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Powering Strong Communities

# Communicating Green Initiatives

# Communicating Energy Efficiency

SVP - LEDs

- https://www.youtube.com/watch?v=sbnMn5uHjhY

SVP – Air Sealing

- https://www.youtube.com/watch?v=AHmCNmYivi0

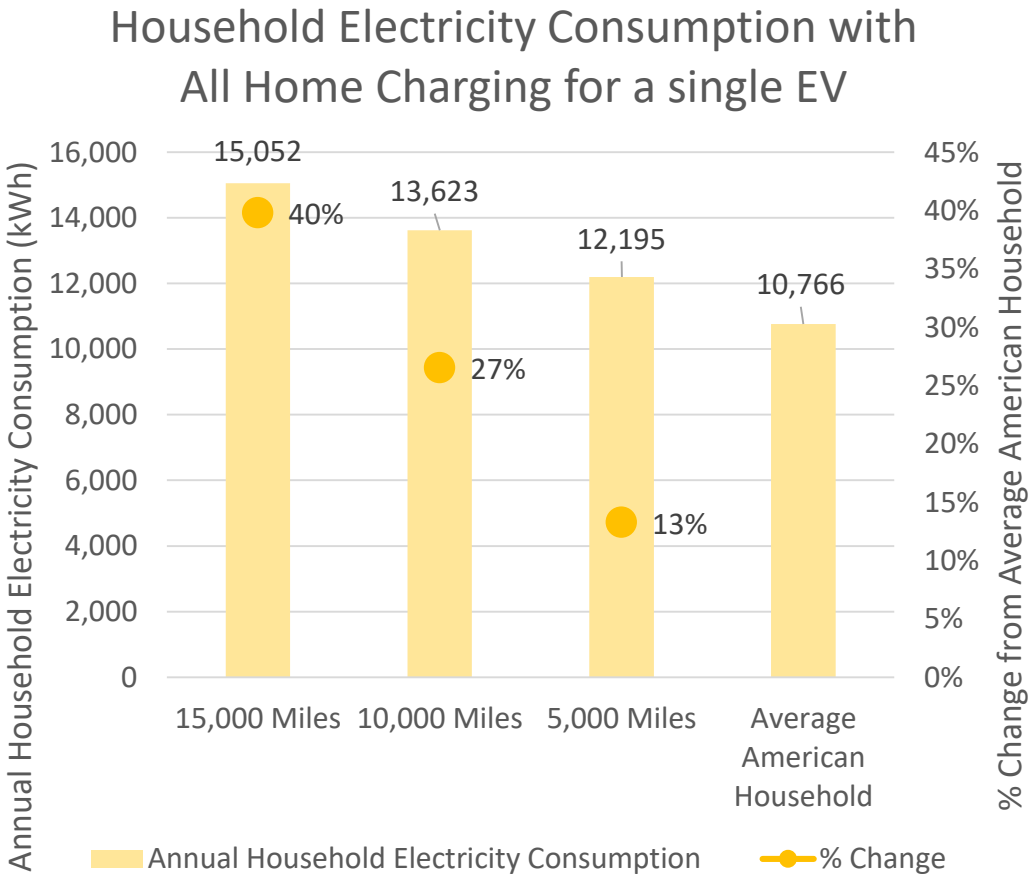
# Creating an Environmental Initiative and Communications Plan

- Who can help?
- How much money do we have?
- What's our goal, broadly speaking?
- What exactly do we want to achieve?
- How are we going to do it?
- What do we have to work with?
- What are we going to do, exactly?
- How are we doing?

# Communicating The Benefits of Electrification

# EVs Are a Potential Source of New Electricity Load

- Transportation electrification at scale may help offset declining system utilization and rising cost-of-service
- Managed charging at home and work may result in more overnight, off-peak charging
  - Better system utilization
  - Reduced peak load

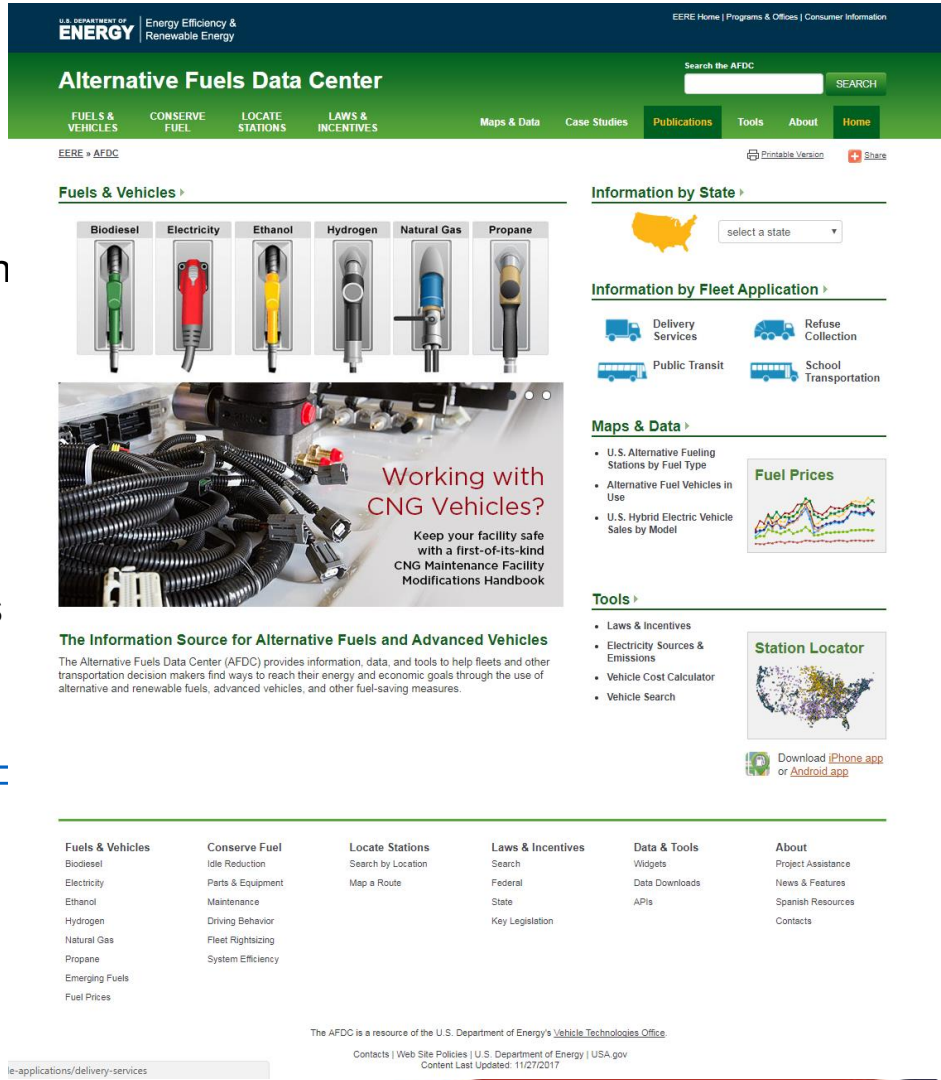



*Calculation assumes an EV gets 3.5 miles per kilowatt-hour*

*Source: U.S. EIA (2017)*

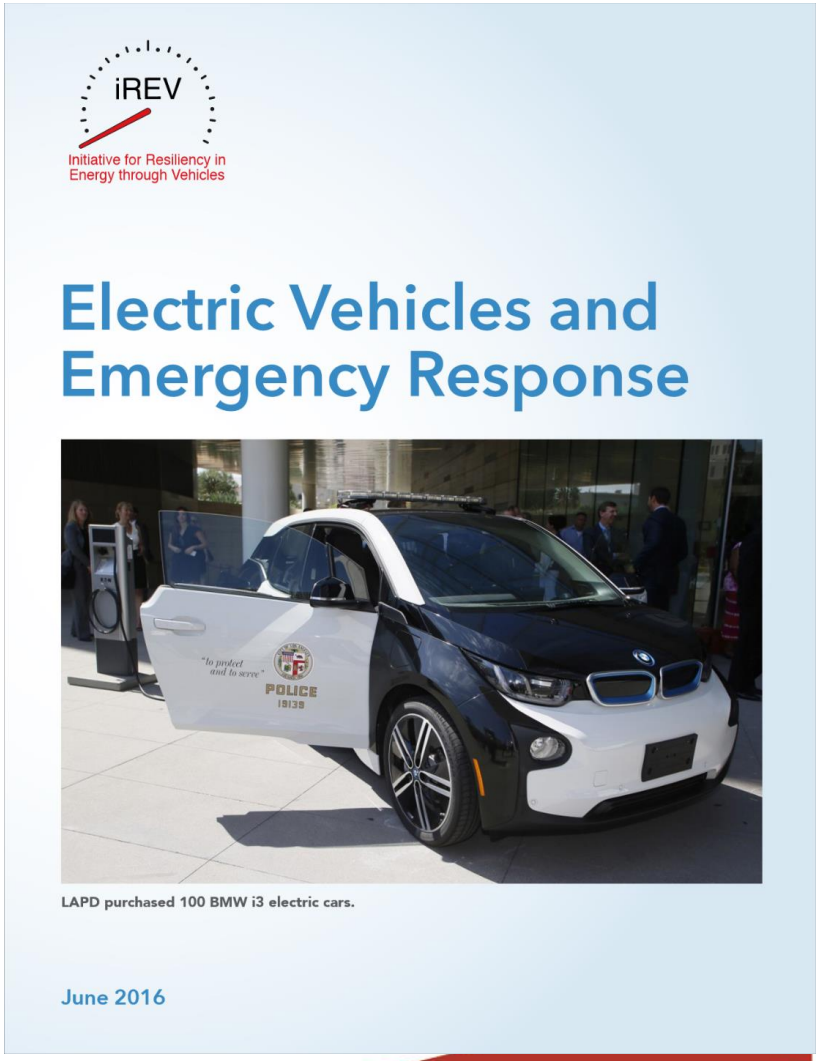
# Where Can I Get Data?

- Valuable resource from U.S. DOE Vehicle Technologies Office's (VTO) Technology Integration http://afdc.energy.gov
- Resource for laws and incentives related to alternative fuel vehicles
- General information on alternative fuel vehicle and fueling technology
- Station locator with data on alternative fueling sites
- Other EV resources from VTO's Technology Integration: https://energy.gov/eere/vehicles/batteries-charging-and-electric-vehicles



# Visible Future Use Cases Make Interesting Public Projects

- EVs that can be mobile power sources in case of emergency by transferring power from their batteries
- Electricity can go out in a disaster but is usually restored quickly
  - Conventional fuel supplies can take longer
- Technology is still emerging and transferring power from the vehicle's batteries is a non-standard use




Source: NASEO, 2016

# EV and Charging Terminology

- Plug-in electric vehicle (EV)
  - Battery Electric Vehicle (BEV): all-electric car only powered by batteries
  - Plug-in Hybrid Electric Vehicle (PHEV) or Extended Range Electric Vehicle (EREV): vehicle that can be powered by either batteries, a gasoline engine, or both
- Charging Levels:

**Low – AC 120 V**
**AC LEVEL 1**

- Primarily residential (All EVs)
- Uses standard outlet
- Power requirements similar to a toaster
- Up to 1.4 kilowatts
- Can use existing power outlets resulting in no cost installation
- Charging rate: 3-5 miles per hour

**Medium – AC 240 V**
**AC LEVEL 2**

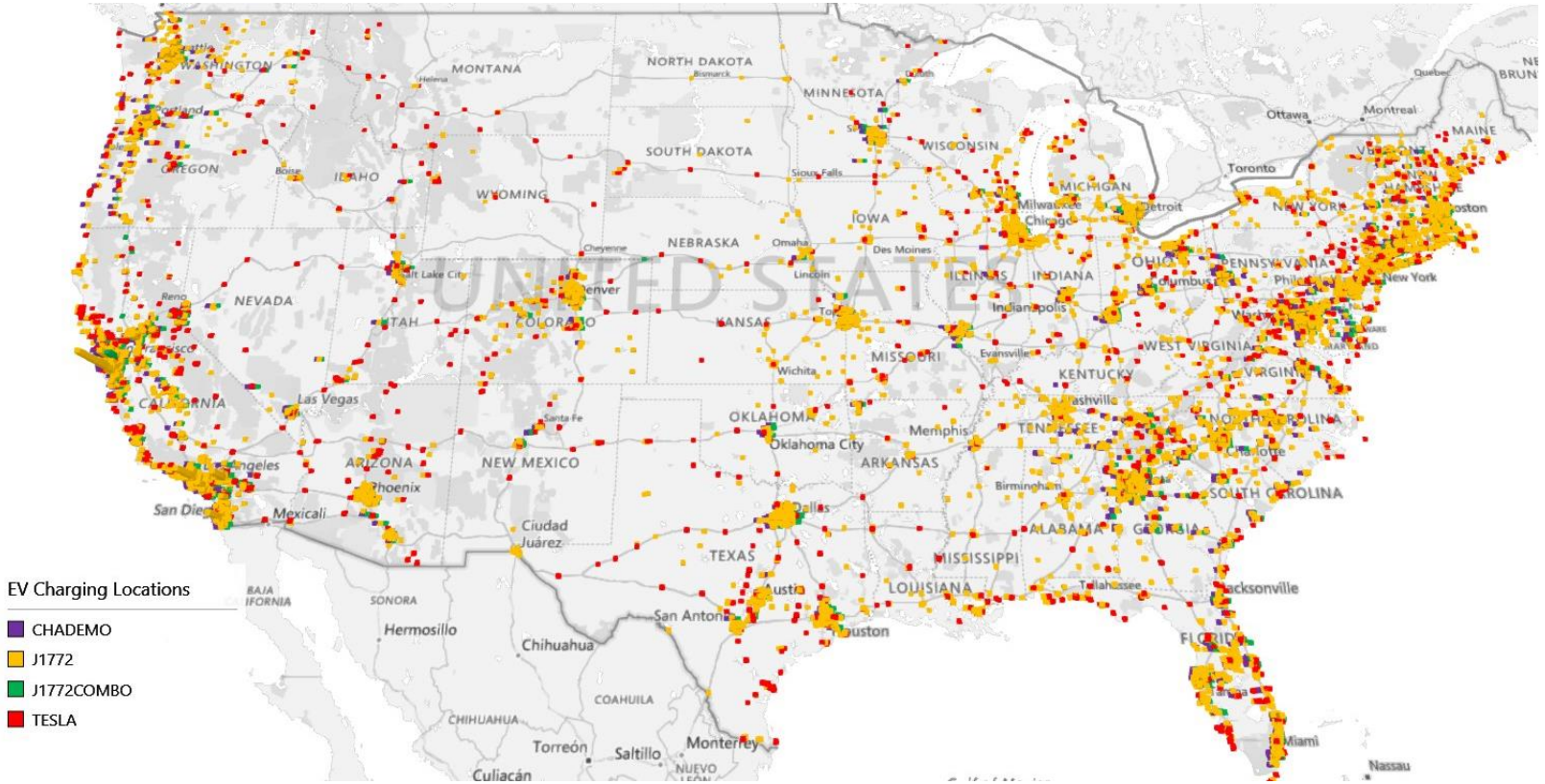
- Residential, Workplace and Commercial (All EVs)
- Requires high-voltage circuit
- Power requirements similar to an electric clothes dryer
- Up to 19.2 kilowatts
- Equipment & installation costs vary widely (~$6,500 in public and ~$2,000 at home)
- Charging rate: 12-75 miles per hour

**High – DC Fast Charge**

- Community/Metro and Highway Corridors (BEVs)
- Power requirements are up to max power for 15 homes
- Max power varies by system (CHAdeMO: 62.5 kW, SAE Combo: 100 kW, Tesla: 120kW)
- Can have very high equipment & installation costs (up to $90,000 per station)
- Charging rate: 100-300 miles per hour

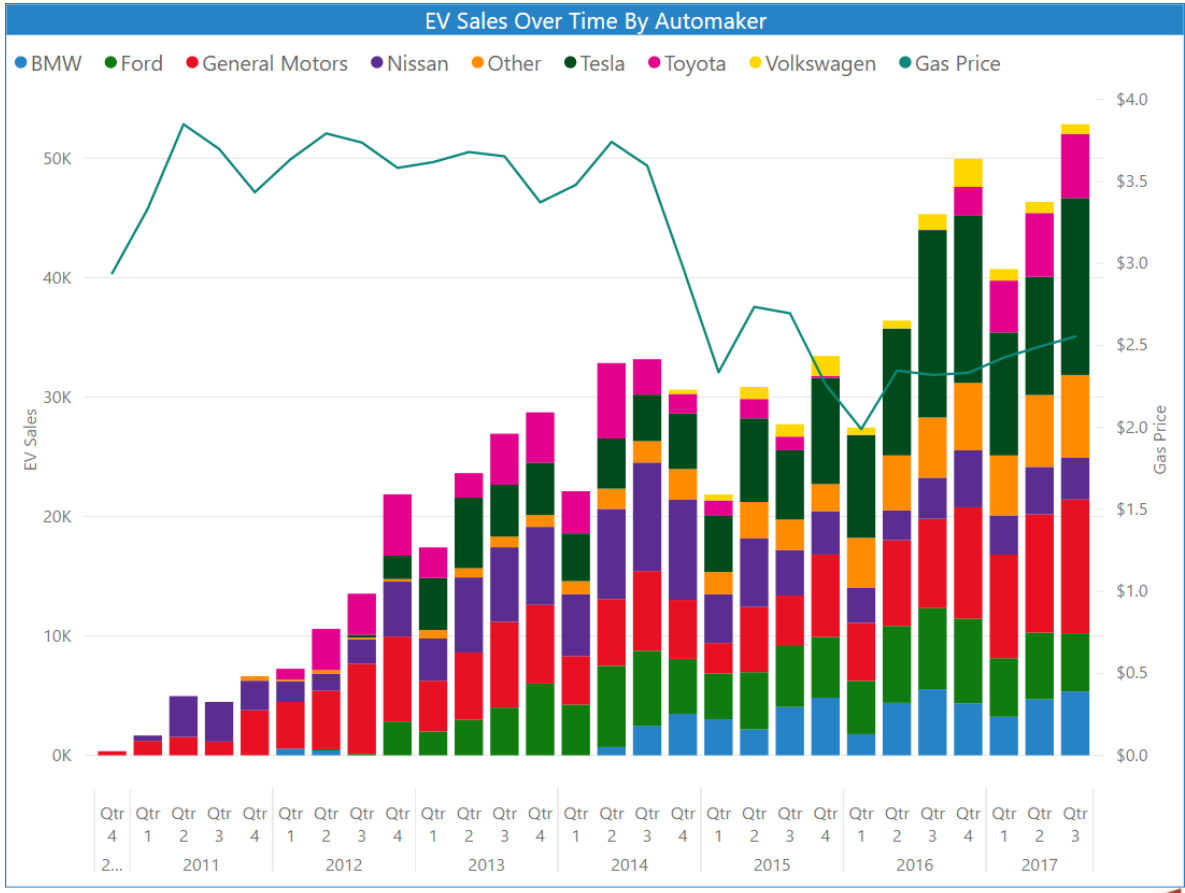
# Public Charging Availability Growing, But Limited

*Source: [U.S. Department of Energy (2017)]*



# EV Sales Have Grown with Low Gas Prices

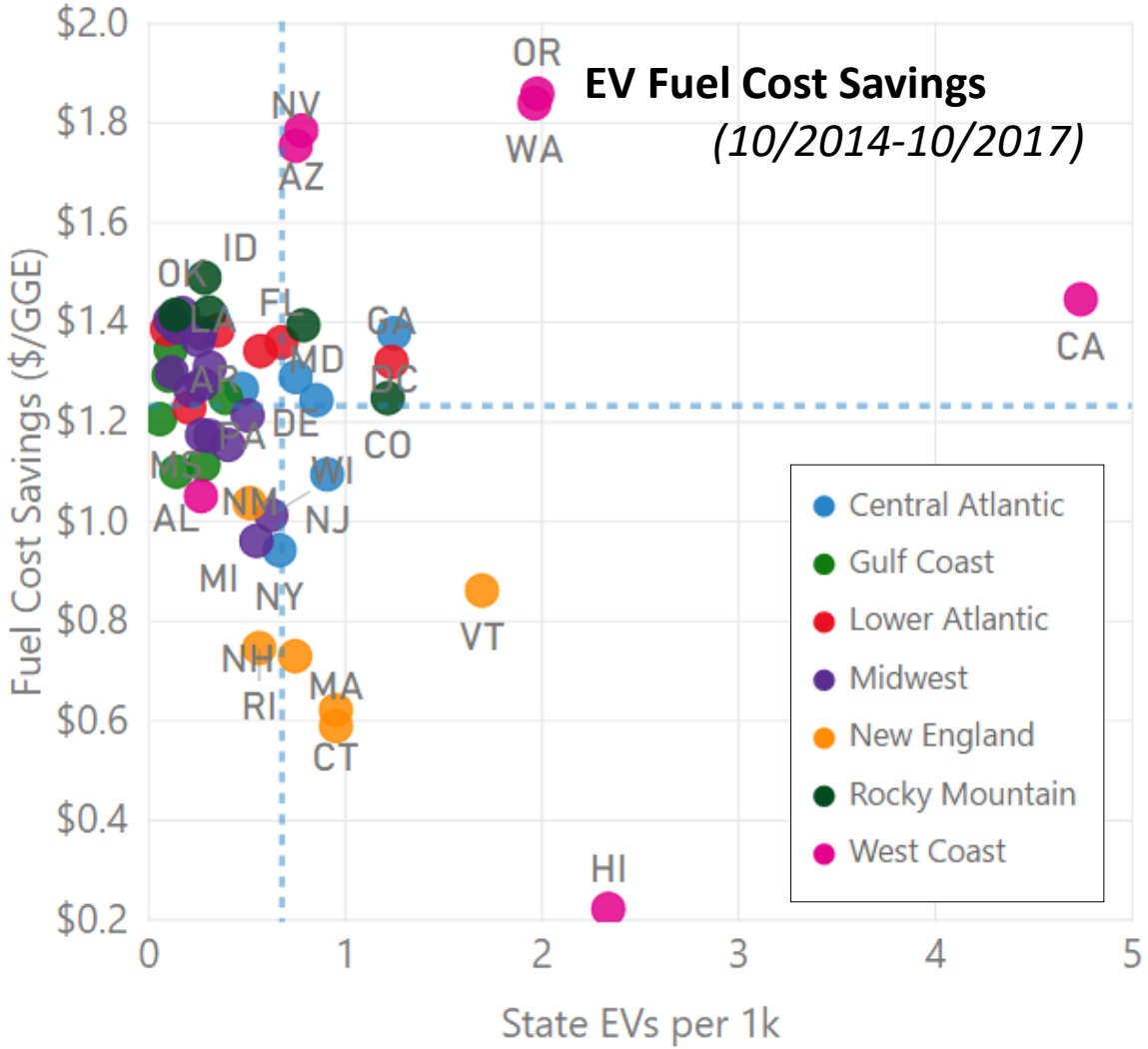
- Gas prices plummeted in summer of 2014
  - Expected to stay below $2.50 through 2018
- 650k EV sales since 2010
  - Could hit 1m EVs by next year
- Continuous quarterly sales records since Q4 of 2015
  - 2016 sales up 30% YOY
  - 2017 sales expected to be up 25% YOY
  - Tesla Model 3 wildcard




*Source: hybridcars.com & U.S. Energy Information Administration (2017)*

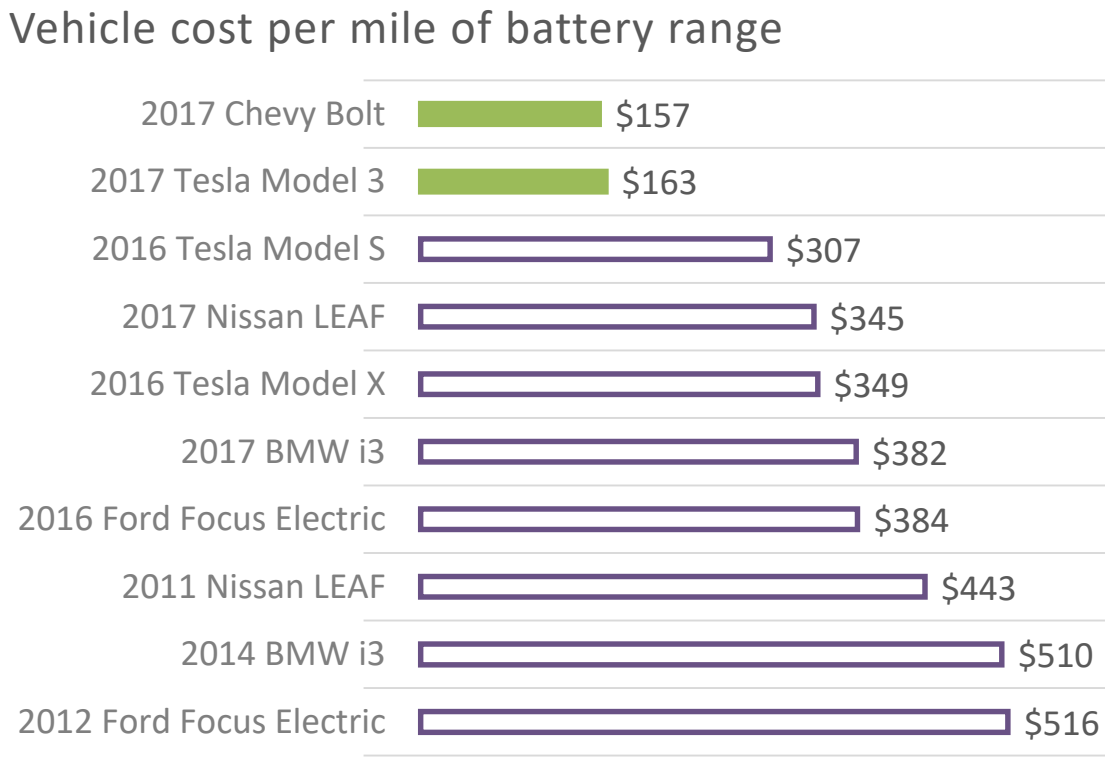
# EVs Have Considerable Fuel Savings Over Gasoline Vehicles

- Gas and electricity price differential can affect consumer and policymaker interest in EVs
  - Electricity prices are predictable and stable, but vary greatly nationwide
  - Gasoline prices fluctuate considerably and vary greatly nationwide
- U.S. average savings still greater than $1/gallon after oil price fall in 2014
  - Fuel cost savings is difference of electricity and gasoline prices on energy-equivalent basis
- 2016 EV sales highest ever in a time of low gas prices




*Source: U.S. EIA (Electricity & Gasoline Prices) (2017)*

# Battery Advances are Making BEVs Affordable

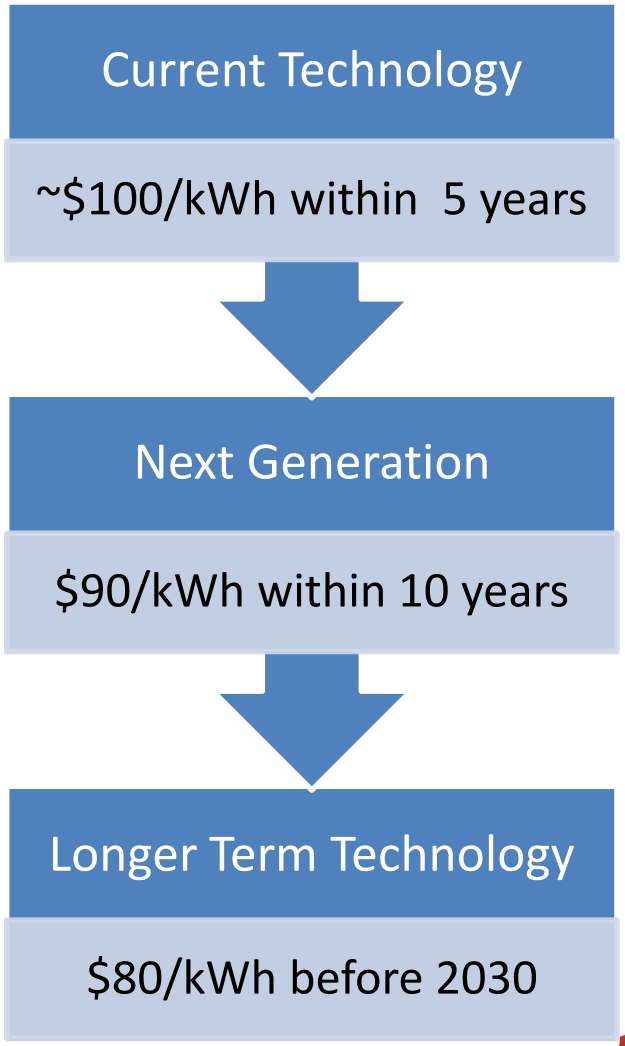



| | Range in miles | MSRP |
|---|---|---|
| 2017 Chevy Bolt | 238 | $37,500 |
| 2017 Tesla Model 3 | 215 | $35,000 |
| 2016 Tesla Model S | 259 | $79,500 |
| 2017 Nissan LEAF | 84 | $29,010 |
| 2016 Tesla Model X | 238 | $83,000 |
| 2017 BMW i3 | 114 | $43,600 |
| 2016 Ford Focus Electric | 76 | $29,170 |
| 2011 Nissan LEAF | 74 | $32,780 |
| 2014 BMW i3 | 81 | $41,350 |
| 2012 Ford Focus Electric | 76 | $39,200 |

*Source: [fueleconomy.gov](fueleconomy.gov) and official automaker websites (2017)*

# DOE Battery R&D Shows Promise of Battery Technology

- DOE Battery R&D Goal
  - Can reduce cost of EV batteries to less than $100/kWh, increase range to 300 miles, and decrease charge time to 15 minutes or less
  - Ultimate goal is $80/kWh for cost competitiveness
- Current Battery Pack Cost Estimates from Two Automakers (Usable Energy)
  - GM: ~$220-235/kWh
  - Tesla: ~$223/kWh




*Source: U.S. Department of Energy (2017)*

# Auto Industry Investing in EVs

- Lower-cost long-range EVs arriving
  - 200-mile Chevy Bolt on sale for $37,500
  - 200-mile Tesla Model 3 on sale for $35,000
- More, improved options for plug-in hybrids
  - 2nd Generation Chevy Volt increased electric range by 40%
  - 2017 Chrysler Pacifica is first plug-in hybrid minivan

## Major EV investments by automakers

### 2016

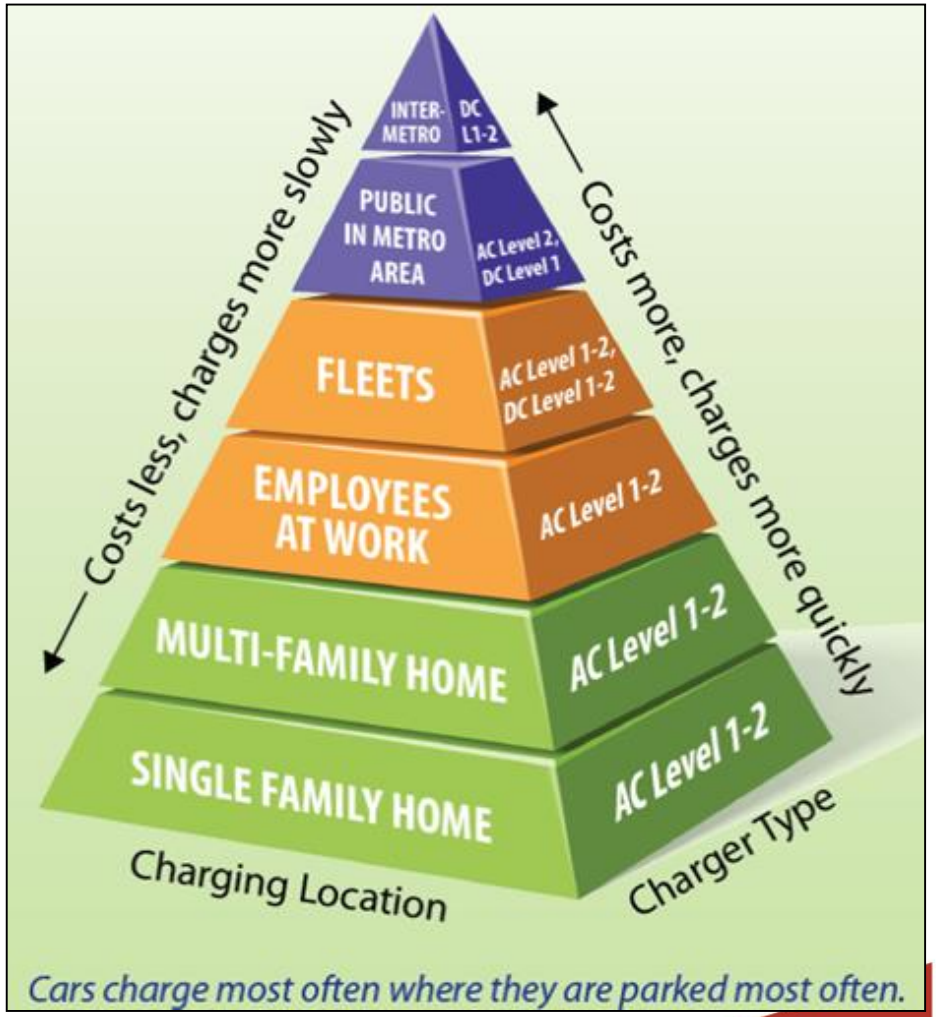
- Ford committed **$4.5b** with goal of 40% of its models having electric option by 2022 (January)
- GM invested **$500m** in Lyft, helping bring autonomous EVs to shared mobility (May)
- Volkswagen plans to have **30** new all-electric models by 2025 (June)
- Tesla opened its **$5b** Gigafactory (July)

### 2017

- Mercedes will invest up to **$11b** in electric vehicles (February)
- Tesla delivers first Model 3 and will rapidly advance EV investments (July)
- GM plans to add **20 new EV models** by 2023 (October)

# Charging Infrastructure

- Charging pyramid reflects current and near-term vehicle technology demand
  - Over 80% of charging is likely to occur at home when available
  - Workplace and public used much less frequently than home charging
- Workplace and Public Charging
  - Substitute when home charging is unavailable
  - Increases electric mile share for PHEVs
  - Extend daily travel for BEVs
- Public DFDC
  - Most relevant for BEVs
  - Needed for long distance BEV travel
  - Important for interregional travel
- Deployment costs almost inverse of charging pyramid




Source: T. Bohn, Argonne National Laboratory

*Source: Idaho National Laboratory (2015)*

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# Questions

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