Electric Vehicles in Alaska

APA Communicators Forum

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November 8, 2018

INTRODUCTION

Topics to Discuss

1. Types of EV
2. Pros and Cons of EVs
3. EVs on the market
4. Future predictions
5. Charging types
6. Driving experience
7. Alaska-specific info
    a. Numbers
    b. Cold research
    c. Charging plan

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Types of Electric Vehicles (EVs)

Hybrid (HEV)

+MOTOR TYPE

+Internal combustion engine
  +Plus small battery/motor

+RANGE

+Electric for ~10 miles

+EXAMPLES

+Toyota Prius, many other brands

Plug-In Hybrid (PHEV)

+MOTOR TYPE

+Internal combustion engine
  +Plus larger battery/motor

+RANGE

+Electric for 25-50 range

+EXAMPLES

+Chevy Volt; Toyota Prius Prime; BMW X5; Audi A3; Ford Fusion; Ford C-Max; Volvo XC90, XC90; Porsche Cayenne; Mini Cooper; Honda Clarity

Battery (BEV)

+MOTOR TYPE

+Large battery and electric motor only

+RANGE

+100-300+ miles

+EXAMPLES

+Tesla S, X, 3, Roadster; Nissan Leaf; Chevy Bolt; BMW i3; Kia Soul EV; Smart Fortwo; Hyundai Ioniq Electric; Toyota RAV4 EV

Benefits and Drawbacks of Electric Vehicles

Benefits

+Efficient, regenerative braking
+Lower fuel costs
+Less maintenance
+No emissions at tailpipe
+Reduced carbon transportation
+Stronger acceleration
+Quiet
+"Fuel" at home
+No more oil changes or stopping for gas
+Tax incentive

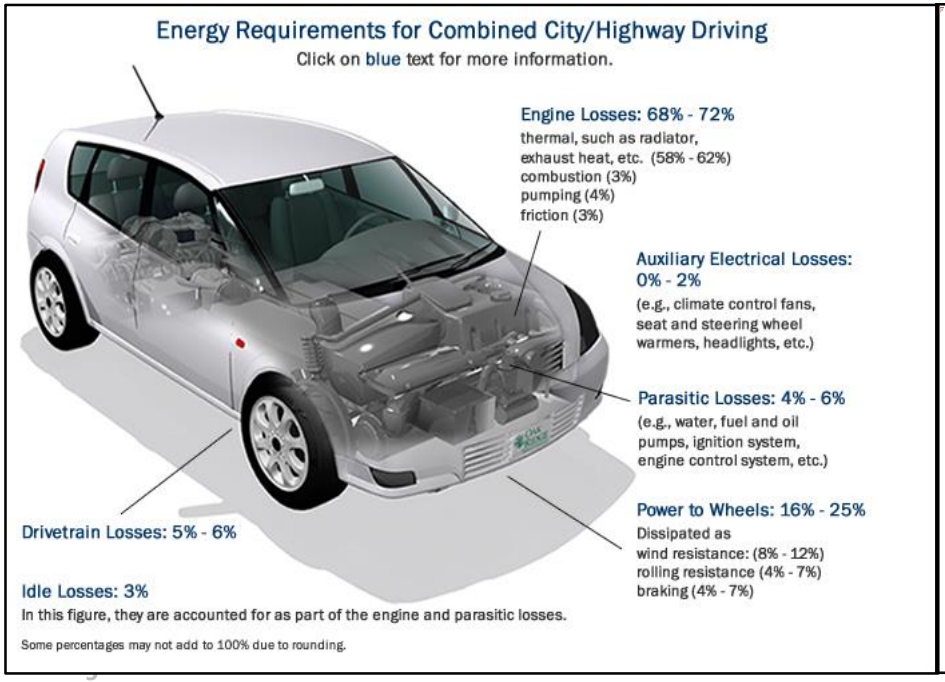
Drawbacks

+Limited range on some models
+Recharge time
+Current availability of charging stations
+Current availability of vehicles in AK
+Upfront cost

EFFICIENCY

Energy Used for Propulsion

Internal Combustion Engine: 12%-30%



Electric: 77%-82%

Source: US Department of Energy, www.fueleconomy.gov

TRENDS

“Tsunami of EVs Coming”

Leaf-based EV CUV

Bolt EV CUV

M-B EQ EV

Audi Q6 eTron

BMW X3e

Ford EV CUV mule

Toyota-Mazda EV CUV

VW ID Crozz

Quote from a vehicle manufacturer regarding multiple brands of electric vehicles in development.

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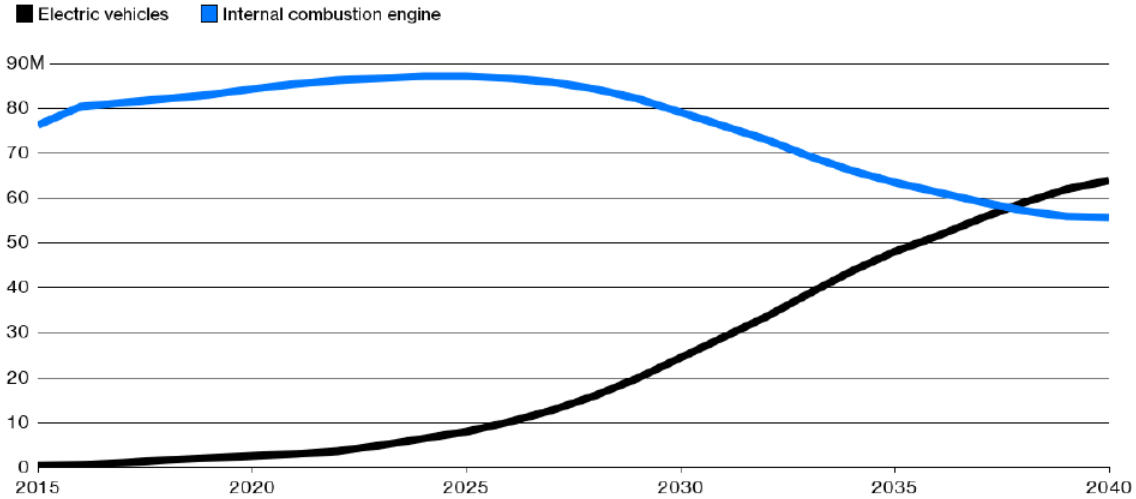
TRENDS

EV Sales Predicted to Surpass ICE, 2038

- Norway EV Sales
  - 2017: ~33%
  - 2018: 40% predicted
  - 2025 goal: 100%
- Manufacturer statements:
  - Ford: 40% of models electric option by 2022
  - VW: 30 new all-electric models by 2025
  - BMW: 25% EV sales by 2025
  - Toyota: All models electric version by 2025



Source: Bloomberg New Energy Finance

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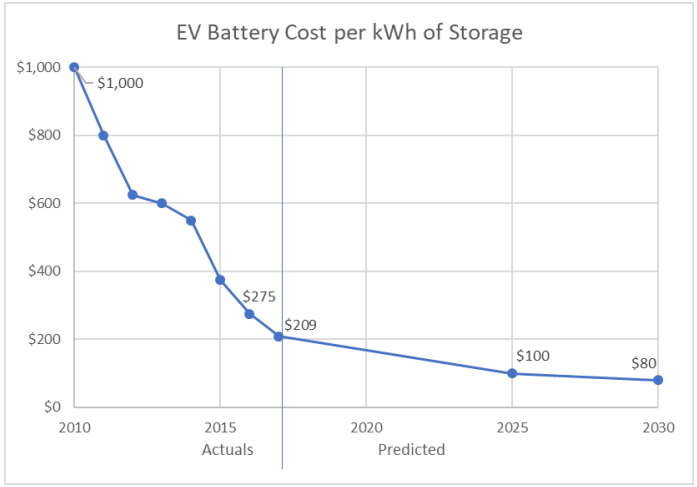
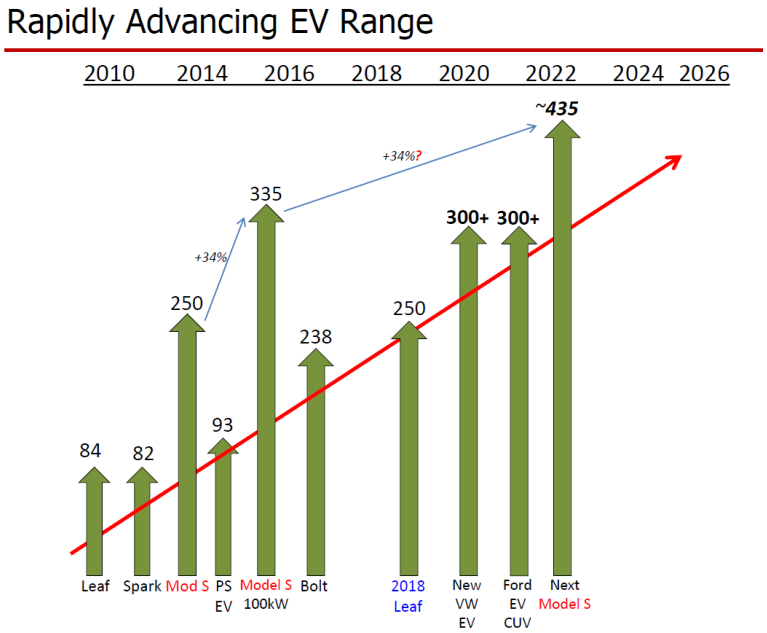
TRENDS

Battery Cost and Vehicle Range Trends

- Current cost: $209 per kWh
- Prediction of cost <$100/kWh by 2025
- Battery is half the cost of some EVs



Source: Bloomberg New Energy Finance



Source: Kia Presentation December 2017

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Charging

- Level 1: 120 Volts
  - Standard household plug
  - 3-4 miles of range per hour
- Level 2: 240 Volts
  - Clothes dryer or oven plug
  - 20-50 miles of range per hour
- Level 3: 480 Volts or higher
  - Variable charging speeds
  - >60 miles of range in 10-30 min.
  - “DC fast charging”
- Battery temperature control
- Charging can be programmed: immediate or scheduled

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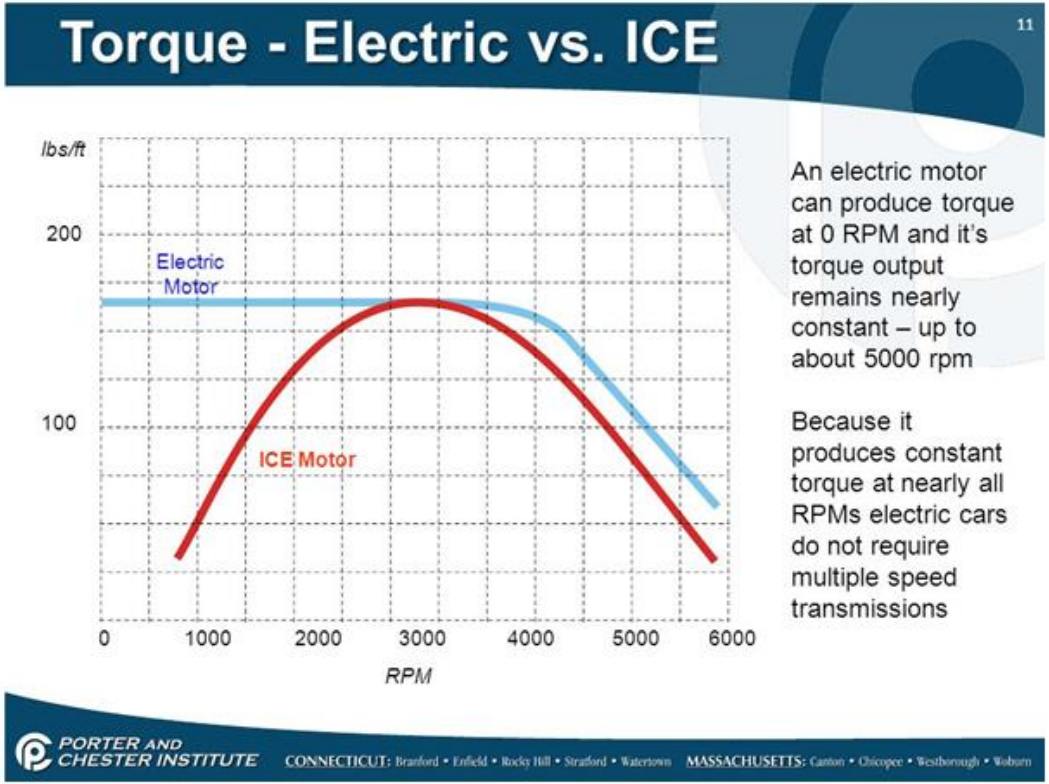
Fuel Cost

- Internal combustion engine vehicle
  - 25 MPG
  - $3.20/gallon
  - 12.8¢/mile
    - 12,000 miles per year = **$1,536**
- Electric vehicle
  - 3 miles/Kilowatt-Hour (kWh)
  - 18¢/kWh
  - 6¢/mile
    - 12,000 miles per year = **$720**

EV Driving - Acceleration



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EV Driving

- Regenerative braking:
  - Releasing the accelerator turns the electric motor into a generator, sending energy into the battery to slow the vehicle.
  - Minimal use of conventional brakes
  - Improved efficiency
  - Brake pads last long
- “One pedal driving”
  - Use just “gas” pedal to accelerate and decelerate
  - Brake lights turn on
- Noise
  - Very quiet, beware of pedestrians

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Alaska Specific Information

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Alaska EV Challenges and Benefits

Challenges

+Cold climate is perceived barrier

+Low population, long distances

+Which came first:

  +The **salmon**, the **fry**, or the **egg**?

  += EV **buyer**, **vehicles**, or **charging**?

Benefits

+Island-ish

+Mostly short local drives

+Alaska communities can respond rapidly

EVs in Alaska

	Anchorage:	Statewide:	
EVs	~50	~420	1/8th in Anch
PHEVs	~140	~260	½ in Anch
Total	~190	~680	

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TO INFORM MEMBERS

Research

1. Cold weather impacts on range
2. Cold weather overnight energy use
3. Defrost speed: EV vs ICE
4. Employee driving survey
5. Member survey
    + 6% report “definitely” or “likely” to own EV in 3 years

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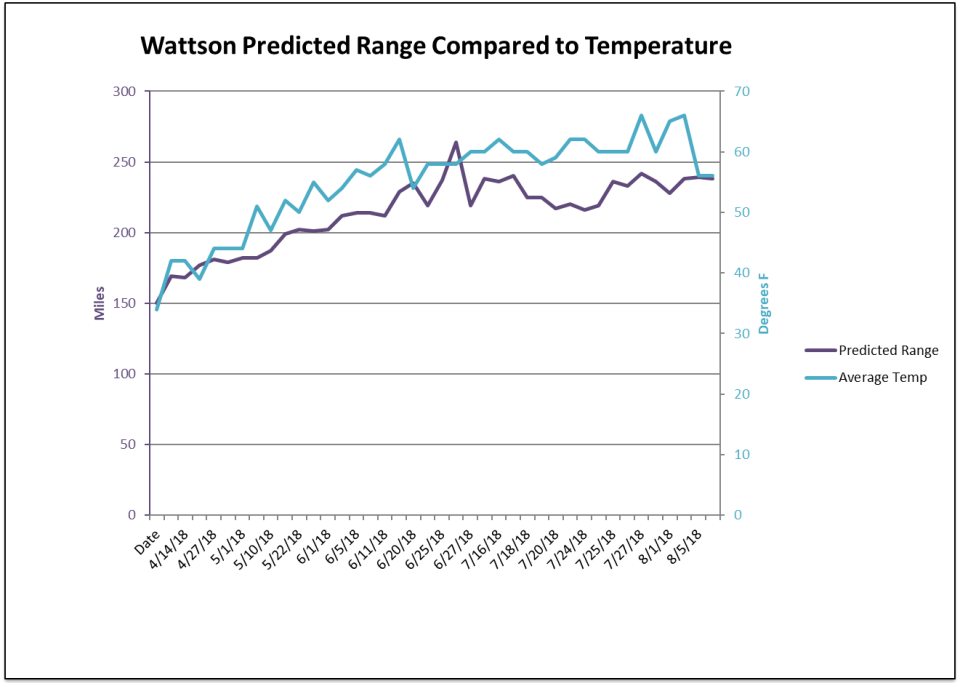
Cold Weather Impacts on Range

1. As temperature increased, the predicted range increased
2. Using cabin heaters decreases range
3. Battery warming decreases range
4. Data collection will continue this winter



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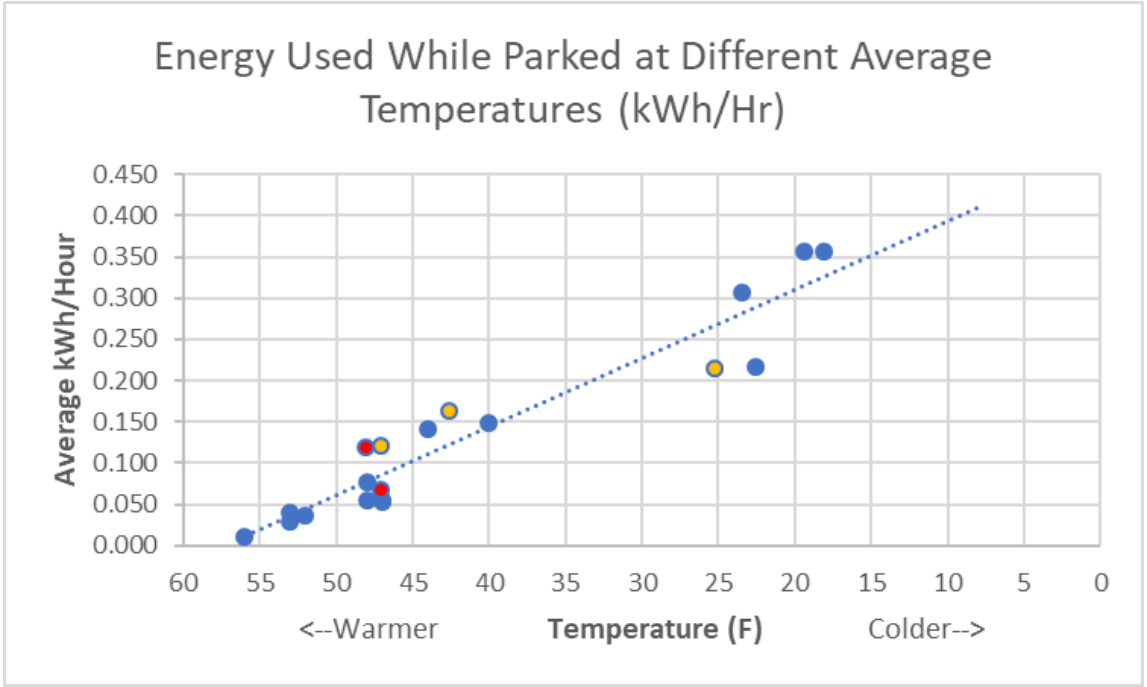
Cold Weather Overnight Energy Use

- Preliminary data
- When fully charged and plugged in outdoors overnight, how much energy is used?
- Engine block heaters use 0.400 to 1.5 kW.
- More data to be collected



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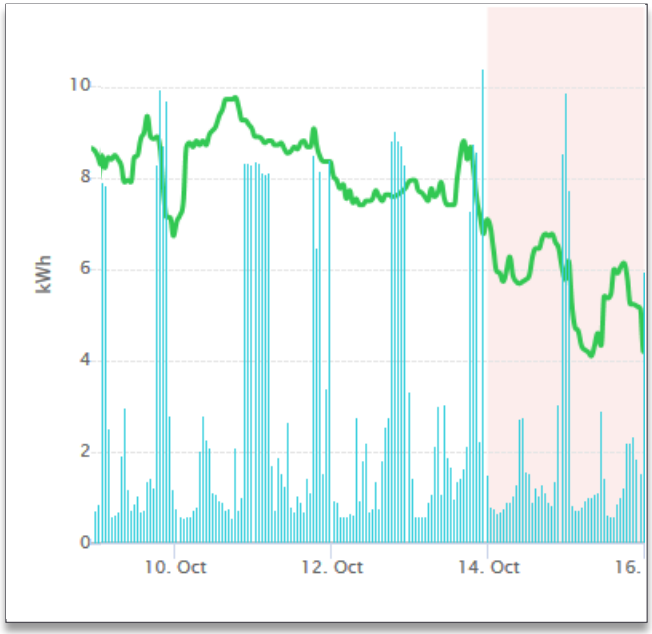
LOCAL

Local Impacts

- One EV adds ~50% to home electric use
- Cuts cost for fuel in half, assuming:
  - 18 cent power
  - $3 per gallon gasloine
- Reduces CO2 emissions by ~60%*
- No cold-start vehicle emissions
- Utilities: watch for distribution system impacts



*When charged by Chugach generation mix

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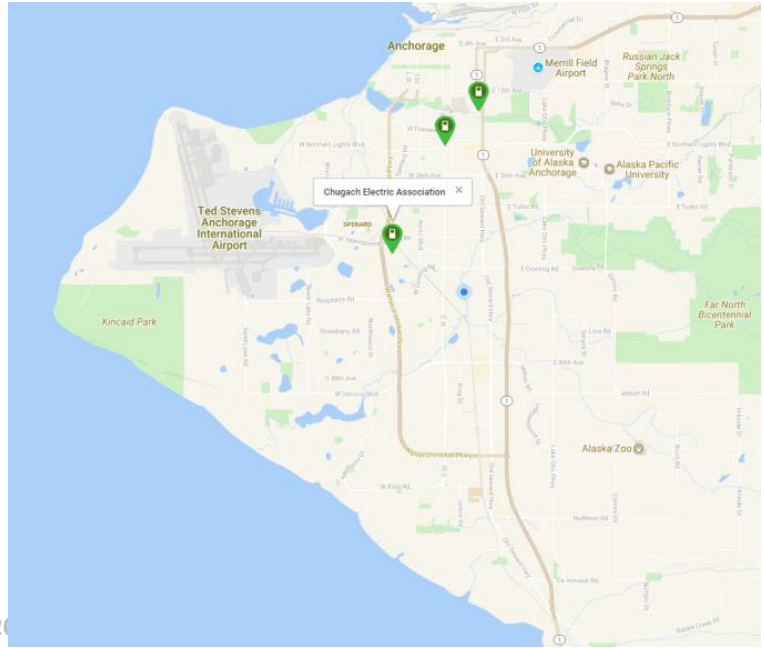
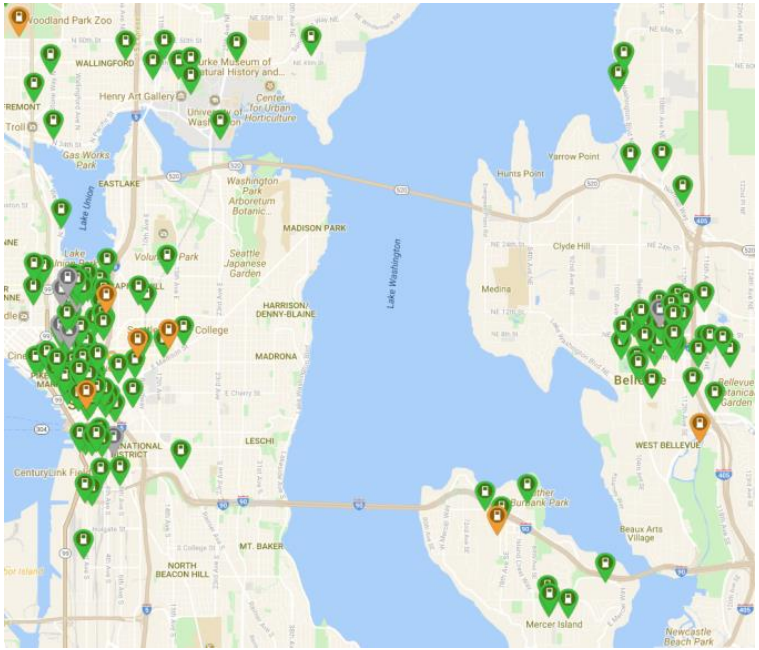
GROWTH OPPORTUNITY

Public Charging Stations

+PlugShare.com Anchorage



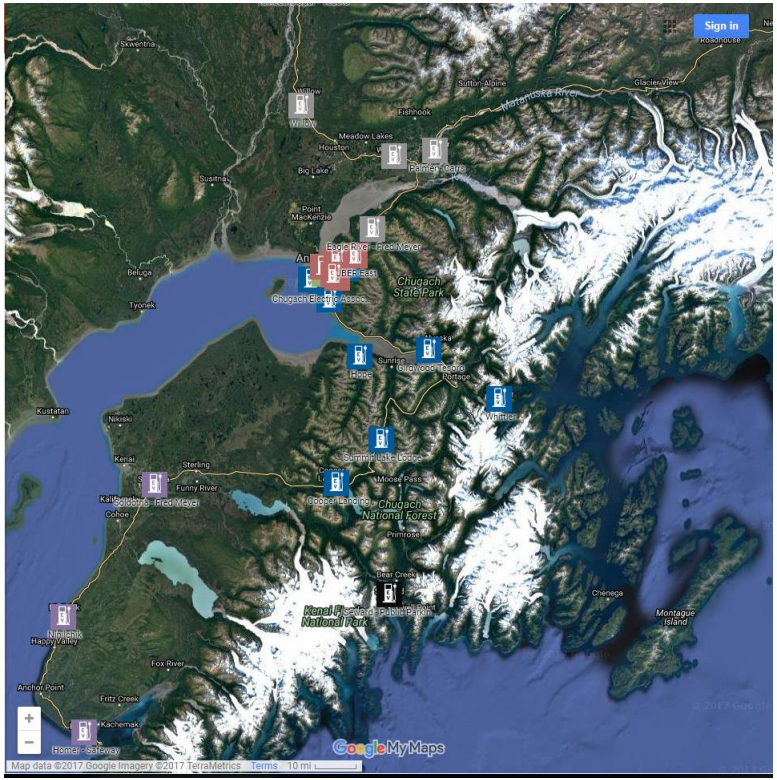
+PlugShare.com Seattle-Bellevue



PLAN

Expansion of Charging Network

- Range anxiety is barrier to EV adoption
- Railbelt utilities planning together
- Developing a charging network plan
  - In Anchorage
  - Railbelt road system
- Develop preferred ownership structure of charging stations
- Apply for VW Settlement funds



Other Features

- Energy analysis on screen
- SAFETY: Eyes on road, not on screen!
- Steering wheel warmer
- Seat warmers (all)
- Paddle braking
- Hill hold
- Regen on demand
- Oil changes (just kidding!)

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HANDS ON!

Test Drive to Believe

- Chugach Member Appreciation Day
  - October 5
  - Dealers offered test drives at Chugach headquarters
- Test drive at local dealers
- Rent an EV on your next trip

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MISC FOR $500, ALEX

Other Topics

+ Rate setting
+ VW Settlement Funding
+ Carbon reduction
+ IPCC Report

HUMOR

FleetCarma EV Video

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Questions?

Follow us to the Future!

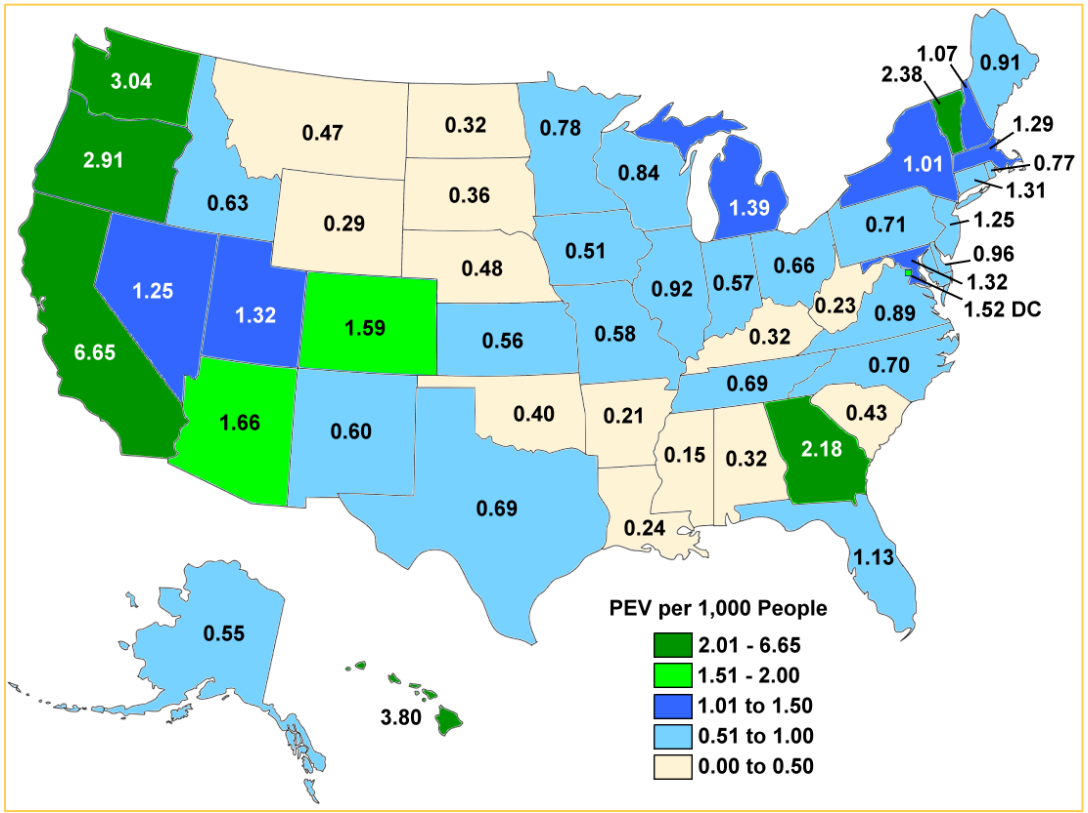
Extra slides for Q&A

TRENDS

PEV Sales in US

- Introduction 2010 – 2016:
  - 557,391 PEVs sold
- First 11 months of 2017:
  - 170,007 PEVs sold
  - 27% higher than 2016

PEV Registrations per 1,000 People by State, 2016



Sources: Electric Drive Transportation Association (above); DOE Vehicle Technologies Office (right)

PLAN

3. Chugach Electric Vehicle & Charger

- Chevy Bolt purchased and in use by employees
  - Increases employee knowledge and familiarity with EVs and charging
- Chugach leading by example
- Creates publicity for EVs and Chugach
- Allows for vehicle and charger testing
- Charging station available for public use

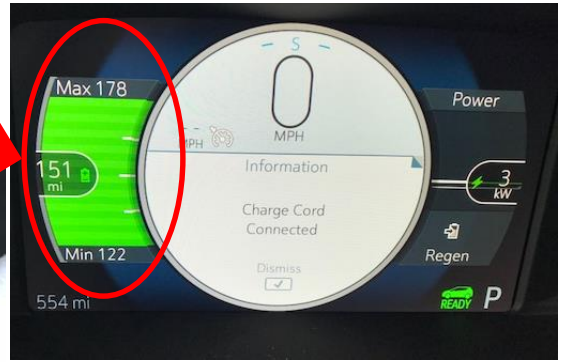
Meet Wattson...

GOOD TO KNOW

Feedback About Driving Wattson

+ Shifting is different than usual
  + Shift lock release button
  + Push button park and parking brake
+ Regenerative braking
  + Stores braking energy
  + May be limited when full charge or cold
+ Drive and Low
  + One-pedal driving
+ Range display
+ Climate controls

Range



Shift lock release on side