



# **Northeast Regional Transportation Electrification Workshop**

**November 29 - 30, 2018**

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**National Governors Association  
Center for Best Practices**

**#WeTheStates**

# Polling Question 1

[Login](#)

**What do you see as the biggest barriers to EV adoption?**[Visual settings](#) /


 Respond at **PollEv.com/ngaeet062**  Text **NGAEET062** to **22333** once to join, then **A, B, C, or D** [Show results](#) 

**A**  
Education

**B**  
Cost

**C**  
Awareness

**D**  
Charging  
Availability

 Poll Everywhere



# Welcome & Opening Remarks

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**Sue Gander**, Director, Environment, Energy & Transportation Division,  
NGA Center for Best Practices

**#WeTheStates**



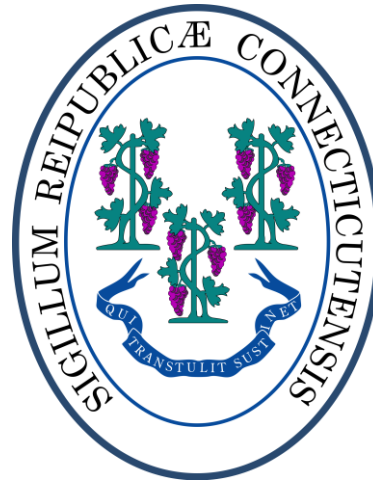
# State Introductions

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**CONNECTICUT**



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November 29, 2018

**Transportation Electrification Workshop, Northeast Regional**



# **Crafting Incentives, Developing Policies, and Building Consumer Awareness**

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Moderator: **Rick Tempchin**, Senior Fellow, Alliance to Save Energy

Speakers:

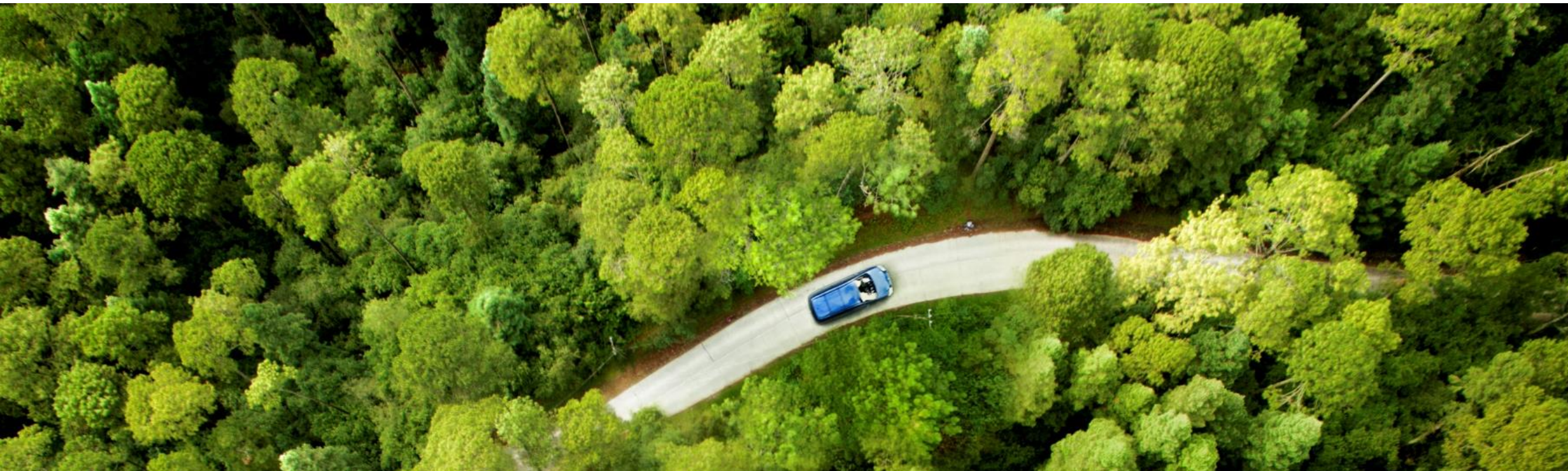
**Elaine O'Grady**, Policy & Program Director, Northeast States for Coordinated Air Use Management

**Rob Klee**, Commissioner, CT Department of Energy and Environmental Protection

**Bob Wimmer**, Director, Energy and Environmental Research Group, Toyota Motors

**#WeTheStates**





# NGA NORTHEAST TRANSPORTATION ELECTRIFICATION WORKSHOP

Crafting Incentives, Developing Policies & Building Consumer Awareness

November 29, 2018





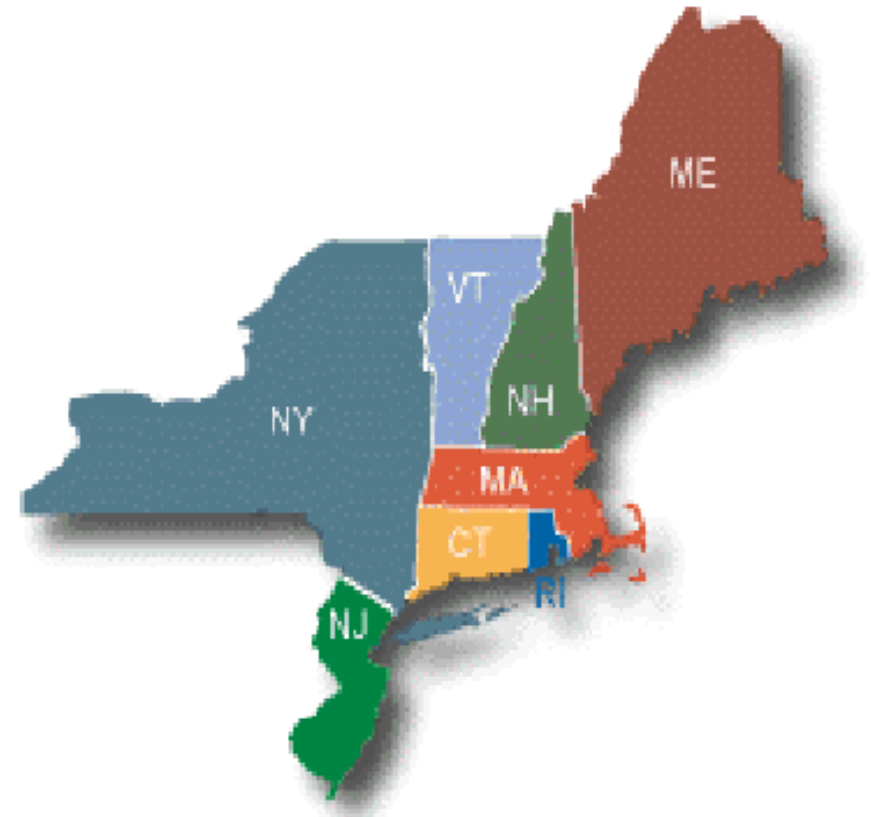
# What is NESCAUM?

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## Northeast States for Coordinated Air Use Management

The regional nonprofit association of air quality agencies in the Northeast.

Our purpose is to provide scientific, technical, analytical, and policy support to the air quality programs of the eight Northeast states.



# The Multi-State ZEV Task Force

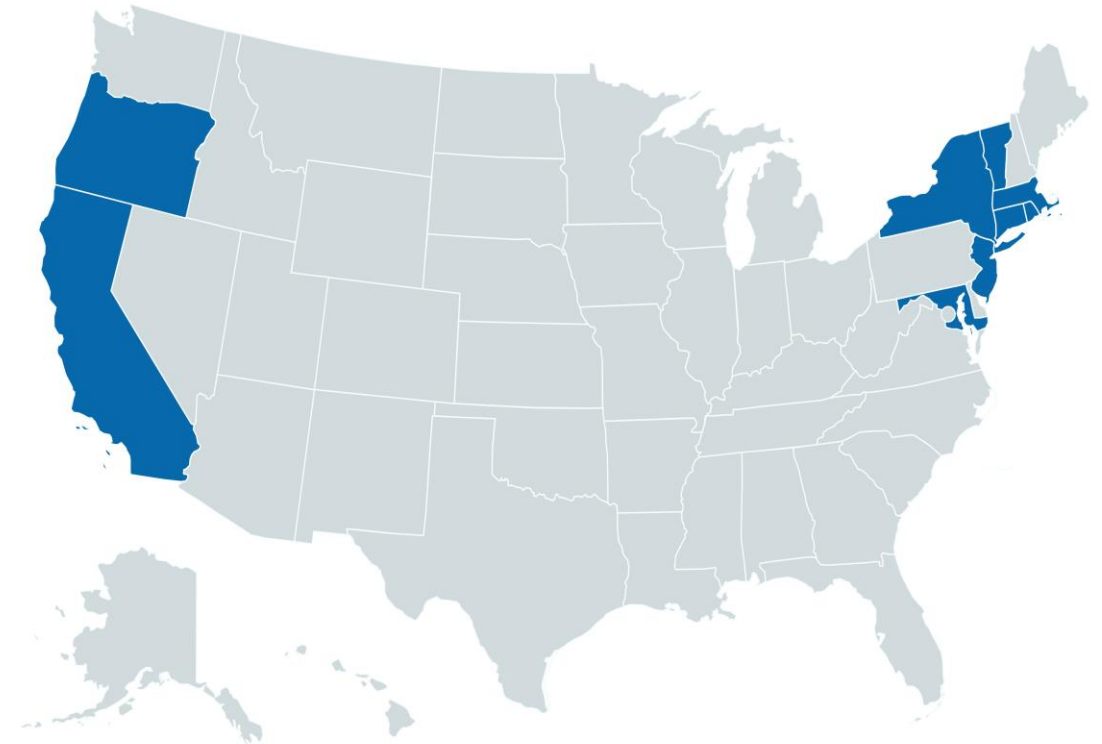
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Nine states working together to identify and remove barriers to ZEV adoption

Formed by a 2013 Governor's Memorandum of Understanding

Facilitated by NESCAUM

All member states have utilized CAA §177 authority to adopt California's ZEV requirements



Created with mapchart.net ©

**ZEV**  
TASK FORCE**MULTI-STATE ZEV ACTION PLAN**  
ACCELERATING THE ADOPTION OF ZERO EMISSION VEHICLES**2018  
2021**

# Multi-State ZEV Action Plan

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Identifies 80 market-enabling actions for states, automakers, dealers, utilities, charging and fueling companies, and other partners in five key areas:

- Consumer Education and Outreach
- Infrastructure
- Consumer Purchase Incentives
- Light Duty Fleets
- Dealerships

## CONSUMER EDUCATION AND OUTREACH

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### High Priority Recommendations for States

Support and encourage innovative state, local, and grassroots efforts to increase consumer experience with ZEVs, such as ride and drive events, car sharing, rental programs, and pop-up or permanent ZEV showrooms.

Support the brand-neutral Drive Change. Drive Electric. campaign in partnership with automakers and work to bring in other partners.



[DriveElectricUS.com](https://DriveElectricUS.com)



[Facebook.com/DriveElectricUS](https://Facebook.com/DriveElectricUS)



[Twitter.com/DriveElectricUS](https://Twitter.com/DriveElectricUS)



[@driveelectricus](https://@driveelectricus)



# DRIVE CHANGE. DRIVE ELECTRIC: TARGET AUDIENCES



## Next Chapter Women (Need Convincing)

### *Demographics:*

*These are late Gen-X and Boomer women approaching retirement and empty nests.*

### **EV Mindset:**

They have the least education about electric cars. They generally appreciate lower fuel costs and environmental benefits, but express anxiety about range and charging station availability.



## Grown Up Millennials (Persuadable)

### *Demographics:*

*These are older millennials; they are establishing their careers and their families; they live in the suburbs.*

### **EV Mindset:**

They are drawn to electric cars but have concerns about “inconvenience” associated with ownership. However, once persuaded, they’re more likely to purchase electric cars throughout their lives.



## Seasoned Base (Interested)

### *Demographics:*

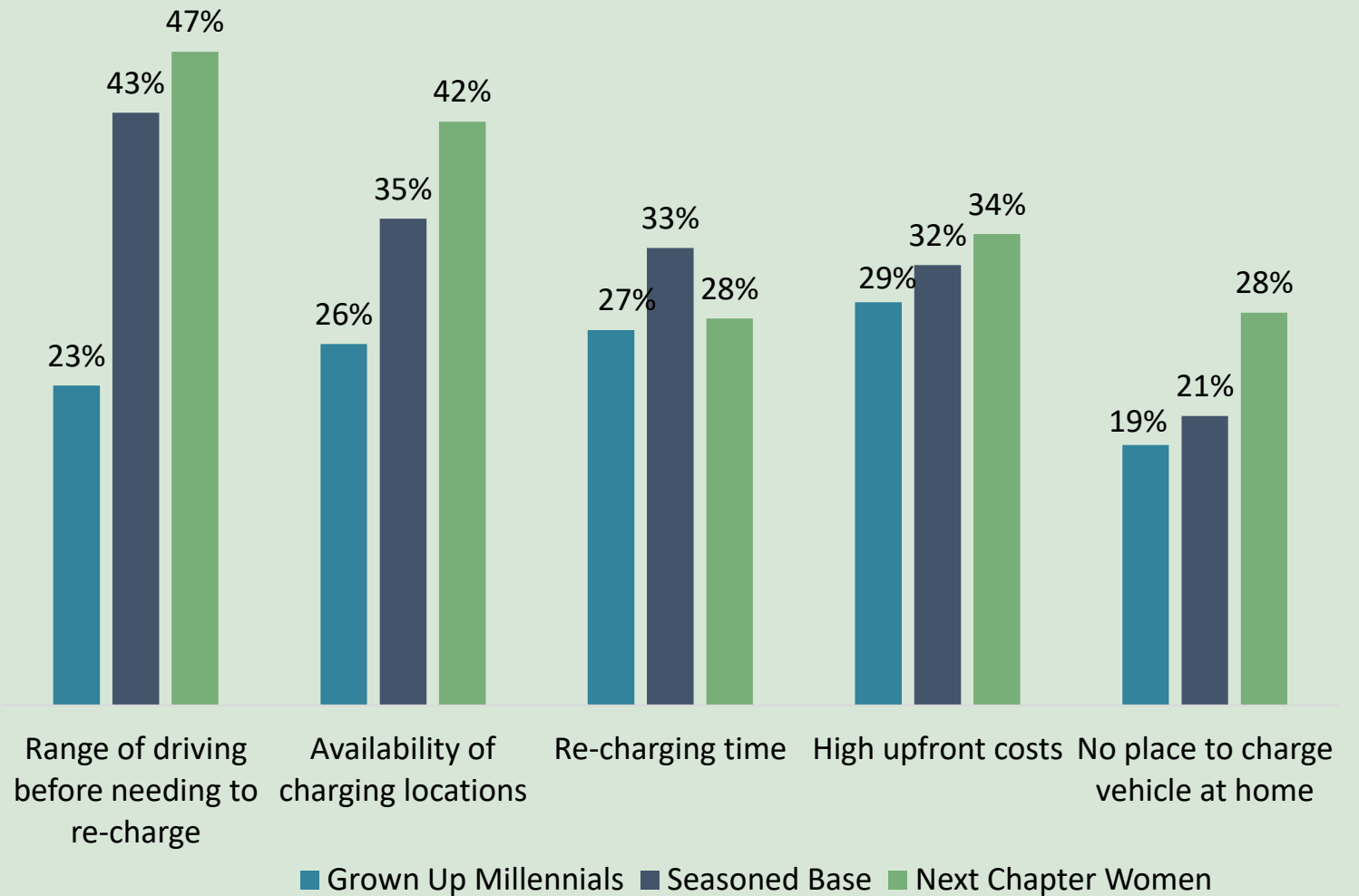
*These are educated, Gen-X and Boomer men; they have been the primary drivers of EV adoption.*

### **EV Mindset:**

Generally favorable towards electric cars. They like the savings on fuel costs but have specific concerns with regard to vehicle performance, range and charging station availability.

## TOP REASONS FOR NOT BUYING EVS

It's not really about the car. It's about the impact of the unknown on the everyday.



Source: Edelman Intelligence, Consumer Survey, Jan. 2017.

# WEBSITE & SOCIAL MEDIA CONTENT

Full torque from a standstill. Remind yourself how much fun driving should be with a new electric car.

VIEW CARS BY BODY STYLE > ☐ Crossover ☐ Hatchback ☐ Minivan ☐ Sedan ☐ Sports ☐ SUV  
VIEW CARS BY DRIVETRAIN TYPE > ☐ Battery Electric Vehicle ☐ Plug-In Hybrid Electric Vehicle

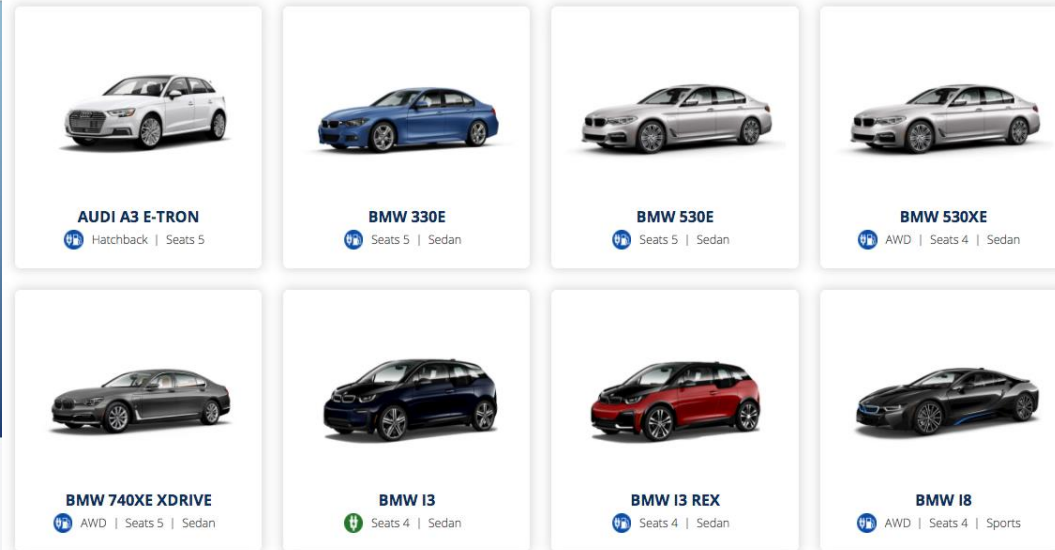


DRIVEELECTRICUS.COM

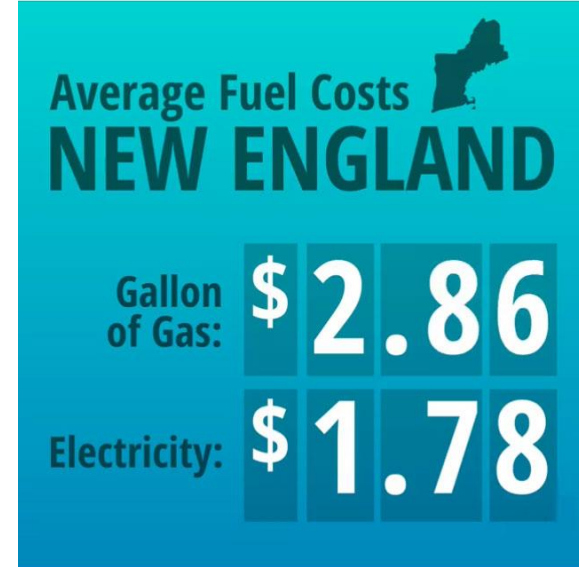
**Drive Change. Drive Electric.**

Switch to electric without switching up your everyday...

[Learn More](#)



It's cheaper to charge your car at home than it is to fuel up on gas. Need more convincing? See our affordability page: <https://bit.ly/2vYl5nA>



## Convenience

Simplify your routine with an electric car that recharges while you recharge, and with driving ranges that fit your lifestyle.



## Affordability

Get information on incentives to purchase electric cars and the savings from reduced operating costs.



## Technology

Learn more about the technological innovations "under the hood."



## Sustainability

See how smart choices now can make a better future.



## The Fun Factor

Go electric for vehicle performance that makes the drive to work almost as much fun as the drive home.

# CONSUMER PURCHASE INCENTIVES

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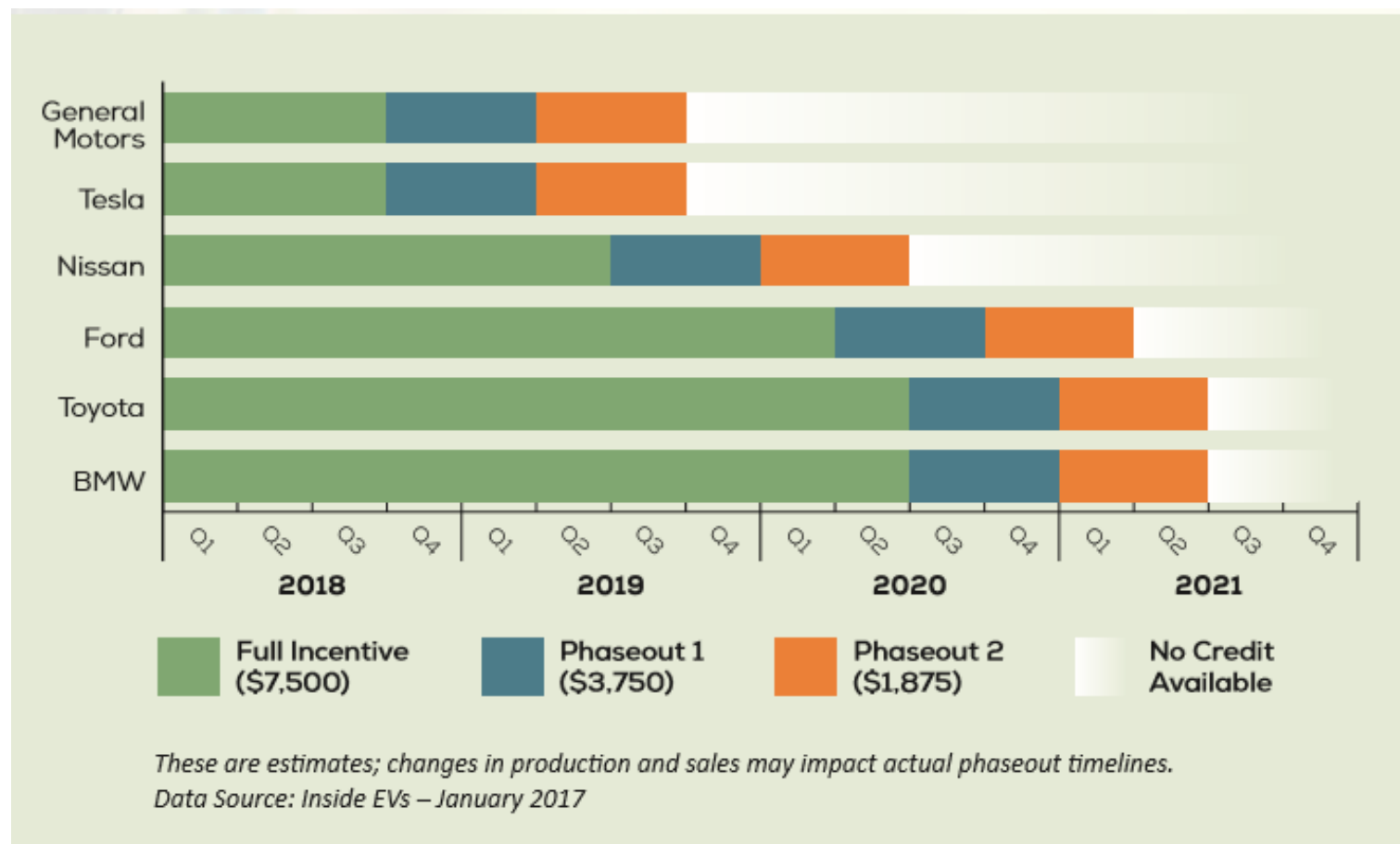
## High Priority Recommendations for States

Advocate for continued availability of federal tax credits.

Continue to offer and promote existing state financial incentives, and consider new programs and outreach efforts to improve access to incentives for moderate and lower income consumers.

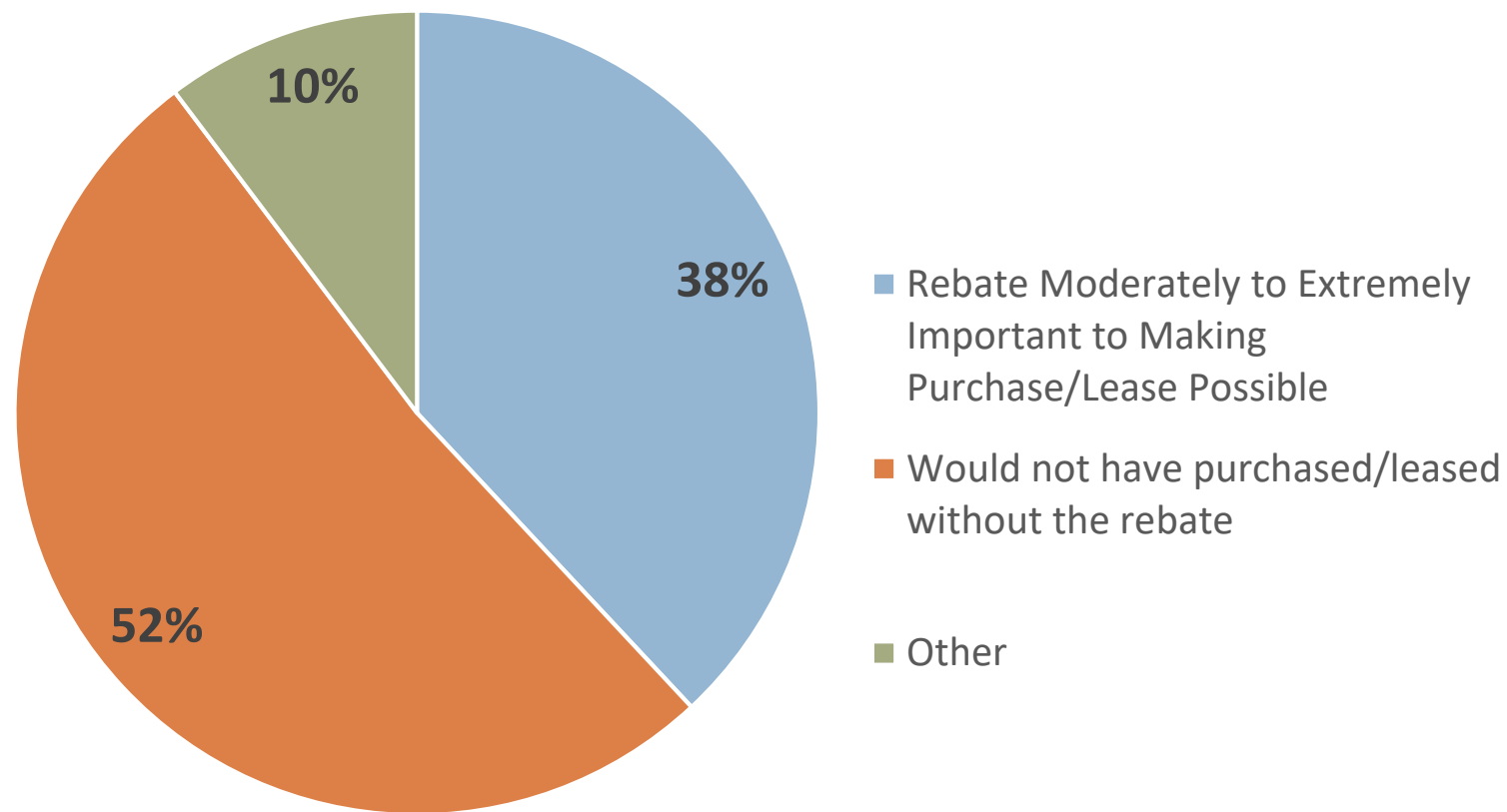
## PROJECTED PHASE OUT OF FEDERAL EV TAX CREDIT

Federal tax credits for  
some EV manufacturers  
are starting to phase.



## CALIFORNIA CLEAN VEHICLE REBATE CONSUMER SURVEY

Purchase incentives play a crucial role in early ZEV adoption and should be maintained or expanded to promote market growth.



Data Source: Center for Sustainable Energy Surveys (2013-2017)

<https://cleanvehiclerebate.org/sites/default/files/attachments/2017-10-19-CSE-EV-Rebate-Impacts.pdf>

# OTHER IMPORTANT POLICIES

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## High Priority Recommendations for States

Revise **building codes** to require supporting electrical infrastructure for EVSE in new construction and major renovations.

Encourage local governments to **streamline permitting** for DCFC and hydrogen fueling stations.

**Open PUC proceedings** to consider utility investments, incentivizing off-peak charging, and ways to address demand charges.

Lead by example: **Add ZEVs to state fleets** and **offer workplace charging** at state buildings.



# Thank you!

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**The Multi-State ZEV Action Plan is available at:**

<https://www.nescaum.org/topics/zero-emission-vehicles/multi-state-zev-action-plan-2018-2021-accelerating-the-adoption-of-zero-emission-vehicles>

**For questions, please contact:**

Elaine O'Grady at [eogrady@nescaum.org](mailto:eogrady@nescaum.org)



**ZEV**  
TASK FORCE

**MULTI-STATE ZEV ACTION PLAN**  
ACCELERATING THE ADOPTION OF ZERO EMISSION VEHICLES

**2018  
2021**







# **Crafting Incentives, Developing Policies, and Building Consumer Awareness**

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**#WeTheStates**

# Vehicle Electrification

## Northeast Regional Transportation Electrification Workshop

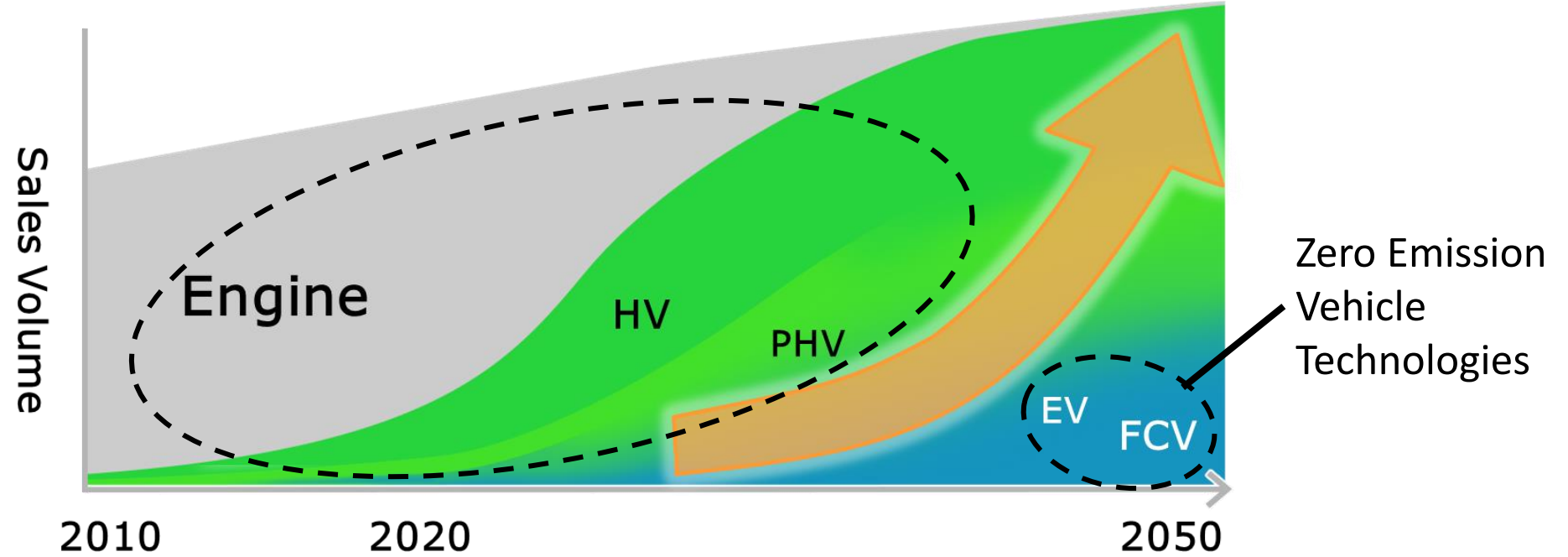
**Bob Wimmer**

**Director, Energy & Environmental Research**

**Toyota Motor North America**

November 29, 2018

# Electrification Pathway Toward 2050



## Conventional



Internal Combustion Engine (ICE)  
Hybrid Vehicle (ICE and Battery)

## Plug-in Hybrid Vehicle (PHEV)



ICE & battery utilizing both  
gasoline and electricity

## Zero Emission Vehicle (ZEV)



Electricity or Hydrogen

# Toyota Electric-Drive Product Offerings

Compact/  
Medium



Prius c



Prius



Prius v

*Hybrid*



Prius Prime PHV

Best selling  
PHEV in U.S.



Mirai FCV

Best selling  
FCEV

## Toyota Global Electrification Targets

La  
Prei

- +5.5M Electrified Vehicle Sales per year by 2030
  - + 1M of those ZEV
- Electrified vehicles available for all models around 2025
- More than 10 new BEVs by 2020



500h

*Plug-In/  
Hydrogen  
Fuel Cell*

SUV

RAV4 Hybrid



Highlander Hybrid



NX 300h

RX 450h



RAV 4 EV  
(out of production)

Commercial



FC Box Truck (prototype)

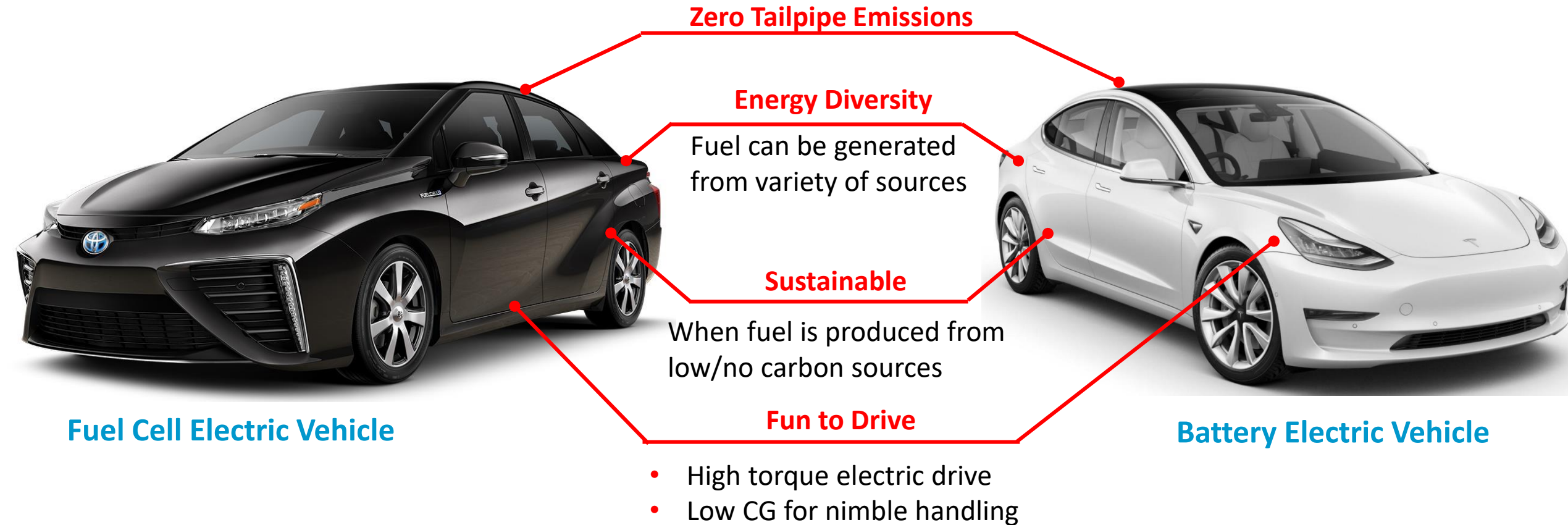


Portal FC Truck (prototype)



Sora FC Bus

# Zero Emission Electric Vehicle Attributes





# Additional Benefits of FCEVs



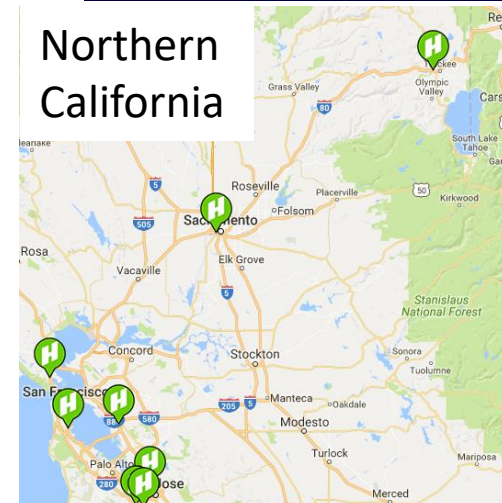
# Light-Duty Fuel Cell Vehicle and Station Status



## United States

- ✓ ~5000 FCEVs on the road
- ✓ +4,200 Mirai sold or leased
- ✓ 36 H2 stations open in California
  - ✓ Targeting 59 by the end of 2019
- ✓ Stations coming on-line in Northeast
- ✓ Targeting NE vehicle deployment in 2019

### Northern California



### Southern California



# The Challenge





# Cost Competitive Technology



Median U.S. Household Income  
\$61,400



Average New Car Transaction Price  
\$34,000 - \$35,000

## Plug-in Hybrid and ZEV Pricing



	Available Models	MSRP Below \$35,000*
PHEV	26	7
ZEV (EV & FCV)	17	6

\*MSRP does not include incentives

# Stable Regulations

## Background

- +5 years to bring a new vehicle to market
- New fueling infrastructure can take decades
- Investment decisions significantly influenced by regulation

## Policies that influence future products

- Fuel economy/GHG regulations
- Fuel regulations (RFS, octane)
- Vehicle/technology incentives
- Carbon policy

## Current Challenge

***Federal  
Policy  
Environment A***

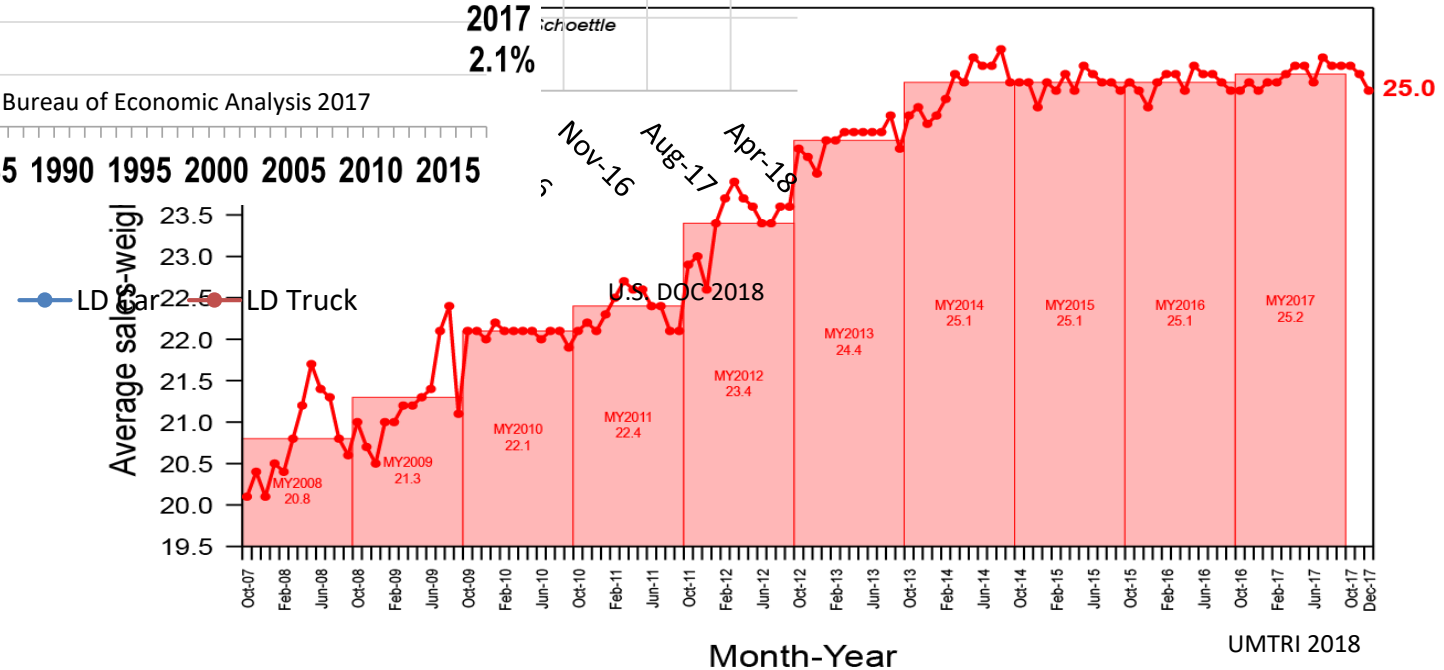
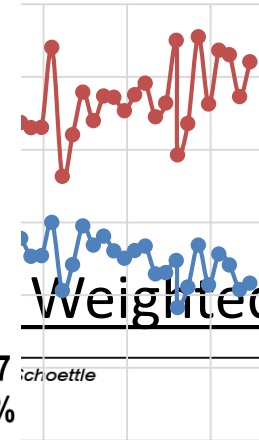
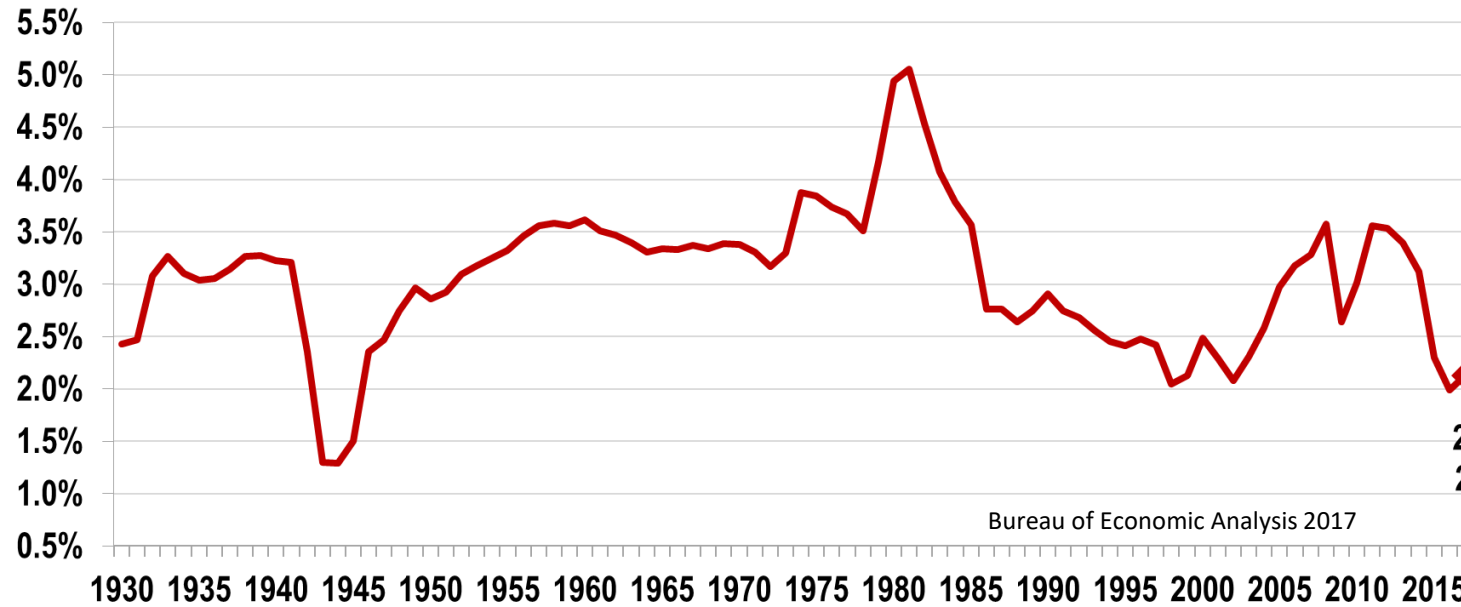


***Federal  
Policy  
Environment B***

***State Policies***

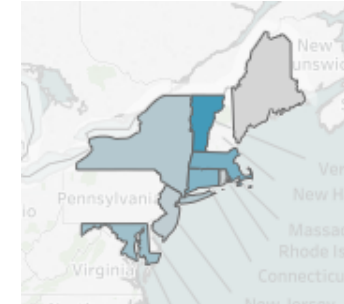
# Consumer Pull

BEA: US Motor Fuel % of Personal Consumption Expenditures



A map of California with the Central Valley region highlighted in blue. The Central Valley is a large, elongated valley that runs north-south through the center of the state. It is bordered by the Sierra Nevada mountains to the east and the Coast Range to the west. The Central Valley is one of the most fertile and densely populated regions in California, and it is a major agricultural hub. The map also shows the surrounding states of Nevada, Utah, and Arizona, as well as the Pacific Ocean to the west.

## NE ZEV States



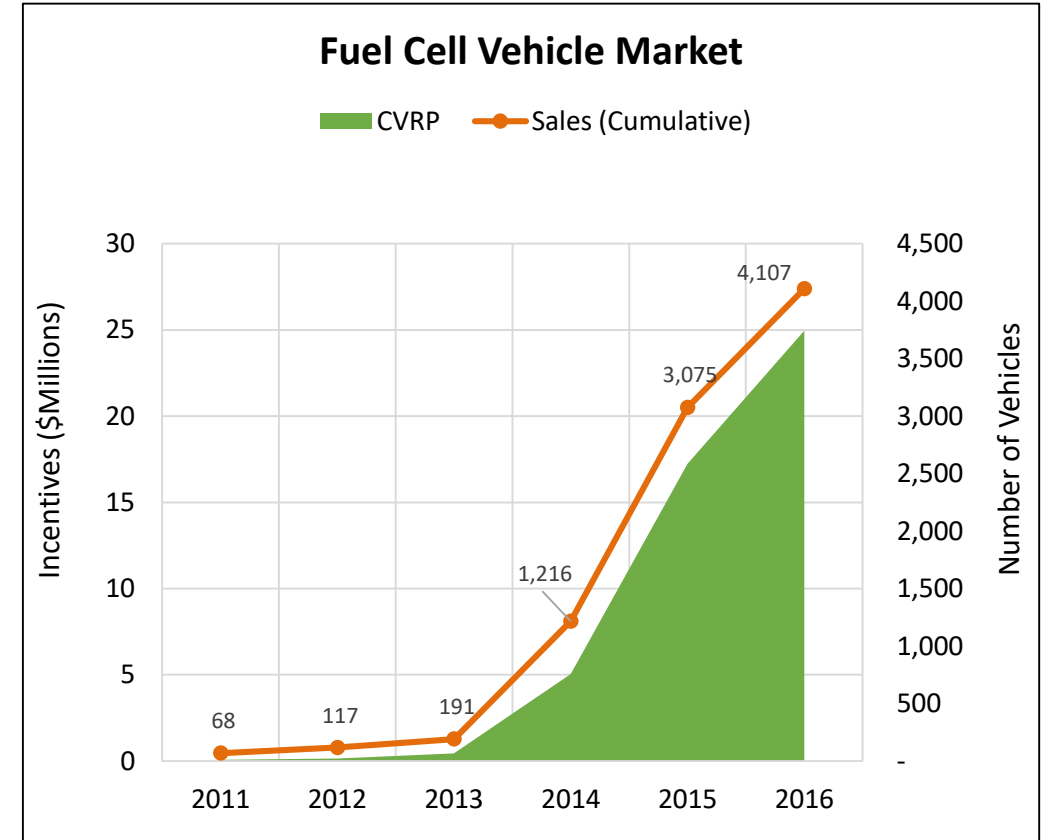
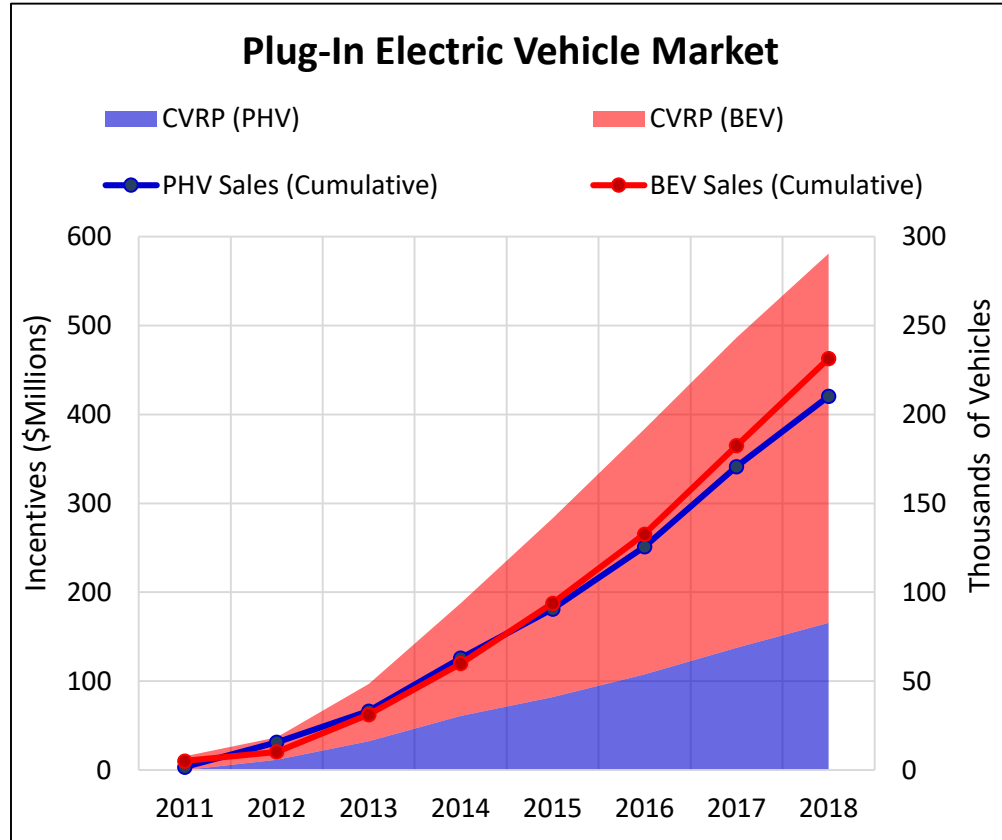
Month	PHEV (%)	BEV (%)	FCEV (%)	Total (%)
Jan-17	2.5	4.1	0.1	6.7
Feb-17	2.2	2.0	0.1	4.3
Mar-17	2.1	2.4	0.1	4.6
Apr-17	2.1	2.9	0.1	5.1
May-17	2.3	1.8	0.1	4.2
Jun-17	2.2	2.2	0.1	4.5
Jul-17	2.1	2.5	0.1	4.7
Aug-17	2.3	2.1	0.1	4.5
Sep-17	2.2	2.7	0.1	5.0
Oct-17	2.6	3.6	0.1	6.3
Nov-17	2.8	2.2	0.1	5.1
Dec-17	3.2	2.8	0.1	6.1
Jan-18	2.6	4.0	0.2	6.8
Feb-18	2.9	2.0	0.1	5.0
Mar-18	3.3	2.2	0.1	5.6
Apr-18	3.2	4.5	0.1	7.8
May-18	3.2	3.4	0.1	6.7
Jun-18	3.3	3.7	0.1	7.1
Jul-18	3.2	4.6	0.1	7.9
Aug-18	3.5	6.4	0.1	10.0

The chart displays the monthly percentage share of three vehicle types: PHEV (blue), BEV (red), and FCEV (green). The Y-axis represents the percentage share from 0% to 10%. The X-axis shows months from Jan-17 to Aug-18. PHEV and BEV are the primary contributors, with PHEV generally accounting for about 0.5% to 0.8% and BEV for about 0.3% to 0.7% of sales. FCEV is not visible in the chart, indicating a share below 0.1%.

Month	PHEV (%)	BEV (%)	FCEV (%)
Jan-17	0.6	0.3	0.0
Feb-17	0.6	0.2	0.0
Mar-17	0.6	0.3	0.0
Apr-17	0.6	0.3	0.0
May-17	0.6	0.3	0.0
Jun-17	0.6	0.4	0.0
Jul-17	0.6	0.4	0.0
Aug-17	0.6	0.4	0.0
Sep-17	0.6	0.5	0.0
Oct-17	0.6	0.5	0.0
Nov-17	0.6	0.4	0.0
Dec-17	0.8	0.6	0.0
Jan-18	0.6	0.4	0.0
Feb-18	0.6	0.4	0.0
Mar-18	0.6	0.5	0.0
Apr-18	0.6	0.5	0.0
May-18	0.6	0.5	0.0
Jun-18	0.6	0.6	0.0
Jul-18	0.6	0.6	0.0
Aug-18	0.6	0.8	0.0

# California Clean Vehicle Rebate Program (CVRP)

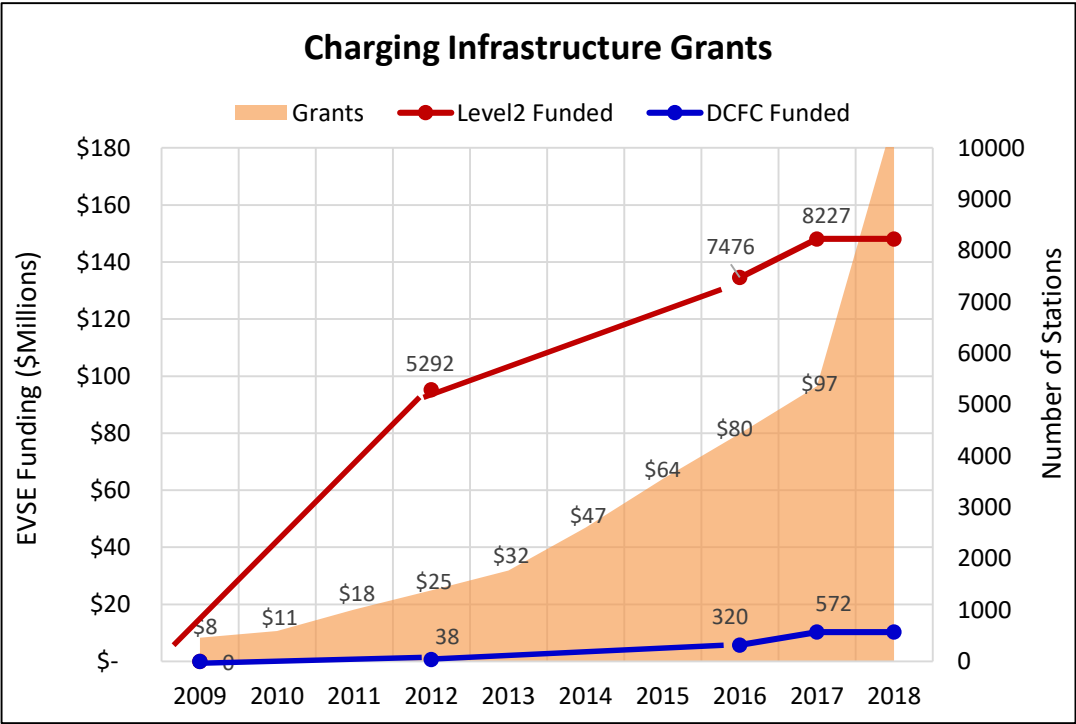
## State Vehicle Incentive Funding to Date



Program funded by revenue from California's Cap & Trade program

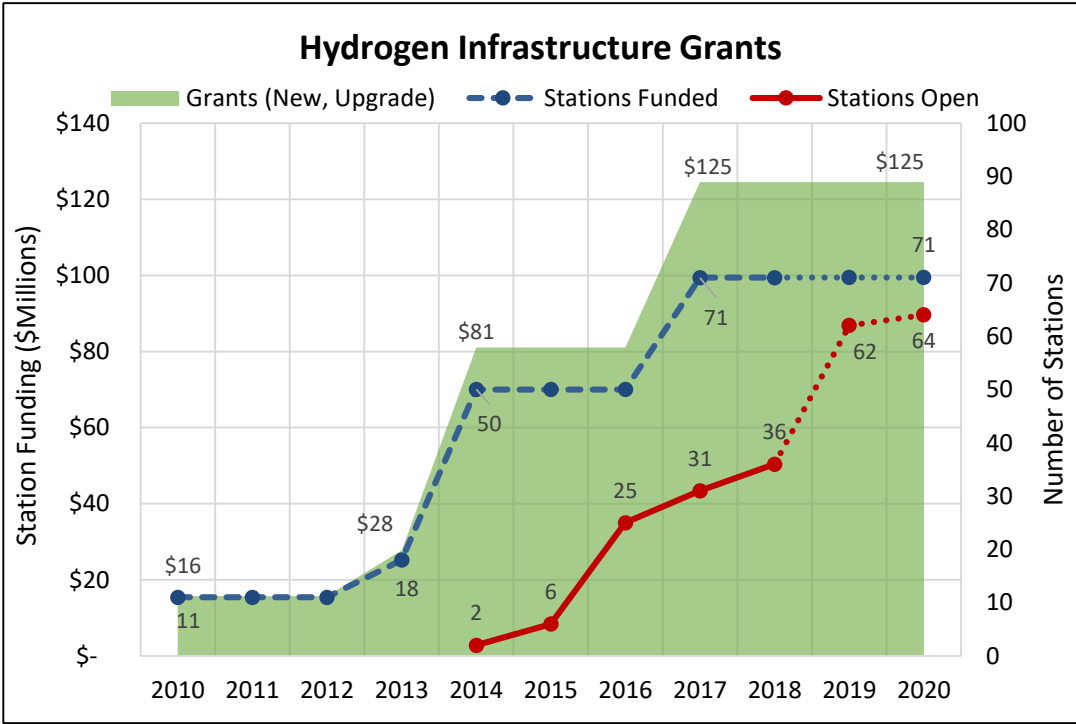
# California Infrastructure Funding

Revenue for infrastructure grants comes from \$4 fee on all vehicle registrations



Additional funds for charging infrastructure funds from

- Electric utility customers (rate-based investments)
- Volkswagen settlement funds



H2 Infra Funding Source	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	...
CARB AQIP											
AB118		\$20M	\$20M	\$20M	\$20M						
AB8						\$20M	\$20M	\$20M	\$20M	\$20M	® 2024
LCFS											®

\* Actual grant spending below appropriation

# Conclusions

- Technologies exists to meet both customer needs & societal CO<sub>2</sub> reduction goals
- All technologies and fuels are needed to meet consumer needs and required volumes
- Stable public sector support (regulations & incentives) are needed to
  - Accelerate sales
  - Encourage private sector investment
- Volumes, variety and time will help reduce costs and lower prices
- Rapid growth in consumer demand for electric drive needed for success





*2018 Prius*



*2018 RAV4 Hybrid*

***Thank You For Your Attention***



*2018 Camrys*



*2018 Mirai*





# **Crafting Incentives, Developing Policies, and Building Consumer Awareness**

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Moderator: **Rick Tempchin**, Senior Fellow, Alliance to Save Energy

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**Bob Wimmer**, Director, Energy and Environmental Research Group, Toyota Motors

**#WeTheStates**



# Electrifying State Light-Duty Fleets and Transit

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Moderator: **Jim Redeker**, Commissioner, Connecticut Department of Transportation

Speakers:

**Harmony Wilder**, Fleet Manager, State of Vermont

**Eric J. McCarthy**, Senior Vice President, Government Relations, Public Policy and Legal Affairs, Proterra

**Doug Holcomb**, Greater Bridgeport Transit

**#WeTheStates**



**DEPARTMENT OF BUILDINGS AND GENERAL SERVICES  
FLEET MANAGEMENT SERVICES**

# Electric Vehicle Deployment Strategies

Northeast Regional Transportation Electrification Workshop

Hartford, CT

November 29-30, 2018

Harmony Wilder

State Fleet Manager

# State Fleet Program Summary

Fleet Management Services (FMS) provides centralized management and control of the State's vehicles, except for those exempt by statute or by Commissioner of Buildings & General Services.

27 agencies and departments are assigned vehicles which serve a variety of needs, from administrative travel to routine off-road use.

Motor pool vehicles are provided at 8 locations throughout the state for short-term use and shared by all agencies and departments.

Currently 35% of the light-duty vehicles provided through the motor pool are plug-in electric (PHEV).

Our mission is to provide safe, economical vehicles for state business use, and reduce the environmental impact of state travel.



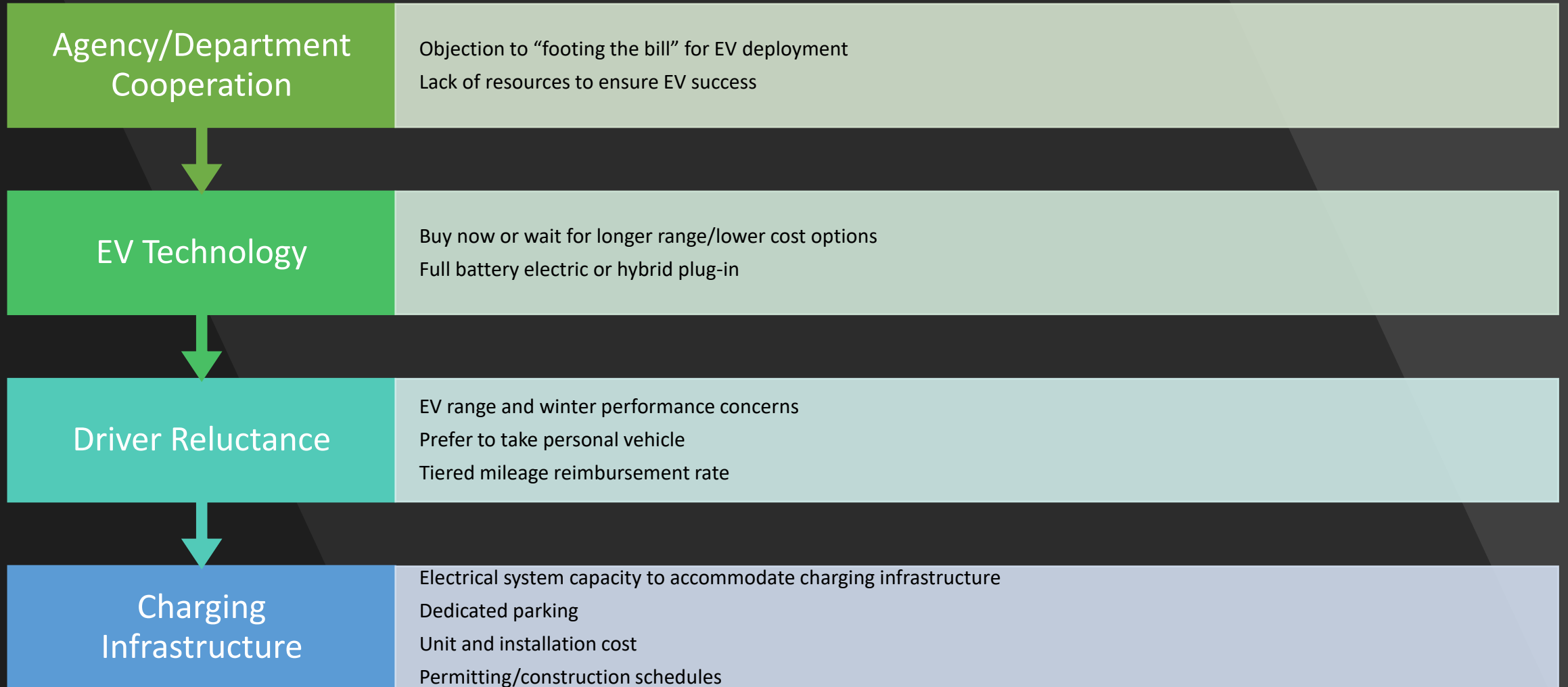


# Policies and Goals

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- Vermont Statute 10 V.S.A § 578(a) – 2006
  - 50% reduction of greenhouse gas emissions from 1990 levels by 2028 (Statewide Goal)
- Vermont Comprehensive Energy Plan – 2011
  - Vehicle electrification identified as a primary pathway to enable the state to meet its renewable energy goal
  - 25% of registered vehicles to be powered by renewable sources by 2030
- Vermont Zero Emissions (ZEV) Action Plan - 2014
  - 25% of new light-duty fleet vehicles purchased/leased will be ZEV by 2025
  - New State-building construction projects will be designed to support planned or future charging stations

# Plug-In EV Deployment Considerations





# Value of EVs in Motor Pool

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Rapid deployment

Exposure to more state employees  
(potential EV owners)

Greater community visibility

Educated drivers = Positive experience

Optimize EV utilization

Blended chargeback rates

Monitored charging



## EV Performance Measures

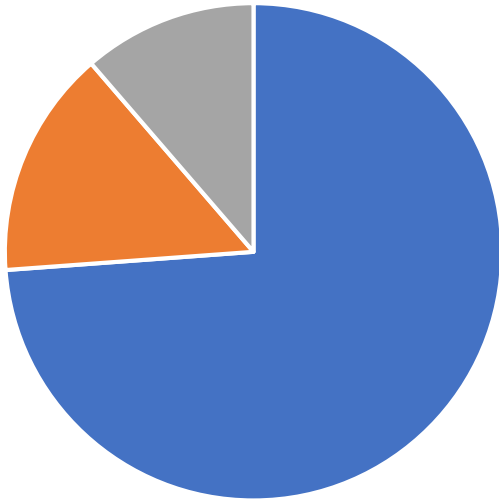
- Total cost of ownership
- Fuel economy
- Residual value vs actual resale

# Cost of Ownership Comparison

2013 Chevy Volt Plug-In Hybrid

Projected Cost to Own

\$30,259



■ Depreciation   ■ Fuel Costs   ■ Operating Costs  
(Projection)

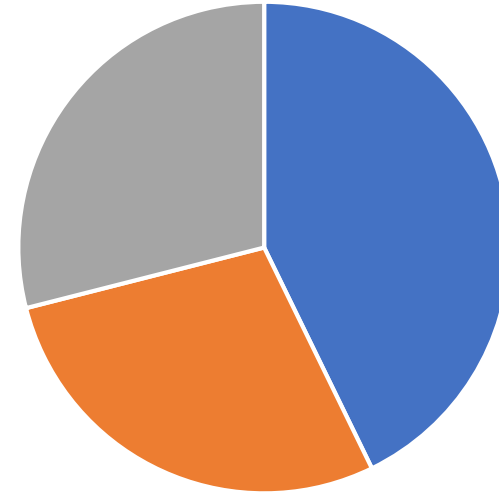
*Original Purchase Price \$31,641*

*Expected Resale \$9,300 (80% book value)*

2013 Ford Focus

Actual Cost to Own

\$28,339



■ Depreciation   ■ Fuel Costs   ■ Operating Costs

*Original Purchase Price \$17,322*

*Actual Resale \$5,200 (81% book value)*





# Challenges and Improvement Opportunities

## Charging Infrastructure

- Construction Delays
- Timing Vehicle Procurement

## More robust rental system

- Automated trip matching to maximize EV use

## Identify Optimal Uses

- Telematics for collecting driving patterns
- Identify “sweet spots” for an EV

## Limited EV models on contract

- Lease vs buy
- Cooperative purchasing

## Driver Behavior

- Seldom charge mid-trip
- Increase awareness of charging locations
- Targeted education and feedback

# PROTERRA: REVOLUTIONIZING TRANSIT



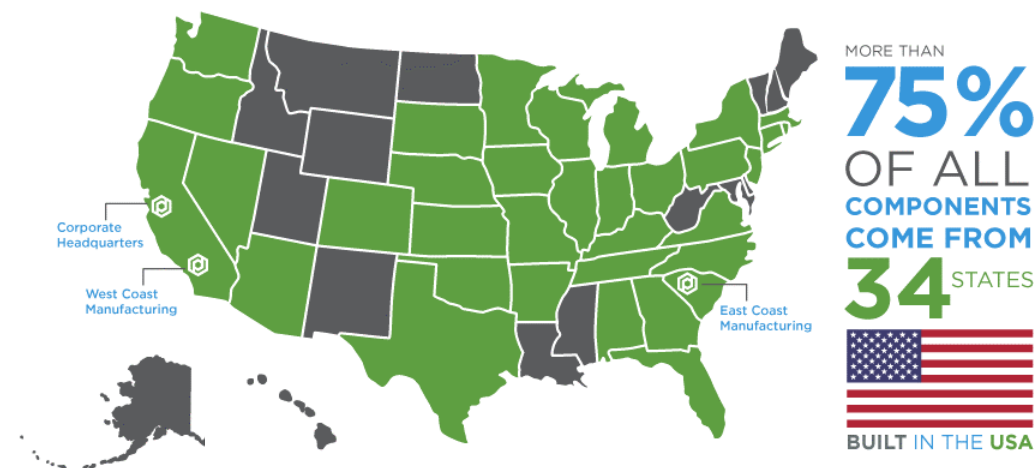
PRESENTED BY  
**Eric J. McCarthy**  
SVP, Government Relations, Public Policy and Legal Affairs



## Proterra's Mission

Advancing electric vehicle technology to deliver the world's best-performing heavy-duty vehicles

- Offices and manufacturing in CA and SC
- 465+ employees, with strong transportation expertise
- >90 customers; >700 vehicles sold
- >230 vehicles delivered; >6,000,000 service miles
- >33,200,000 pounds of CO2 emissions avoided



## Strong Transportation Expertise



## World-Class Financial Partners





# HIGH-QUALITY, ADVANCED MANUFACTURING FOR RAPID EV ADOPTION AT SCALE



## Burlingame, California

*Battery Manufacturing  
Company HQ*



## Los Angeles, California

*Bus Manufacturing  
West Coast Operation*

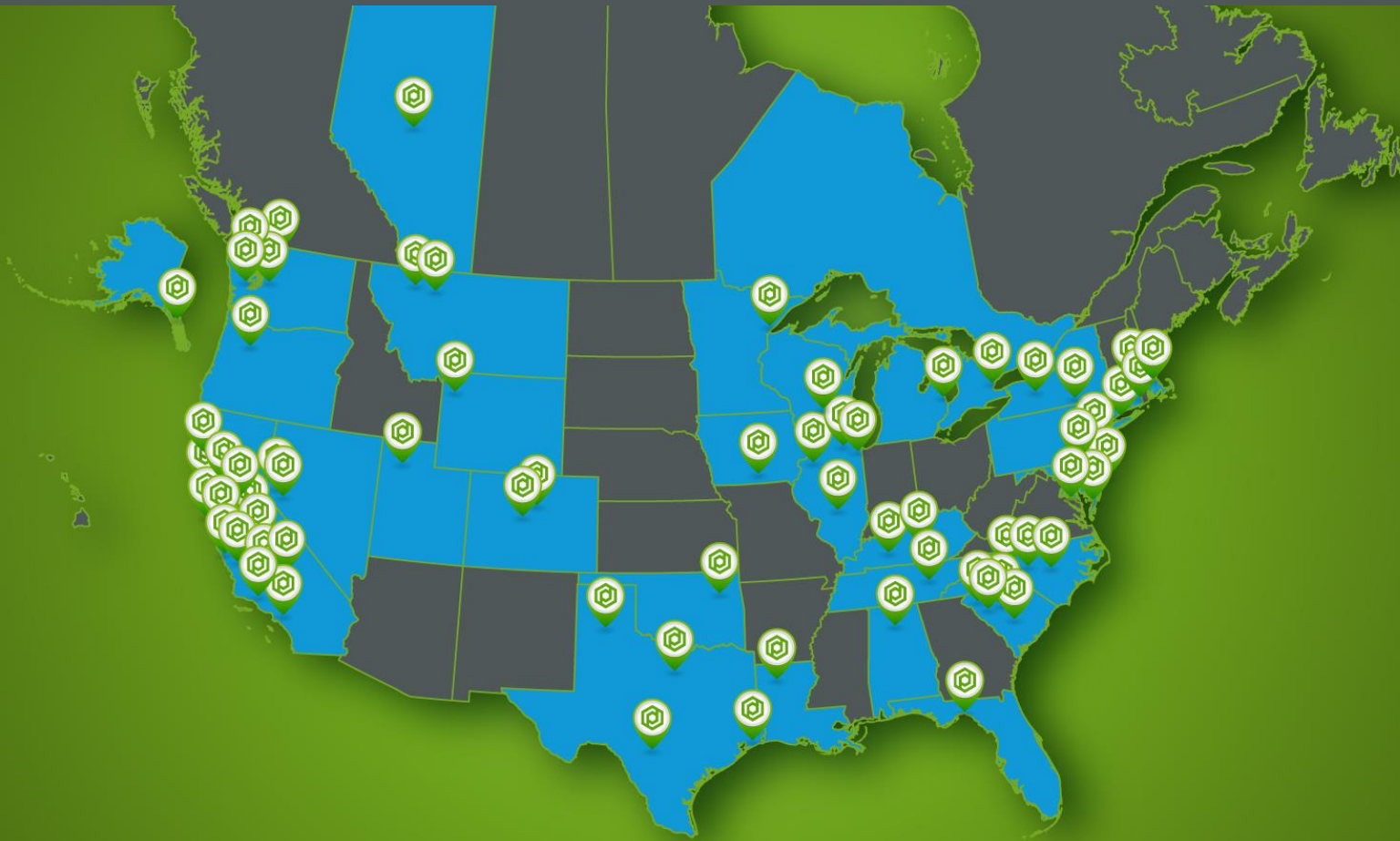


## Greenville, South Carolina

*Bus Manufacturing  
East Coast Operation*



# OUR CUSTOMERS IN 2018...



**>700 buses** sold to **>90 customers** across **41 states/provinces**

## AL

ALABAMA A&M UNIVERSITY  
NORMAL

## AK

CAPITAL TRANSIT JUNEAU

## CA

CITY OF ARVIN  
FCRTA FRESNO  
FOOTHILL TRANSIT WEST COVINA  
LADOT TRANSIT LOS ANGELES  
MAX MODESTO  
RABA REDDING  
RTD STOCKTON  
SACRAMENTO INTERNATIONAL AIRPORT  
SAMTRANS SAN CARLOS  
SAN JOSE INTERNATIONAL AIRPORT  
TRI DELTA TRANSIT ANTIOCH  
VTA SAN JOSE  
VISALIA TRANSIT VISALIA  
YOSEMITE NATIONAL PARK

## CO

TOWN OF BRECKENRIDGE  
SUMMIT COUNTY FRISCO

## CT

GBT BRIDGEPORT

## DC

DC CIRCULATOR WASHINGTON

## DE

DART FIRST STATE DOVER

## FL

STAR METRO TALLAHASSEE

## IL

QUAD CITIES METROLINK MOLINE  
PRUDENTIAL PLAZA/AON CENTER CHICAGO  
CONNECT TRANSIT BLOOMINGTON - NORMAL  
CHICAGO TRANSIT AUTHORITY

## IA

DART DES MOINES

## KY

TARC LOUISVILLE  
LEXTRAN LEXINGTON

## LA

SPORTRAN SHREVEPORT

## MD

BGE BALTIMORE  
MCDOT ROCKVILLE

## MT

DASH UNIV. OF MONTANA MISSOULA  
MOUNTAIN LINE MISSOULA

## NV

RTC RENO  
TAHOE TRANSPORTATION DISTRICT  
STATELINE

## NY

MTA NEW YORK CITY  
TOMPKINS CONSOLIDATED  
AREA TRANSIT ITHACA

## NC

RALEIGH-DURHAM INTERNATIONAL AIRPORT  
ART ASHEVILLE  
GTA GREENSBORO

## OK

THE CHEROKEE NATION

## PA

SEPTA PHILADELPHIA

## OR

SMART PORTLAND

## SC

CATBUS CLEMSON  
CATBUS SENECA  
GREENLINK GREENVILLE  
CITY OF ROCK HILL

## TN

MTA NASHVILLE

## TX

VIA SAN ANTONIO  
DART DALLAS  
CITIBUS LUBBOCK  
PAT PORT ARTHUR

## UT

PARK CITY TRANSIT PARK CITY

## WA

KING COUNTY METRO SEATTLE  
EVERETT TRANSIT EVERETT  
KITSAP TRANSIT BREMERTON  
PIERCE TRANSIT LAKEWOOD

## MA

WRTA WORCESTER  
PVTA SPRINGFIELD

## MI

BLUE WATER AREA TRANSIT  
PORT HURON

## MN

DTA DULUTH

## WI

METRO TRANSIT MADISON

## WY

START JACKSON

## CANADA

## AB

EDMONTON TRANSIT SERVICE

## ON

TORONTO TRANSIT COMMISSION



# NORTHEAST & MID-ATLANTIC PROTERRA CUSTOMERS



## CT

GBT BRIDGEPORT

## DC

DC CIRCULATOR WASHINGTON

## DE

DART FIRST STATE DOVER

## MA

WRTA WORCESTER

PVTA SPRINGFIELD

## ME

SH-ZOOM TRANSIT BIDDEFORD

GREATER PORTLAND METRO PORTLAND

## MD

BGE BALTIMORE

MCDOT ROCKVILLE

## NY

MTA NEW YORK CITY

TOMPKINS CONSOLIDATED  
AREA TRANSIT ITHACA

## PA

SEPTA PHILADELPHIA

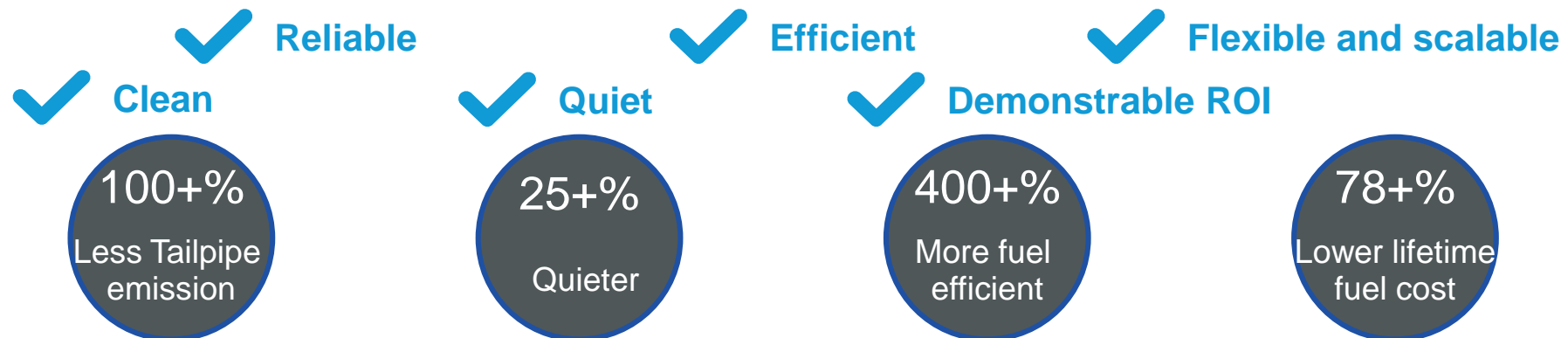
## VA

HAMPTON ROADS TRANSIT NORFOLK

# THE SOLUTION: REVOLUTIONARY APPROACH TO TRANSPORT



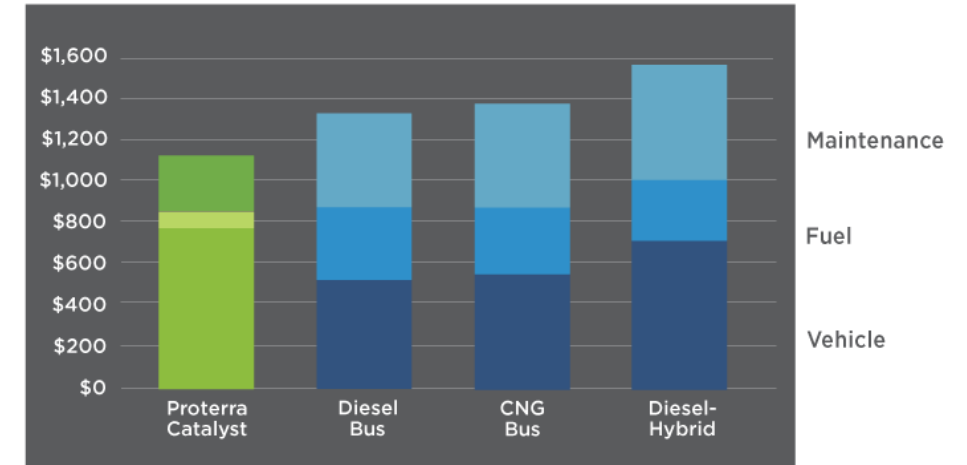
THE ONLY TRANSIT PLATFORM DESIGNED SPECIFICALLY FOR EV PERFORMANCE



# CATALYST 40 FT. TOTAL COST OF OWNERSHIP ADVANTAGE



	Proterra EV	Diesel Bus	CNG Bus	Diesel Hybrid
Vehicle	\$749	\$493	\$531	\$712
Energy/Fuel	\$94	\$381	\$336	\$297
Maintenance	\$275	\$450	\$500	\$550
TCO	\$1,118	\$1,324	\$1,367	\$1,559
TCO \$'s/Mile	\$2.24	\$2.65	\$2.73	\$3.12



est. over 12 year lifetime / \$ in thousands, except TCO \$'s/mile

- **Battery-electric vehicles** have the **lowest operational lifecycle** cost:
  - High EV energy efficiency, low electricity rates, and high annual vehicle mileage combine to create significant fuel savings
  - **30% fewer parts** dramatically reduce maintenance and operating costs
  - Electricity prices far **more stable** and predictable than volatile fossil fuel prices

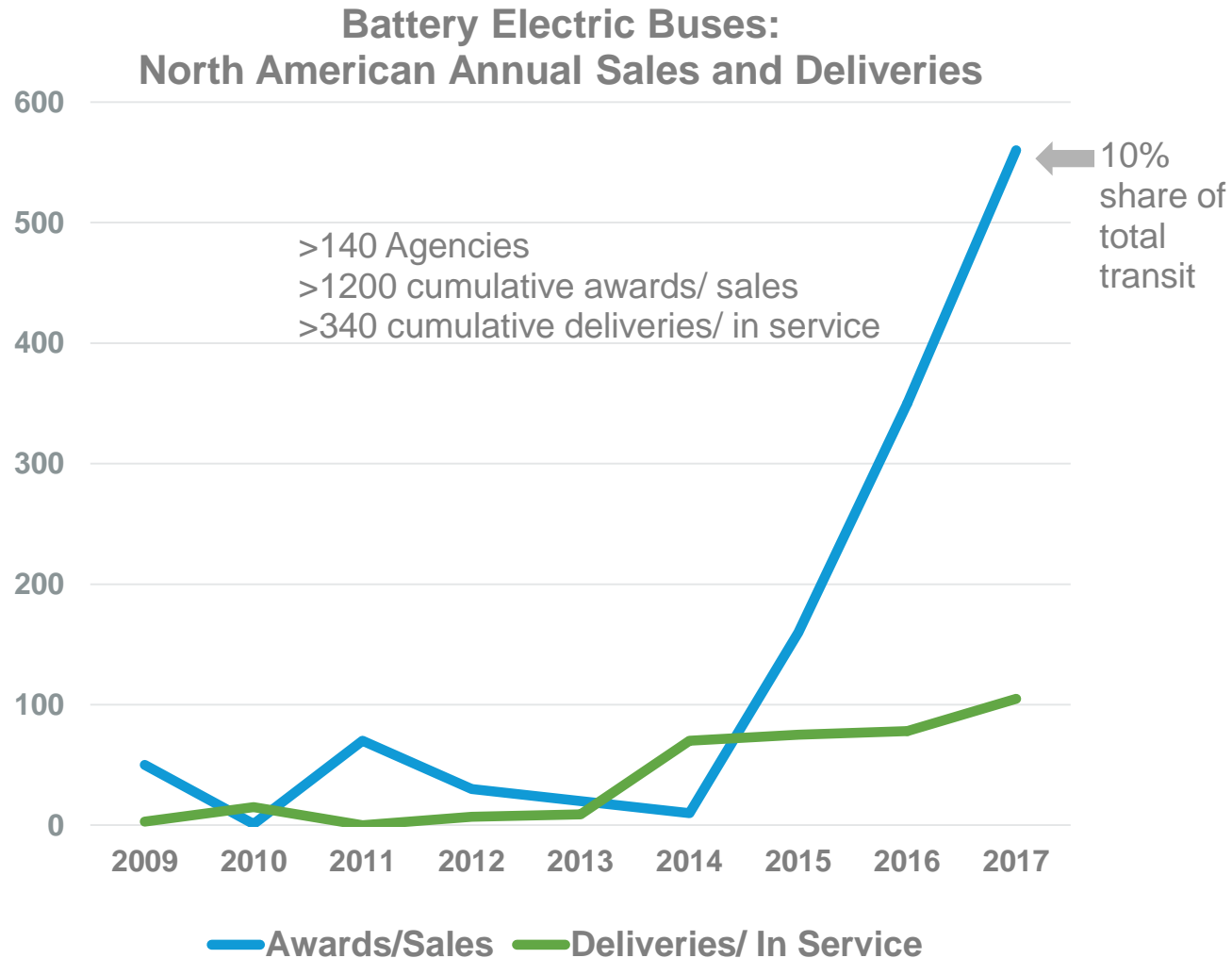
## 12-yr Operational Savings per Bus

**\$462k vs. Diesel**

**\$467k vs. CNG**

**\$479k vs. Hybrid**

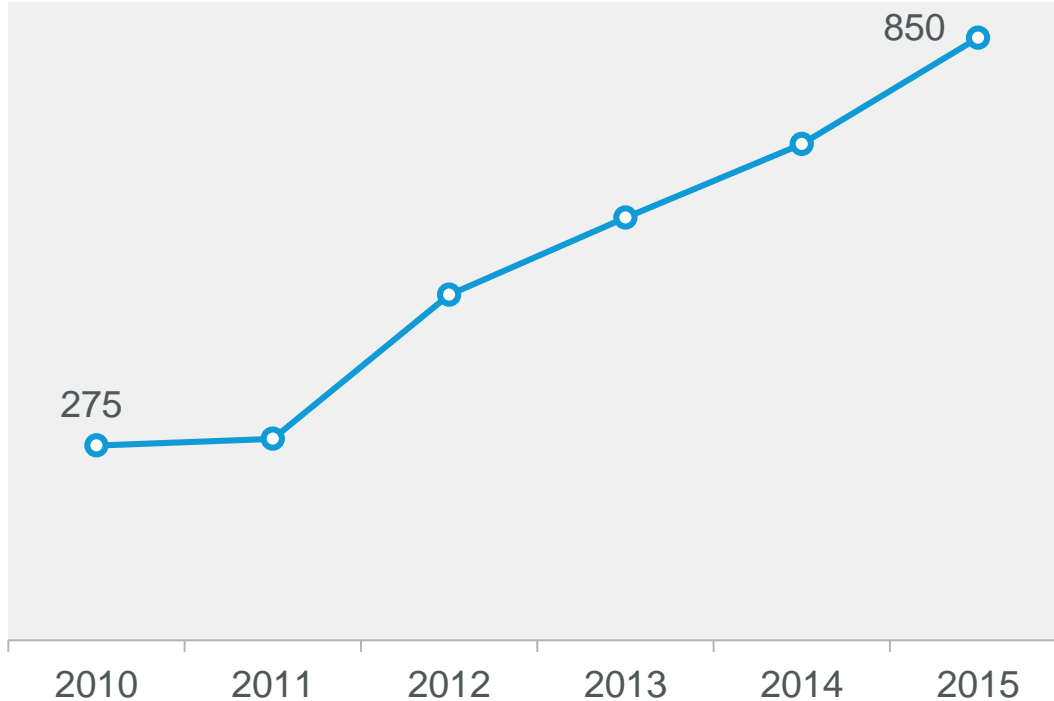
# THE TRANSIT MARKET IS RAPIDLY SHIFTING TO EV



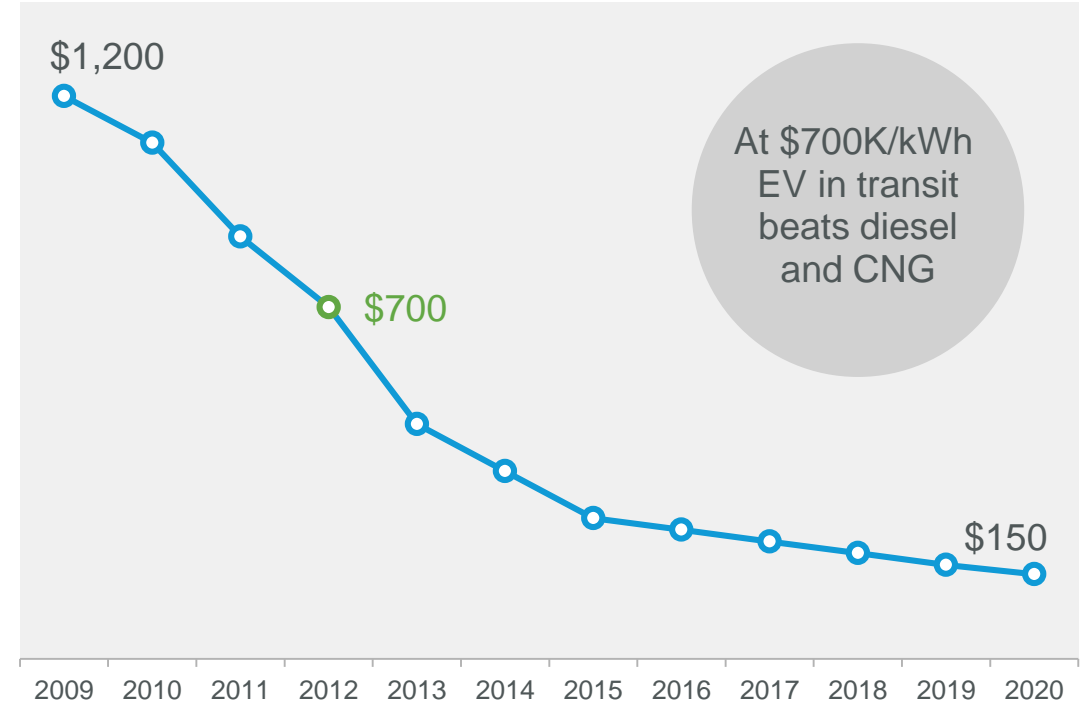
Source: CTE Center for Transportation and the Environment

- Moving toward **widespread industry adoption**
- **Purchase barriers eliminated** due to:
  - Improved range
  - Charging standardization
  - Sharp decline in battery costs
  - Service-proven performance

## U.S. Electric Vehicle Sales (000s Units)



## Proterra Battery Cost (\$/kWh)



Advanced battery technology cost has declined to the point of replacing fossil fuels in the transit market.

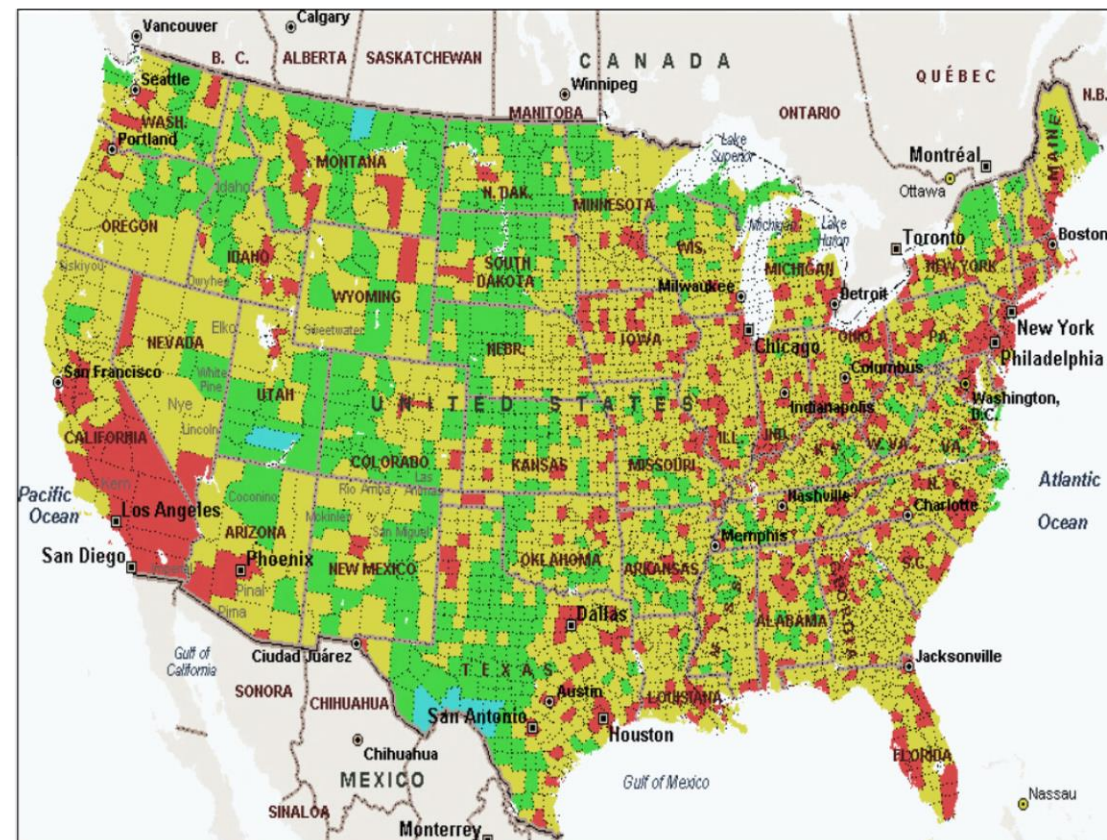
Sources: Navigant Research, green.autoblog.com, Electric Drive Transportation Association. xEV = PHEV, HEV, EREV and BEV.



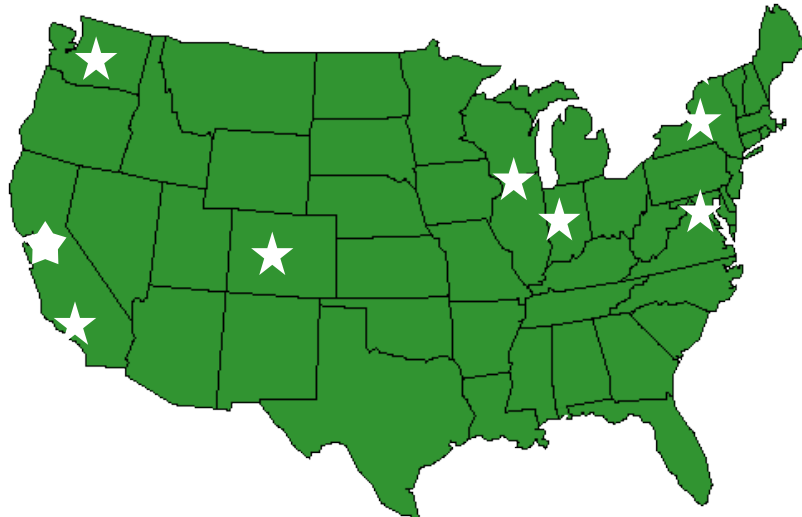
# THE HEALTH COSTS OF FOSSIL FUELS

## Annual Diesel Health Impacts in the US (Number of cases in 2010)

Premature Deaths	21,000
Lung Cancer Deaths	3,000
Hospital Admissions	15,000
Emergency Room Visits for Asthma	15,000
Non-fatal Heart Attacks	27,000
Asthma Attacks	410,000
Chronic Bronchitis	12,000
Work Loss Days	2,400,000
Restricted Activity Days	14,000,000

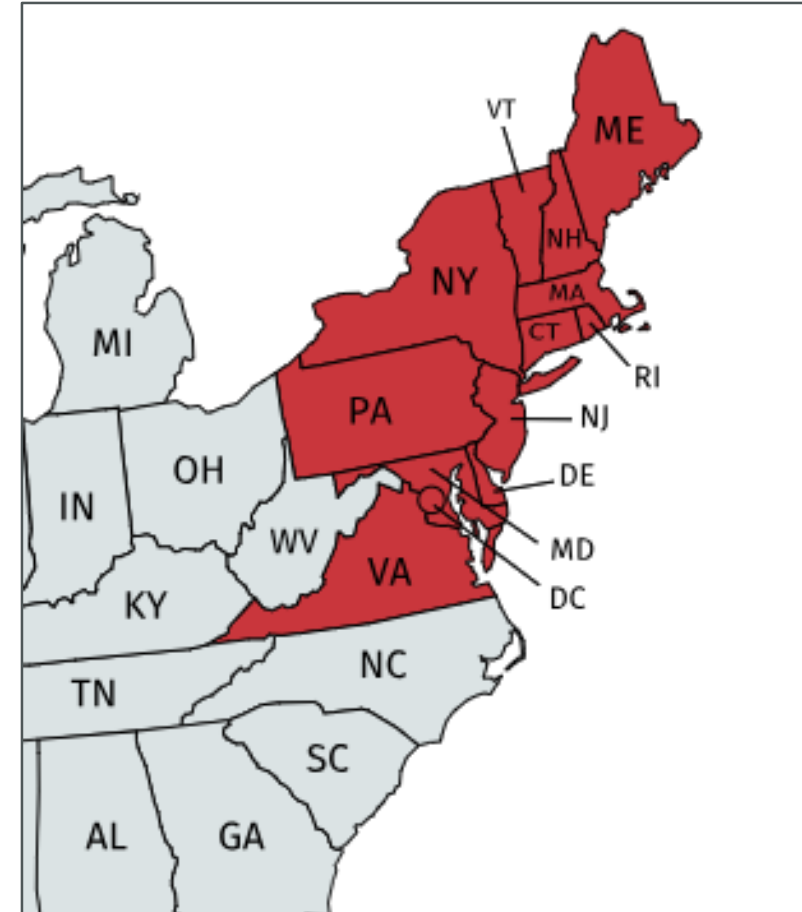


- New York's Truck Voucher Incentive Program offers \$150k per Proterra bus
- FAST Act: LowNo grants increased >100% to \$55M annually; introduction of innovative procurement methods and leasing options
- Maryland Freedom Fleet Voucher program offers \$20k per heavy duty vehicle; BG&E used to purchase 2 Proterra buses



- LA Metro Board passed resolution to convert its entire bus fleet to all-electric by 2030; LA DOT also moving to 100% zero emission by 2030
- Colorado now funds up to \$35k per vehicle for Class 8 vehicles
- Stockton, CA announced the nation's first all-electric bus rapid transit (BRT) route
- Indianapolis E-Bus Rapid Transit plans electrification of its biggest and most traveled corridor
- Chicago's Drive Clean Truck Voucher Program offers \$150k per Proterra bus
- King County announced the purchase of 120 electric buses by 2020

- Through the Volkswagen Settlement, VW agreed to invest \$2.925 billion nationwide under Appendix D - the Environmental Mitigation Trust, to reduce NOx emissions.
- \$720 million is allocated to the states from Maine to Virginia. Through the development of Beneficiary Mitigation Plans, these states have allocated approximately \$120 million to electrify transit and school buses to date.
- States investing heavily in electric buses include:
  - **Vermont** - \$5.7 million for transit and school bus electrification
  - **Massachusetts** - \$11 million for transit bus electrification (draft BMP)
  - **Rhode Island** - \$10 million for transit bus electrification
  - **Connecticut** - \$6.2 million for transit and school bus electrification
  - **New York** - \$52.4M for transit, school, and shuttle bus electrification
  - **Maryland** - \$16 million for transit and school bus electrification (draft BMP)
  - **Washington D.C.** - \$5 million for transit bus and truck electrification
  - **Virginia** - \$14 million for transit bus electrification
- Furthermore, ZEV transit and school buses are also eligible for up to \$131 million in additional funding through open, vehicle and fuel neutral programs across these states.

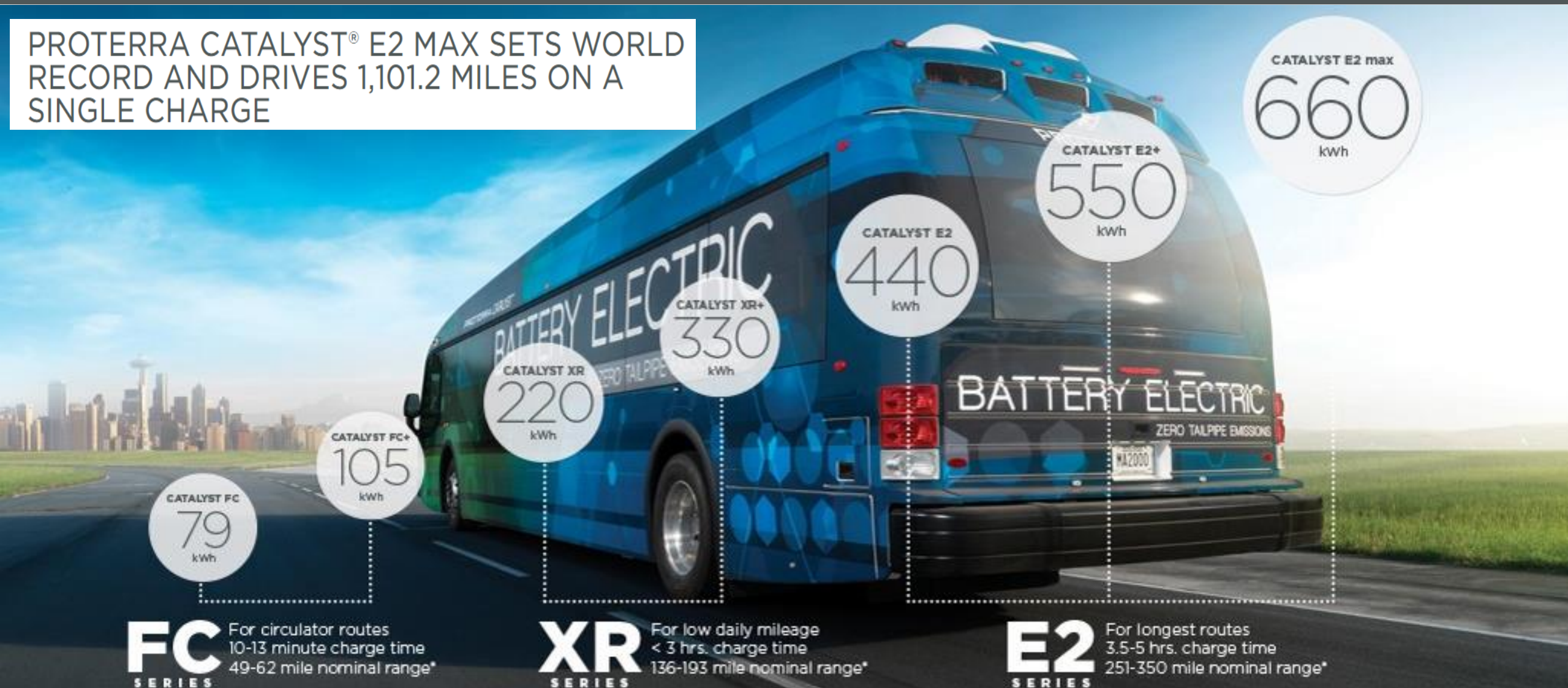




# THE PROTERRA CATALYST'S RANGE



PROTERRA CATALYST® E2 MAX SETS WORLD RECORD AND DRIVES 1,101.2 MILES ON A SINGLE CHARGE



\*Depending on model. Nominal range = total energy/ projected Altoona efficiency. Actual range will vary with route conditions, battery configuration and driver behavior.

## What Can Utilities Do?

- Customers are confused and unsure about large scale charging solutions; easing the customer experience through utility support can facilitate vehicle adoption
- Establish a transportation electrification group
- Support electrification efforts with lower TOU rates for charging and addressing demand charges
- Rate basing infrastructure build-out
- E.g. PECO developed model legislation that facilitates rate based long-term clean transportation infrastructure & time of use rates for the state of PA (HB 1446)
- Utilities can identify steps in interconnection and local permitting processes that can be streamlined and made more uniform

## Why Beneficial?

- Potential to drive down average rates through infrastructure investment in high utilization projects
- Opportunity to strengthen utility service through a smarter grid
- Optimize the load profile on the grid through smart charging and using vehicles as distributed storage devices
- More load on the grid will potentially lead to lower electricity rates or the stabilization of such rates. EVs lead to increased throughput on utility distribution assets and more balanced loads in the generation market.
- Utilities can demonstrate their support for improving air quality and local health benefits, particularly in disadvantaged communities





Proterra works closely with customer to recommend the [appropriate charging solution](#) for fleets and facilities planning for scale as the demand for charging increases.

Proterra technologies enable:

- Efficient charge speed
- Dynamic power sharing
- Driver-friendly stations
- Cost-effective operations
- Universal compatibility
- Serviceability
- Low maintenance costs
- High availability

Our experts provide counsel on:

- Site layout
- Energy management
- Real-time energy monitoring
- Site configurations

Proterra Introduces the DuoPower™ Drivetrain for its Catalyst® Zero-Emission Buses at APTA



New drivetrain delivers nearly twice the horsepower and acceleration of a standard combustion engine and 500 percent improvement in efficiency

**Proterra Gives Fleet Operators More Reasons To Go Electric With New Line Of Charging Stations**



**Global Double Deck Bus Market Leader, Alexander Dennis, Selects Proterra to Power North America's First Electric Double Deck Transit Bus**



**Proterra Inks Electric Bus Deal for Toronto Transit**



**Emphasizing Connectivity at Scale, Proterra Introduces the APEX™ Vehicle Intelligence System for Heavy-Duty Transit Fleets**



**Proterra, Van Hool Venture to Build Electric Motor Coaches**



**Daimler invests in electric bus company Proterra; exploring electrification of Daimler's Thomas Built school buses**



**Edmonton transit orders 25 Proterra buses**





# Connecticut Zero Emission Bus Project Update

*Incorporating Cleaner,  
More Efficient Propulsion Systems, into Connecticut's Fixed Route Fleet*

---

Northeast Regional Transportation Electrification Workshop  
Hartford, Connecticut  
November 29-30, 2018



# Project Background

- Partnership with CTDOT
- Deployment of 12 ZEBs in Transit Fleets, in Two Locations
- Three Applications for Low-No Funding from FTA
- Third Application Successful (Scaled Down)
- \$1.4 Million for Charging Infrastructure, Project Management and Workforce Development
- Supplemented with FTA 5307 Formula Funding for Vehicles

# Fleet Considerations





# The Project Team

- The Connecticut Department of Transportation (CTDOT)
- Greater Bridgeport Transit (GBT)
- The Center for Transportation and the Environment (CTE) - Atlanta, Georgia
- Wendel (Architects) A/E Design for Charging Stations - Buffalo, New York
- Proterra, - Greenville, South Carolina



# Multiple Areas of Evaluation Underway



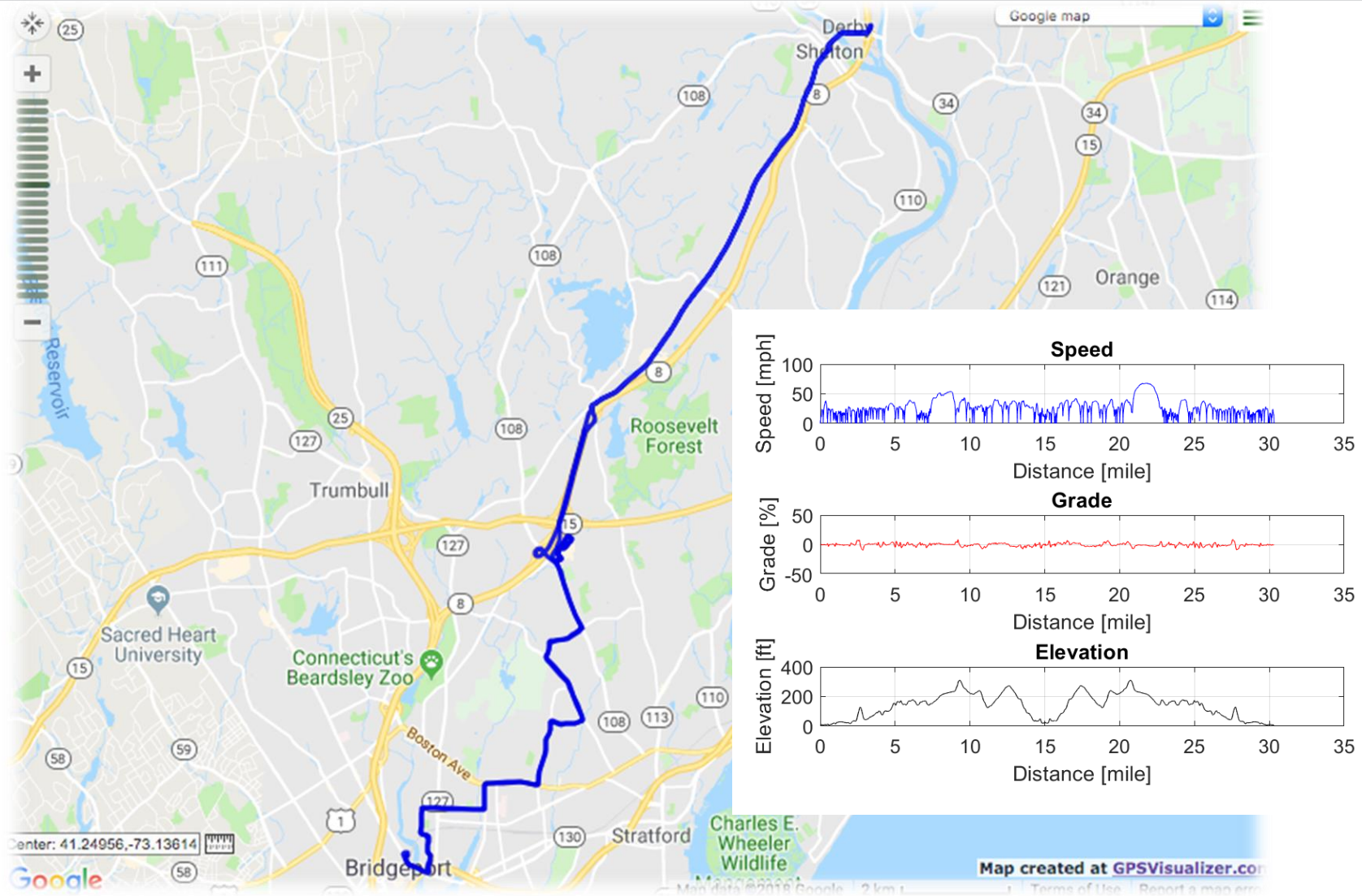
## Load Cases and Assumptions – ProDrive

Battery (kWh)	Load Case	Occupants (@ 150 lb)	Total Weight (lb)	Hotel Load (kW)	HVAC Load (kW)	Total Aux Load (kW)
440	Nominal	19 + operator	32,900	2.7	3.6	6.3
	Strenuous	42 + operator	36,350	9.3	8.6	17.9
	GVWR*	–	43,650	–	–	–
660	Nominal	19 + operator	36,152	2.7	3.6	6.3
	Strenuous	42 + operator	39,602	9.3	8.6	17.9
	GVWR*	–	43,650	–	–	–

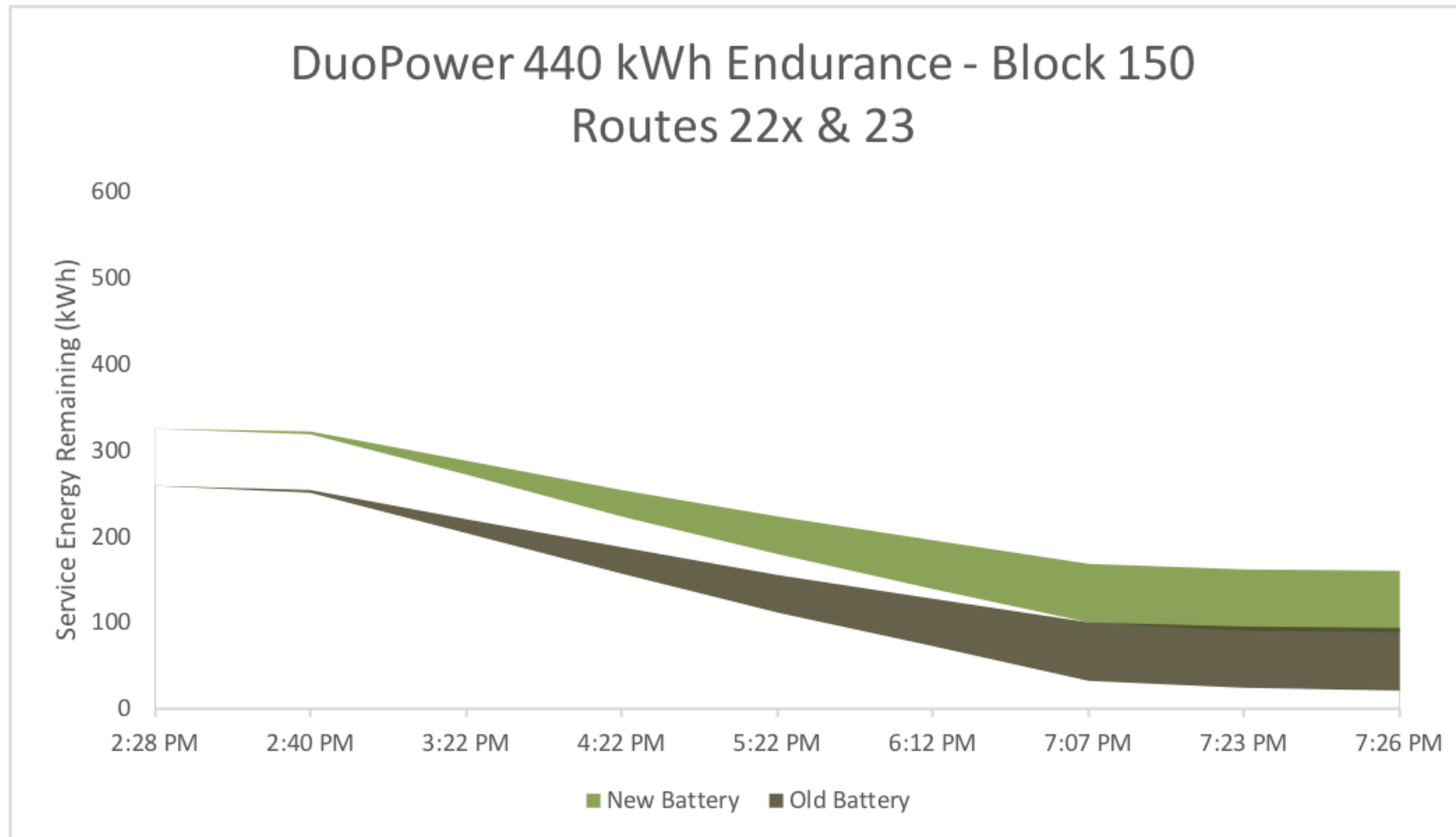
\* GVWR load case not simulated.

- Vehicle weight, hotel loads, traction motor/inverter, traction battery final drive, chassis, and tires and traction battery modeled based on data provided by Proterra.
- HVAC electrical loads provided by Proterra.
- Occupant weight based on FTA standard of 150 lbs per person.

# Route 15



## Routes 22x & 23 – Block 150 – DuoPower 440 kWh



DRAFT



# Block Analysis – New Battery/Strenuous

Block	Route(s)	ProDrive		DuoPower	
		440 kWh	660 kWh	440 kWh	660 kWh
102	23	Y	Y	Y	Y
104	23	Y	Y	Y	Y
126	15	N	N	N	N
138	22x	Y	Y	Y	Y
150	22x, 23	Y	Y	Y	Y
160	8	N	N	N	N
161	8	N	Y	N	Y
162	8	N	Y	N	Y
616	6	N	Y	N	Y
623	6, 9	N	N	N	Y
624	6, 9	N	N	N	N
625	15	N	N	N	Y
705	15	N	Y	N	Y

DRAFT

# Block Analysis – Old Battery/Strenuous

Block	Route(s)	ProDrive		DuoPower	
		440	660	440	660
102	23	Y	Y	Y	Y
104	23	Y	Y	Y	Y
126	15	N	N	N	N
138	22x	Y	Y	Y	Y
150	22x, 23	N	Y	Y	Y
160	8	N	N	N	N
161	8	N	N	N	N
162	8	N	N	N	Y
616	6	N	N	N	Y
623	6, 9	N	N	N	N
624	6, 9	N	N	N	N
625	15	N	N	N	N
705	15	N	N	N	N

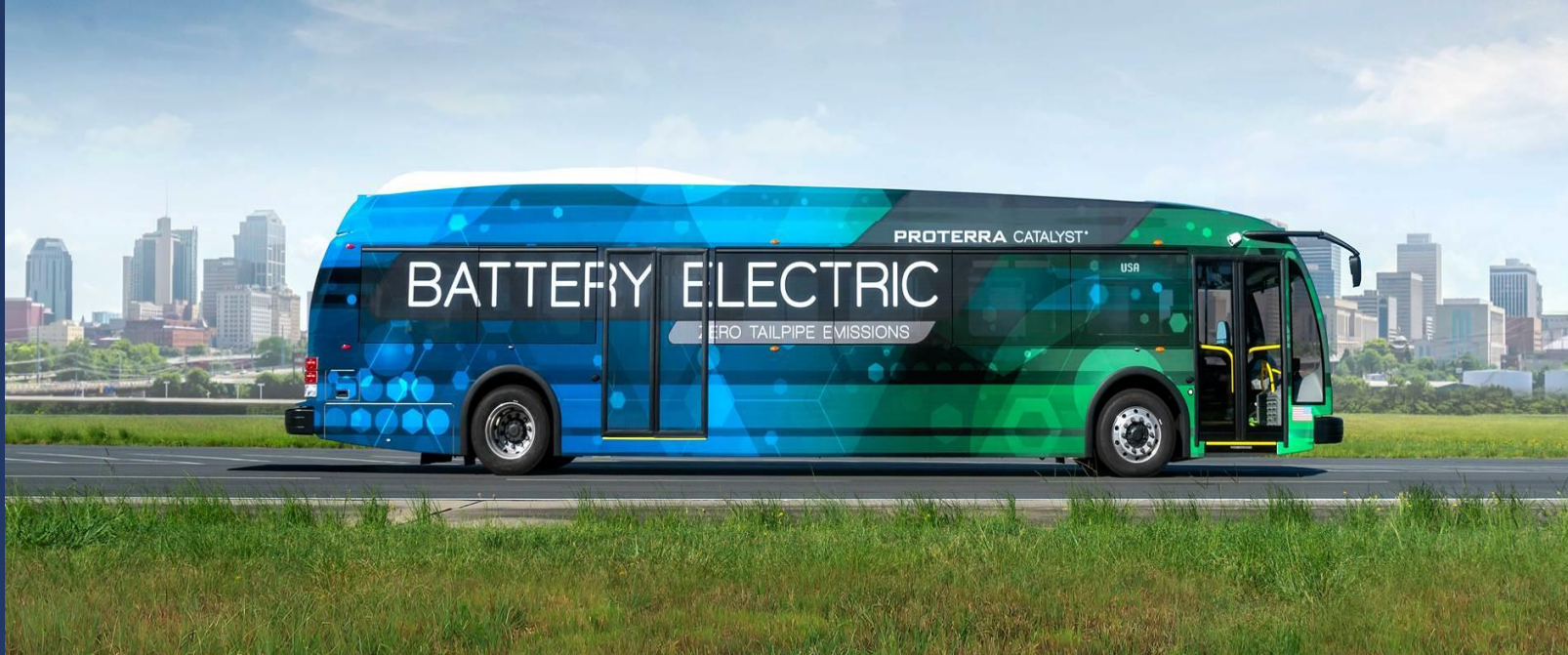
DRAFT

## Range by Route – ProDrive 440 kWh (mi)

	New Battery		Old Battery	
Load Case	Nominal	Strenuous	Nominal	Strenuous
Coastal Link	173	107	137	130
Routes 6 & 3	152	98	121	77
Route 8	137	84	109	67
Route 15	163	109	130	87
Route 22x	154	121	122	96
Route 23	156	110	124	88

DRAFT

# Vehicle Specifications - The Proterra Catalyst E2



- Specifications for 35' and 40'
- 90% Complete
- Outside Review
- Configuration – Partially Complete
- Specification Prepared for Use in other State Procurements

# Charging Infrastructure

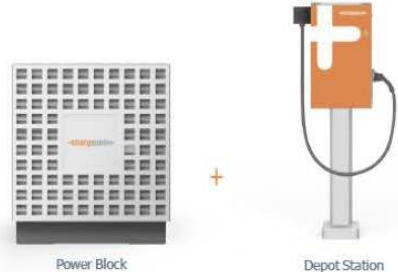
## Buy-America Plug-In Chargers



### ChargePoint (Managed)

#### CPE Depot

Up to 156 kW shared between up to 16 dispensers



#### CPE 250

62.5 kW

-or-

Up to 125 kW

shared between  
two CPE 250s

### Siemens: 30-150 kW



### ABB: 150 kW

Sequenced between up to 3 dispensers



### Heliox: 50-100+ kW

Separate dispenser option available



### Proterra: 60 or 125 kW



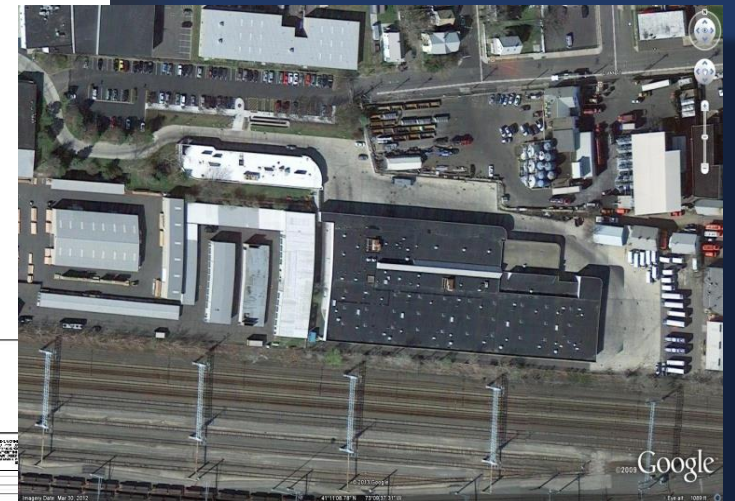
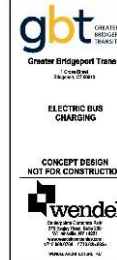


# Facility Improvements



**GENERAL NOTES:**

**CONSTRUCTION NOTES:**



THESE  
THESIS  
THESIS  
THESIS  
THESIS

**ELECTRICAL FLOOR PLAN**

**(09-998) (012) (016)**

NAME: JAMES HENRY

DOB: 08/11/70

SSN: 000 000 000

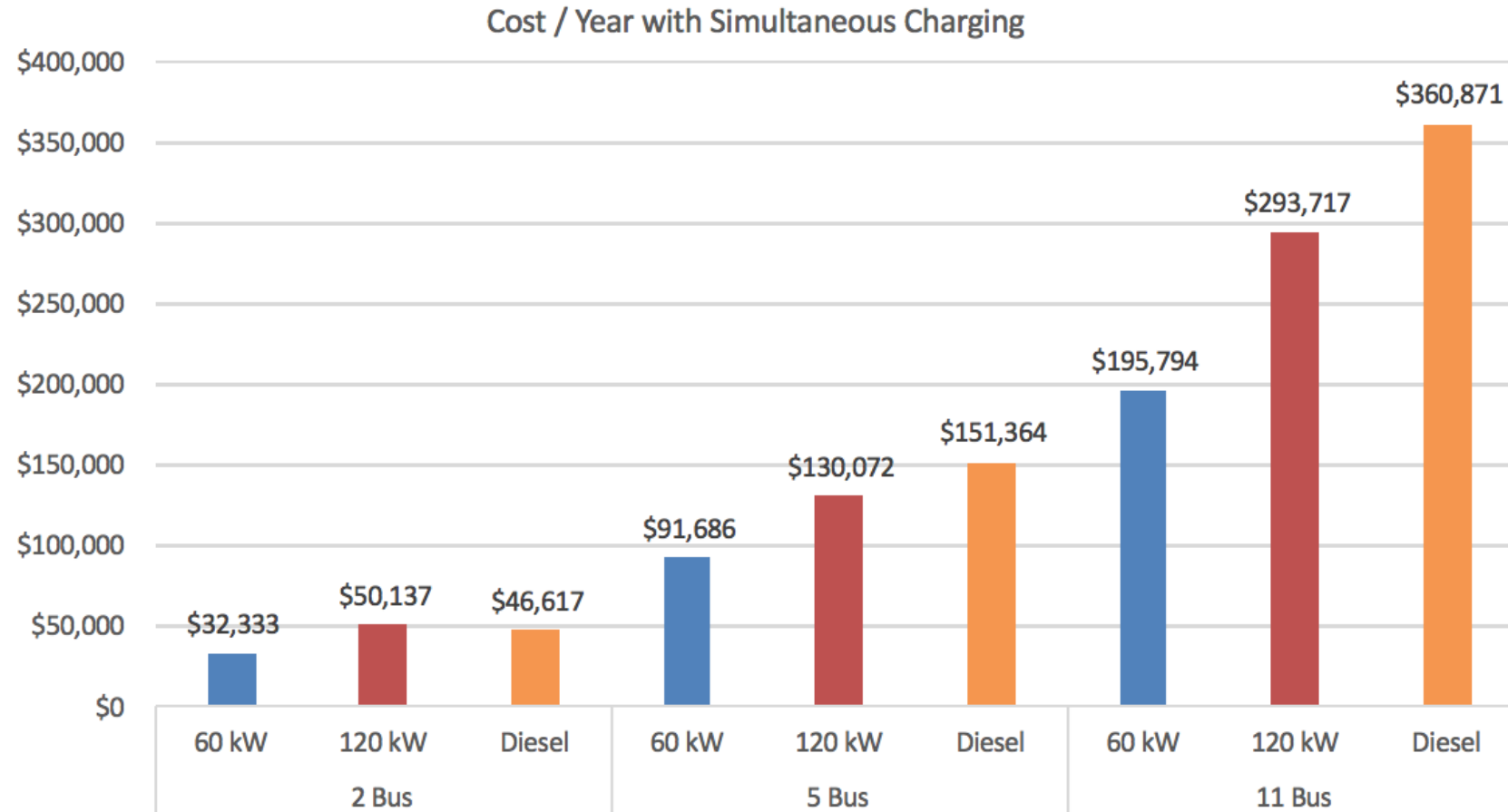
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MOA: 000000

WGT: 150

E101

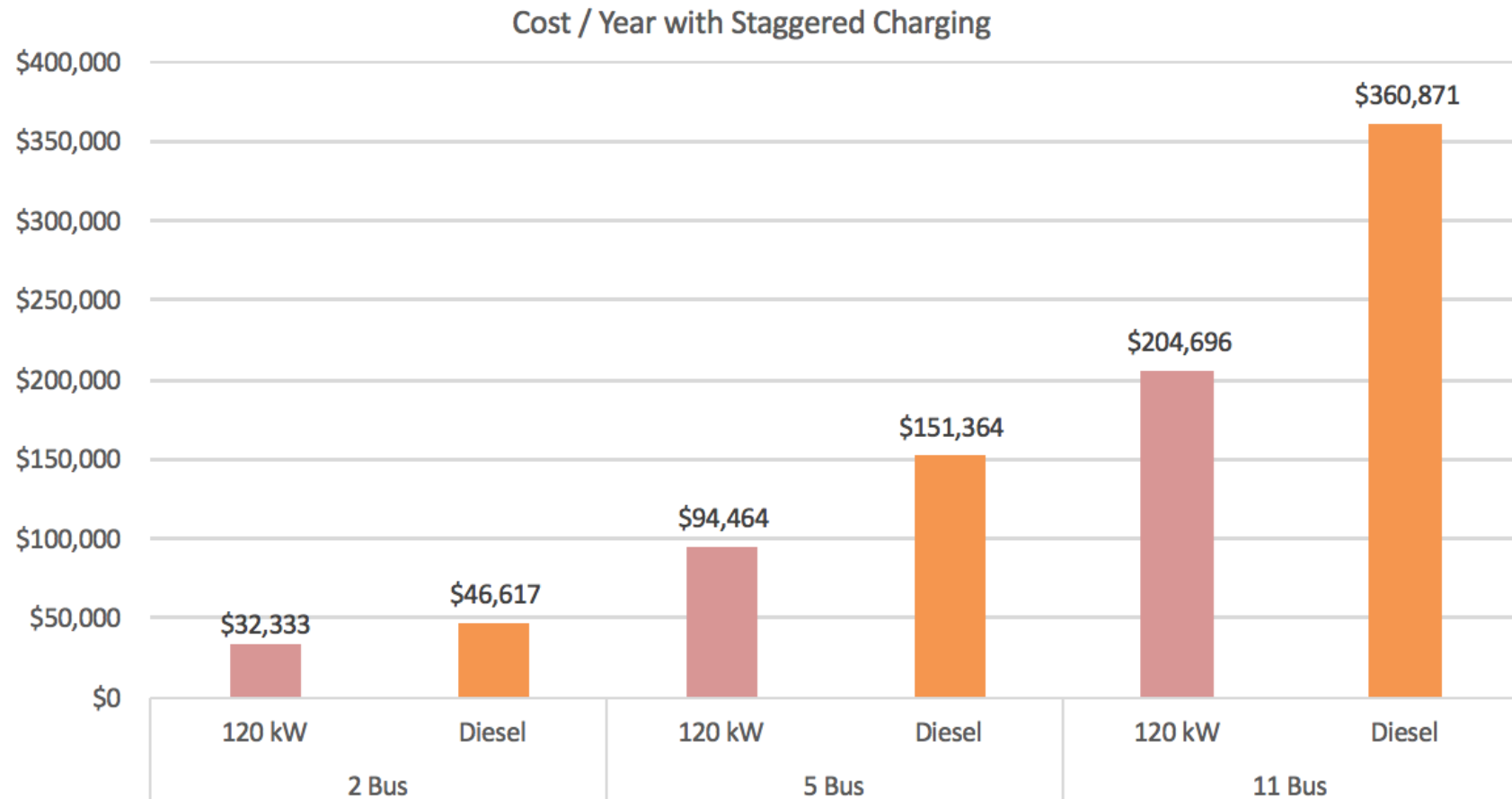
# Annual Fuel Cost (Simultaneous Charging)



DRAFT

- Diesel costs are based on the 5 year average (\$2.72/gal)
- Based on 80% of operating time (24.33 days / month)

# Annual Fuel Cost (Staggered Charging)



DRAFT

- Diesel costs are based on the 5 year average (\$2.72/gal)
- Based on 80% of operating time (24.33 days / month)

# December 12<sup>th</sup> - From Planning to Implementation





# Connecticut Zero Emission Bus Project Update

*Incorporating Cleaner,  
More Efficient Propulsion Systems, into Connecticut's Fixed Route Fleet*

---

Doug Holcomb, AICP

[dholcomb@gogbt.com](mailto:dholcomb@gogbt.com)

(203) 366-7070 Ext. 124







# Electrifying State Light-Duty Fleets and Transit

---

Moderator: **Jim Redeker**, Commissioner, Connecticut Department of Transportation

Speakers:

**Harmony Wilder**, Fleet Manager, State of Vermont

**Eric J. McCarthy**, Senior Vice President, Government Relations, Public Policy and Legal Affairs, Proterra

**Doug Holcomb**, Greater Bridgeport Transit

**#WeTheStates**



# Supporting e-Mobility

---

Speaker:

Emily Warren, Senior Director of Policy and Public Affairs, Lime

**#WeTheStates**



# Charging Infrastructure: What, Where, and How Many?

---

Moderator: **Chris Nelder**, Manager, EV-Grid Integration, Rocky Mountain Institute

Speakers:

**David Althoff, Jr.**, Director, Energy Program Office, Pennsylvania Department of Environmental Protection

**Patricia Bouch Readinger**, Manager, Federal Government Affairs & Public Policy,  
Electrify America

**Noah Garcia**, Transportation Policy Analyst, Natural Resources Defense Council



**pennsylvania**  
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Energy Programs Office



# EV Charging Infrastructure Pennsylvania

NGA NE Regional Transportation Electrification Workshop

David Althoff Jr. – PA DEP

November 29, 2018

# Electric Vehicle Charging Station Locations

Find electric vehicle charging stations in the United States and Canada. For Canadian stations in French, see [Natural Resources Canada](#).

Public Stations

Advanced Filters

23,352 results in U.S. and Canada

Enter location

Q

Electric

Level 1

Level 2

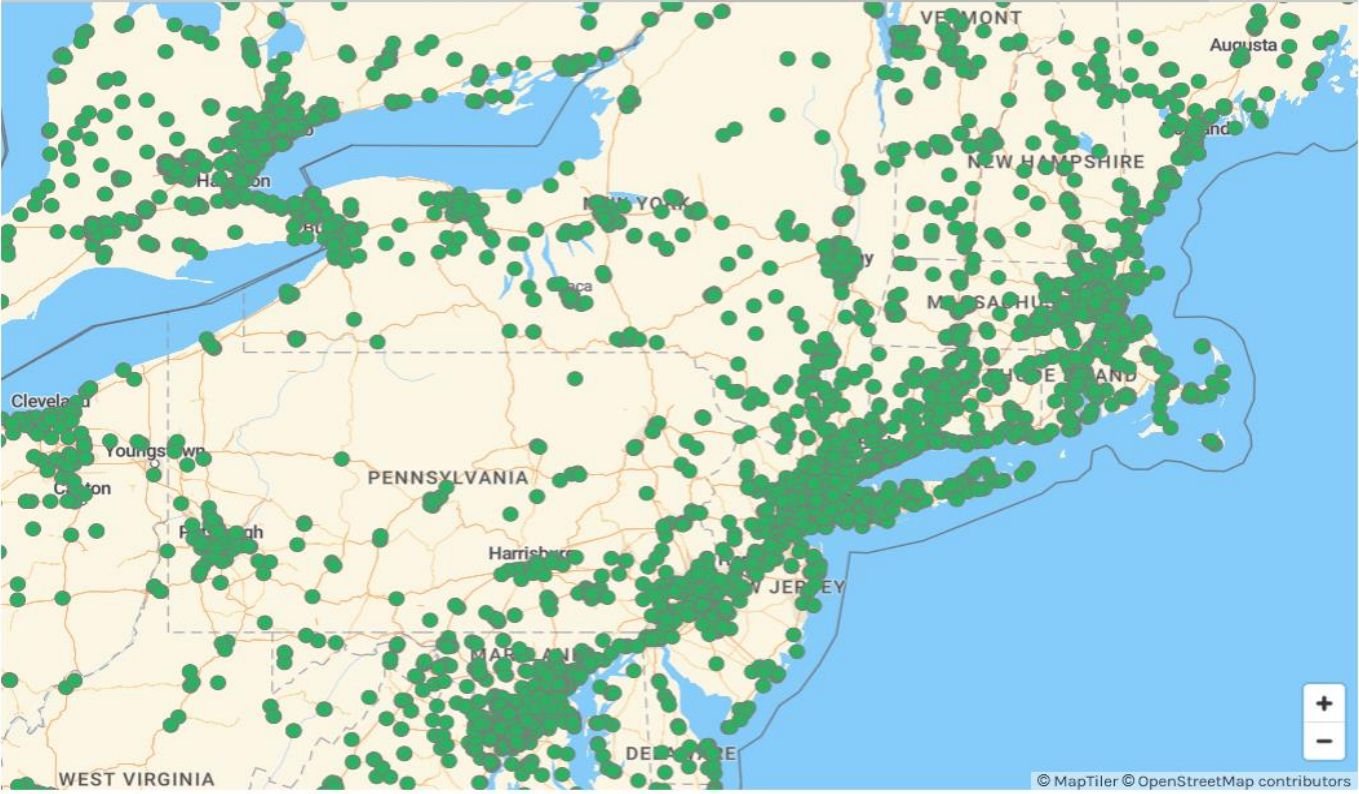
DC Fast Charging

CHAdemo

CCS

Tesla

Map a Route





Natural Gas Fueling Stations

CNG Completed

- Public
- Public Limited Access
- Private

CNG Uncompleted

- Public
- Private

LNG Completed

- Private

LNG Uncompleted

- Public

CNG & LNG Completed

- Public

CNG & LNG Uncompleted

- Public

Electric Vehicle Stations

EV Stations

- Public
- Public Call Ahead
- Public Dealership Hours

E85 Stations

USDA Funded E85 Stations

- 

Boundaries

County Boundaries

- 

Find

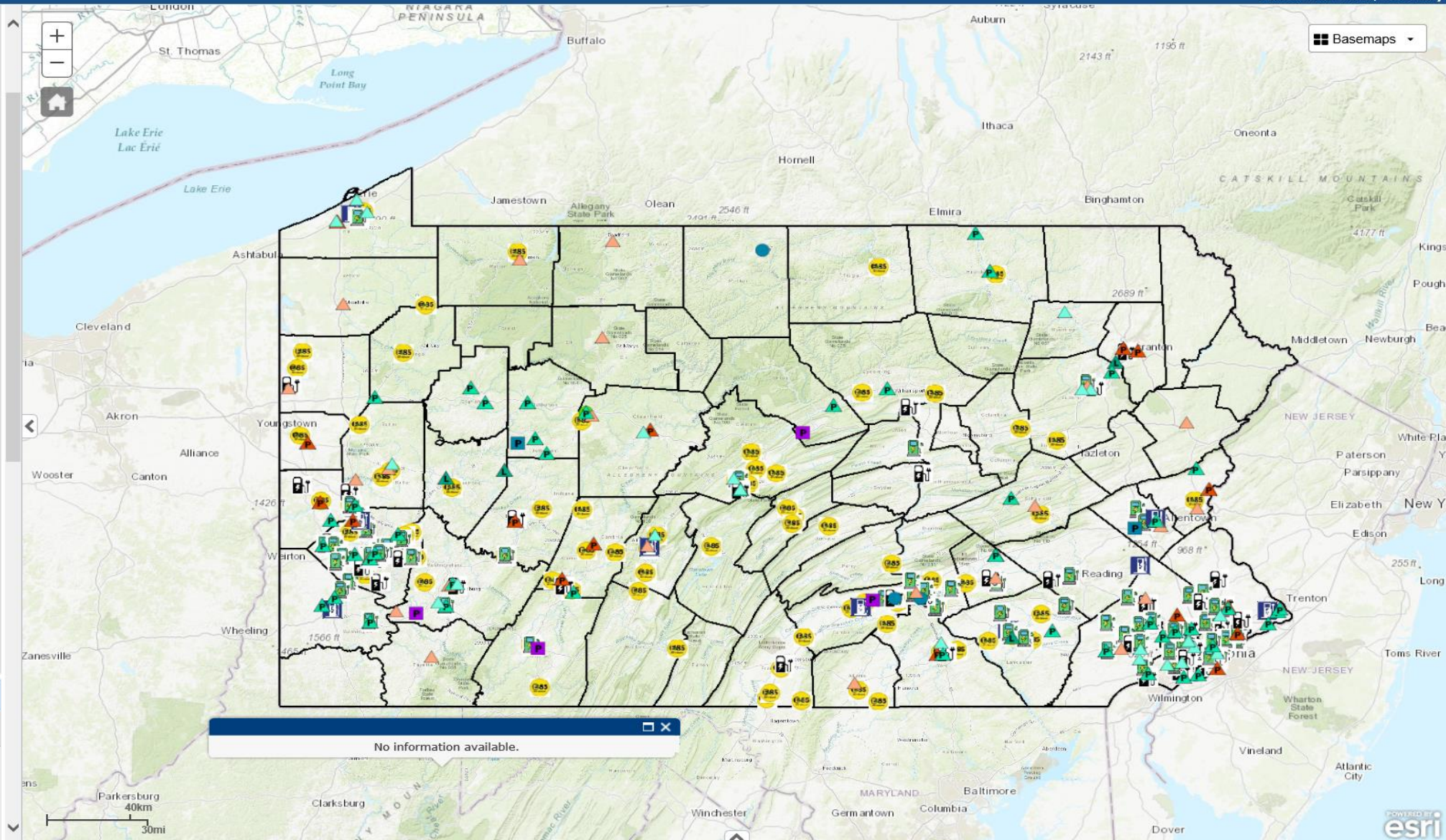
By Attribute By Shape

Select A Layer:

CNG Completed Stations

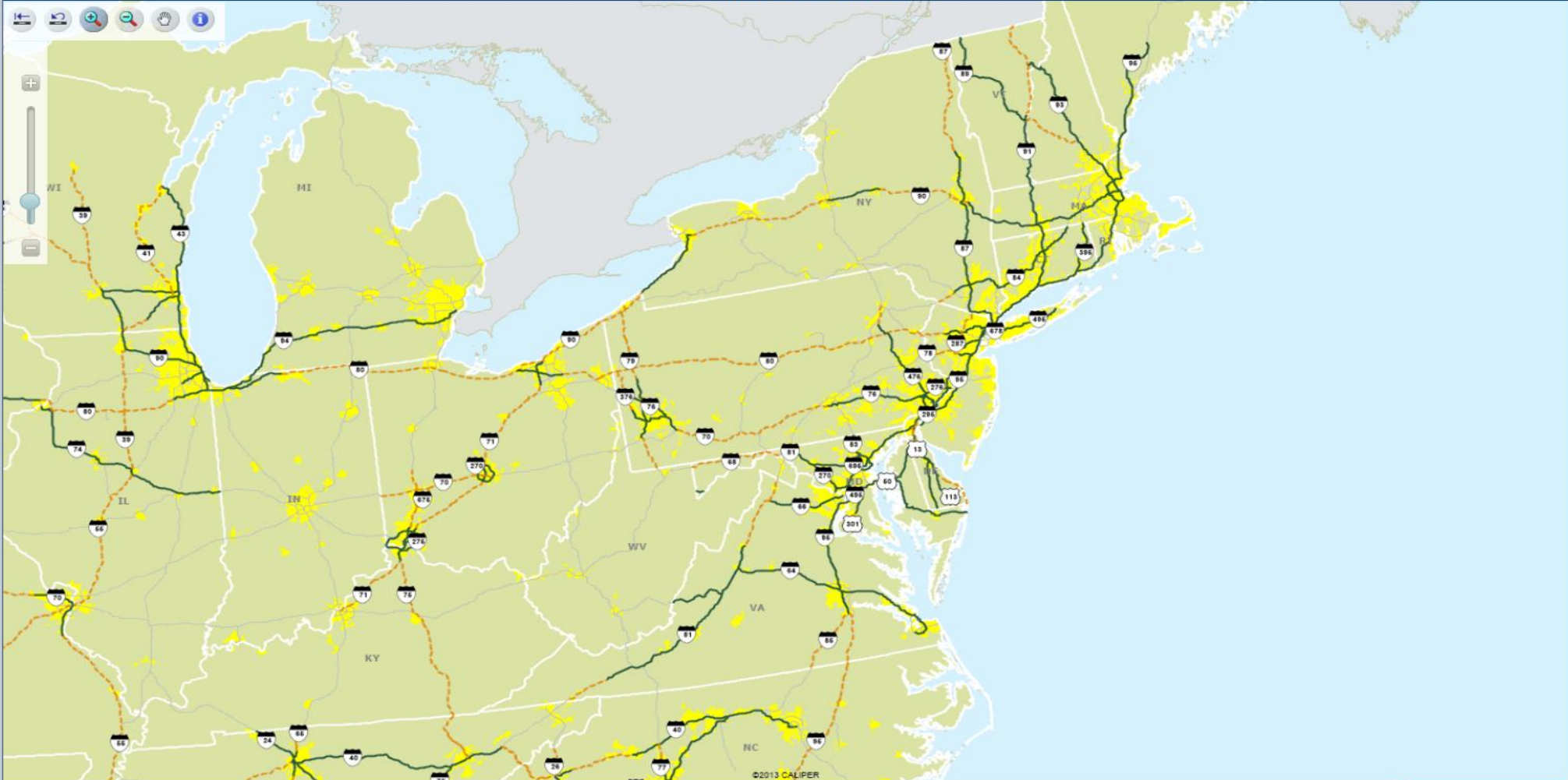
City:

Enter city





Electric Vehicle (EV-Round 1 and 2)



Sources Legend Data Layers

**Legend**

- 2010 Urbanized Area
- Alternative Fuel Corridors**
- EV - Corridor Ready
- EV - Corridor Pending

0 33.3 66.7 100  
Miles

[Go to Layers to turn on Fuel Stations](#)

Map Scale: 1 : 5,000,000 Width: 1,411 Miles

Powered by TransCAD for the Web

For information and comments about this web site, contact Supin Yoder

# Sparse Public Charging Availability

- PA has over **391** publicly available charging stations, and a total of **892** “plugs” at those locations.
- NREL study projects that PA would need on the order of **13,600** workplace chargers, **9,200** public chargers, and **810** DC Fast Chargers by 2030 to reach about a 20% EV market share.
- Pennsylvania EV Roadmap – High penetration
  - PA has **1.4 million EVs on the road by 2033**, and 30% of light duty sales would be Evs
  - Currently **< 20,000 EVs**
- Pennsylvania has a significant need to invest in workplace and public charging to reach any expansion/sales/benefit goals.

# Incentives

- Drive PA Forward (\$17.7 Million)
  - \$3,000,000 available for Level 2 EV charging projects located at:
    - Public spaces; Work places; Multi-unit dwellings
  - \$3,000,000 available for publicly accessible DC Fast and DC Fast combined with Level II located at:
    - Transportation corridors, Community hubs, Destination locations
- Alternative Fuels Incentive Grant
  - \$5 million available each year for alternative energy transportation grants
    - 2018 AFIG Grant
    - Alternative Fuel Vehicle Rebate
    - 2018 AFIG FAST Act Corridor Infrastructure Grant
      - Refueling infrastructure priority given to PA Interstate Highway corridors
        - Designated: I-76, I-276, I-376, I-476, I-79, I-90, I-95, and I-80
        - Not yet Designated I-70, I-78, I-81, I-83, I-84, I-99, and I-180

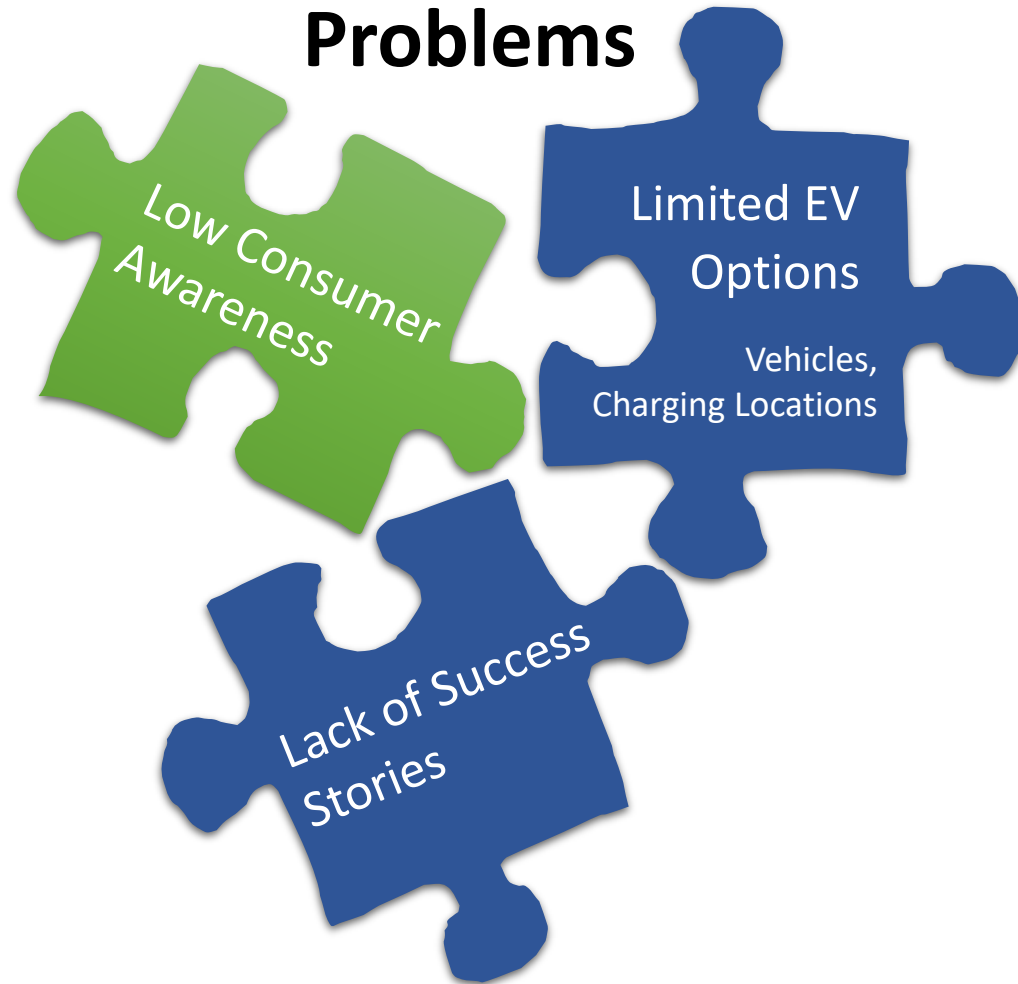
# AFIG Rebates for Consumers 2018/2019

- The Alternative Fuel Vehicle Rebate Program
  - Provides rebates to Commonwealth residents to assist individuals with the costs of purchasing an alternative fuel vehicle.
  - \$8 Million Since 2011
  - \$967,500 for 706 EV Rebates issued since January, 2018.
    - 657 new vehicle rebates
    - 48 used vehicle rebates
    - 1 leased vehicle rebate



# Awareness/Cooperation/Confidence

## Problems



## Solutions

- Establish Goals
  - Meet them/Celebrate them
- Dealerships.... Outreach (Utilities?)
  - Deliver support/technical assistance - they sell these vehicles!
- Signs, Signs, Everywhere Signs!
  - ...and Marketing.
- EV Ready Regional Planning
  - Practical solutions from both outside your state and inside.



**pennsylvania**  
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Energy Programs Office



# Questions?

David Althoff Jr.

717-783-0542

[dalthoff@pa.gov](mailto:dalthoff@pa.gov)

A large, stylized, wavy line graphic that starts in light blue on the left and transitions to white on the right, curving across the middle of the image.

# ***Northeast Regional Transportation Electrification Workshop***

*Panel: "Charging Infrastructure: What, Where, and How Many?"*

National Governors Association; Hartford, CT  
November 29, 2018



# Our transformational opportunity: the largest single investment ever made in infrastructure, education and awareness, and access to drive ZEV adoption

## Our Mission

Electrify America will be a catalyst for promoting ZEV adoption by offering transformative, customer-centric infrastructure and energy management solutions.

## Our Company

Electrify America is a subsidiary of Volkswagen Group of America created to implement the \$2 billion ZEV Investment Commitment. We have recruited talent from across diverse industries.

## Our Approach

Electrify America is a data-driven company committed to increasing the use of ZEV technology.



# Cycle 1 investment will create a robust DC charging network linking U.S. highways and major metropolitan areas

42 states

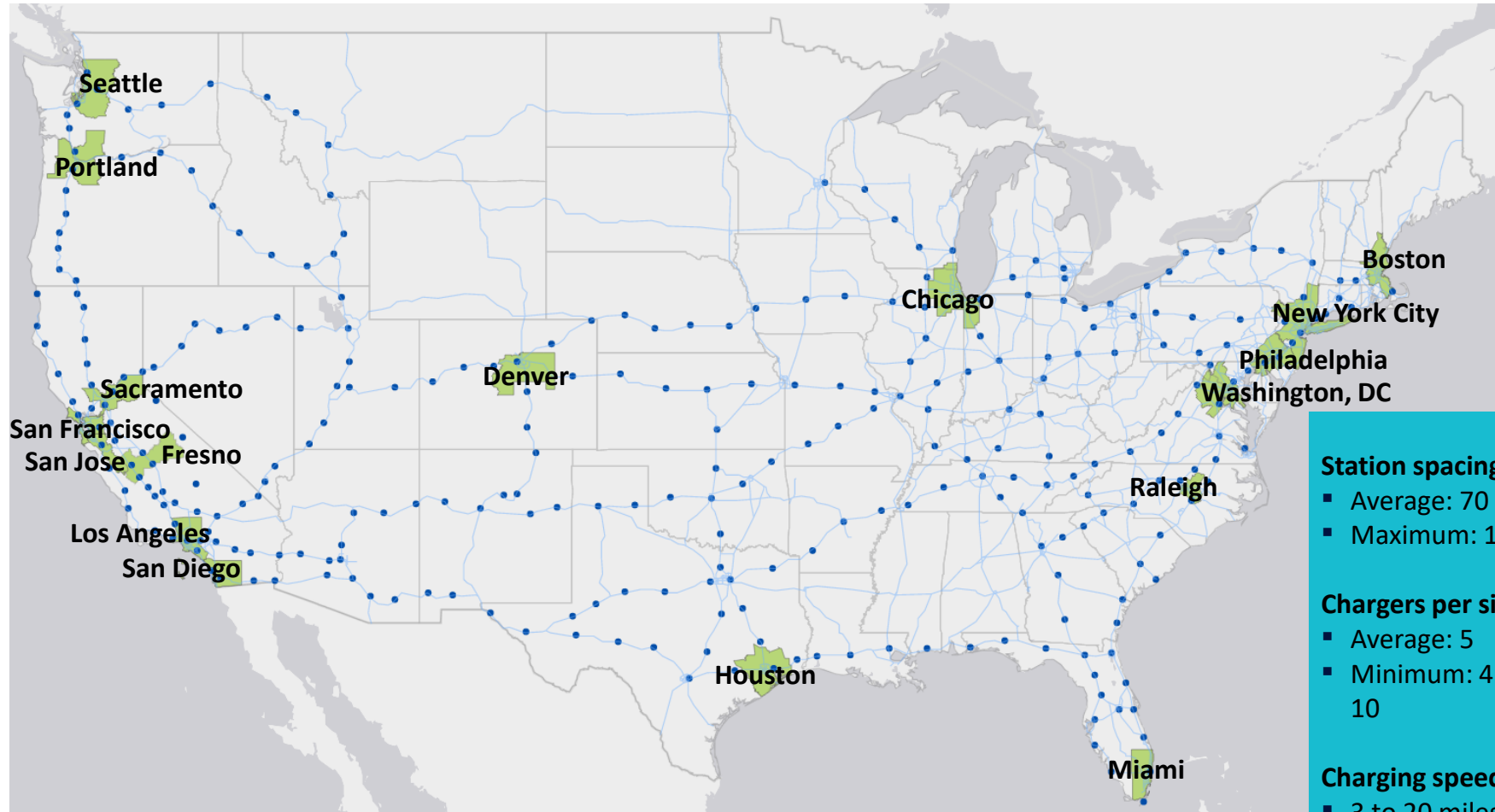
17 large metros

86 metros\*

484 stations

2000+ DCFC

2800+ Level 2s



\* Highway sites in MSAs with more than 500,000 population

#### Station spacing:

- Average: 70 miles\*
- Maximum: 120 miles

#### Chargers per site:

- Average: 5
- Minimum: 4 Maximum: 10

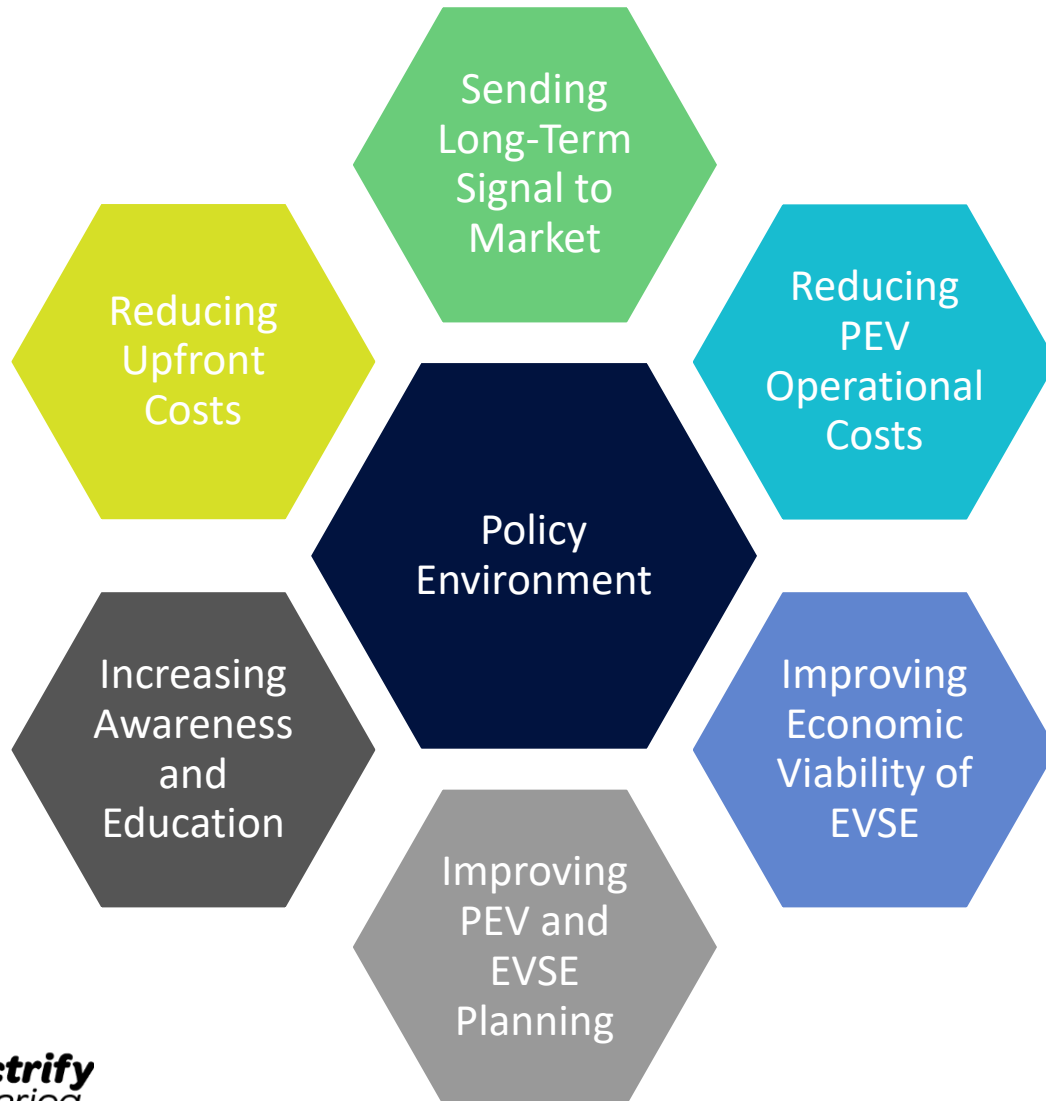
#### Charging speed

- 3 to 20 miles per minute

\*48 miles in California



# States and cities can create policy environments to encourage ZEV adoption and investment



Analysis by NASEO and Cadmus found sending a long-term signal to the market and reducing upfront costs were the most powerful policy tools to drive ZEV adoption.

## PEV Policy Evaluation Rubric:

[https://naseo.org/Data/Sites/1/pevpolicyrubricmethodology\\_naseo.pdf](https://naseo.org/Data/Sites/1/pevpolicyrubricmethodology_naseo.pdf)

# Challenges to investment persist

1

## Permitting Delays

*Current construction bottlenecks in many areas of the country, especially California, are due to lengthy permitting durations.*

3

## Need for Education & Awareness Efforts

*Focused investment to raise consumer education and awareness is needed by all sectors to educate and encourage ZEV adoption.*

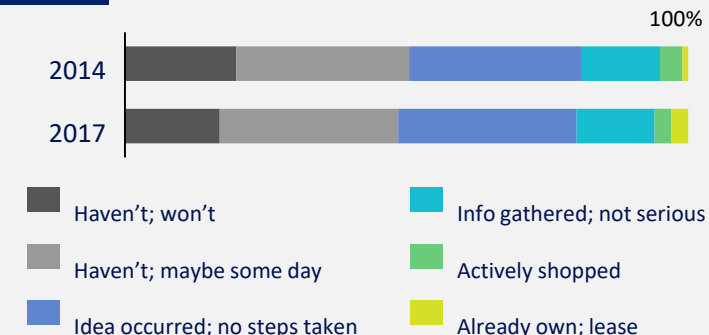
2

## Lack of ZEV Vehicles and Users

*The higher purchase cost associated with a ZEV vs. an ICE vehicle remains a barrier to wider ZEV adoption.*

4

## ZEV Consideration Remains Low







Thank you!

Questions? [Patricia.Readinger@electrifyamerica.com](mailto:Patricia.Readinger@electrifyamerica.com)



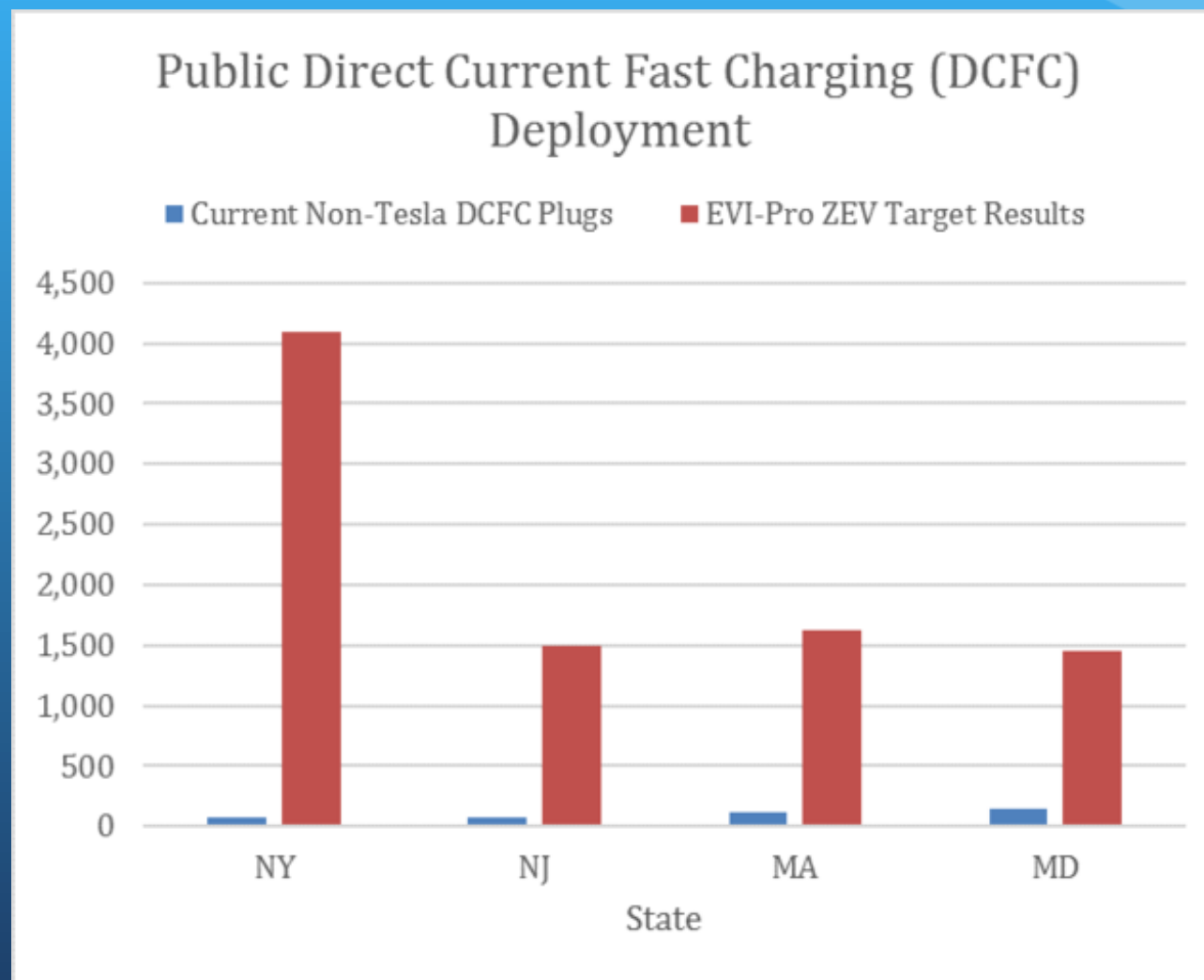
# Charging Infrastructure: What, Where, and How Many?

Noah Garcia

Natural Resources Defense Council

November 29, 2018

# There's a (Big) Gap: EVI-Pro Lite





# Utilities are Critical Partners

- The California Experience
- **Approved** programs: Massachusetts, Rhode Island, New York
- **Pending** programs: New Jersey, Pennsylvania, Delaware, Maryland, D.C.
- **Transportation Electrification Accord**



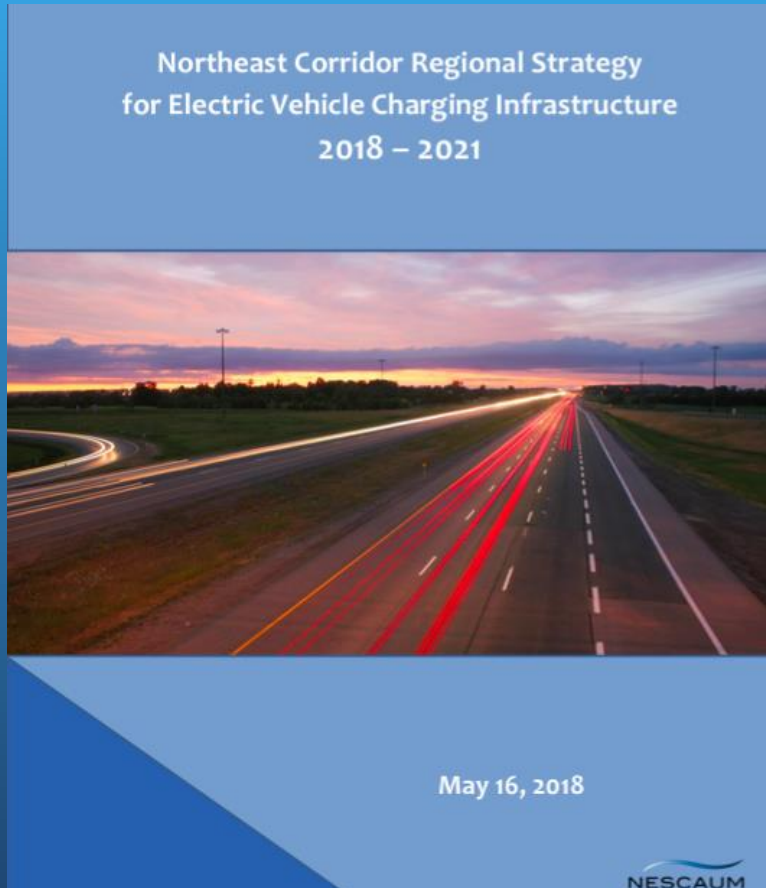
**SIEMENS**



**ConsumersUnion**

THE ADVOCACY DIVISION OF CONSUMER REPORTS

# Steel-in-the-Ground: Necessary but Not Sufficient



- Interoperability
- Smart rate design
- Equity
- Future-proofing
- Reliability
- Signage

# Thank You

[ngarcia@nrdc.org](mailto:ngarcia@nrdc.org)



# Charging Infrastructure: What, Where, and How Many?

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Moderator: **Chris Nelder**, Manager, EV-Grid Integration, Rocky Mountain Institute

Speakers:

**David Althoff, Jr.**, Director, Energy Program Office, Pennsylvania Department of Environmental Protection

**Patricia Bouch Readinger**, Manager, Federal Government Affairs & Public Policy,  
Electrify America

**Noah Garcia**, Transportation Policy Analyst, Natural Resources Defense Council



# Electrification for All

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Moderator: **Elin Swanson Katz**, President of NASUCA, Connecticut Consumer Advocate

Speakers:

**Jenifer Bosco**, Staff Attorney, National Consumer Law Center

**Jennifer Wallace-Brodeur**, Director of Transportation Efficiency, Vermont Energy Investment Corporation

**#WeTheStates**



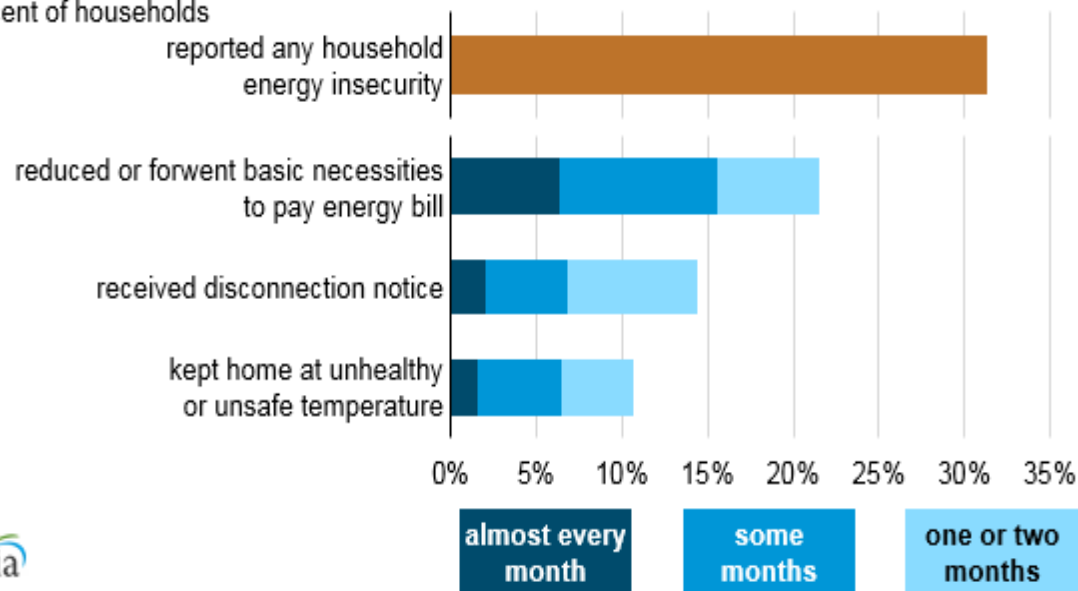
# Affordability is crucial

**One in three U.S. households faces a challenge in meeting energy needs**

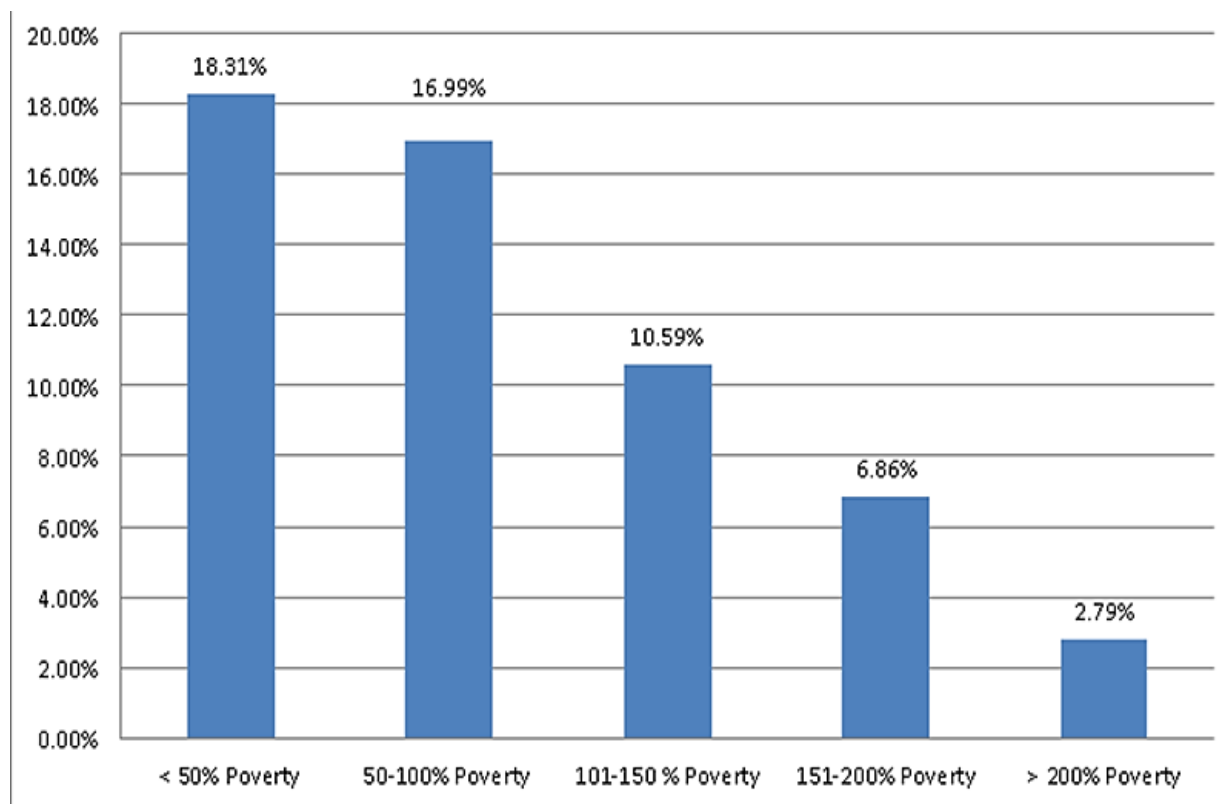
*Source: U.S. EIA, Residential Energy Consumption Survey 2015 (Sept. 19, 2018)*

Households that experienced energy insecure situations, 2015

percent of households



## People in Households Without a Vehicle, by Income (2016)



Source: Steven Ruggles, Katie Genadek, Ronald Goeken, Josiah Grover, and Matthew Sobek. *Integrated Public Use Microdata Series: Version 7.0 [dataset]*. Minneapolis, MN: University of Minnesota, 2017. <https://doi.org/10.18128/D010.V7.0>; *The Future of Transportation Electrification: Utility, Industry and Consumer Perspectives*, by Philip B. Jones, Jonathan Levy, Jenifer Bosco, John Howat, and John W. Van Alst, Ed. Lisa C. Schwartz, FEUR Report No. 10 (2018), available at <https://emp.lbl.gov/projects/feur>



# Electrification for All

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Moderator: **Elin Swanson Katz**, President of NASUCA, Connecticut Consumer Advocate

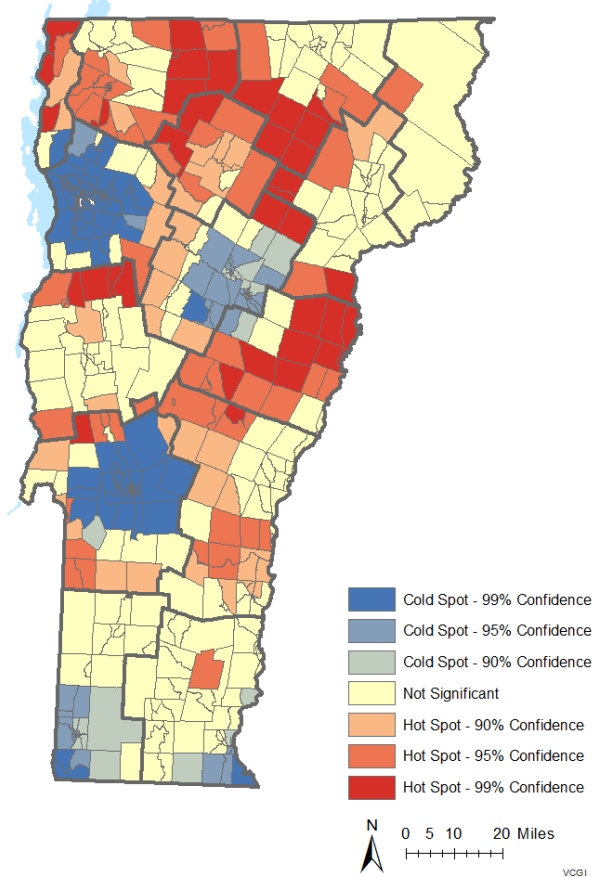
Speakers:

**Jenifer Bosco**, Staff Attorney, National Consumer Law Center

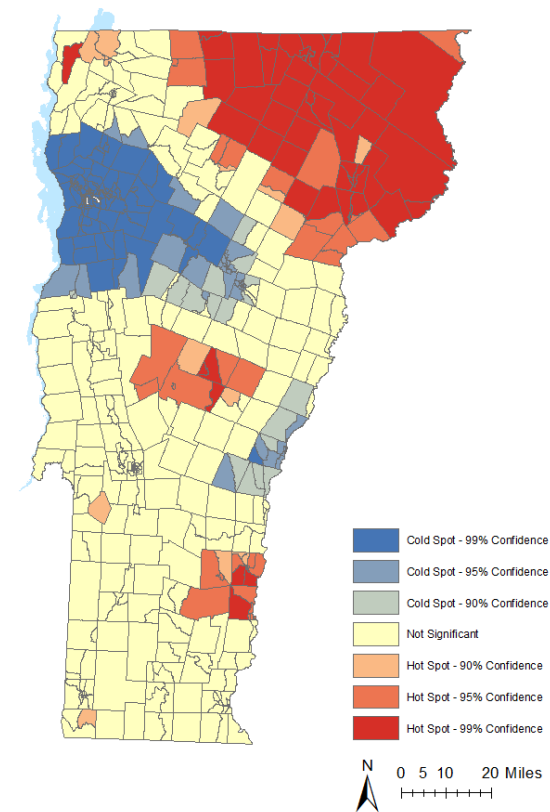
**Jennifer Wallace-Brodeur**, Director of Transportation Efficiency, Vermont Energy Investment Corporation

# VT Transportation Expenditures: Impact on Household Budgets

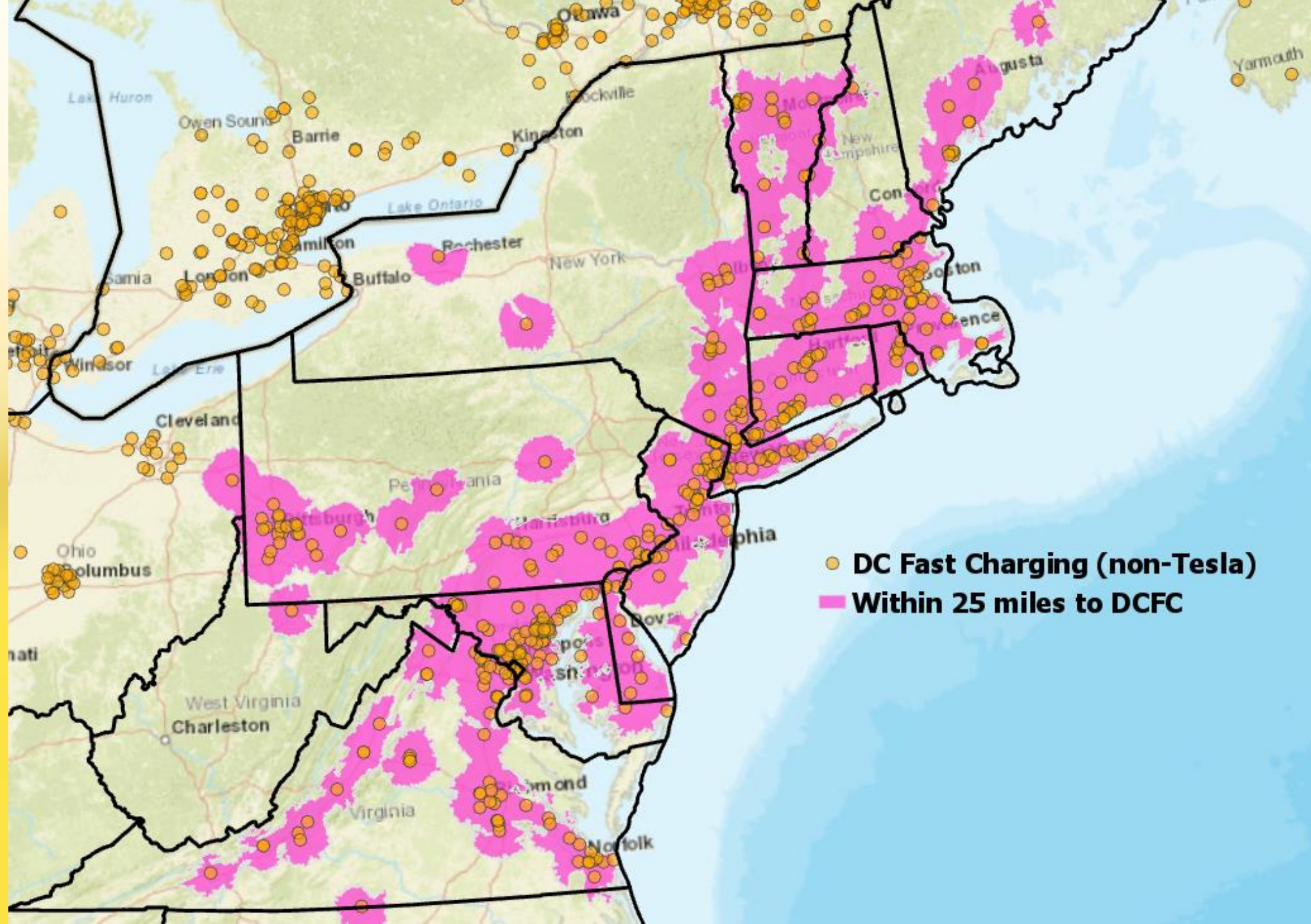
Transportation Energy Expenditure (\$)  
Hot Spot Analysis



Transportation Energy Burden (% Median Income)



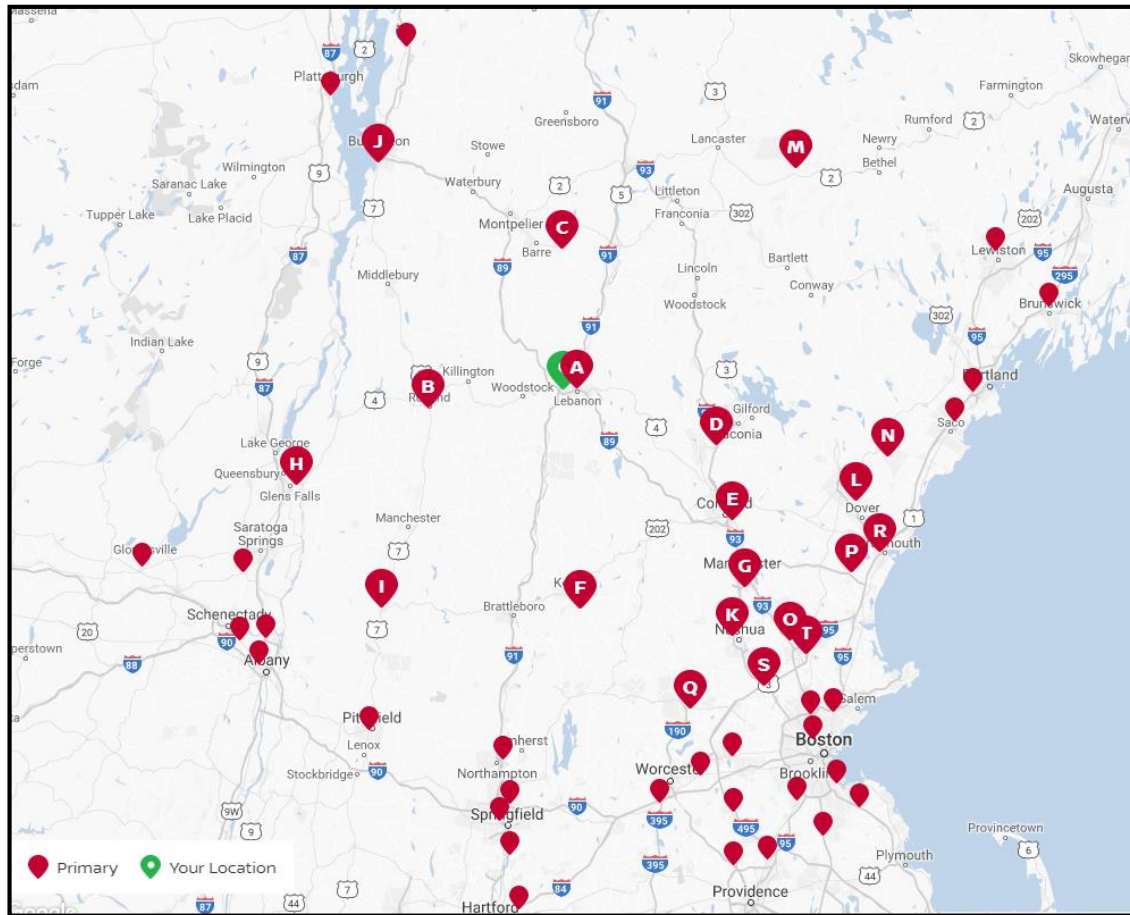




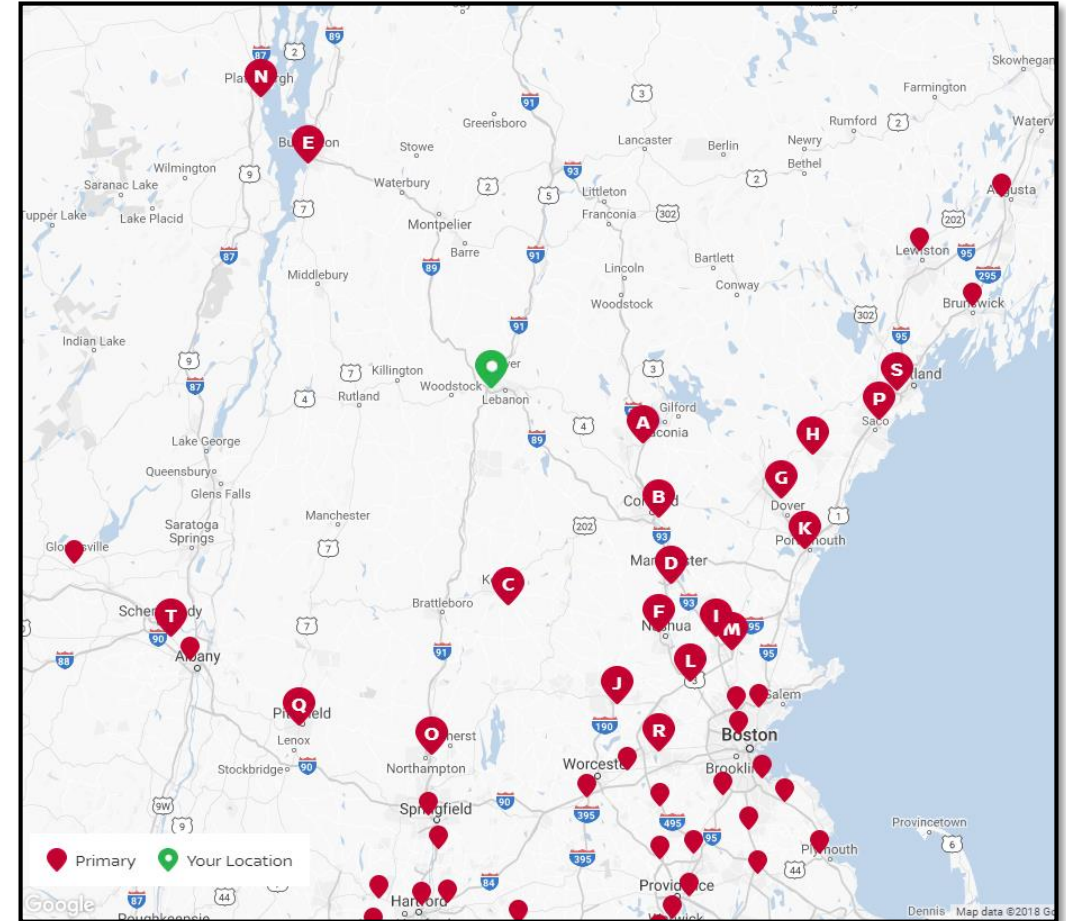


# Nissan Dealership Locations

All Dealers within ~100 miles of White River Jct, VT

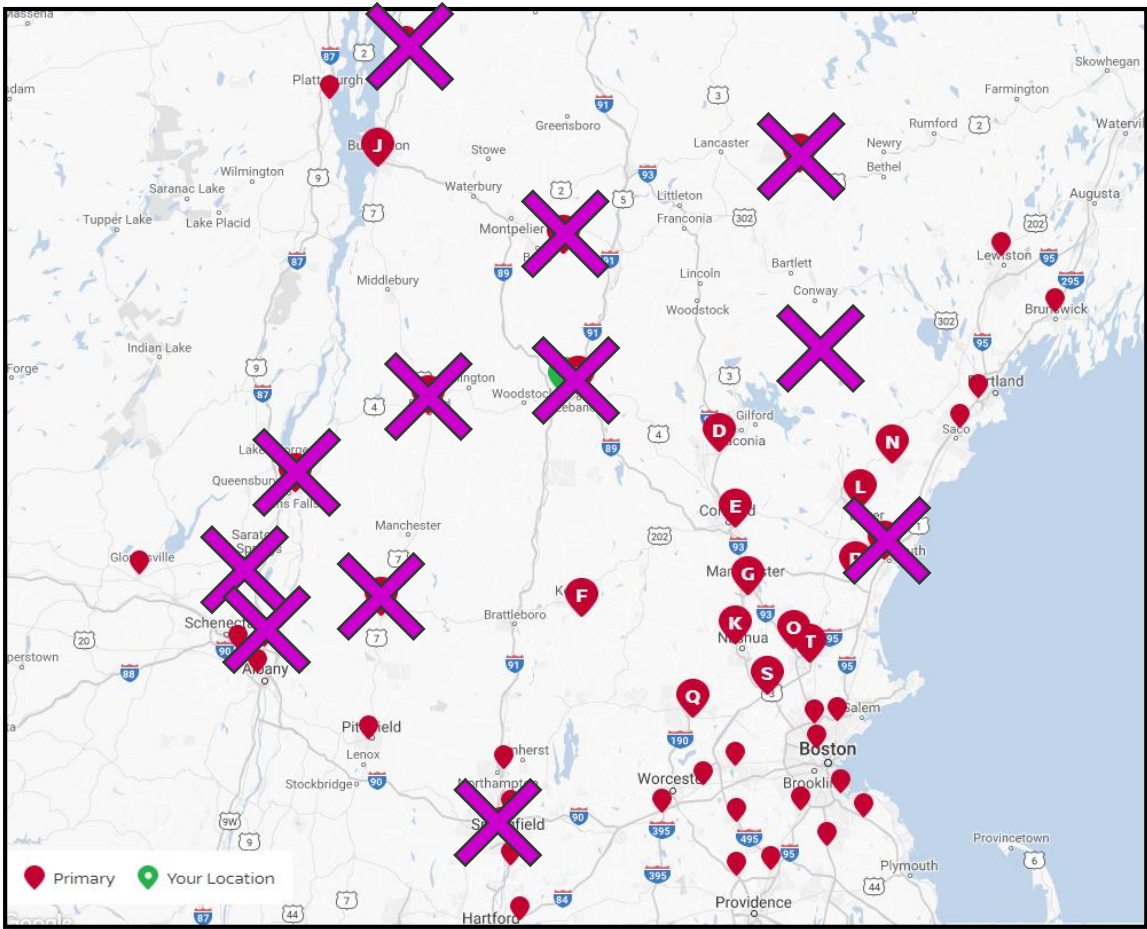


LEAF Certified Dealers

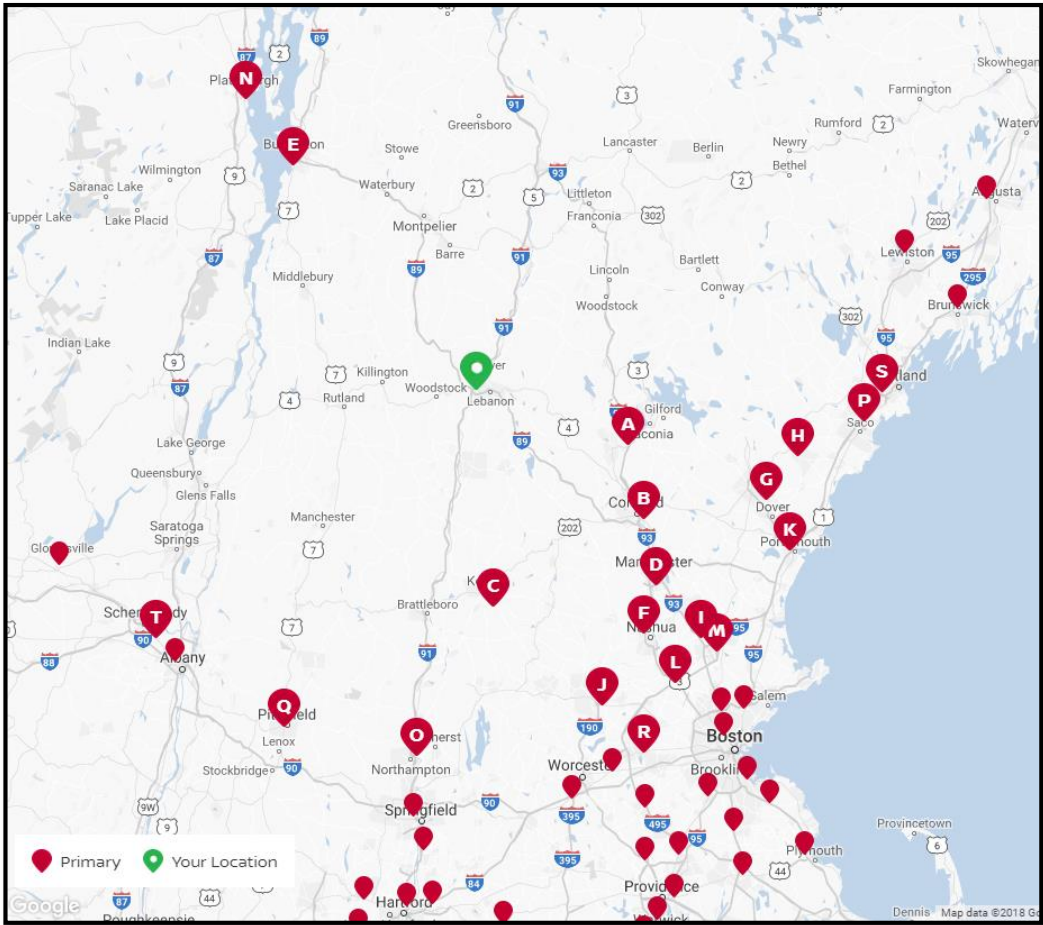


# Nissan Dealership Locations

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LEAF Certified Dealers





# Electrification for All

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**Jennifer Wallace-Brodeur**, Director of Transportation Efficiency, Vermont Energy Investment Corporation

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# State Team Time

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**#WeTheStates**



# Scooter Test Rides



Lime

Lime Scooter test rides will be offered tomorrow afternoon following the final session





# State Team Report Out

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**#WeTheStates**



# Who Owns, Operates, and Pays for the Infrastructure?

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Moderator: **Nick Nigro**, Founder, Atlas Public Policy

Speakers:

**Paul Allen**, Senior Vice President, M.J. Bradley & Associates

**Kevin Boughan**, Manager, Business Development & Research, Eversource Energy

**Colleen Turner**, Assistant Director, Office of Planning & Capital Programming, Maryland Department of Transportation



# Managing the Grid

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Moderator: **Nancy Seidman**, Senior Advisor, Regulatory Assistance Project

Speakers:

**Nancy Ryan**, Partner, Energy and Environmental Economics

**Tony Markel**, Senior Engineer, National Renewable Energy Laboratory

**Tim Roughan**, Director of Energy and Environmental Policy, National Grid

**Katie Dykes**, Chair, Connecticut Public Utilities Regulatory Authority

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# Regional Electrification Coordination

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Speakers:

**Matthew Goetz**, Electric Vehicle Program Manager, Georgetown Climate Center

**Elaine O'Grady**, Policy & Program Director, Northeast States for Coordinated Air Use  
Management

**#WeTheStates**

# Regional and Multi-state Planning for Transportation Electrification

NGA Northeast Regional Transportation  
Electrification Workshop

November 2018

Matthew Goetz  
Electric Vehicle Program Manager  
Georgetown Climate Center



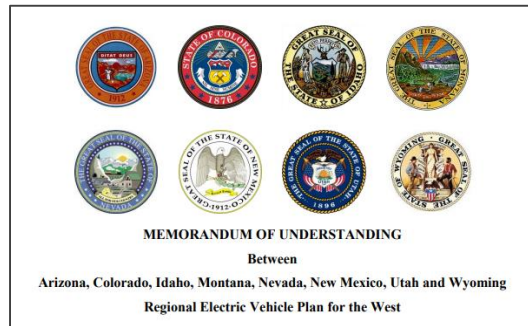
# Georgetown Climate Center:

## A Resource for State and Federal Climate Policy



- Launched in 2009 as a resource to states
- Works at the nexus of federal-state policies
- Supports states and other stakeholders through research, facilitation and convening

# Multi-state Collaboration to Accelerate Transportation Electrification



WEST COAST  
ELECTRIC  
HIGHWAY

 MULTI-STATE  
ZEV TASK FORCE

**3.3 MILLION**  
ZERO-EMISSION VEHICLES  
**BY 2025**



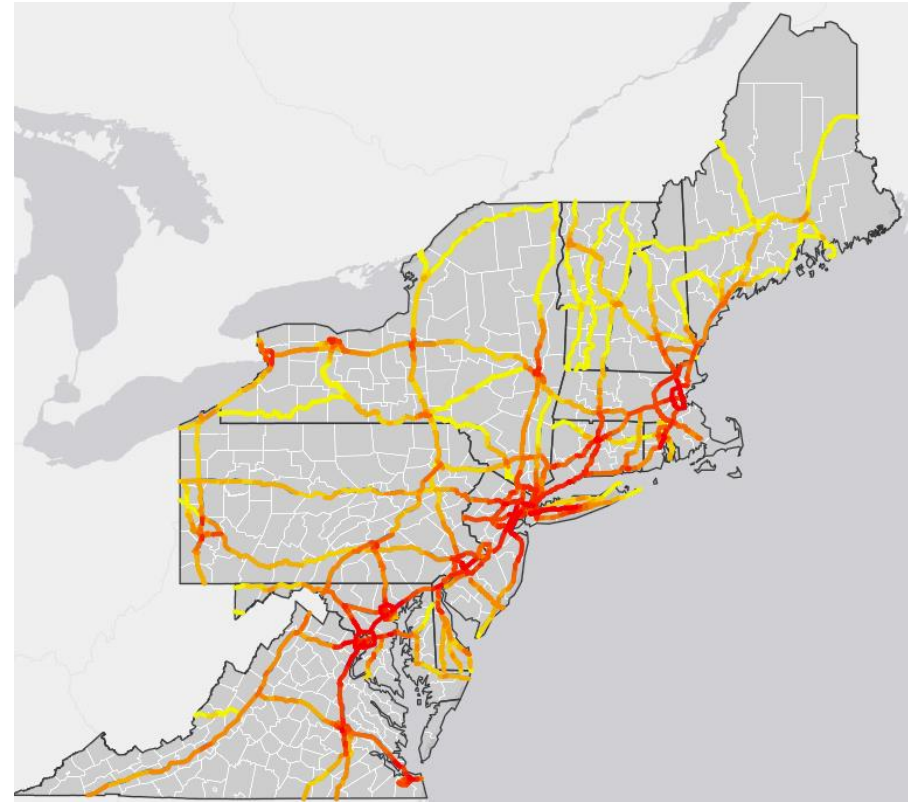
UNITED STATES  
CLIMATE ALLIANCE



GEORGETOWN CLIMATE CENTER  
A Leading Resource for State and Federal Policy

# Benefits of Regional Coordination on Electric Vehicles and EV Charging

- Close geographic and economic connections
- Interconnected highway and transit networks
- Important to create consistent experience for drivers and businesses
- Can create efficient build-out of EV charging network



# Opportunities for Regional Coordination

- Incentives for vehicles and charging stations
- Public fleet electrification
- Interstate corridor planning
- Charging station industry requirements and consumer experience
- Consumer outreach & education





# Incentives for Drivers, Businesses, and Fleets

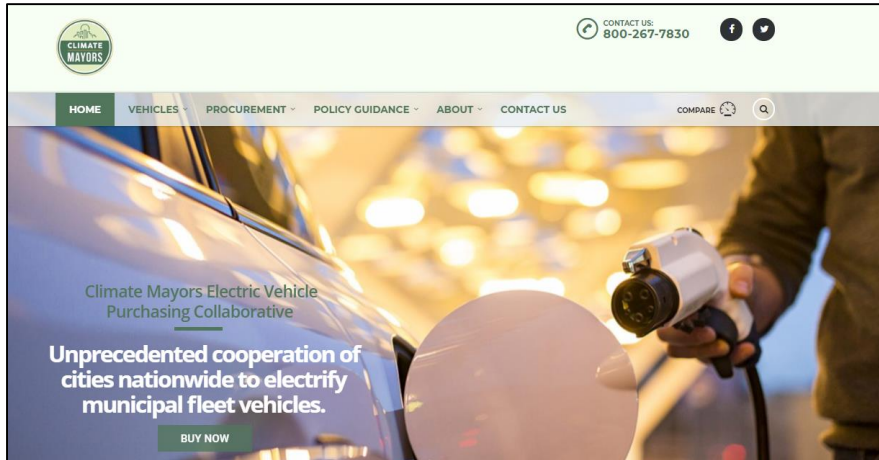
Opportunities for regional coordination?

- Private fleet incentives
- HOV access
- Workplace charging for regional businesses
- Collaboration on pre-owned EV incentive design





# Public Fleet Procurement Coordination



- Multi-state EV procurements demonstrate interest and expand availability
- Climate Mayors EV Purchasing Collaborative launched in 2018
- Regional coordination on transit fleet electrification



# Multi-state Collaboration on Regional EV Corridor Planning

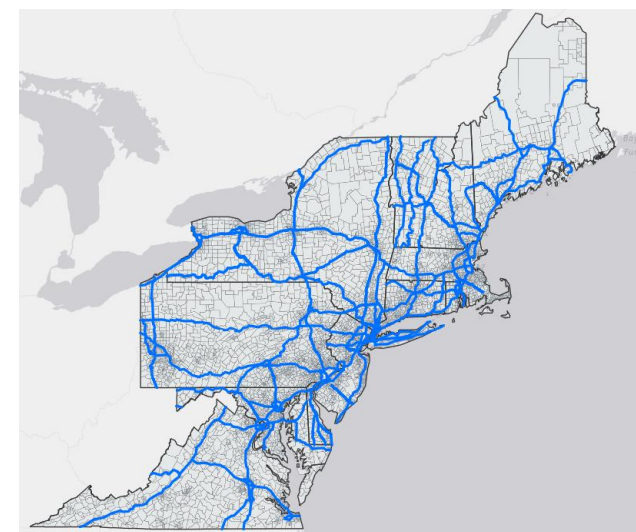


**WEST COAST  
ELECTRIC  
HIGHWAY**

Intermountain West EV Corridor



**TRANSPORTATION &  
CLIMATE INITIATIVE**  
Of the Northeast and Mid-Atlantic States

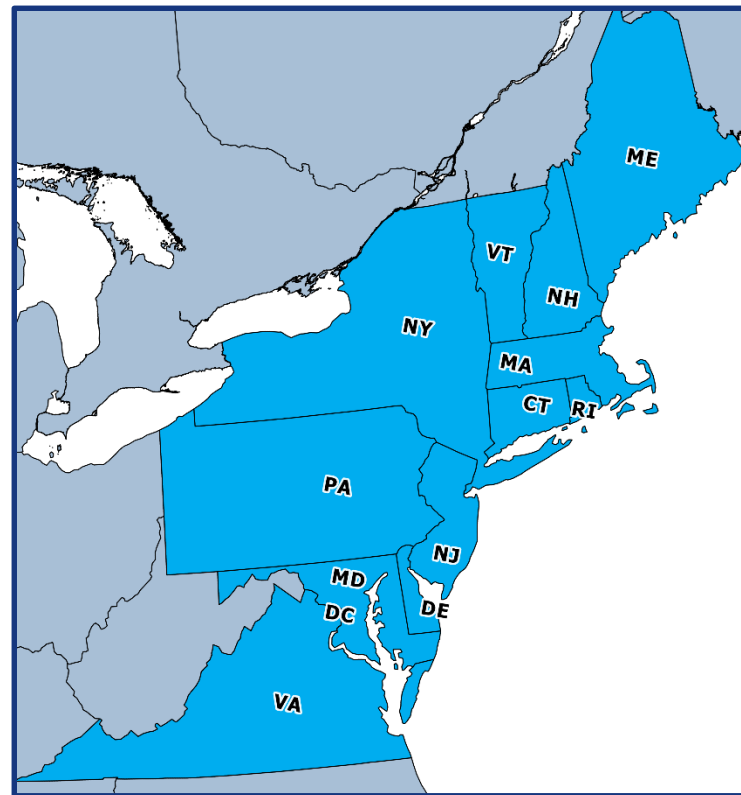




## TRANSPORTATION & CLIMATE INITIATIVE

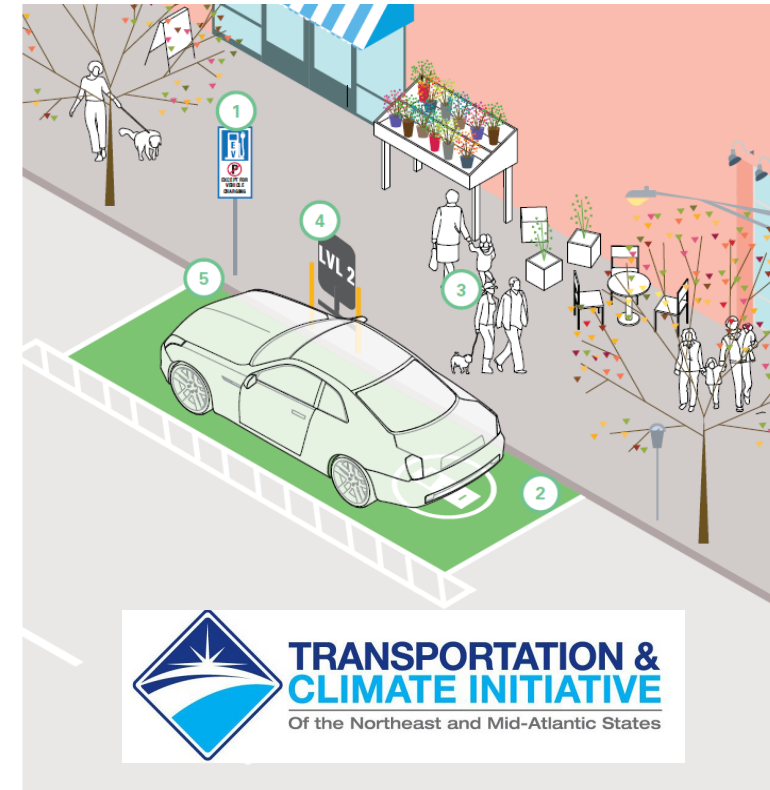
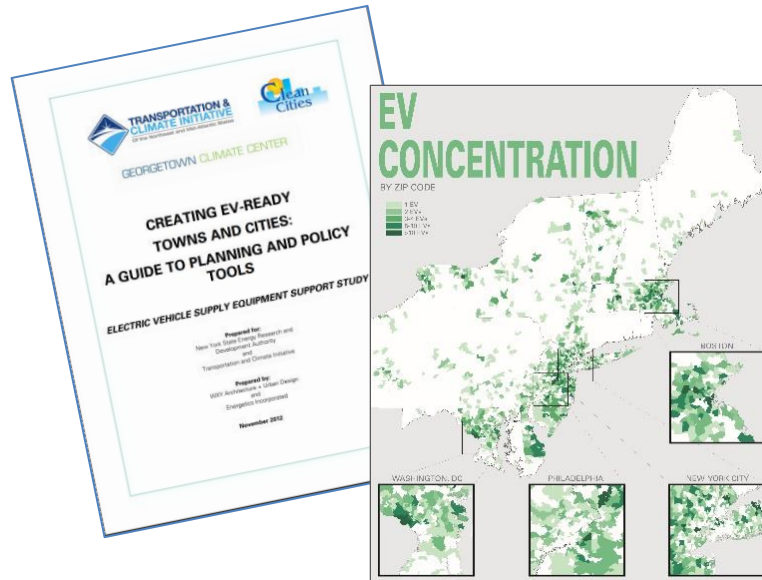
Of the Northeast and Mid-Atlantic States

- 12 Northeast and mid-Atlantic states and D.C.
- State energy, environment, and transportation agencies
- Clean vehicles & fuels, regional emissions transportation policies, sustainable communities, freight, and resilience





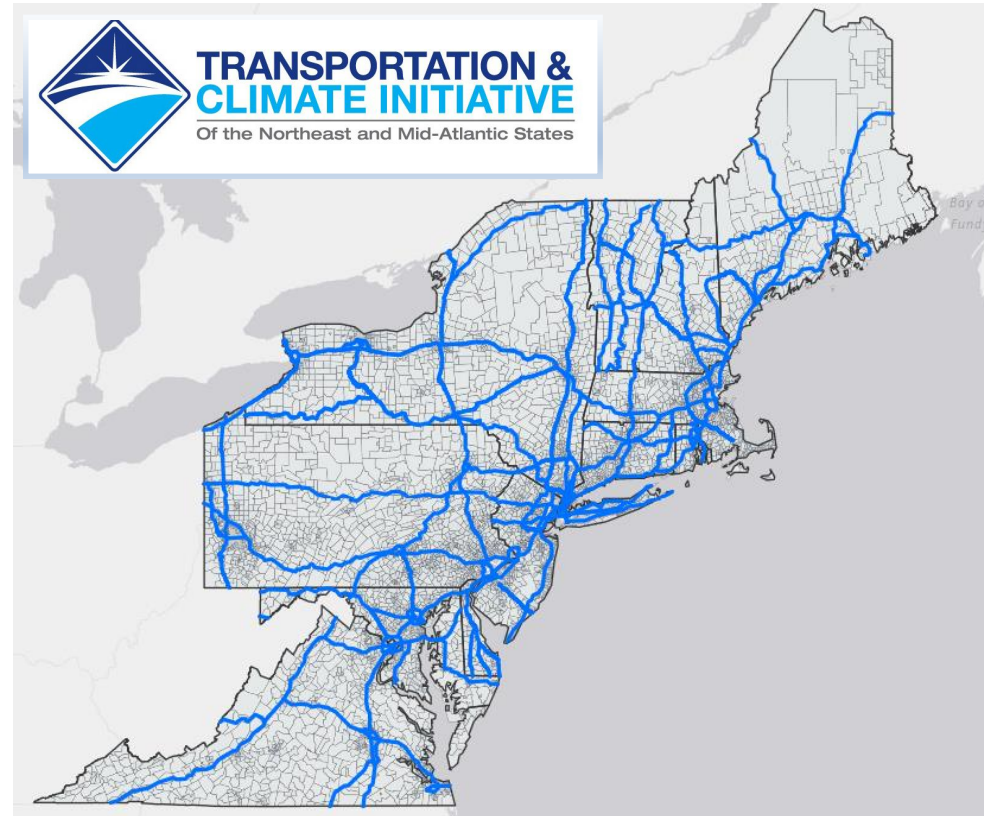
# Regional Coordination on Electric Vehicle Charging Infrastructure



# Transportation and Climate Initiative

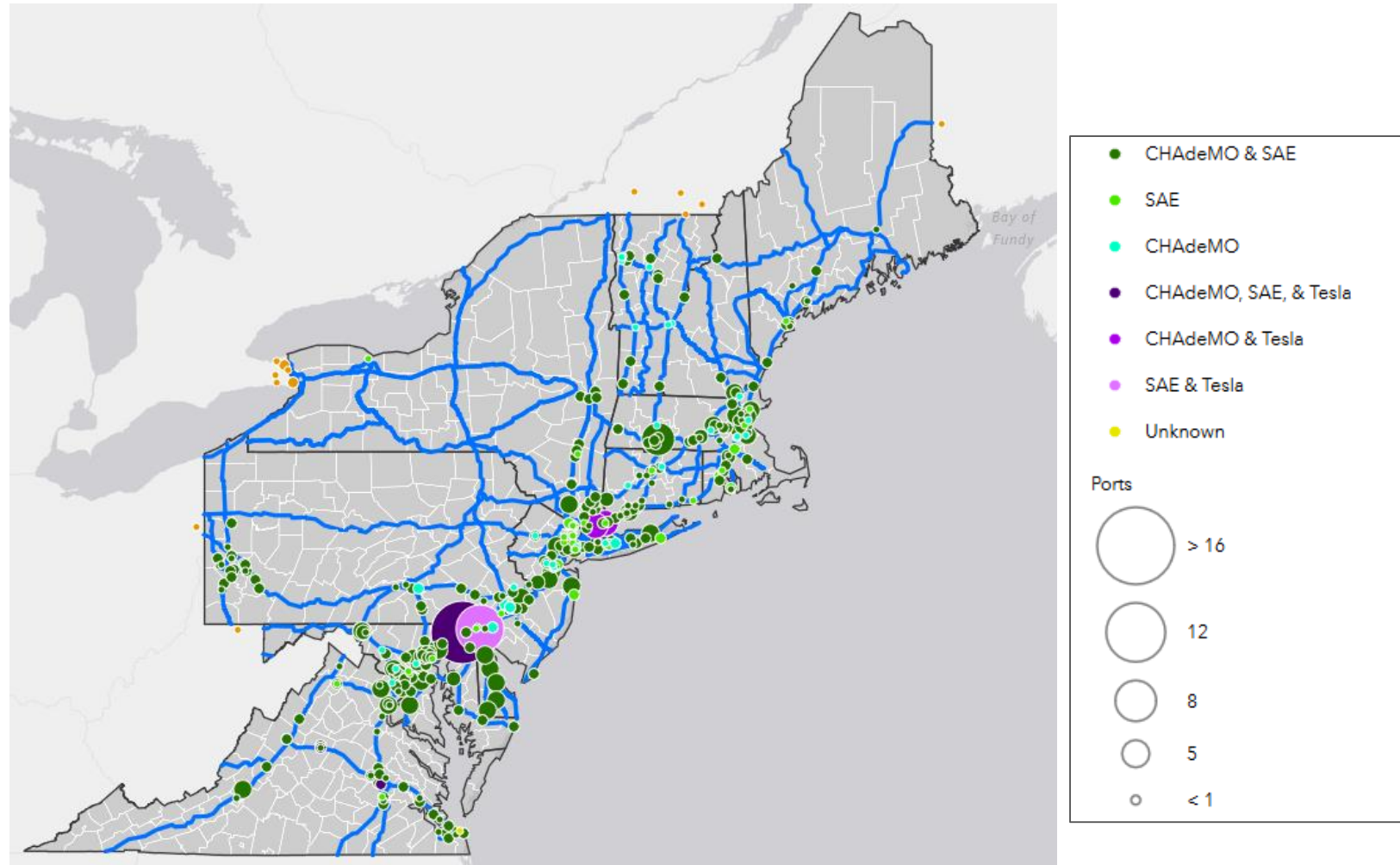
## Regional EV Corridor Planning & Analysis

- Share best practices and technical expertise
- Engage with other jurisdictions and key stakeholders
- Analysis to inform EV Fast Charging infrastructure planning

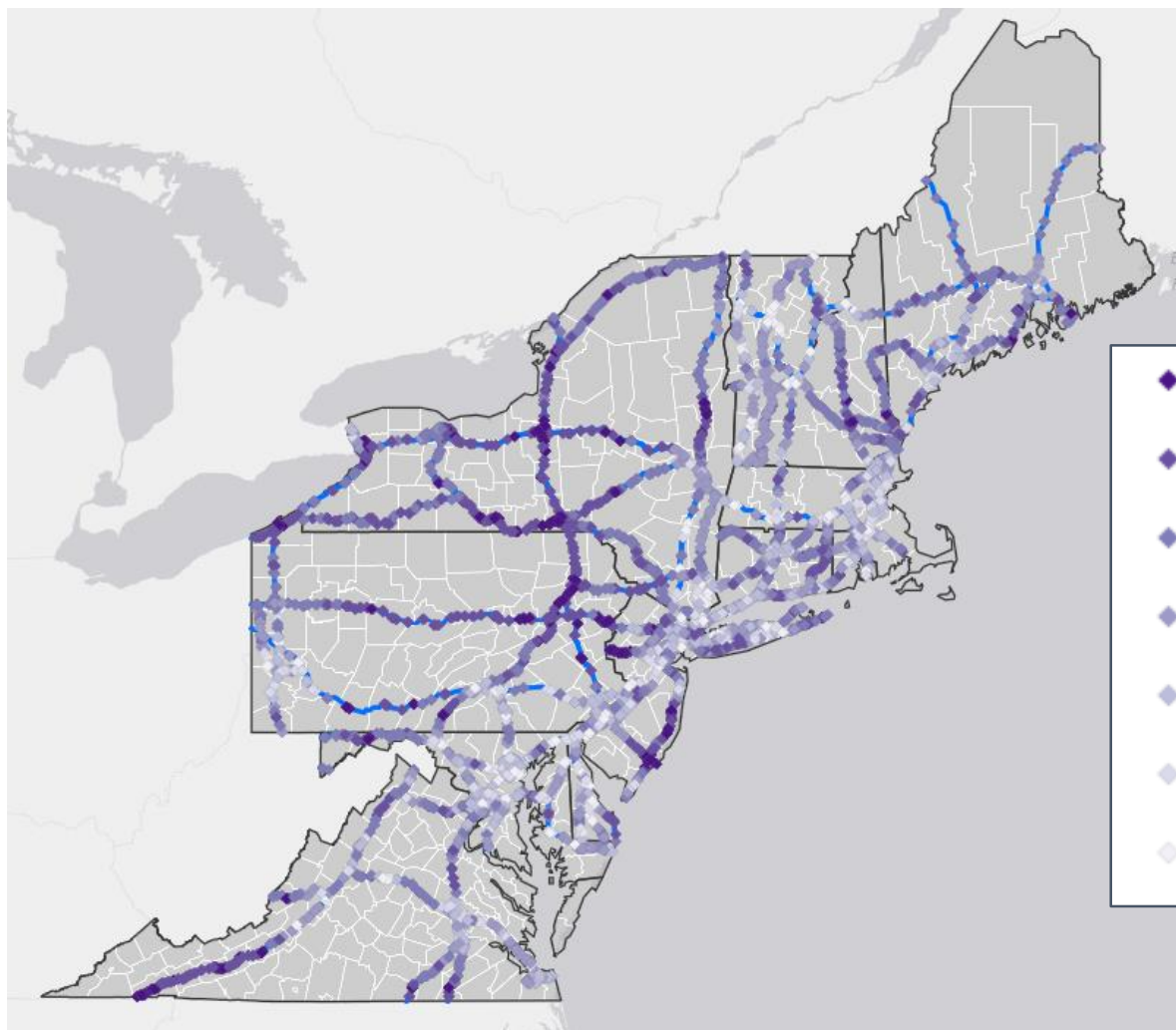




# Existing Public Fast Charging Along Corridors



# TCI Corridor Analysis Sample Results

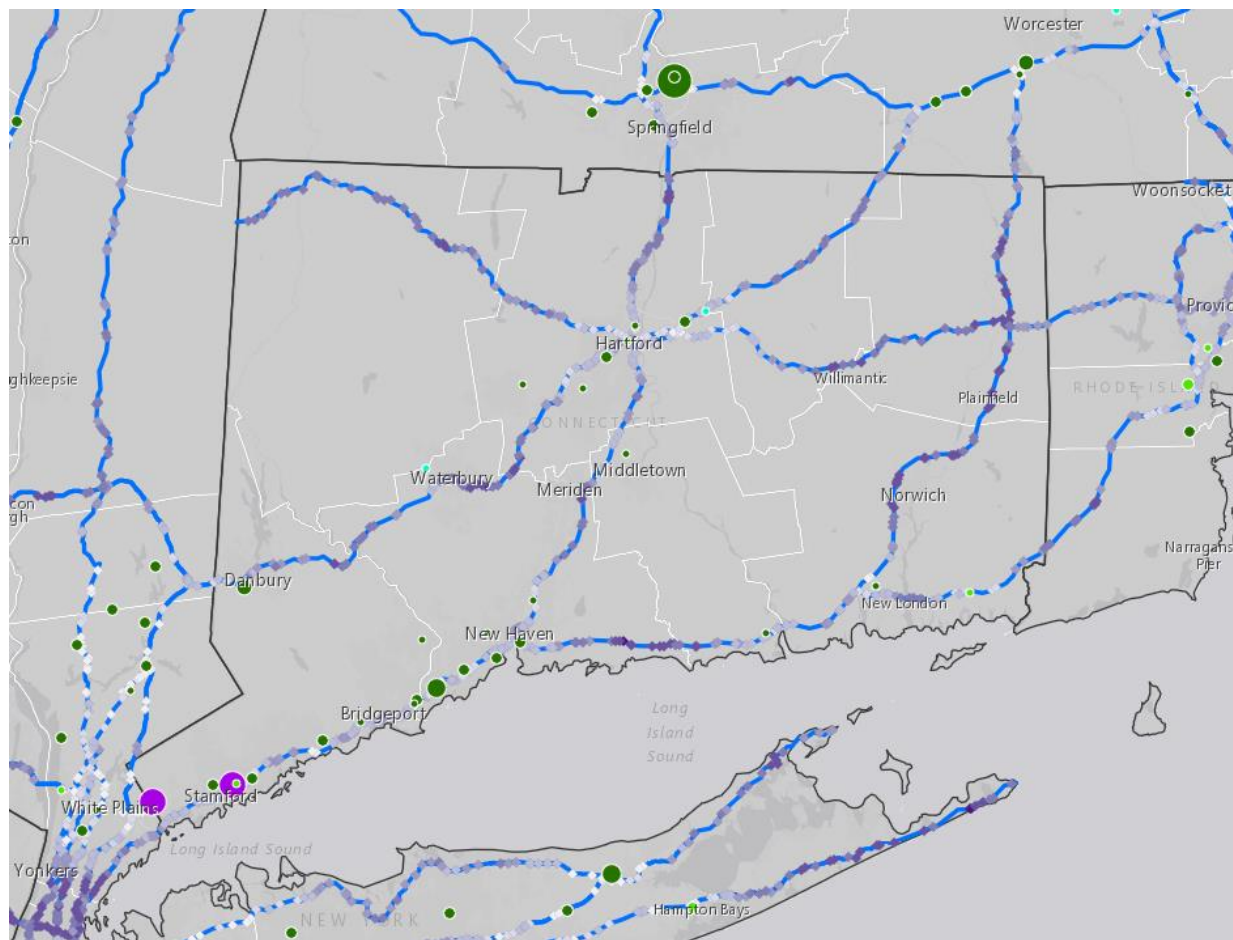


Highway exits ranked  
using “Fill Gaps”  
method of assessment

- ◆ High Suitability/Rank
- ◆
- ◆
- ◆ Medium Suitability/Rank
- ◆
- ◆
- ◆ Low Suitability/Rank

<https://www.georgetownclimate.org/transportation/development-ev-corridors.html>

# TCI EV Corridor Analysis Results for “Fill Gaps” Method



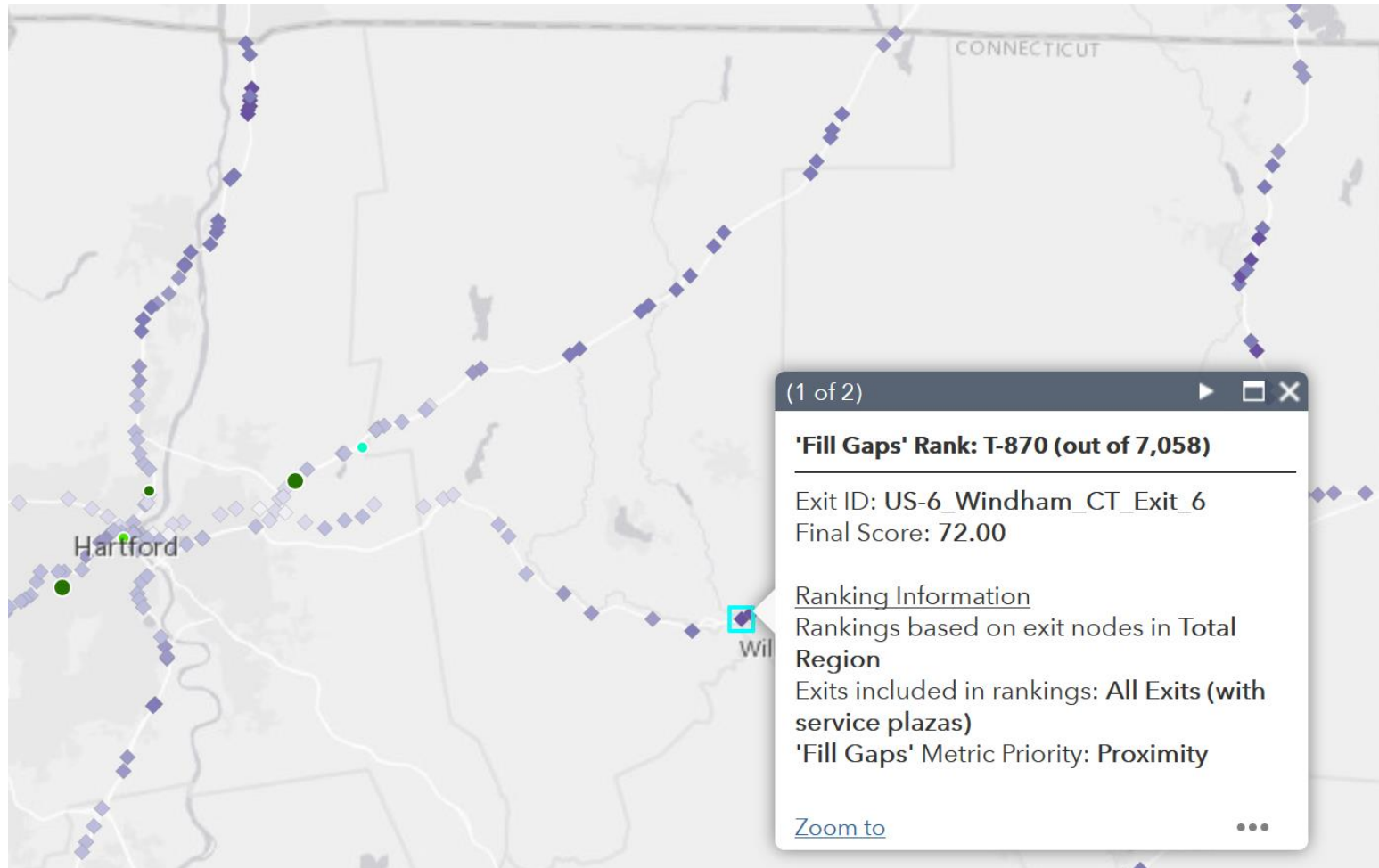
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<https://www.georgetownclimate.org/transportation/development-ev-corridors.html>



# TCI EV Corridor Analysis Results for “Fill Gaps” Method



# Transportation and Climate Initiative Regional Policies Development

- Analysis and convenings to inform development of potential regional policies
- In 2018, held public listening sessions to discuss opportunities and challenges of a low-carbon transportation system:
  - Albany, NY (April 9)
  - Hartford, CT (May 21)
  - Wilmington, DE (June 6)
  - New York, NY (July 24)
  - Largo, MD (August 27)





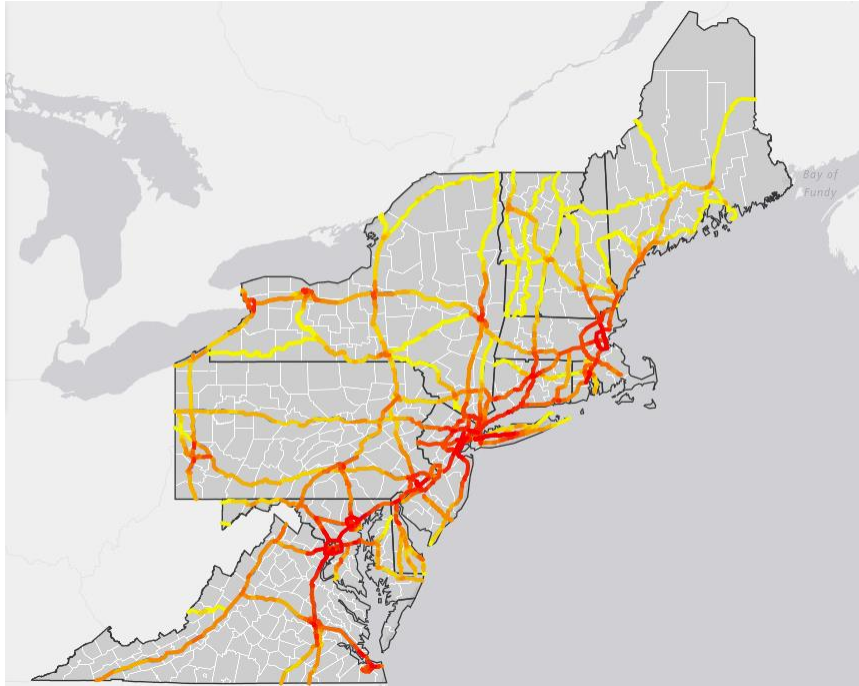
# Questions and Discussion

**Matthew Goetz**  
**Electric Vehicle Program Manager**  
**Georgetown Climate Center**  
**goetz@georgetown.edu**

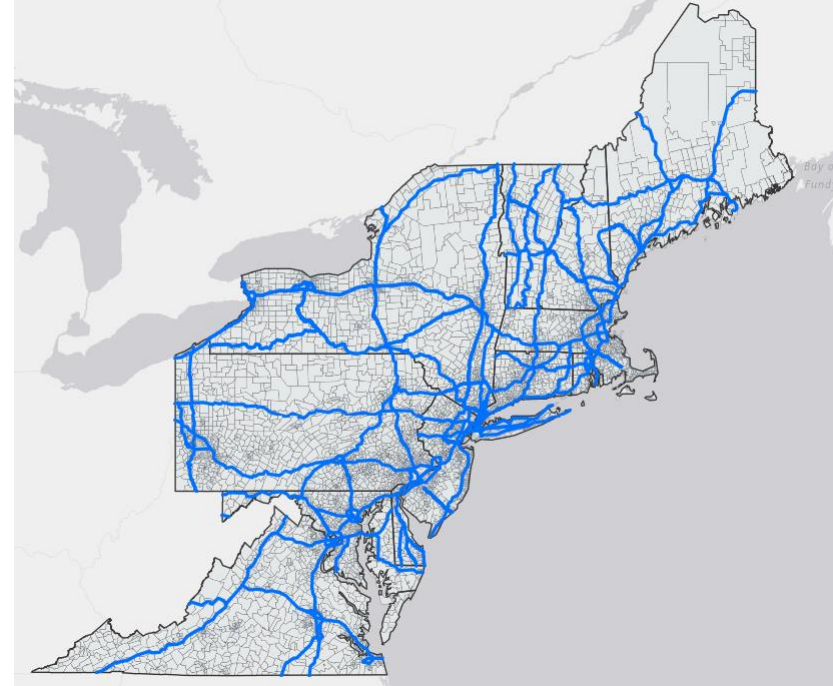


[www.georgetownclimate.org](http://www.georgetownclimate.org)

## Appendix: TCI Regional EV Corridor Analysis Metrics

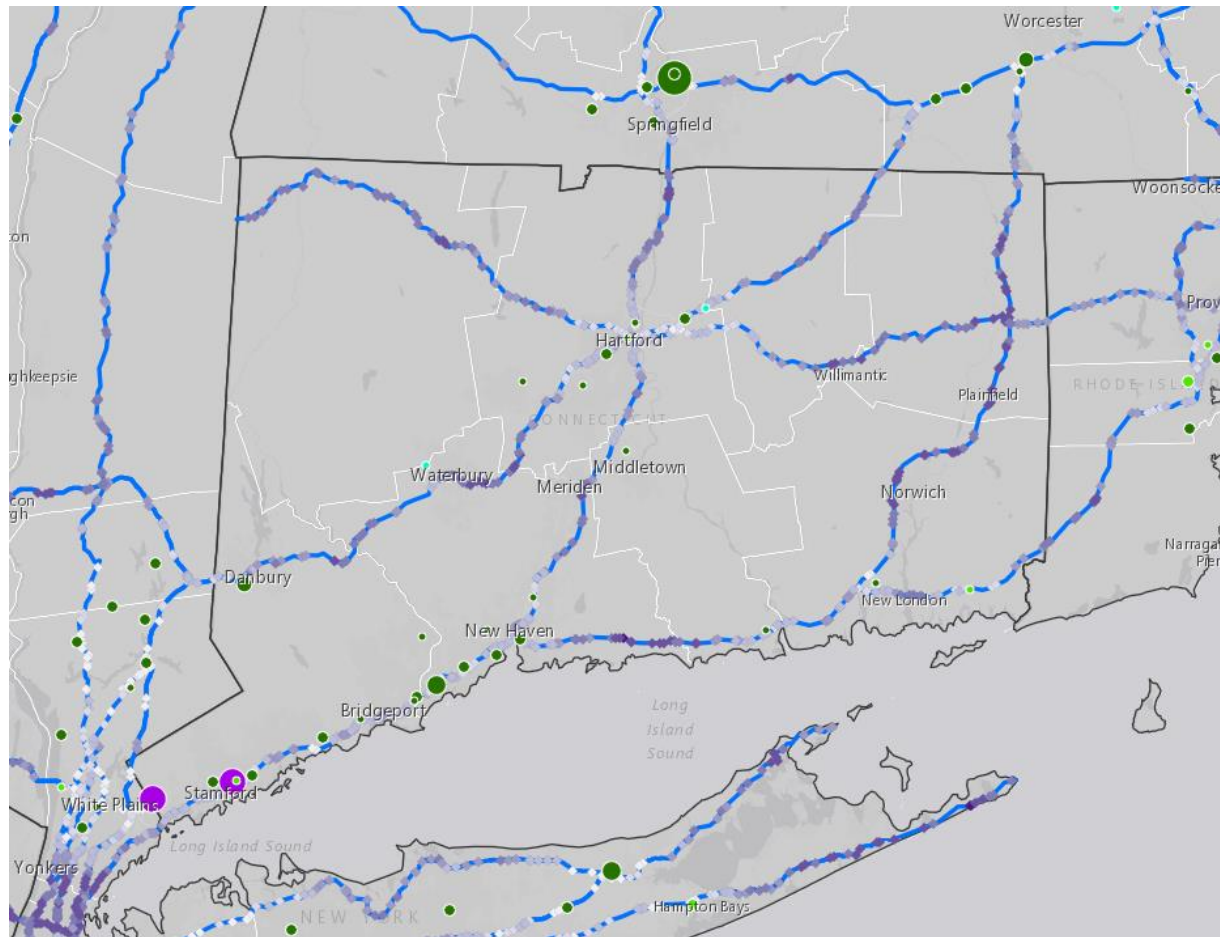


Traffic Volume (AADT)



Population Density (census tract)

# Appendix: TCI EV Corridor Analysis Results for “Fill Gaps” Method

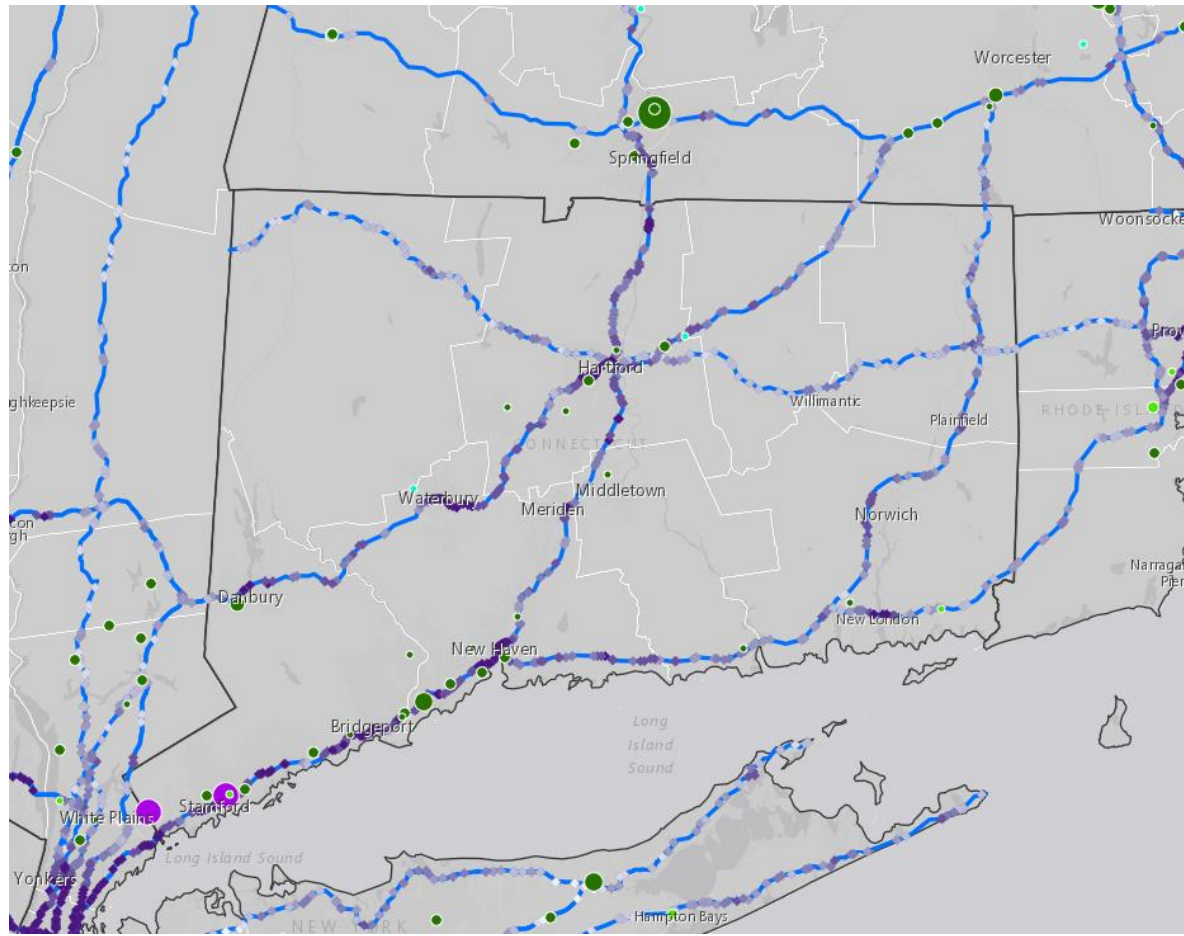


Highway exits ranked  
using “Fill Gaps”  
method of assessment

- High Suitability/Rank
- Medium Suitability/Rank
- Low Suitability/Rank

<https://www.georgetownclimate.org/transportation/development-ev-corridors.html>

# Appendix: TCI Corridor Analysis Results for “Through Traffic” Method



Highway exits ranked  
using “Through Traffic”  
method of assessment

- ◆ High Suitability/Rank
- ◆ Medium Suitability/Rank
- ◆ Low Suitability/Rank

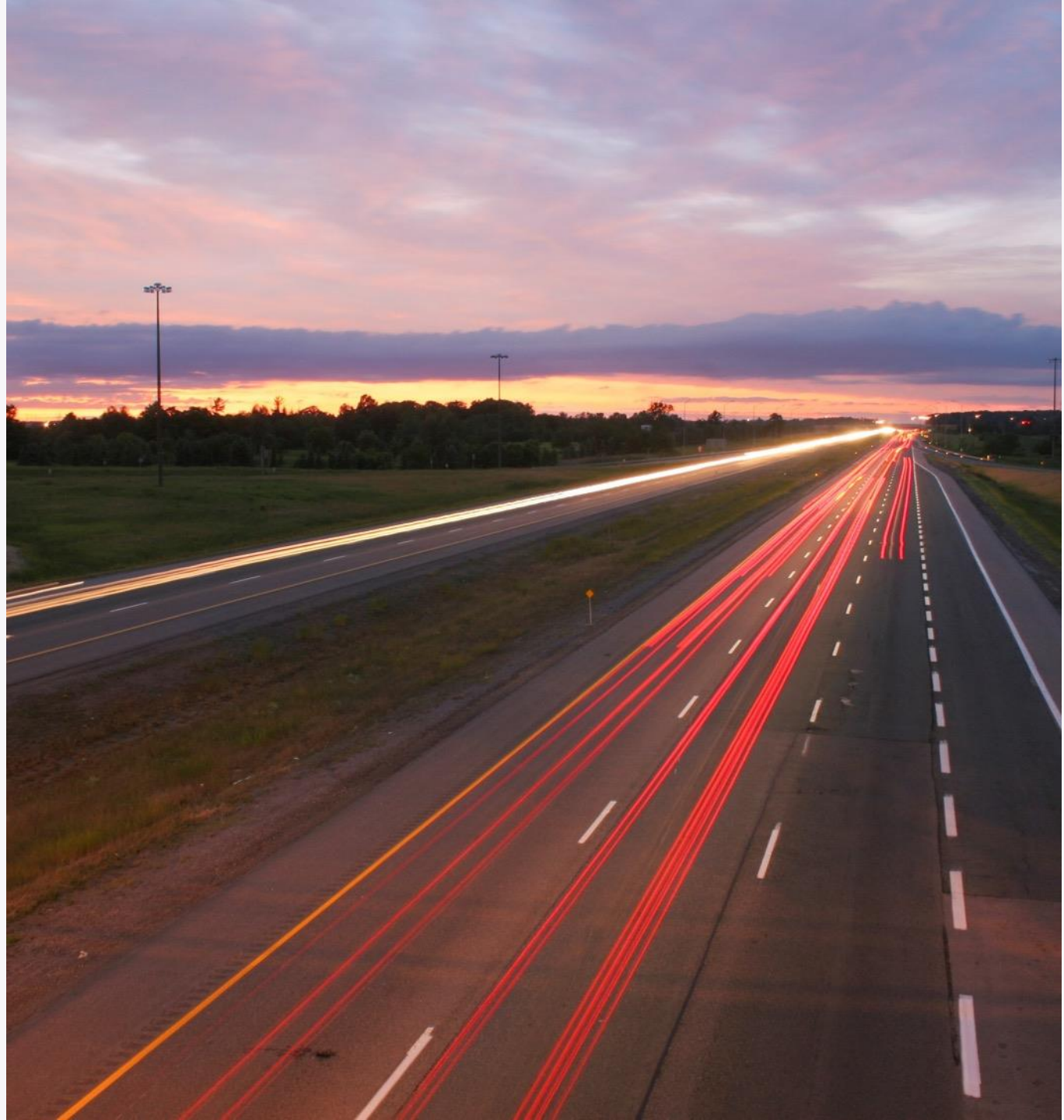


# **Northeast Corridor Electric Vehicle Charging Infrastructure Strategy 2018-2021**

**National Governors Association  
Northeast Regional Transportation  
Electrification Workshop**

November 30, 2018

Elaine O'Grady, Policy & Program Director







## **OBJECTIVE**

# **Northeast Corridor EV Charging Infrastructure Strategy**

Provide guidance and direction to public and private investments to ensure they are coordinated, well-informed and complementary in order to build out a robust and reliable charging network that will meet the region's emerging needs

# Coordinating Infrastructure Investments

While other investments by utilities, OEMs, EVSE providers, and businesses and workplaces are expected (and will be needed to meet state and regional goals), there are three major sources of known funding:

## APPENDIX D FUNDS

Under the Volkswagen settlement, the Northeast Corridor States may invest up to \$108 million on ZEV charging and hydrogen fueling infrastructure.



Pursuant to the Volkswagen settlement, Electrify America is investing \$2 billion to promote ZEVs, which will include substantial infrastructure investments in the Northeast Corridor.

## UTILITY PROPOSALS

Utilities in the region are starting to invest in transportation electrification, with proposals in DE, DC, MD, MA, NJ, NY and RI, representing an investment of roughly \$750 million.

# Why Develop a REGIONAL Strategy?







# GETTING STARTED

## Common Vision

Public and private investors should work together to:

- Inspire drivers to choose ZEVs through effective education, outreach, and exposure to ZEVs
- Make workplace and public charging the norm;
- Provide viable charging options for residents in MUDs and single family homes without access to off-street parking; and
- Install ZEV charging and fueling infrastructure in high density areas and along travel corridors.

## Manageable Scope

- Plug-in Electric Vehicles
- Light Duty
- 2018-2021 Timeframe

# APPROACH

Northeast Corridor Steering Committee identified overarching issues, key investors and their roles, and priorities for different charging use cases.

## CHARGING USE CASES

- Home
- Workplace
- Around Town
- On the Road
- Destinations

## KEY INVESTORS

- State and local governments
- EVSE Providers
- Utilities
- Automakers
- Businesses

## OVERARCHING ISSUES

- Interoperability
- Rate Design
- Signage
- Permit Streamlining
- Pricing Transparency
- Building Codes
- Uptime
- Data Collection
- Future Proofing
- Low-Income/Disadvantaged Communities





## Charging Use Case Priorities

**Home:** Lower cost of installing and using EVSE at home, especially at MUDs

**Work:** Incentivize EVSE at workplaces, conduct outreach, and recognize business leaders

**Around Town:** Deploy EVSE at airports, train stations, strategically located charging hubs, and highly visible sites with longer dwell times

**On the Road:** Expand DCFC network along interstate and state highway corridors

**Destinations:** Deploy EVSE at key destinations such as beaches, mountain resorts, state parks, historic sites, etc.

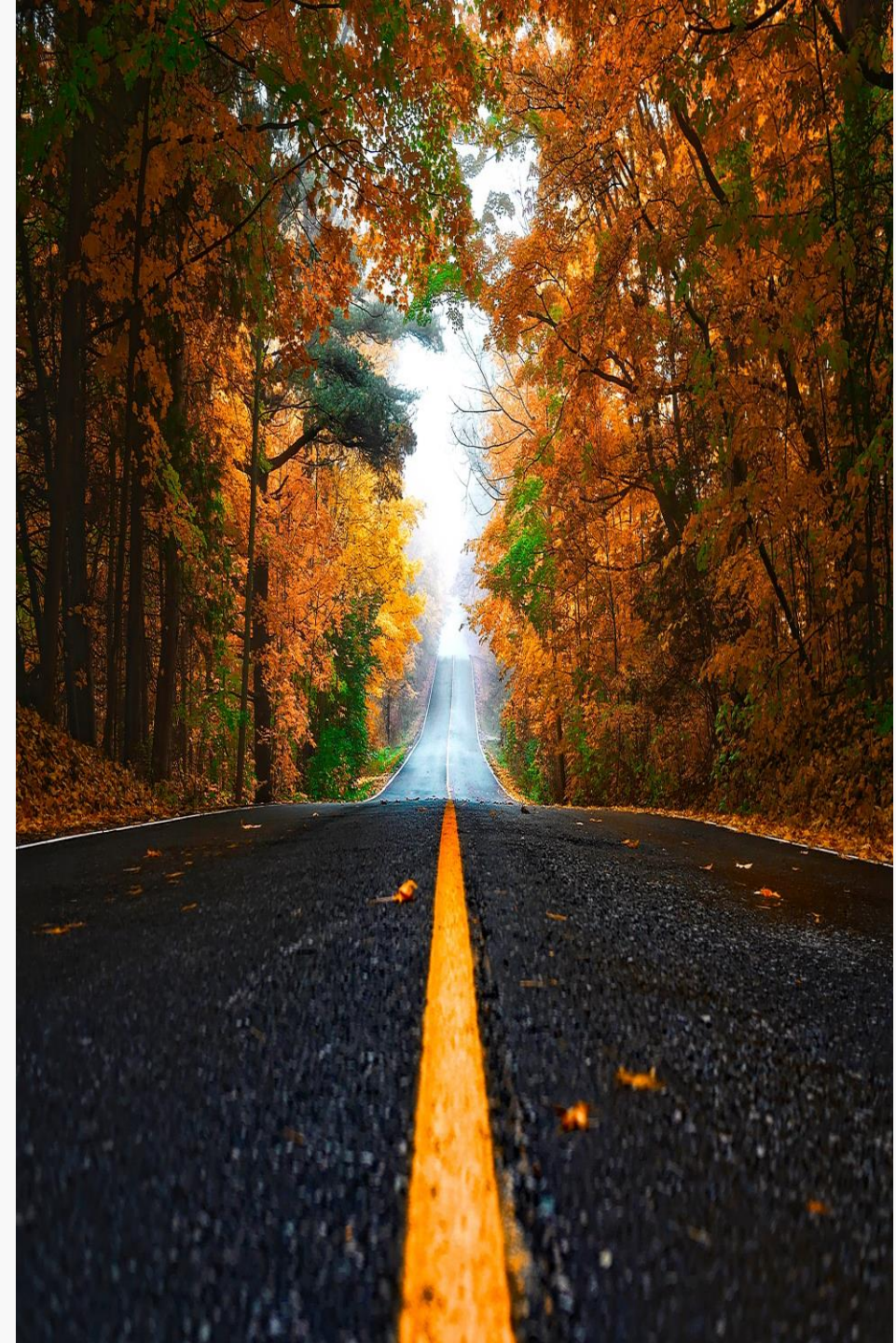


## Examples of Key Roles

**States:** Policies to address overarching issues; workplace charging incentives; L2 in highly visible places around town and at destinations

**Electrify America/EVSE providers:** DCFC for long distance charging, strategically placed community charging hubs, and at airports and train stations (for TNCs)

**Utilities:** Lower cost of charging at home, especially MUDs, and help deploy DCFC (at a minimum siting and make-ready)



Northeast Corridor Regional Strategy  
for Electric Vehicle Charging Infrastructure  
2018 – 2021



May 16, 2018



**The regional strategy is available at:**

<http://www.nescaum.org/documents/northeast-regional-charging-strategy-2018.pdf>

**For questions, please contact:**

Elaine O'Grady at [eogrady@nescaum.org](mailto:eogrady@nescaum.org)



# Regional Electrification Coordination

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Speakers:

**Matthew Goetz**, Electric Vehicle Program Manager, Georgetown Climate Center

**Elaine O'Grady**, Policy & Program Director, Northeast States for Coordinated Air Use  
Management

**#WeTheStates**



# Brainstorm Activity: Regional Approaches

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Rooms

**#WeTheStates**





# **Working Lunch: Reconvene and Regional Report Out**

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Moderator: Patricio Portillo, Policy Analyst, NGA

**#WeTheStates**



# Scooter Test Rides

Scooters will be available for test rides  
outside the hotel on Haynes Street



Lime

#WeTheStates



# Wrap Up

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Sue Gander, Division Director, NGA

**#WeTheStates**