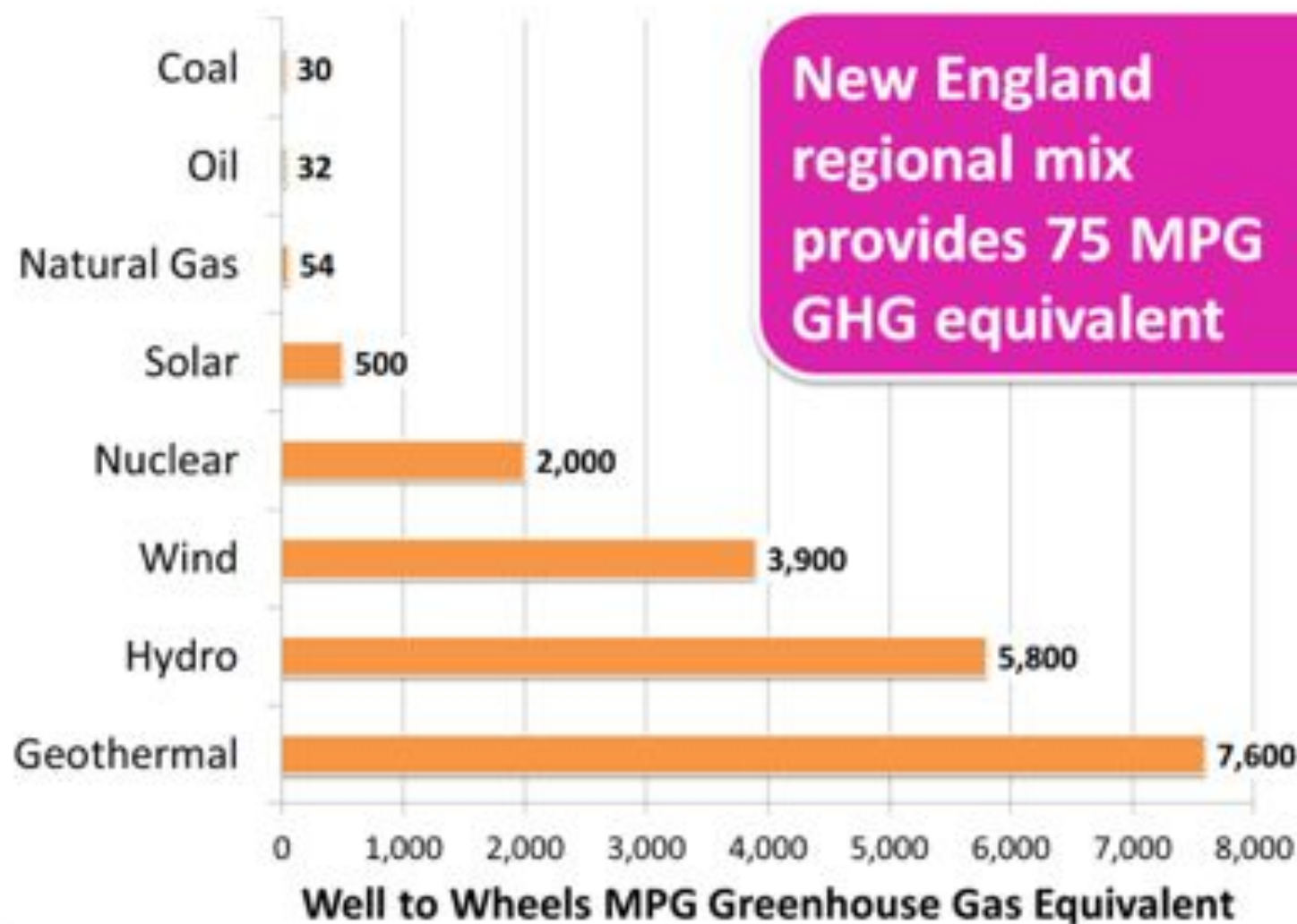


Performance

- Less Gas = More Fun



“Long Tailpipe” Greenhouse Gas Emissions



Solar PV Connection

- EVs typically travel 3-4 miles per kWh
- Driving 12,000 miles per year will require 3,000-4,000 kWh



Vehicle to Grid / Vehicle to Building



Additional Resources

- Drive Electric Vermont
 - <http://driveelectricvt.com>
 - <https://www.facebook.com/DriveElectricVT>
- Northeast EV Network
 - <http://www.northeastevs.com>
- National EV websites
 - <http://www.afdc.energy.gov/fuels/electricity.html>
 - <http://goelectricdrive.com>
 - <http://www.pluginamerica.org>
 - <http://www.electricdrive.org>
 - <http://www.greencarreports.com/>





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