

WE DRIVE ELECTRIC. YOU CAN TOO.

October 2, 2019
The Electric Vehicle Transportation Revolution
Waltham, MA

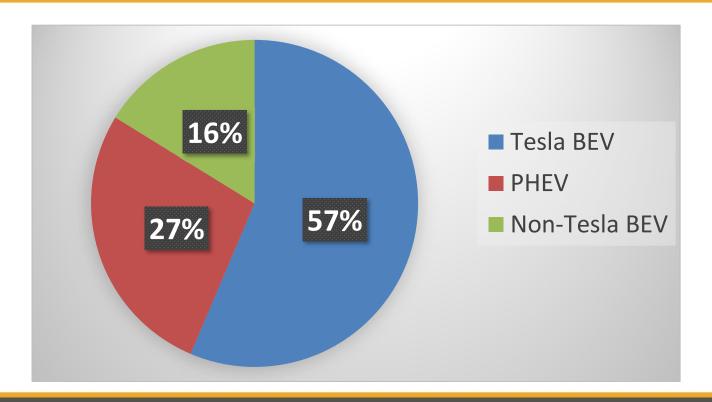
The EV Market

- ~2.5% of light-duty vehicle sales in June 2019
 - 1.5 million vehicles sold
 - 37,818 EVs
- 7% of passenger car market in June
- CA market share about 8% in 2018
- Several new BEV models this year, including SUV/Crossovers

Market Growth

- 41.4% growth is doubling every 2 years
- Sustained 42% growth will hit state ZEV targets (3.3 million ZEVs by 2025)
- 2018 was up 81% over 2017
- 2019 YTD up only about 7% over 2018
- EV market is growing rapidly (if unevenly)
- States need to be ready

Which Vehicles? Jan-Jun 2019

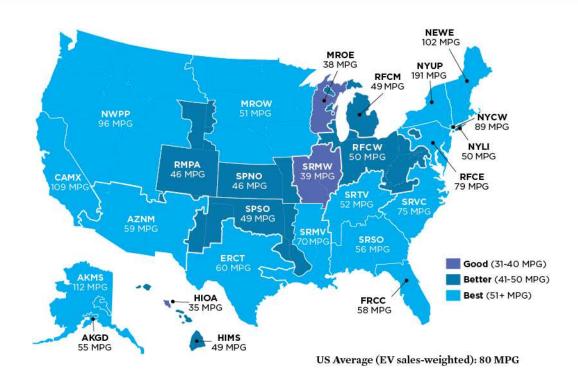


Emissions Impact

- ~3-4 miles per kWh
- Electricity from coal is about 1 kg CO2/kWh
- Gasoline is about 10 kg per gallon and about 30 mpg
- Both about 0.3 kg per mile
- BUT.... EVs are not 100% coal
 - Coal was only 27% of electricity in 2018
 - About 1% in New England
- Using grid average mix, EVs are about 50% lower GHG nationwide including manufacturing impacts
- Also smart charging and green power



Emissions Impact



Note: The MPG (miles per gallon) value listed for each region is the combined city/highway fuel economy rating of a gasoline vehicle that would have global warming emissions equivalent to driving an EV. Regional global warming emissions ratings are based on 2016 power plant data in the EPA's eGRID 2016 database (the most recent version). Comparisons include gasoline and electricity fuel production emissions estimates using Argonne National Laboratory's GREET 2017 model. The 80 MPG US average is a sales-weighted average based on where EVs were sold in 2011-2017.

Battery lifetime

- 100,000 mile warranty is typical
- Battery is not useless at the end of that time "battery second life"
- Recycling/refurbishment a possibility but little market for it right now
- Early LEAFs had some problems, companies worked hard on battery management systems



Range



Electric Vehicle Guide



- Many ~250 miles
- What are daily driving needs?
- What about recharge time?
 - Mostly for road trips











Hyundai Kona Electric \$36,950 258 miles



\$38,500 239 miles



238 miles



\$69,500 234 miles



Starting at \$29,990 150-226 miles



\$74,800 204 miles



\$44,450 153 miles



Volkswagen e-Gotf \$31,895 125 miles



\$30,315 124 miles



\$33,950 111 miles



Honda Clarity Electric \$199/mo. lease only 89 miles



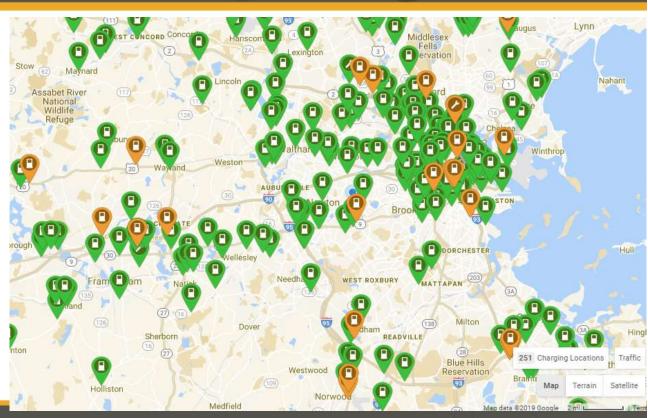
Flat sooe \$32,995 84 miles





Charging

More than you think



Smart Charging and V2G

- Many pilot projects
- Need a compelling value proposition

Car-Sharing

- Many pilot projects
 - Indianapolis, LA, Chattanooga, Sacramento, others
- Envoy (car-sharing)
- Maven (GM, ride-sharing)
- Some challenges to be resolved
 - Accountability for charging
 - Insurance



Thank you! Pete O'Connor

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