The Only Smoke In The Air

Electric Vehicle Workshop
&
Networking BBQ

EASTERN PENNSYLVANIA ALLIANCE FOR CLEAN TRANSPORTATION

EP-ACT

Agenda

10:00 -10:05: Welcome- PECO Perspective—Bill Patterer -PECO

10:05- 10:15: EP-ACT Intro Tony Bandiero EP-ACT

10:15- 10:25: EV Everywhere- DOE's plans - Nick DeMarie- EP-ACT

10:25- 10:35: Smart Driver Network - Tom Bonner- PECO

10:35- 10:50: EVSE's- What Charges you? – Mike Waters - ChargePoint

10:45-11:00: V2G- Saving Power & Money! –Dick Johnson - Autoport

11:00 -11:10: Break

11:10-11:20: SEPTA Electric Bus Program –Jerry Gauracino- SEPTA

11:20-11:30: Other uses for Electric on Vehicles – Steve Bytof- Altech

11:30-11:40: Light/Medium Duty EV's– Brett Gipe- Motiv Power Systems

11:40-11:50: FORD EV's/hybrids & GEM/Polaris Don Slipp- Winner Ford

11:50-12:00: GM EV's/hybrids Tim Thompson General Motors

12:00-12:10: Nissan EV's/ Leaf- Jean Gough- Nissan North America

12:10-12:15: AFIG-Funding Mark Hand – PA DEP

12:15- 2:00: TOSITA Networking BBQ- Vendor tables & Vehicle Displays

EP-ACT
Eastern Pennsylvania Alliance for Clean Transportation

Special Thank You to Our Sponsors

Who is: EP-ACT?

EP-ACT
Eastern Pennsylvania Alliance for Clean Transportation

- Non-profit 501 (c) (3) organization
- Comprised of Public and Private Companies
- Assist with grants/writing/ Project Management
- Education and Outreach
- Tiered Levels of Stakeholder Membership

The- What is Clean Cities?

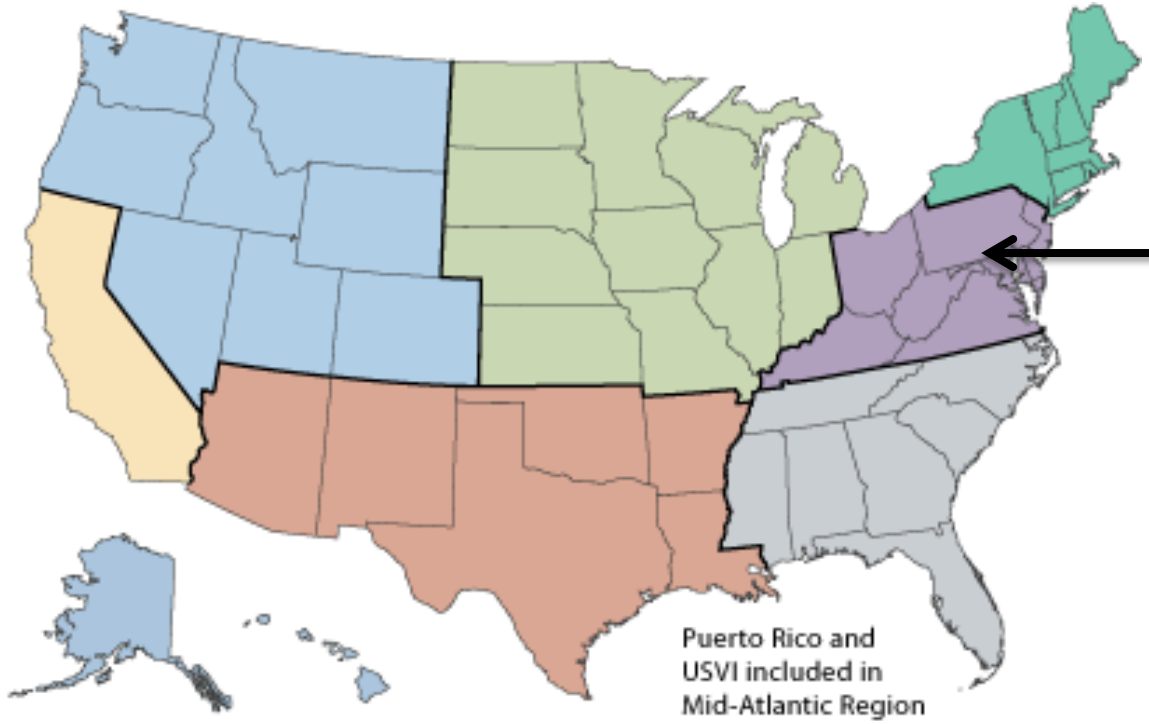
•Sponsored by the DOE's Office of Energy Efficiency and Renewable Energy's Vehicle Technologies Program (EERE)

•A Public/Private Partnership for Clean Fuel Vehicles and Fuel Efficient Technologies

•Provides a framework for businesses and governments to work together as a coalition to enhance markets

•Coordinate activities, identify mutual interests, develop regional economic opportunities, and improve air quality

Where is: EP-ACT



Mid-Atlantic Region

- *Brett Aristegui, Acting,* Northwest
- *David Kirschner,* North Central
- *Erin Russell-Story,* Northeast
- *Darren Stevenson,* Mid-Atlantic
- *Trev Hall,* Southeast
- *Neil Kirschner,* South Central
- *Brett Aristegui,* California

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The Where, of EP-ACT

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Portfolio of Technologies

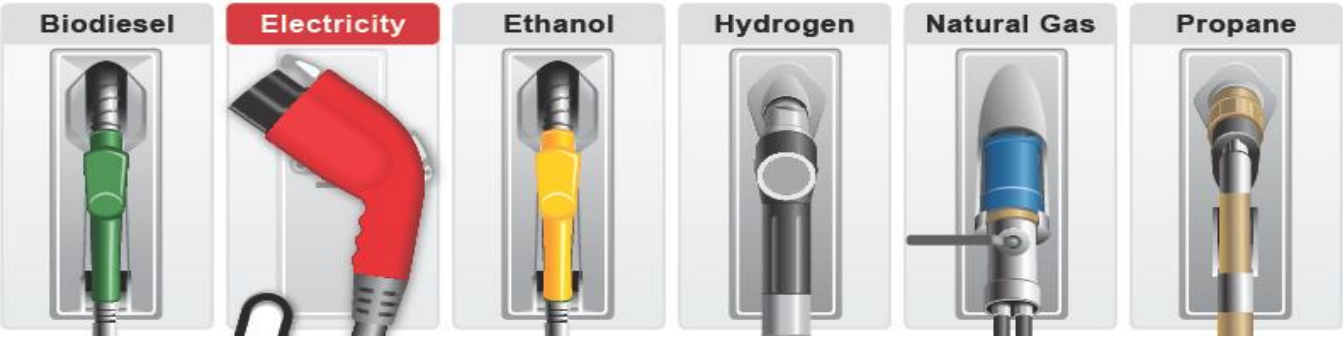
Alternative Fuels and Vehicles
Biodiesel (B100)
Electricity (EV's EVSE's)
Ethanol (E85)
Hydrogen Fuel Cells
Natural Gas (CNG, LNG)
Propane/Autogas (LPG)

Fuel Blends
Biodiesel/diesel blends (B2, B5, B20)
Ethanol/gasoline blends (E10)
Hydrogen/natural gas blends (HCNG)

Fuel Economy
Fuel efficiency
Behavioral changes
Vehicle maintenance
Vehicle miles traveled (VMT)

Hybrids
Light- and Heavy-duty HEVs
PHEVs (Plug- ins)

Idle Reduction
Heavy-duty trucks
School buses
Truck stop electrification



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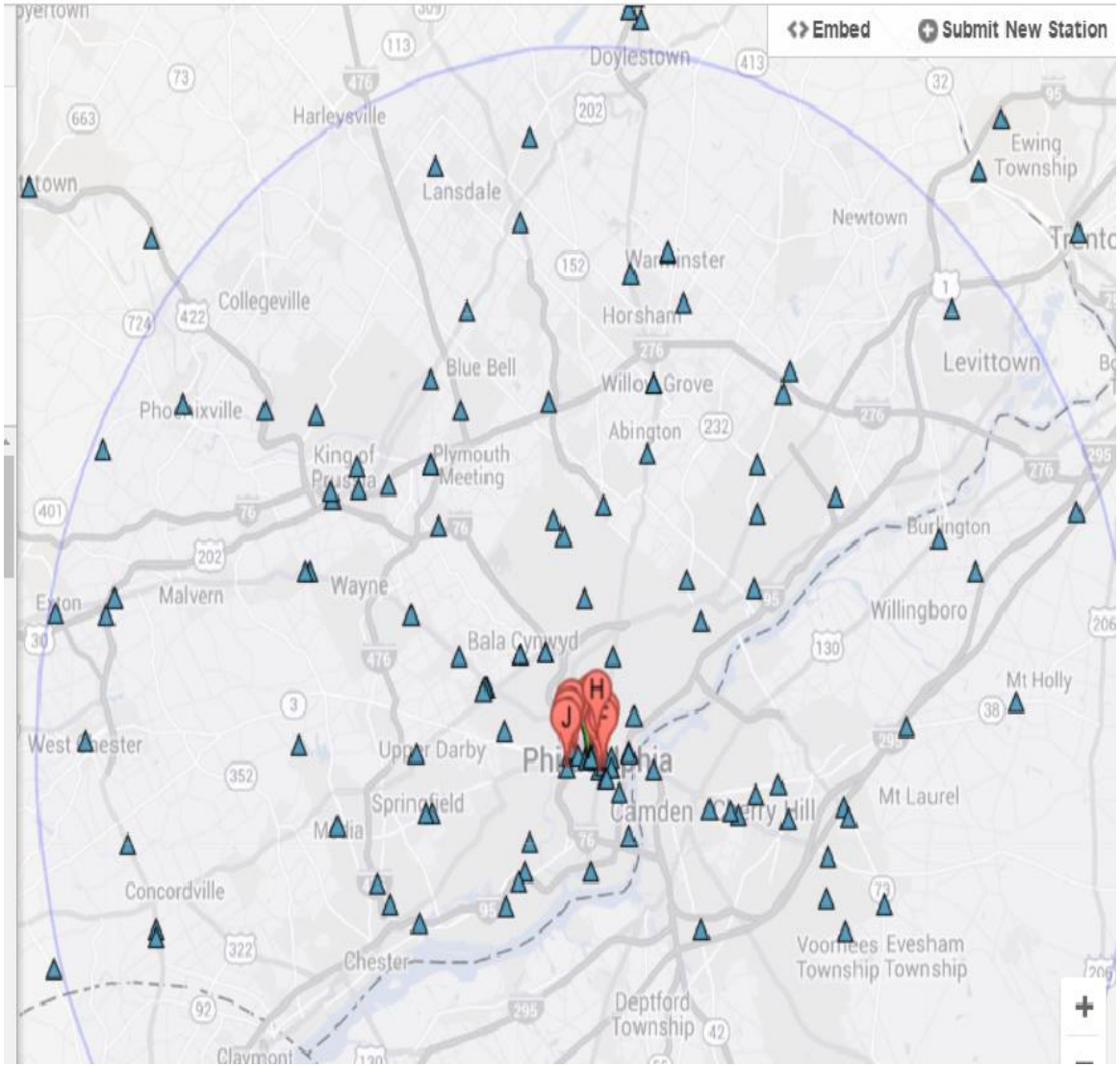
50 Mile Radius of Philly- EVSE's



- ~ 340 in PA
- ~ 215 in EP-ACT Territory
- ~50 in Philly

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Services

EP-ACT
Eastern Pennsylvania Alliance for Clean Transportation

What can we do for You?

- Workshops/ educational seminars
- Training
- Fleet Analysis
- Facility Analysis
- Informational Resources
- Market Research
- Incentives
- Grant Writing
- Grant Administration
- Project Management

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PECO®
An Exelon Company

PA Smart Driver Network Initiative

July 13, 2016

Agenda

- ✓ What PECO Has Done To Date
- ✓ The EV Opportunity
- ✓ Getting Beyond “The Chicken and Her Egg”
- ✓ PECO PEV Market Adoption
- ✓ NGV Concepts

What PECO Has Done to Date

- ✓ EV impact analysis with DVRPC
- ✓ Supported regional “Ready to Roll” study
- ✓ Hosted regional educational programs on AFVs
- ✓ Offered rebates for PECO customers who registered their EV purchase with us
- ✓ Participating in EPRI, EEI and AGA initiatives to promote adoption of AFVs

The EV Opportunity

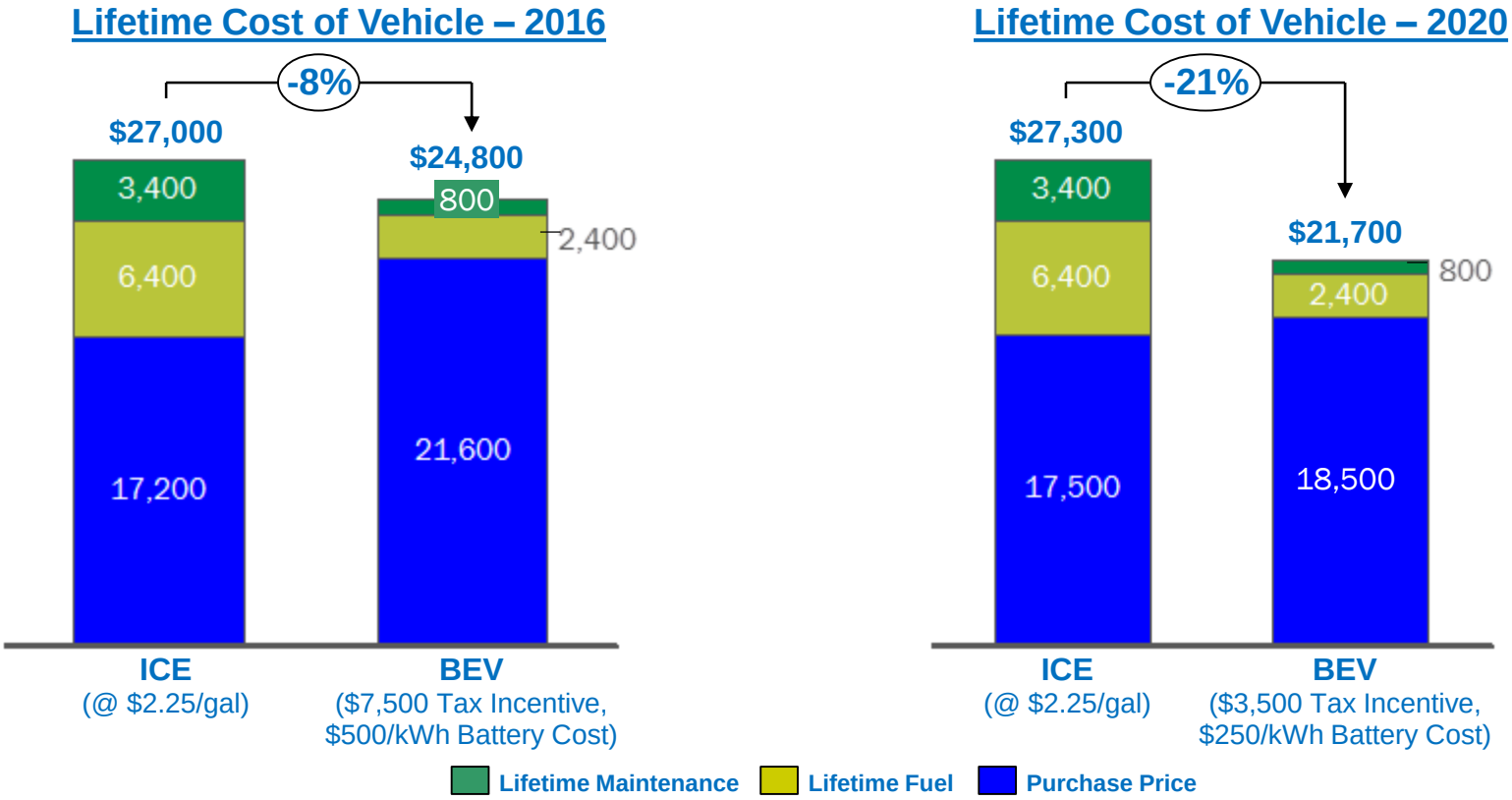
- ✓ Environmental
  - Tripling adoption of EVs over baseline forecast would result in:
    - More than 500,000 tons of CO2 emissions avoided
    - Approximately $20 million in benefits from avoided emissions*
    - Additional benefits would be achieved from reduced conventional pollutants and noise

- ✓ Energy Independence
  - While we have made great progress in recent years, the U.S. still imports about one quarter of its petroleum needs
  - With the Marcellus Shale resource, not only can we shift more of this supply to the U.S., but we can also use a PA-based resource for both EVs and NGVs

- ✓ Levelized Cost of Ownership (LCO)
  - While the up front cost of EVs and NGVs remain above ICE vehicles, the LCO of these vehicles can be lower than conventional vehicles
  - With anticipated improvement in battery costs, we expect the competitiveness of these vehicles to continue to improve

EV Total Cost of Ownership (TCO)

Today EVs offer a lower TCO when compared to a traditional ICE vehicle, as battery prices fall EV purchase prices will be on par with ICE vehicles, making the value proposition even more attractive

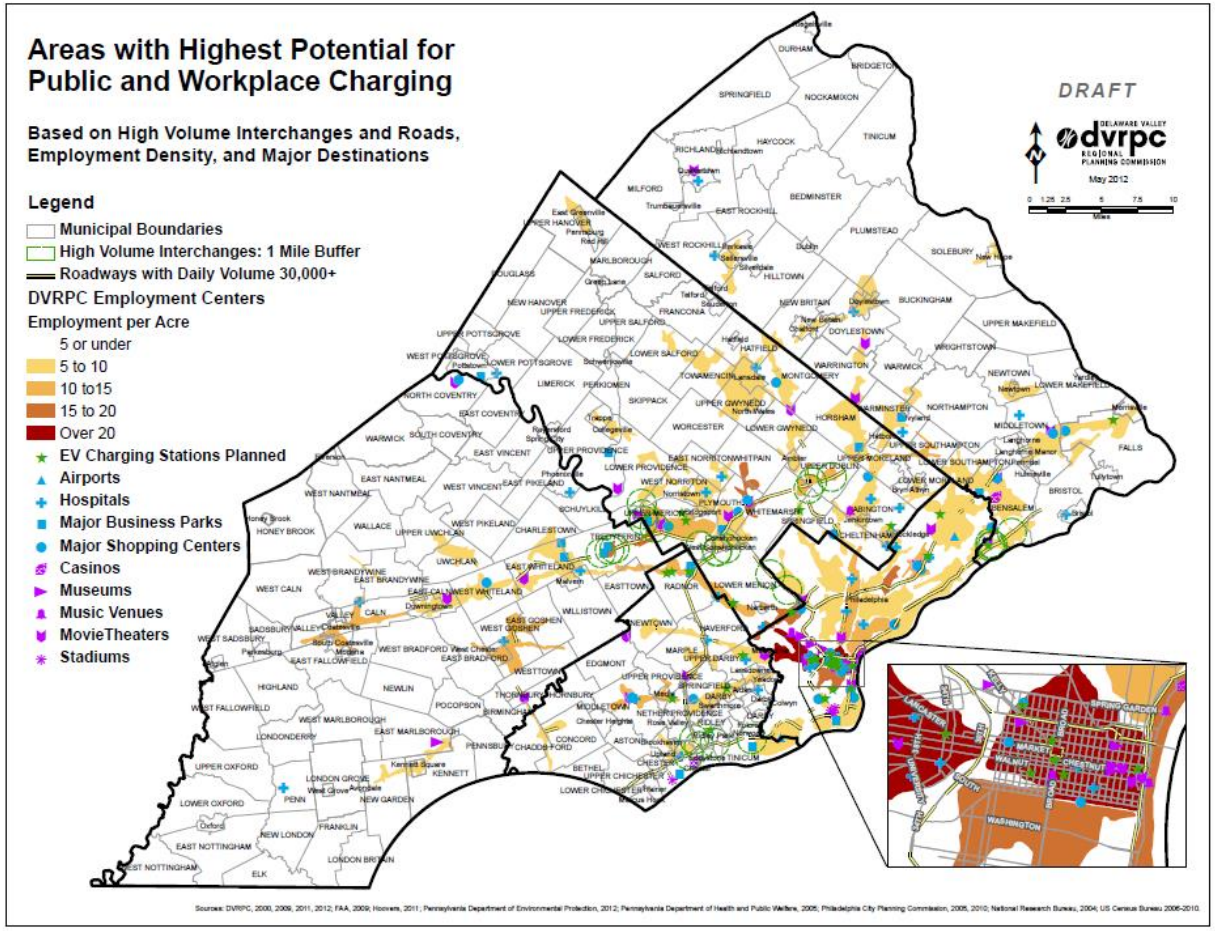


Notes: BEVs include 24 kWh battery; IRS Code - ICT of $2,500 for a vehicle battery with at least 5 kWh of capacity, plus $417 for each kWh of battery capacity in excess of 5 kilowatt hours with a maxi of limited to $7,500.
Sources: US Internal Revenue Service, Gas Buddy, Accenture Analysis

Getting Beyond
"The Chicken and Her Egg"

- ✓ Market Analysis
- ✓ Transportation Infrastructure Assessment
- ✓ Utility Infrastructure Cross-Mapping
- ✓ Ensuring Inclusion

Smart Driver Network



Smart Driver Network:

- ✓ Establish state goal of tripling deployment of EVs and NGVs in PA by 2025
- ✓ Develop state and regional EV and NGV infrastructure plans through planning collaboration between transportation agencies and utilities
- ✓ Support transition of public transportation to EVs and NGVs
- ✓ Authorize establishment of EV smart charging rates

PECO EV Initiatives

- ✓ Continuing to offer rebates for PECO customers who register their EV purchase with us
  - Since 2011 the program has offered over 700 rebates
- ✓ Participating in EEI's Transportation Electrification Initiative by:
  - Committing at least 5% of Fleet's annual vehicle procurement budget on PEVs
  - Developing an Employee EV Engagement Program that will provide EV education and promotional information for all employees
  - Installing employee workplace charging by 3Q 2016 – over 35 parking spaces to be equipped with EV charging capability at several PECO work sites
- ✓ Coordinating with Septa and Proterra to conduct a demo of electric bus technology during the upcoming DNC

SEPTA BATTERY-ELECTRIC BUS PROJECT

BATTERY-ELECTRIC BUS GRANT

FTA "LONO" GRANT PROGRAM

- $25M Available Nationwide for "Low or No-Emission" Technology
- $2.585M Awarded to SEPTA for Incremental Cost of 25 Battery-Electric Buses
- SEPTA One of Seven Selected Grant Recipients
- First Large Urban Agency in Northeast U.S. to Pilot Battery-Electric Technology


metro
PHILADELPHIA NO. 1 FREE DAILY IN THE US
FLYERS' SEASON NOT OVER YET
Though you'd think it was after watching them in Game 3. 19
Getting groovy with White Denim. 16
A better way to cook with cannabis for 4/20. 14
Hide your braces not your smile.
SEPTA TO GET A JOLT
Philly will soon be the first big city on the East Coast to start rolling out electric buses thanks to a $2.5 million grant. 2
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HELPING INJURED PEOPLE
YOUR PERSONAL INJURY ATTORNEY FOR THE PEOPLE
Member of the Philadelphia Trial Lawyers
215-665-8990
Car/bus/train accidents • Slip & falls • Medical mistakes • Birth injuries

BUS TECHNOLOGY SELECTED

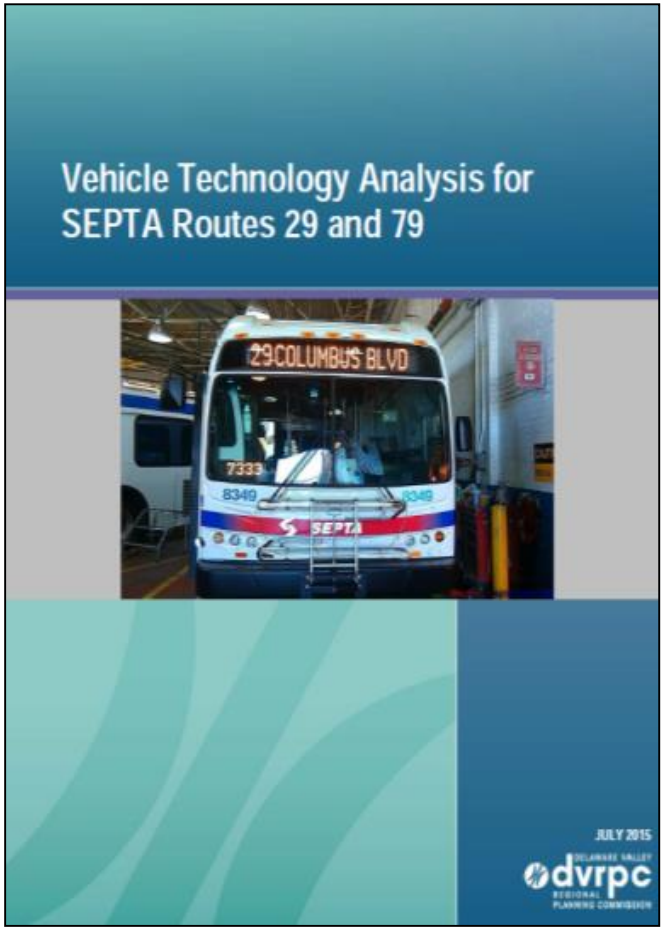
PROTERRA CATALYST:

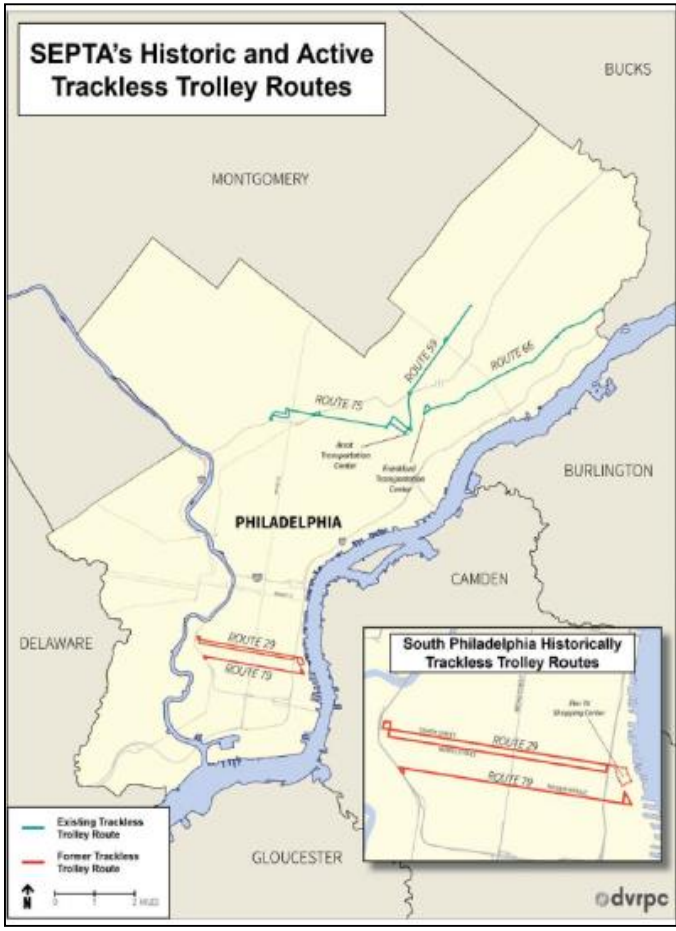
- Selected Based on Performance & Pricing
- Fast Charge ~10 Minutes
- Drive Range ~50 Miles
- Charging Infrastructure
  - On Route
  - Southern Garage

ROUTES 29 & 79 SELECTED

ADVANTAGES:

- Short Routes (3.5 Miles End-to-End)
- Flat Topography
- Close to Home (Southern Depot)
- Historic Trackless Trolley Routes





FINANCIAL BENEFITS

LIFECYCLE COSTS WITH FTA LONO GRANT

	Trackless Trolley Restoration	Diesel-Electric Hybrid Bus	Battery-Electric Bus
Capital (per mile)			
Infrastructure Costs	$ 2.40	$ 0.02	$ 0.61
Vehicle Acquisition Costs	$ 3.82	$ 2.21	**$ 2.21**
Federal Apportionments	($ 2.49)	($ 0.50)	($ 0.50)
Subtotal (Capital)	*$ 3.73*	*$ 1.73*	***$ 2.32***
Operations & Maintenance (per mile)			
Infrastructure Maintenance Costs	$ 0.85	Not applicable	Unknown
Fuel/Power Costs	$ 0.63	$ 0.74	$ 0.27
Vehicle Maintenance Costs	$ 1.54	$ 2.20	$ 1.54
Subtotal (Operations & Maintenance)	*$ 3.02*	*$ 2.94*	*$ 1.81*
Total Lifecycle Costs (per mile)	***$6.75***	***$4.67***	***$4.13***

IMPACT OF GRANT SELECTION

SOURCE: DELAWARE VALLEY REGIONAL PLANNING COMMISSION

SIMULATION RESULTS

SUMMER 2014 SIMULATION

SEPTA ROUTE 29

	PROTERRA 40-FOOT FAST CHARGE BATTERY-ELECTRIC FLEET	SEPTA 40-FOOT DIESEL FLEET	SEPTA 40-FOOT HYBRID FLEET
AVERAGE EFFICIENCY	2.69 kWh/mi→**14.0 MPGe**	**3.09 MPG***	**3.95 MPG***
ESTIMATED "HOT DAY" (98°F) EFFICIENCY	4.77 kWh/mi→**7.9 MPGe**	**2.93 MPG****	**3.69 MPG****
FINAL BATTERY STATE OF CHARGE AFTER ONE LAP	**76%**		
ONE LAP CHARGE TIME	**~ 3.75 minutes**		

*FISCAL YEAR 2016 YEAR-TO-DATE FOR AVERAGE EFFICIENCY

**JULY 2015 FOR "HOT DAY" FUEL EFFICIENCY

TENTATIVE PROJECT SCHEDULE

- SEPTA will be installing in early 2017 the charging infrastructure at various locations including on the 29/79 bus routes and in its Southern depot facility

- SEPTA Pilot Bus is tentatively scheduled to begin production in Spring of 2017 for evaluation in the Summer

- Production of 24 electric vehicles for SEPTA is tentatively set to begin in late 2017, with deliveries finishing in early 2018.

DEMONSTRATION BUS - DEMOCRATIC NATIONAL CONVENTION

- A Proterra Catalyst Demonstration Bus will be arriving on July 18th for a 2 week period.
- The bus will be used for special service during the Democratic National Convention.
- The bus will also be a part of several static displays and events.
- SEPTA's engineering, transportation, and maintenance groups will also have a opportunity to inspect the bus.

QUESTIONS?

EV Charging - What Charges You?

Mike Waters, Director – Utility Solutions

EP-ACT TOSITA Event

July 13th, 2016

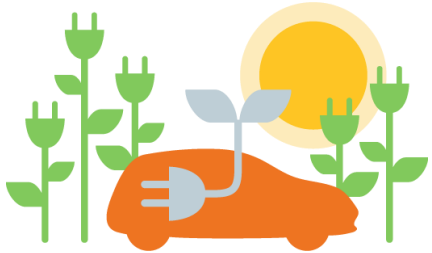
The World's Largest and Most Open EV Charging Network

Largest Community of EV drivers

+ 70% of new EV drivers join every month
+ A driver plugs into our network every 4 seconds

Charging Everywhere

+ 29,000+ charging spots
+ 600+ ports added every month



We're Established and Growing

+ $165 million in funding
+ Market share leader

We Are the Industry Leader

According to Time, Bloomberg, CNBC, Navigant Research and many others

Electric Vehicles Are Here

More Models Are Coming

AUDI: A3 e-tron

November 2015

HYUNDAI: Sonata

Est. 2016

MITSUBISHI: Outlander

Est. 2016

CHEVROLET: Bolt

Est. 2016

AUDI: Q7 e-tron

Est. 2016

VW: CrossBlue

Est. 2017

TESLA: Model 3

Est. 2017

AUDI: e-tron quattro

Est. 2018

PORSCHE: Mission E

Est. 2018

HYUNDAI: *New sedan*

Est. 2016

HONDA: *New*

Est. 2018

FORD: *New*

Est. 2018

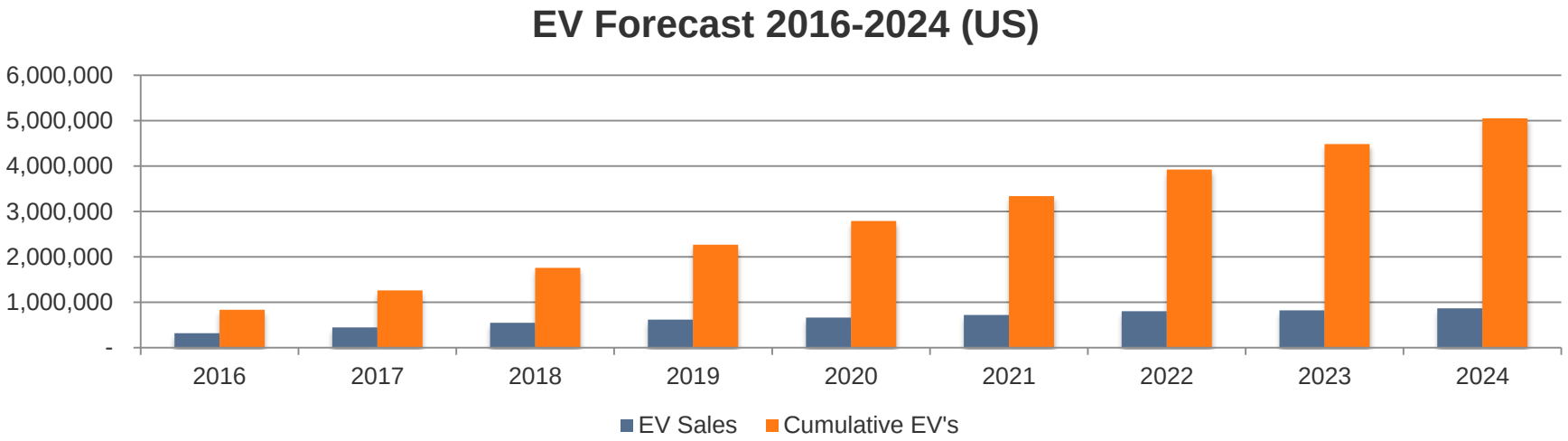
HONDA: *New*

Est. 2018

- Volkswagen Group, Volvo: all models will have a plug-in option
- BMW: all models will have a plug by 2025
- Hyundai: 12 PHEV models by 2020

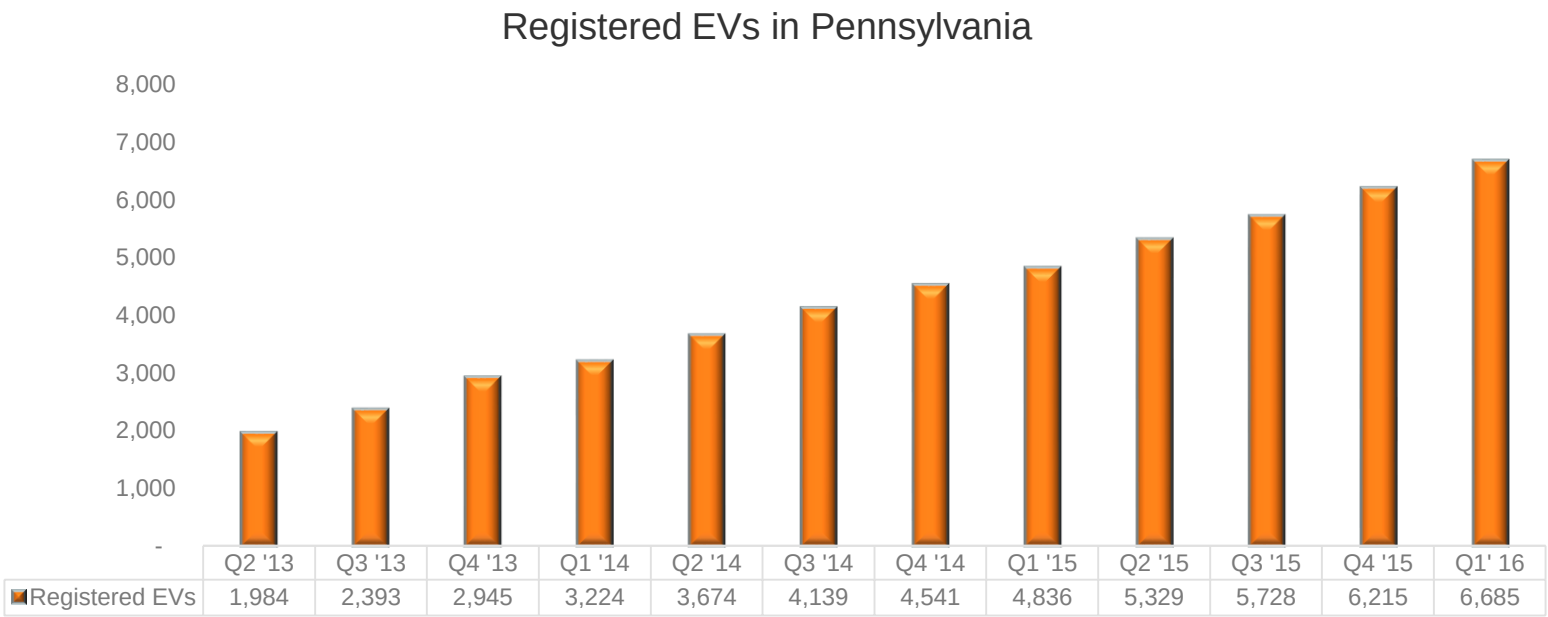
EV Forecast

- Over 425,000 EVs on the road today
- 5 million EVs on the road by 2024
- Every hybrid will soon come with a plug



Source: Navigant Research

EV Adoption in PA is Growing at a Steady Pace



Source: Polk

EV Charging Levels

Type	Power Supply		Charger Power	Charging Level	Charger Location	Miles Per Hr Charge	Charge Time (35 miles)
Trickle	120VAC Single Phase	12A	1.4kW	AC Level 1	On-board	3-5	<10hr
Normal	240VAC Single Phase	16A	3.8kW	AC Level 2		12	~3hr
		30A	7.2kW			24	<2hr
DC Fast	[illegible] 3-		[illegible]0kW	DC Level [illegible]		10[illegible]	<15min

Home

Fleet/MUD

Workplace/Public

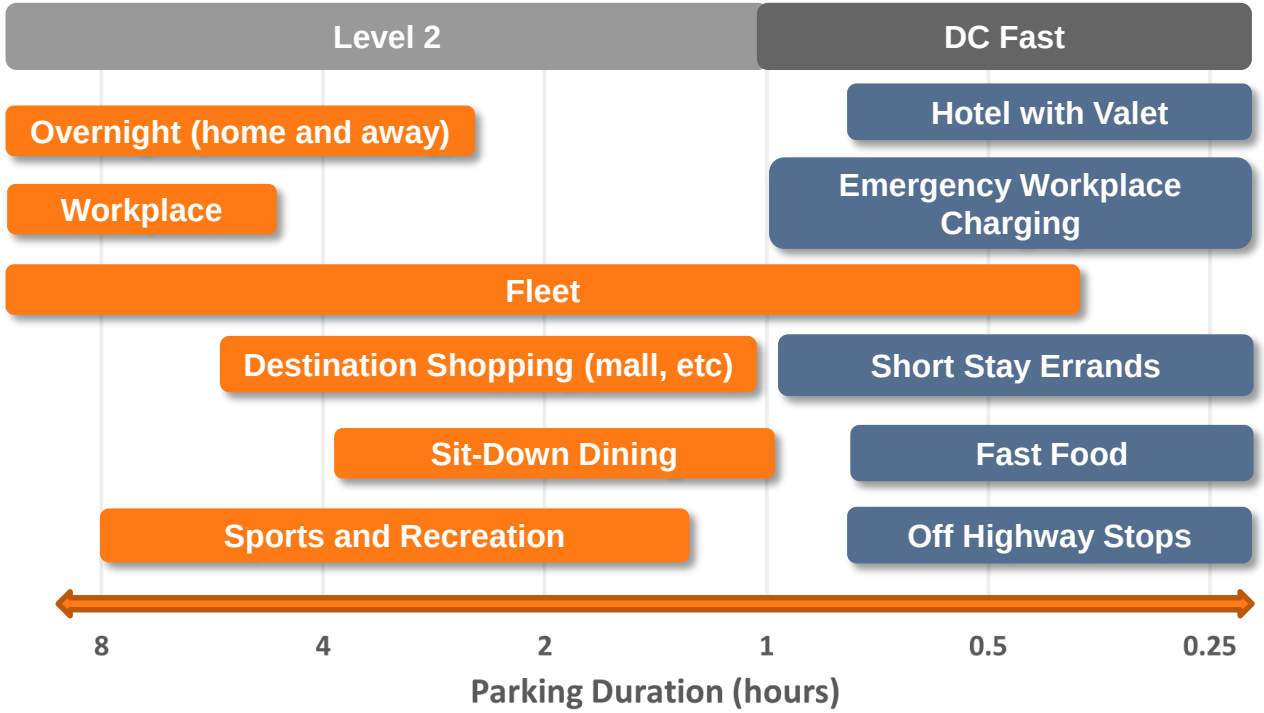
DC Level 2

EV Charging Locations

Majority of EV charging will occur at the home…

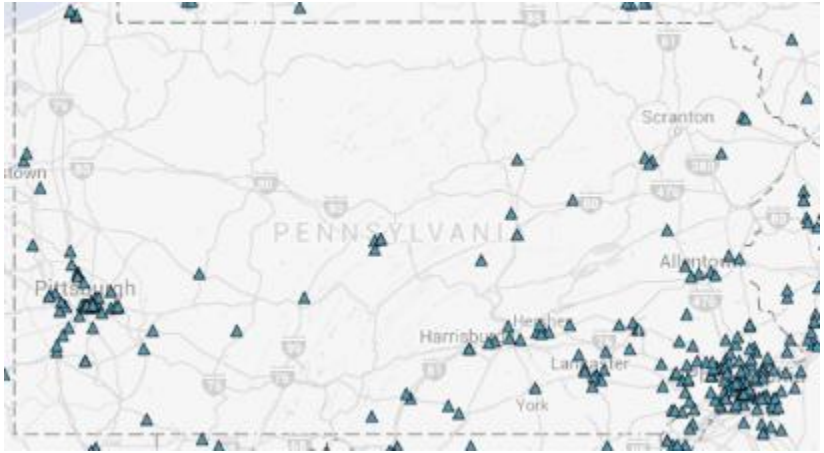
…but access to convenient charging at home, work, around town and out of town is still a critical need.

Ideal Charging Level Varies Based on Use Case



EV Stations in Pennsylvania

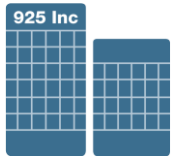
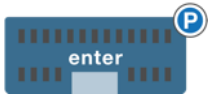
- 415 public AC L2 ports across 241 locations
- Additional 62 private AC L2 ports
- 97 DCFC ports across 51 locations



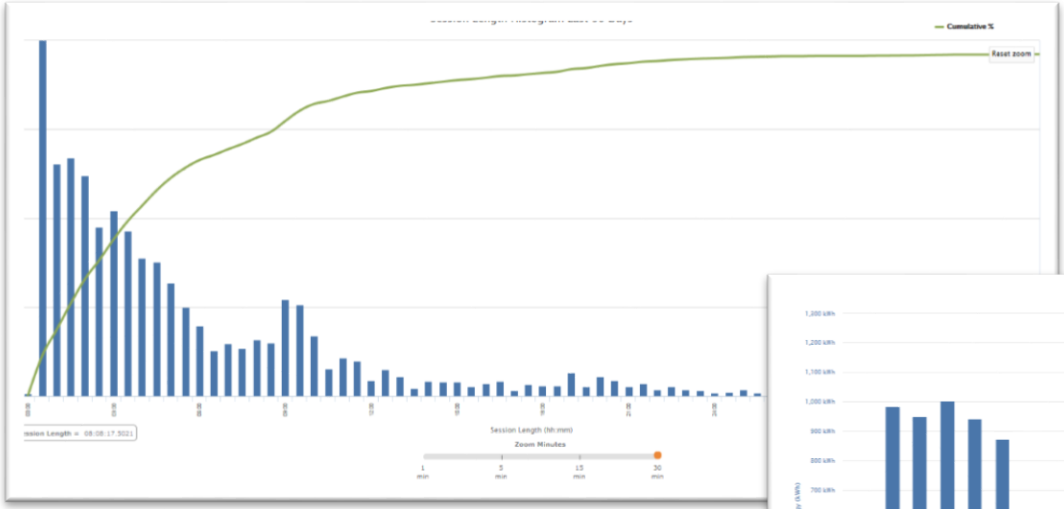
Source: DOE Alternative Fuels Data Center

The Value of Smart Charging

- Real-time availability
- Access control by time, vehicle, individuals or groups
- Set varied pricing by time, energy or driver
- Remote station services support, 24/7 remote support for drivers
- Manage ROI, energy usage, generate reports and track environmental figures

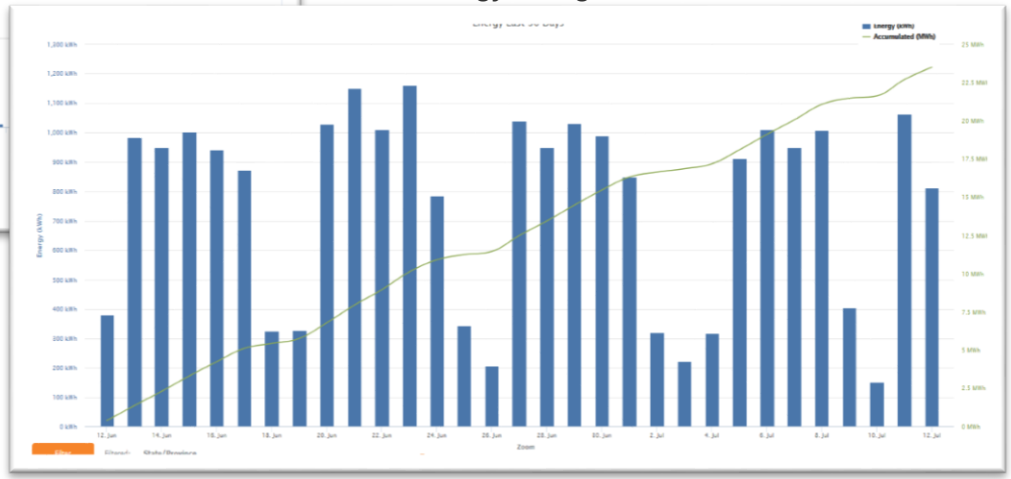
Workplaces	Retail & Hospitality	Commercial Property	Multi-family Homes	Parking	Fleet
					
Attract & Retain Talent	**Increase Sales**	**Attract New Tenants**	**Attract & Retain**	**Attract New Customers**	**Lower Cost of Transportation**

Example Reports from Connected Chargers

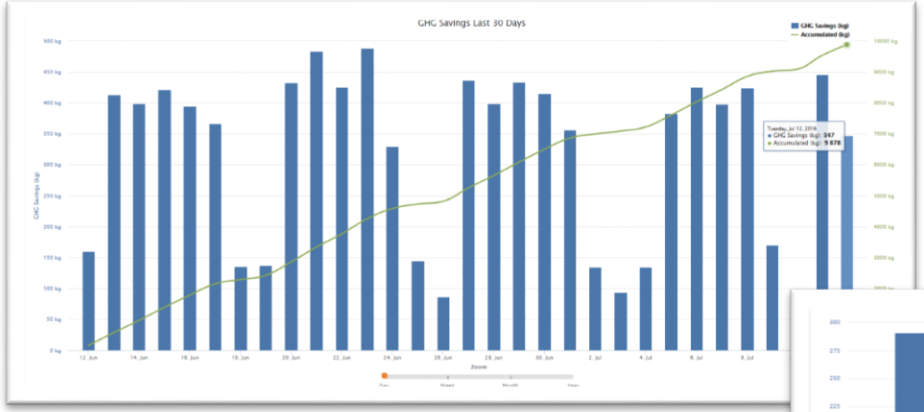


Charging Session Length

Energy Usage

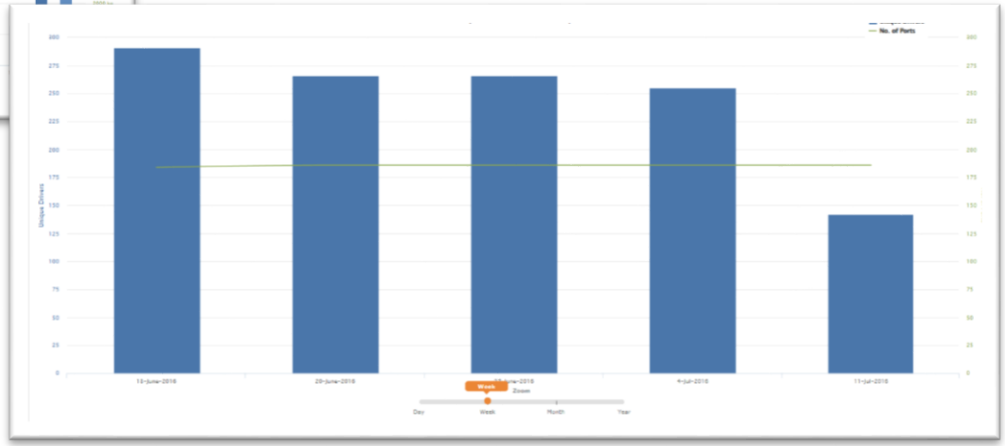


Example Reports from Connected Chargers (cont.)



GHG Savings

Unique Drivers



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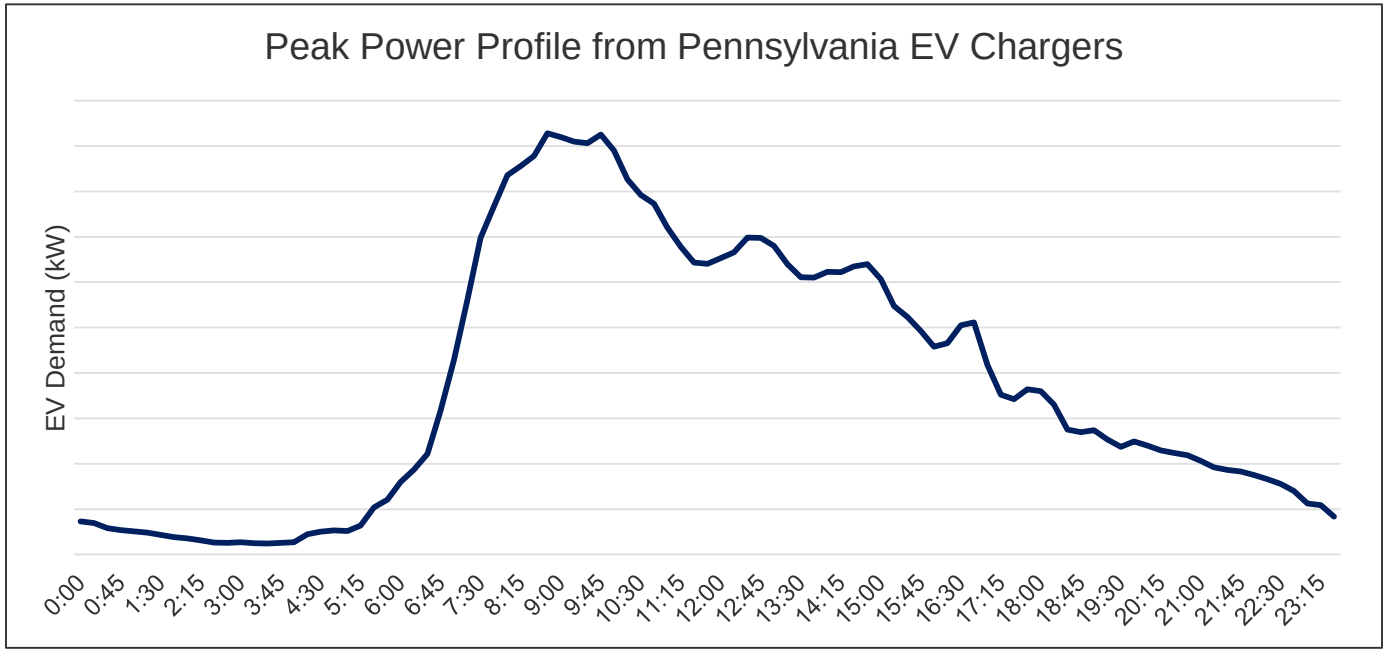


Summary

- EVs are here today with almost 7,000 on the roads in Pennsylvania and many new models on the horizon
- EVs deliver a better driving experience, are cleaner and cheaper to operate, and increase domestic energy security
- While a majority of charging will occur at home, drivers need access to workplace and community charging to ensure satisfaction
- There are three main levels of charging, and the ideal application is based on the driver use case among other factors
- Intelligent, connected, and coordinated charging allows for greater value for the EV driver, the site host, and the utility


chargepoint®
Driving a Better Way

Appendix

Commercial Level 2 Charging Stations

Charging for businesses and municipalities that want to offer charging to employees, customers and visitors

- **Speed**: 25 RPH (estimated maximum miles of Range Per Hour of charging).
- **Clean Cord Technology**: Self-retracting, maintenance free and ultra-lightweight cord management system.
- **Power Management Options**: Cut installation costs and double the number of parking spots served.
- **Branding and Customization**: Promote your brand with an LCD screen and customizable signage.

Express DC Fast Chargers

Fast charging for all DC enabled vehicles

- **Speed**: 50 kW station provides 200 RPH (estimated miles of Range Per Hour).
  24 kW station provides 100 RPH (estimated miles of Range Per Hour).
- **Connectors**: CHAdeMO and/or SAE Combo connectors to serve all EVs with fast charging capabilities.
- **Form Factor**: Slim design allows for flexible installation locations, lower shipping and lower install costs.
- **Reliable**: Designed to increase reliability and performance.

ChargePoint Home

The world's smartest, smallest and most advanced residential charging station

- **Fast and Easy**: 6X faster than plugging into the wall, standard connector and simple installation
- **Integrated**: Works with Nest to track usage and save on energy costs
- **Connected**: WiFi enabled. Mobile app allows for remote start, scheduling and reminders.
- **Safe and Reliable**: From the world leader in commercial EV charging and backed by a 3 year warranty
- **Designed**: Ultra-thin and smaller footprint than a piece of paper

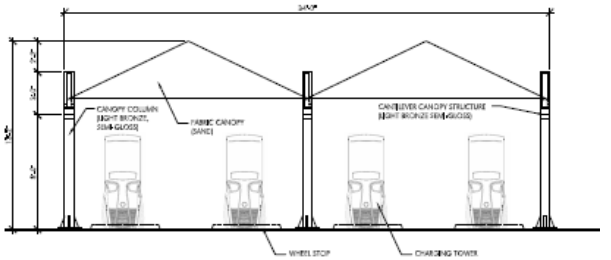
CPF25 Family

Charging for designed for select fleet depot and multi-family applications

- **Energy Management:** Lower both installation and electricity costs with advanced energy management tools such as panel sharing and scheduled charging.
- **Access Control:** Control who can use your charging stations. Assign RFID cards to vehicles or drivers and allow only those approved vehicles or drivers to charge at your stations.
- **Speed:** Our Level 2 CPF25 stations charge at a maximum rate of 25 RPH (miles of Range Per Hour), supplying up to 7.7 kilowatts (kW).

Site Selection Considerations

- Understand use case (public commuter, corridor, TNC hub, multi-modal)
- Corridor spacing (distance to next sites)
- Proximity to highway, intersections and interchanges
- Safety – (well lit, 24/7 access, safe neighborhood)
- Existing electrical capacity at site – reduces make-ready costs
- Amenities at sites and within safe walking distance (restroom, dining, stores, WiFi)
- Regional context with other public stations (other DC and level 2)
- Profile of site host – attract new customers, sustainability, etc.
- Viability of host location for long term – 10+ year view



Auto Port INC.

VEHICLE TO GRID (V2G)

GRID ON WHEELS PROJECT

AutoPort Converted and V2G Compatible Vehicles

Overall eV2g Architecture

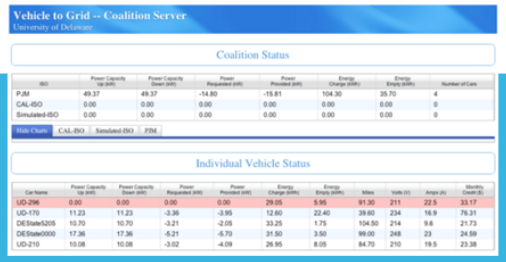
1 – Vehicles equipped with bi-directional flow, communications, and high power A/C charging

5 – Vehicles provide energy or ancillary services to grid

2 – Grid operator sends energy or ancillary services requirement to aggregator

3 – Aggregator presents many vehicles as one power plant to grid operator

4 – Aggregator communicates with vehicles to determine capacity available to grid



The architecture leverages the A/C propulsion on-board inverter, but could also work with off board inverter

PJM:

- 164,000 MW peak
- 60 mil population
- 214,000 sq mi

Grid on Wheels is participating in PJM's hour-ahead reg-up and reg-down markets.

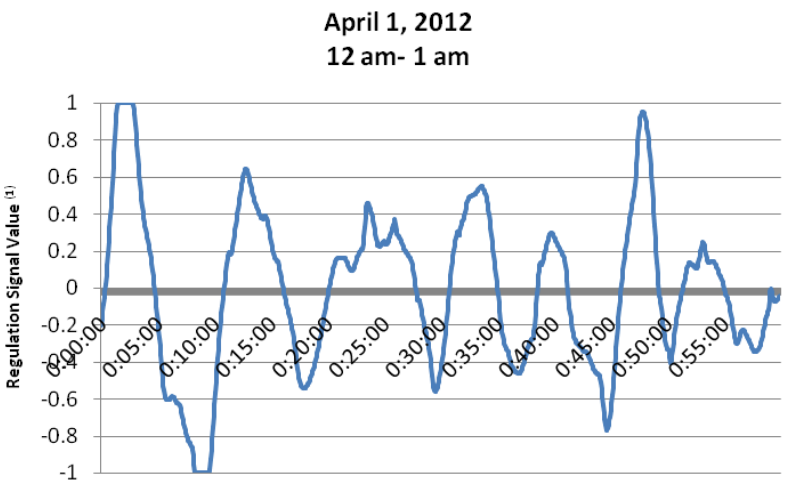
PJM Demonstration Project

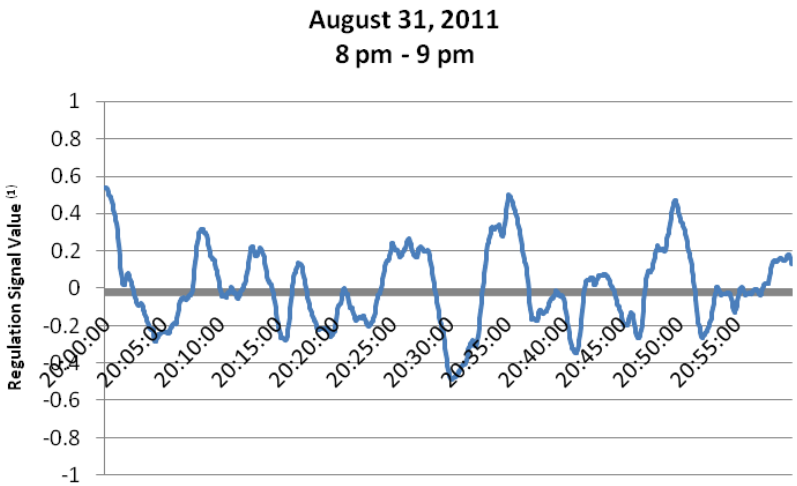
University of Delaware

- 15 Mini Coopers Electrics operating from University of Delaware Science and Technology Campus
- Are stationary vehicles, and provide 24/7 ancillary services to PJM. The average vehicle earns $150 per month performing these services.
- BMW has provided the project with additional drivable vehicles to be located at local companies or non-profits in the Delaware, Philadelphia. Southern NJ area

Regulation Signal Dynamics

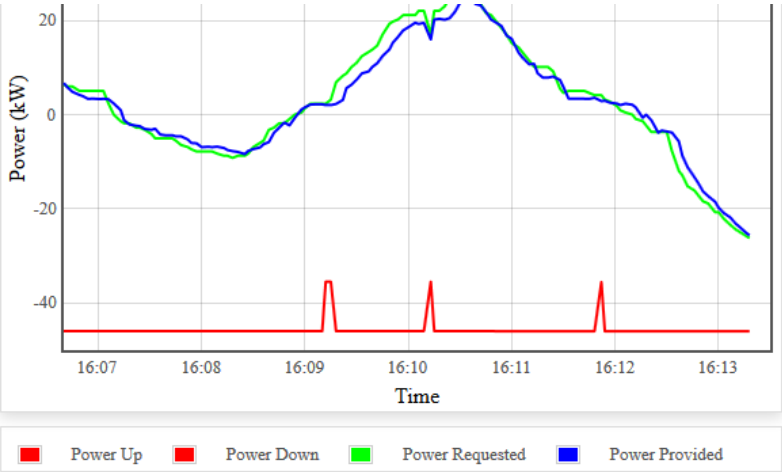
PJM Dynamic Regulation Signal – Typical Hours

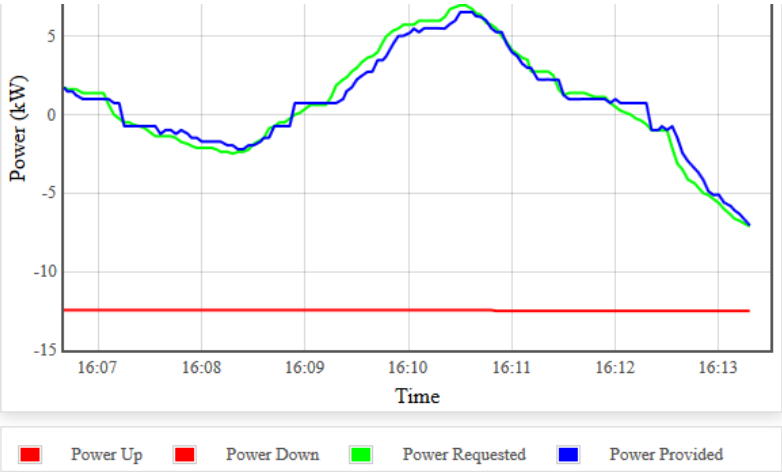




- Grid resources follow signal – either by adding power to grid or using power, depending on signal
- Because regulation signal crosses 0 many times during an hour, the market is ideally suited for keeping battery state of charge within a narrow band
- University of Delaware architecture includes integration with vehicle battery management system, so state of charge can be managed
- PJM grid first to adopt this dynamic signal – other grids will follow based on FERC ruling

1) Signal amplitude is normalized between -1 and 1 and reflects the need to maintain the grid at a frequency of 60 Hz

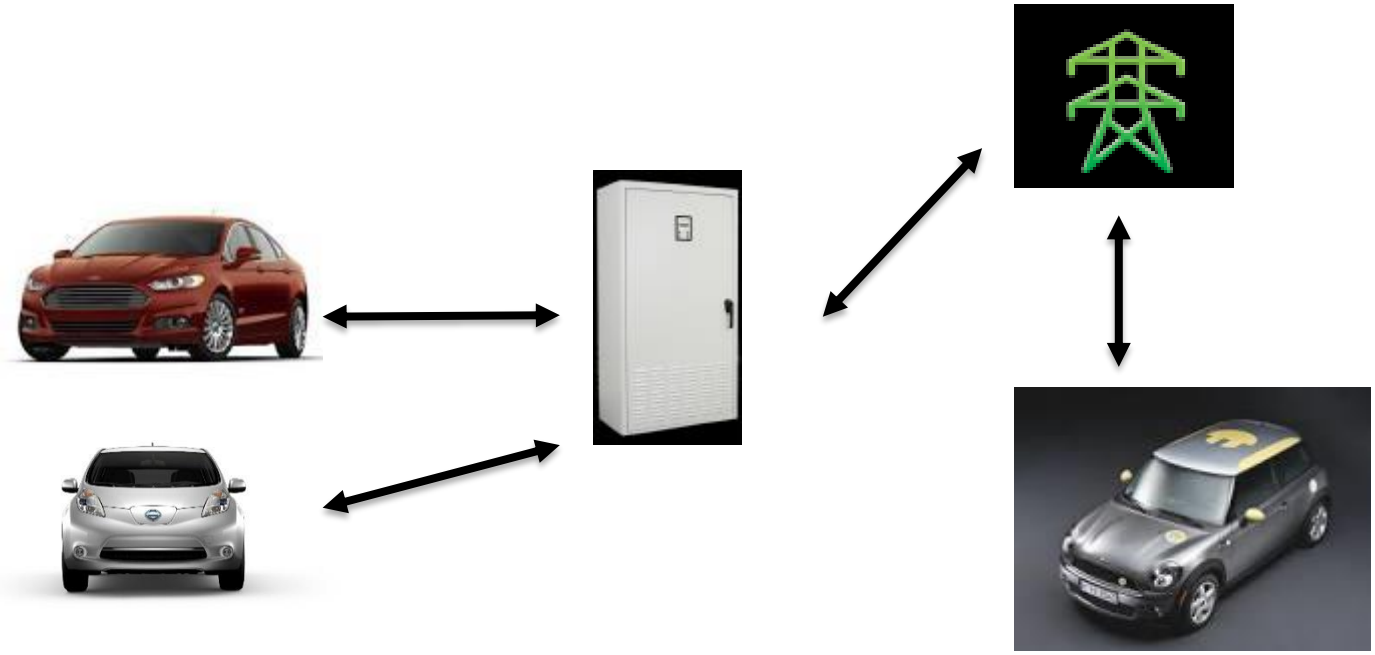




Individual Vehicle Status

Car Name	EVSE Name	ISO Name	Power Capacity Up (kW)	Power Capacity Down (kW)	Power Requested (kW)	Power Provided (kW)	Energy Charge (kWh)	Energy Empty (kWh)	Miles	Preferred Operating Point (kW)	Power Flow (kW)	Volts (V)	Amps (A)	Status
ACP MiniE	ACP1	Not in ISO Market	N/A	N/A	N/A	N/A	29.05	5.95	83.00	N/A	-7.42	206	-36	NC:
EV-Grid MiniE		Charge Only	N/A	N/A	N/A	N/A	24.50	10.50	70.00	N/A	0.0	241	0	NC:
eVan-2	UD-Robinson-2	Not in ISO Market	N/A	N/A	N/A	N/A	28.70	6.30	82.00	N/A	-0.17	208	-0.8	NC:
MiniE-013	UD-STAR-15	PJM	N/A	N/A	N/A	N/A	28.35	6.65	81.00	N/A	-2.18	242	-9	NC:
MiniE-023	UD-Robinson-2	PJM	10.45	-10.45	-5.96	-5.80	25.55	9.45	73.00	0.00	-5.80	207	-28	GI:V2G
MiniE-073	UD-STAR-11	PJM	N/A	N/A	N/A	N/A	23.80	11.20	68.00	N/A	-0.98	244	-4	NC:
MiniE-082	UD-STAR-06	PJM	N/A	N/A	N/A	N/A	23.45	11.55	67.00	N/A	0.49	243	2	NC:
MiniE-089	UD-STAR-02	PJM	N/A	N/A	N/A	N/A	23.80	11.20	68.00	N/A	2.21	246	9	NC:
MiniE-090	UD-Robinson-1	Not in ISO Market	N/A	N/A	N/A	N/A	35.00	0.00	100.00	N/A	0.0	210	0	NC:

ON BOARD VERSUS OFF BOARD



THE FUTURE OF V2G

- OEM's are just trying to figure out the markets for Electric Vehicles
- There is interest in many OEM's in V2G and V2B
- Sales of Electric Vehicles are less than 1% until there is more market acceptance they are less likely to add this capability
  - Battery technology is improving and the cost per kWh is getting less
  - Fast charging is a requirement for acceptance
- The Grid currently was not designed for storage
- V2G is closer to reality because of the pilot programs being conducted
  - LA Airforce Base
  - DOD locations

Eastern Pennsylvania Alliance for Clean Transportation

6th Annual TOSITA

Medium- and Heavy-Duty EV Truck & Bus Market Overview

Why Electric ?

- The perfect choice for urban logistics applications and duty cycles:
  - **Return on Investment:** Total Cost of Ownership (TCO) reduction
    - Additional benefits to your bottom line!
  - **Driver Satisfaction & Retention**: No noise, no fumes, no vibrations, instant torque, company & personal pride
  - **Brand Enhancement/Recognition & Mandates** (internal & external pressures)
  - **Operational Efficiencies & Benefits**
  - **Shareholder Value**
  - **Environmental Impact !!!**

Advantages & Applications for Electric Commercial Vehicles

- Where does electric work today? Ideal for:
  - Depot-based urban logistics (delivery, service, parcel, transit, campus / base operations, island locations, etc.)
  - Route mileages of 100 miles or less between charges (battery limitations) and that use lots of fuel (excessive idle and/or poor fuel mileage per gallon)
  - Static routes with multiple stops & starts
  - Facilities with robust electrical service infrastructure

Medium- & Heavy-Duty Urban Trucks/Buses are Ideal for Electrification

Poor Fuel Economy	Short Payback Periods
Fixed Routes Less Than 100 Miles	No "Range Anxiety" / Purpose-built
Operate From Central Depots	No Need to Build Distributed Charging Infrastructure
Low Speeds, Few Highway Miles	Long Battery Life
Lots of Stops and Starts	Ideal for Regenerative Braking
High Levels of Noise, Vibration and Air Pollution	Zero Emissions, No Vibration and Silent Operation

Commercial EVs do not face the same issues as passenger Evs – Specifically Designed

Areas Economic Impact

- Cost Reduction
  - Total Cost of Ownership / ROI
  - Operational Savings / Benefits
- Revenue Enhancement / New Business Growth
  - Competitive advantages
- Customer & Driver Retention
  - Competitive necessity
- Corporate and/or Government Mandates
  - Emissions / Idle Laws, Restrictions, Fines

Economics & Business Case

Avg. Annual Fuel savings = $7,500 - $12,000

- No fossil fuels used
- No tailpipe emissions

Avg. Annual Maintenance Savings = $3000 +

- No oil changes, transmission fluid flushes
- No diesel particulate filters
- Extended brake life
- Virtually no moving parts

Electric: Clear Environmental Impact

Well-to-wheel, including electric power generation:

A mid-duty 100% electric truck eliminates over 15 TONS of greenhouse gases per year vs. its diesel counterpart.

That's the annual CO_2 absorption value of 28,000 red maple trees.

Driver Feedback

"Exceeded expectations. Drives very well. Does the job."

"Like the way the vehicle handles, and **love** the instant torque!"

"Multiple different drivers drove the vehicles and liked the way they drove and how customers perceived the trucks and our company!"

"Very pleased with how the unit operated."

"There is no noise, no vibrations, no smell of exhaust…. ……I feel so much better at the end of the day!"

Charging Requirements

Charge Stations:

- 208 VAC: Clipper Creek CS-100-3

  ~ 8 hours charge time

V2G capability (coming soon)

Federal & State Grants, Incentives & Funding Opportunities…..

……Simple solution (who'ya gonna call) =

Tony Bandiero !!!

EP-ACT

Medium- & Heavy Duty EVs

- Truck & Bus Applications: OEMs, QVMs & Upfitters
  - Motiv (w/Roush and body-builder partners)
  - First Priority GreenFleet
  - Zenith
  - Phoenix
  - Lion
  - Trans Tech
  - Morgan Olson
  - BYD
  - Proterra
  - Workhorse
  - Etc…..


MOTIV
Freeing Fleets From Fossil Fuels!

Free trucks and buses from fossil fuel


E450

AmeriPride….30 vehicles and more coming

Google Shuttle Buses

About Motiv

- Based in Foster City, CA (Founded 2009)
- Manufacturing Facility in Hayward, CA
- Primary focus on powertrains for medium- & heavy-duty truck/buses
- 50 employees (and growing) – all with a passion for vehicle electrification!
- Electrify Any Truck / Bus!
  (Battery, Motor, & Chassis Agnostic)

Motiv….partnering with, First Priority GreenFleet

Motiv-powered Type-A School Bus

First Priority GreenFleet eLion - Type C School Bus

THANK YOU !!

Brett Gipe

Vice-President, Sales & Business Development

Motiv Power Systems

650-730-7604

bagipe@motivps.com

TOSITA JULY 2016
Fleet Initiatives

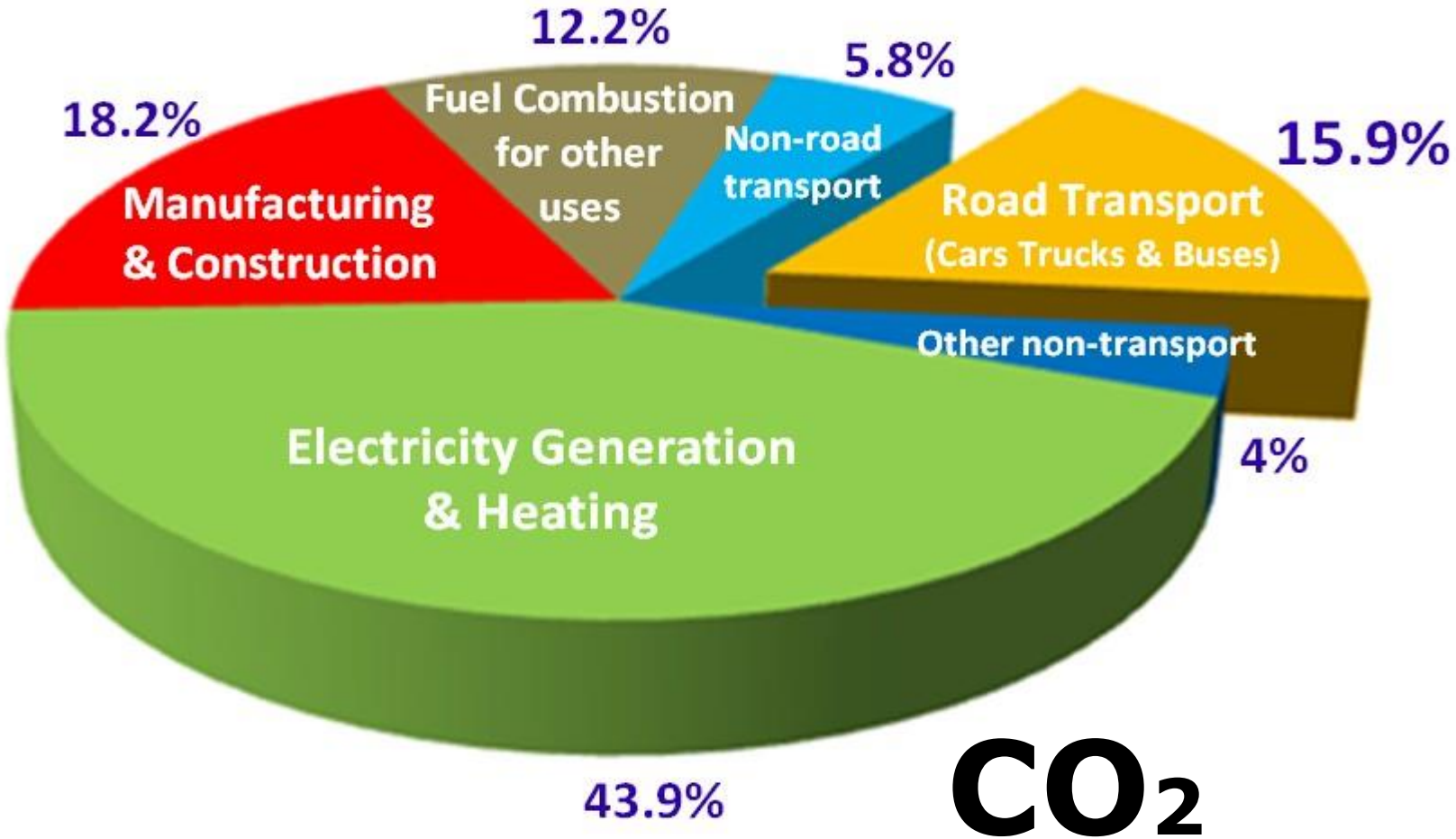
zero Emission

Sustainable EV LEAF Fleet Solutions

Demonstrate YOUR sustainability leadership through:

- Reduced greenhouse gas emissions – Zero emissions LEAF
- New model of cost effectiveness – EV fleet case studies
- LEED certification- through EV charging stations at your campus location
- LEAF Ride and Drive events on YOUR campus

Transport is the easiest Segment to Reduce Greenhouse Gas Emissions



CO_2 Emissions

zero Emission

EV Fleets: WHY they make sense

Reliable, with Zero Emissions and Lower Operating Costs

- Nissan LEAF is already the "Best-Selling Electric Vehicle in Automotive History"
- Global sales: 190,000+, with, over 80,000 are on U.S. roads today. **Built in the USA**
- Driven over 2 Billion, Zero Emissions miles, 90,000 Tons of CO_2 displaced
- Five years of proven performance and many worldwide automotive awards

zero Emission

Winner of 50+ Major Worldwide Automotive Awards

"2015 Top Car Green Vehicle"
Mexico's MAPFRE Award

NISSAN
Innovation that excites

2012 Car of the Year
Japan Automotive Hall of Fame

2015 BOLD Award
Point Energy Innovations

2014 Best Non-Luxury, Traditional Compact Car
IHS Automotive Loyalty Awards

2014 "Tried & Tested" Award
Good Housekeeping Magazine

VINCENTRIC BEST CPO VALUE IN AMERICA 2015

2012 International Green Award

10 Best Green Cars
2013-2015
Kelly Blue Book.com

2015 Best Small Family Car
Next Green Car Awards

WORLD CAR OF THE YEAR AWARDS
Prix mondial de la Voiture de l'année

2015 Lifestyle Award
Cars.com

BEST CARS
U.S.News & WORLD REPORT
FOR THE MONEY 2014

2012 Best Car To Buy
High Gear Media

2013 Top Safety Pick
Insurance Institute for Highway Safety

- 2011 World Car of the Year
- 2011 European Car of the Year
- 2011 10 Most Transformative Products

Popular Mechanics Magazine

Built in America, Smyrna, Tennessee

Best Certified Pre-Owned Value 2014 & 2015
VinCentric

Zero Emission

2015 **Autobytel** Car of the Year Award

EV Fleets: WHEN they make sense

- Cargo room for local deliveries
- Inter-city/county travel
- Predictable routes with infrastructure availability
- **Usage examples**:

Campus deliveries, meter checking, security routes, parking enforcement, shared pool vehicles

zero Emission

New Model for Cost Effectiveness

Case Studies: EV Fleets in Practice

1

Plug In British Columbia: Modelling vehicles for 9 fleet operators

- BEVs suited 94% of fleet routes
- $15,968 lower TCO per vehicle
- 95% reduction in life-cycle GHG emissions
- Estimated $1,964,148 in financial savings

2

City of Houston: Parking and Zoning Enforcement

- 27 LEAFs in fleet
- Estimated $110,000 savings in first year maintenance and fuel
- 47% utilization rate among 480 drivers

Source: FleetCarma, Electrification Coalition

Case Study: EV Fleets in Practice

3

City of Seattle : 43 Nissan LEAFs in Fleet

- 17 Reserved for individual users: housing inspectors, parking enforcement, deliveries, etc.
- 26 LEAFs in Employee Motor Pool
  - All with dedicated L2 charging
  - Accessible to all city employees
  - Easy to use online reservation and key kiosk system
  - High utilization by city employees
- Trial Nissan LEAF with DCFC in 2014
- Savings:
  - 375,000 gas free miles & counting
- Charging Costs:
  - To date paid total ~$9000 in power bills averaging $300/month for 26 LEAFs

Nissan LEAF VMTs & Fuel Saved in Gallons by Year

Year	LEAF VMTs	Fuel Saved*
2011	25,068	612.9
2012	149,109	3,645.7
2013	192,561	4,708.1
2014 (Feb)	7,621	186.3
Total	**374,359**	**9,153**

***Assuming 40.9 mpg of Hybrid Prius**

Source: City of Seattle

The Basics of EV Charging

Three Types of Chargers

AC - Level 1, Standard 120 Volt, (L1) Typically found in every home or office. Adds about 5 miles of range per hour of charging, 80% Charge at home. Charger Cord is Standard Equipment on LEAF.

AC Level 2, 240 Volt, (L2) Most homes have this service for Clothes Dryers. The commercial equivalent is 208 Volt. All modern EV's uses the same connector, both L2 and L1 equipment (SAE J-1772). Charging for approximately one hour adds 20 to 40 miles of range.

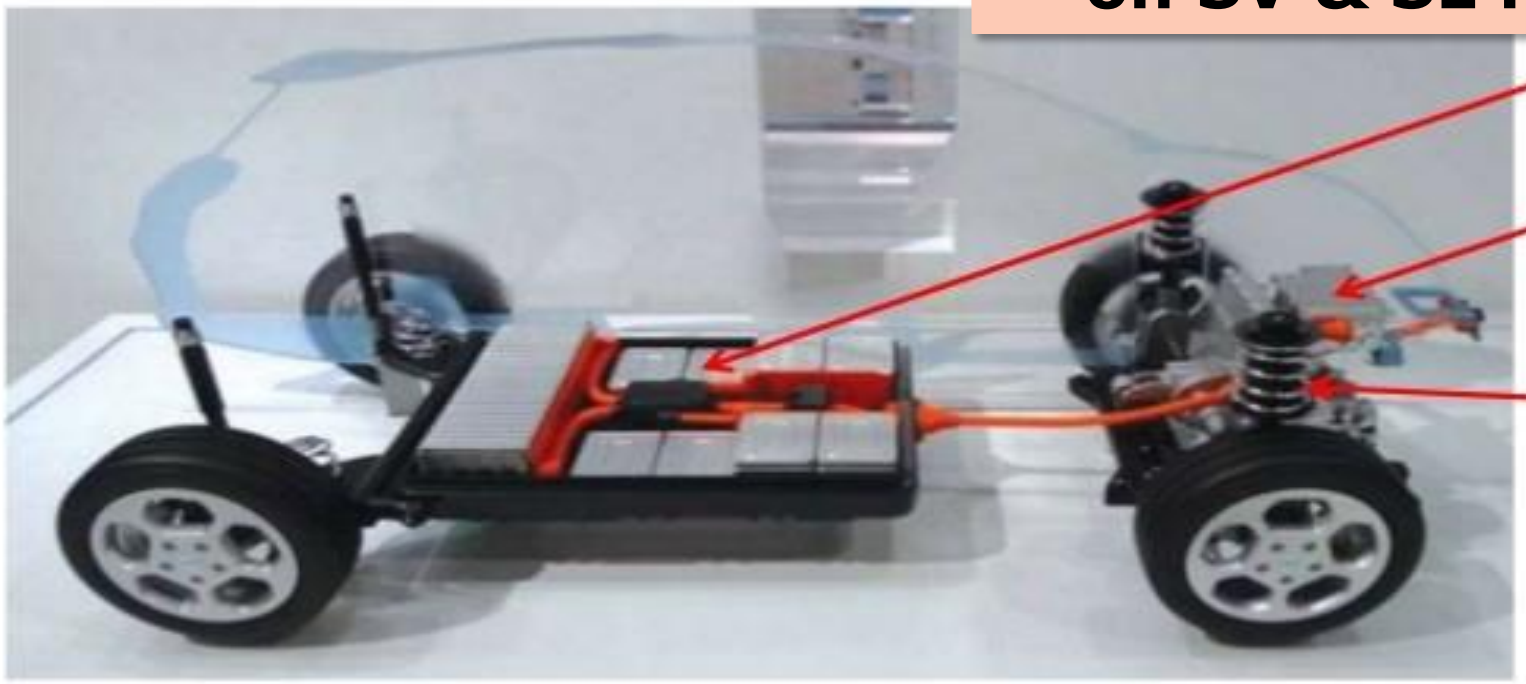
DC Fast Charging, Typically AC 480 V, Sometimes called DCFC, DC Level 2 or Level 3. This is the game changer, providing rapid charging that add 40 to 50 miles of range in just 10 minutes.

Zero Emission

LEAF's EPA Range increases 25%, to 107 Miles

Nissan Leaf Powertrain –
2016 Model

30 kWh Battery
on SV & SL Models



Sports Car like Performance & Handling

Instant Torque

Near 50%-50% Weight Balance

Best in Class Warranty Coverage

Zero to 40 mph in 4.7 sec
Compared to 5.3 sec for Toyota Corolla

Plenty of Storage Space
With room for 5 passengers

Nissan Fleet Retail Incentive makes an offer so Generous, Adopting the 100% Electric LEAF, is the Smartest Move Financially

NISSAN

Innovation that excites

Up to **$7500** **Fed Tax Credit**

$8000 **Fleet Rebate**

On 2016
Nissan LEAF

zero Emission

LEAF "SV" Trim Model

SV adds much more:

- 107 Mile Range2
- Quick Charge Port
- 6.6 kW Onboard Charger
- Heated Outside Mirrors
- Heated Steering Wheel
- 6 Speaker Audio System
- 17" Alloy Wheels

Potential Savings:

MSRP Starting at	***$34,200***
Fed Tax Credit (up to) -	$7,500
Nissan Incentive -	$8,000
Brand New LEAF	**= $18,700**

8 year, 100,000 mile warranty

TAKE AWAY – Support for YOUR Sustainability Plan

NISSAN
Innovation that excites

NISSAN PROGRAMS w/ zero emissions LEAF:

SIGNIFICANT Fleet Retail Incentives

EV **Lower Operating Costs-** TCO

LEAF **Ride and Drive** events on YOUR campus

Jean Gough
EV Fleet Business Development Manager,
Northeast Region
Jean.Gough@nissan-usa.com

GENERAL MOTORS FLEET

TIM THOMPSON

FLEET ACCOUNT EXECUTIVE

GM'S EV COMMITMENT IS LONG TERM (& LONG RANGE)

We believe **plug-in based** vehicles will **lead the industry** in **alternative propulsion** in the long run

Others recognize an EV trend and changing perceptions among consumers

AUTOMOTIVE TRENDS – AN EYE ON 2030

Study by McKinsey & Company – January 2016

FOUR DISRUPTIVE TECHNOLOGY-DRIVEN TRENDS

1. DIVERSE MOBILITY
2. AUTONOMOUS DRIVING
3. ELECTRIFICATION
4. CONNECTIVITY

ELECTRIFICATION 3
According to McKinsey

By 2030,

electrified vehicles could range from

10% - 50%

of new vehicle sales

U.S. market on high end of range

- Highest in developed countries
- Dense cities with strict emission regulations and consumer incentives

Source: McKinsey & Company

CHALLENGES TO GROWTH

Electric vehicles have made incredible progress over the last few years, but **viable** widespread EV adoption still faces challenges:

Demand for improved **EV range**

Lack of EV charging **infrastructure**

Reducing overall **costs** (to both build and buy EVs)

Continued **collaboration** between *business*, *civic* and *industry* leaders through partnerships like Clean Cities can overcome these challenges

ELECTRIFIED VEHICLES

Chevrolet Malibu Hybrid

Hybrid Electric Vehicles

Gas engine with lithium-ion battery pack providing electric power to the hybrid system and a two-motor drive unit to help power engine during acceleration

Chevrolet Volt

Extended-Range Electric Vehicles

Back-up gas engine kicks in seamless when EV battery is depleted

Chevrolet Bolt EV

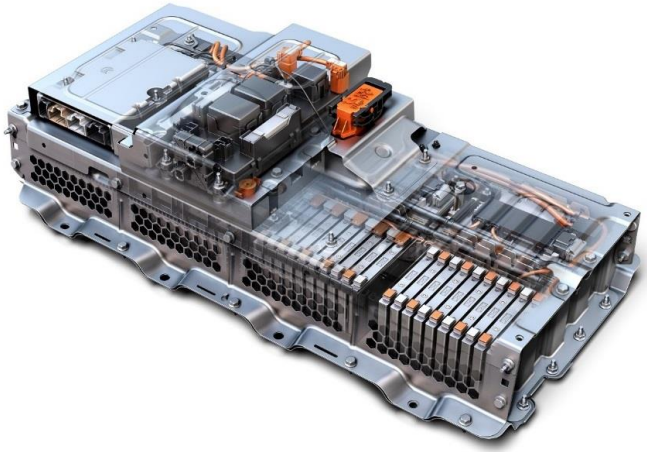
All-Electric Vehicles

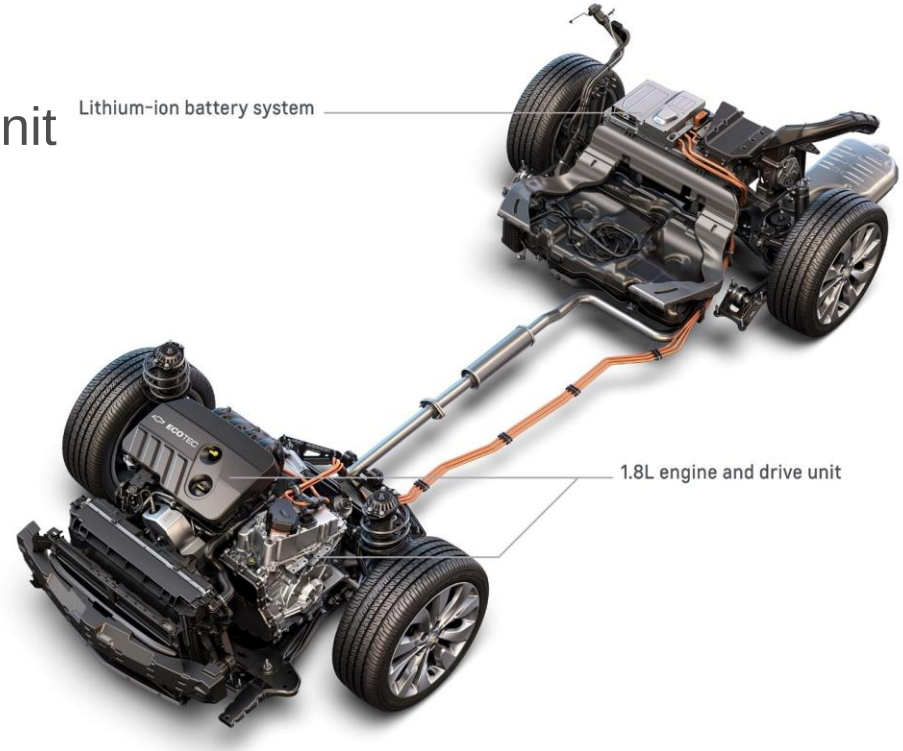
Long-range, affordable pure electric vehicles for the masses


ECOTEC
CHEVROLET
MALIBU HYBRID

MALIBU HYBRID TECHNOLOGY

- Leveraged knowledge from the Volt
- 1.8L gas engine with two-motor drive unit
- 1.5 kWh lithium-ion battery





EXCEPTIONAL EFFICIENCY

Malibu's 1.8L hybrid engine delivers an EPA-estimated

47 mpg city

46 mpg highway

Unsurpassed in its class

WWW.FUELECONOMY.GOV

Personalize

Edit Vehicles

	2016 Chevrolet Malibu Hybrid X	2016 Ford Fusion Hybrid FWD X	2016 Hyundai Sonata Hybrid SE X	2016 Toyota Camry Hybrid LE X
	Hybrid Vehicle Gasoline	Hybrid Vehicle Gasoline	Hybrid Vehicle Gasoline	Hybrid Vehicle Gasoline
				
	1.8 L, 4 cyl, Automatic (variable gear ratios)	2.0 L, 4 cyl, Automatic (variable gear ratios) MSRP: $25,675 - $31,430	2.0 L, 4 cyl, Auto(AM6) MSRP: $26,000 - $30,100	2.5 L, 4 cyl, Automatic (variable gear ratios) MSRP: $26,790
EPA Fuel Economy	**Regular Gasoline** **46** combined city/highway MPG 47 city 46 highway 2.2 gal/100mi Gasoline 598 miles Total Range	**Regular Gasoline** **42** combined city/highway MPG 44 city 41 highway 2.4 gal/100mi Gasoline 567 miles Total Range	**Regular Gasoline** **42** combined city/highway MPG 40 city 44 highway 2.4 gal/100mi Gasoline 668 miles Total Range	**Regular Gasoline** **41** combined city/highway MPG 43 city 39 highway 2.4 gal/100mi Gasoline 697 miles Total Range
You save or spend* Note: The average 2016 vehicle gets 25 MPG	**You SAVE** **$3,000** in fuel costs over 5 years compared to the average new vehicle	**You SAVE** **$2,500** in fuel costs over 5 years compared to the average new vehicle	**You SAVE** **$2,500** in fuel costs over 5 years compared to the average new vehicle	**You SAVE** **$2,500** in fuel costs over 5 years compared to the average new vehicle


CHEVROLET
VOLT

A CHARGE YOU CAN COUNT ON

53 miles of EV range

420 miles total range

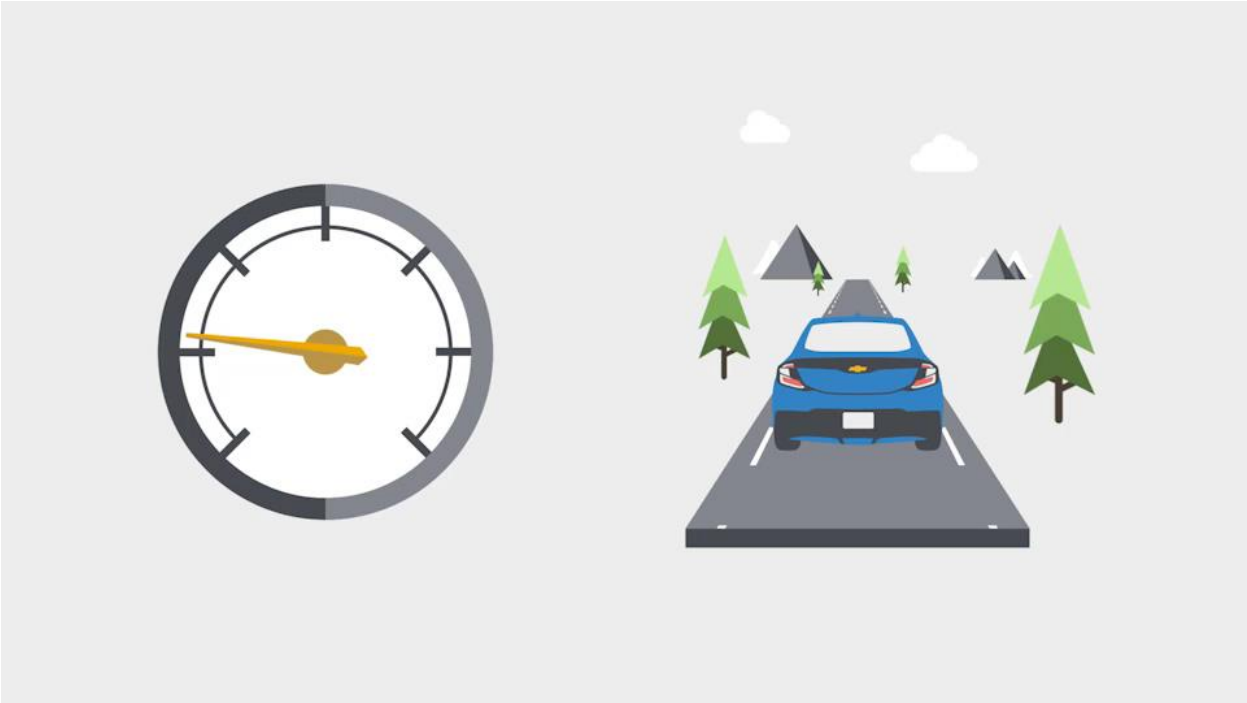
on a full charge and full tank of gas

Less trips to the gas station means more time meeting with customers

HOW IT WORKS

ELECTRIC MOTOR

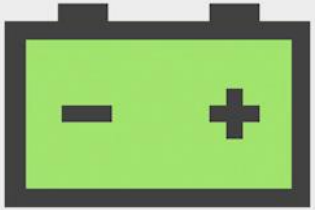
Volt is powered by two electric motors that work in unison to optimize efficiency and conserve electric charge while providing responsive power and torque



HOW IT WORKS

BATTERY

With a fully charged lithium-ion battery, Volt is capable of driving up to 53 miles without using gas. The second-generation Volt battery is both lighter and holds more energy than the first-generation one.



HOW IT WORKS

GAS-POWERED GENERATOR

Volt looks for ways to smartly use energy while you're on the road. Through regenerative braking and Regen on Demand, Volt captures its own momentum to recharge the battery as it slows down.

HOW IT WORKS

REGENERATION

Volt looks for ways to smartly use energy while you're on the road. Through regenerative braking and Regen on Demand, Volt captures its own momentum to recharge the battery as it slows down.


CHEVROLET
BOLT EV

REMARKABLE RANGE

GM-estimated

200+ miles

of range

GAS-FREE

EMISSIONS-FREE

RANGE-ANXIETY-FREE

FAST, CONVENIENT

CHARGING

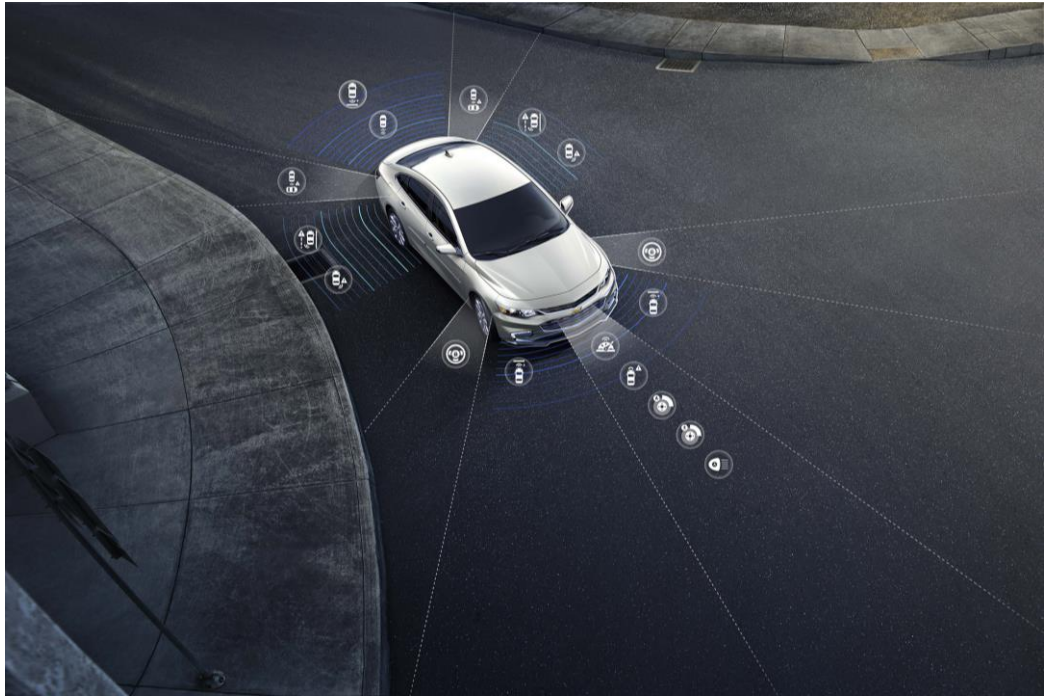
BOLT EV WITH DC FAST CHARGER:

- **90 MILES OF RANGE IN 30 MINUTES OF CHARGING**
- **160 MILES IN AN HOUR**

While these technologies are at the heart of GM's electrified lineup, they **DO NOT** come at the expense of features **our customers expect** from our vehicles

DRIVER SAFETY FEATURES

Advanced safety technologies help **prevent**, **protect** and **respond** in the event of a collision



ACTIVE SAFETY FEATURES

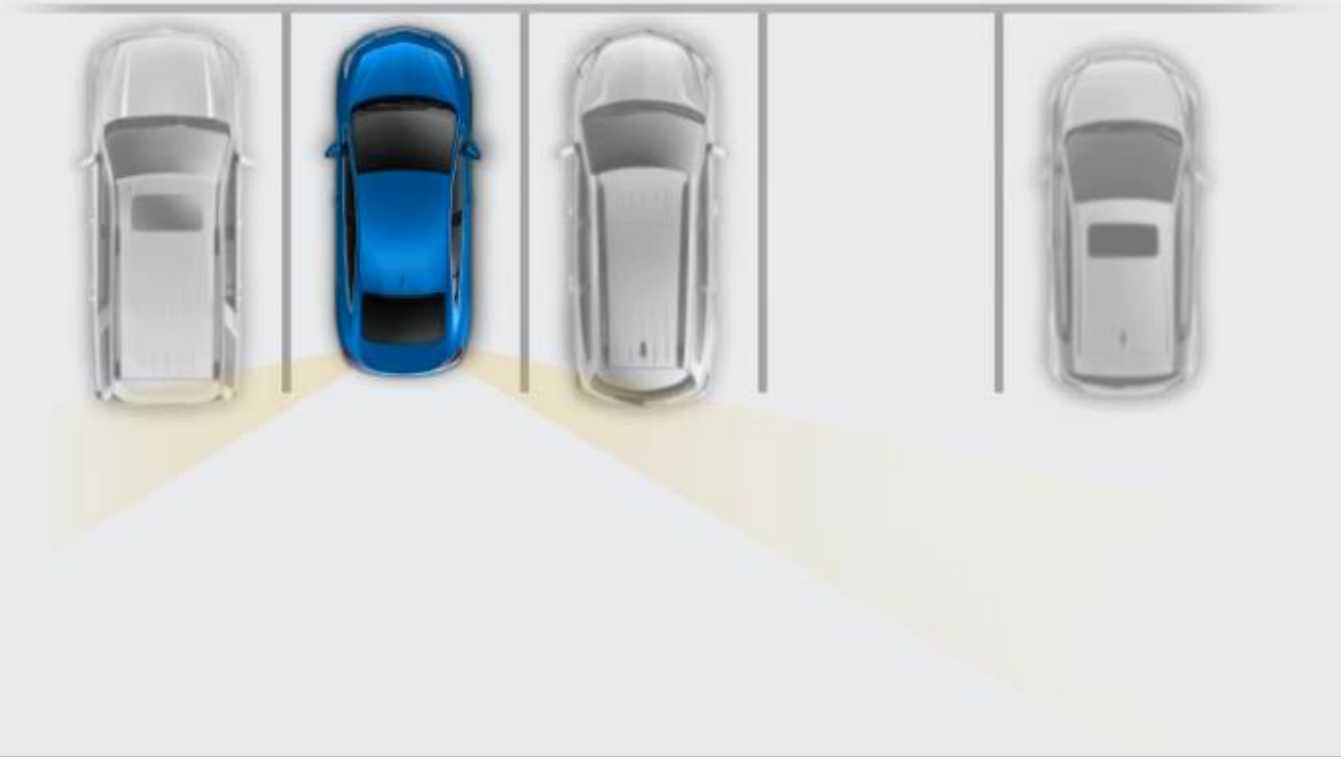
PREVENT

- Adaptive Cruise Control with Front Automatic Braking
- Front Pedestrian Braking
- Forward Collision Alert with Following Distance Indicator
- Projector-beam headlamps with integrated LED daytime running lamps
- Lane Keep Assist with Lane Departure Warning
- Lane Change Alert with Side Blind Zone Alert
- Rear Cross Traffic Alert
- Rear Vision Camera
- Front and Rear Park Assist
- Semi-Automatic Parking Assist

REAR CROSS TRAFFIC ALERT

PREVENT

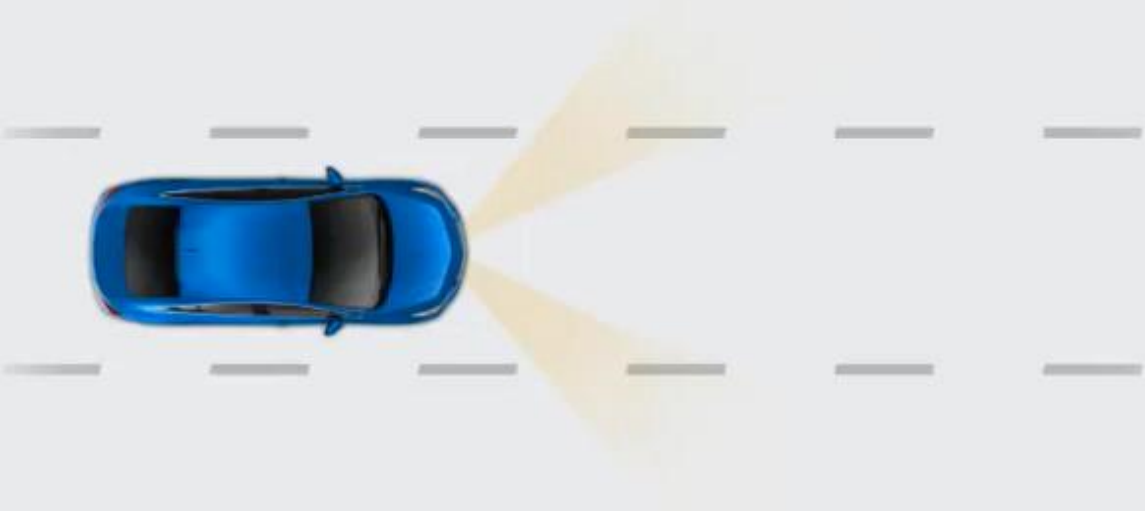
Available Rear Cross Traffic Alert uses radar sensors to monitor traffic behind and to the sides of you, and visually warns you of those vehicles using the standard rear vision camera.



LANE KEEP ASSIST

PREVENT

Available Lane Keep Assist uses sensors to warn you if you unintentionally drift from your lane and gently helps you steer the vehicle back into the lane if you don't take action.



FORWARD COLLISION ALERT

PREVENT

Available all-new Forward Collision Alert helps you to stay safe with two warnings, a Tailgating Alert to let you know if you're following another vehicle too closely, and a Crash Imminent Alert to signal when you're approaching a vehicle too quickly, so you can take action.

WORKFORCE PRODUCTIVITY FEATURES

- 4G LTE Wi-Fi can power up to **7 devices** and helps drivers stay connected to customers. Malibu is 1st vehicle in its class with available built-in 4G LTE Wi-Fi.

- Standard Bluetooth connectivity for easy access to customer contacts using simple voice commands

- Additional mobile office features include available USB ports and wireless charging powers business fleets all day

GENERAL MOTORS FLEET

THANK YOU

TIM THOMPSON
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