MD-DC Utility
2018 Environmental Conference
Alternate Fuel Vehicles Panel

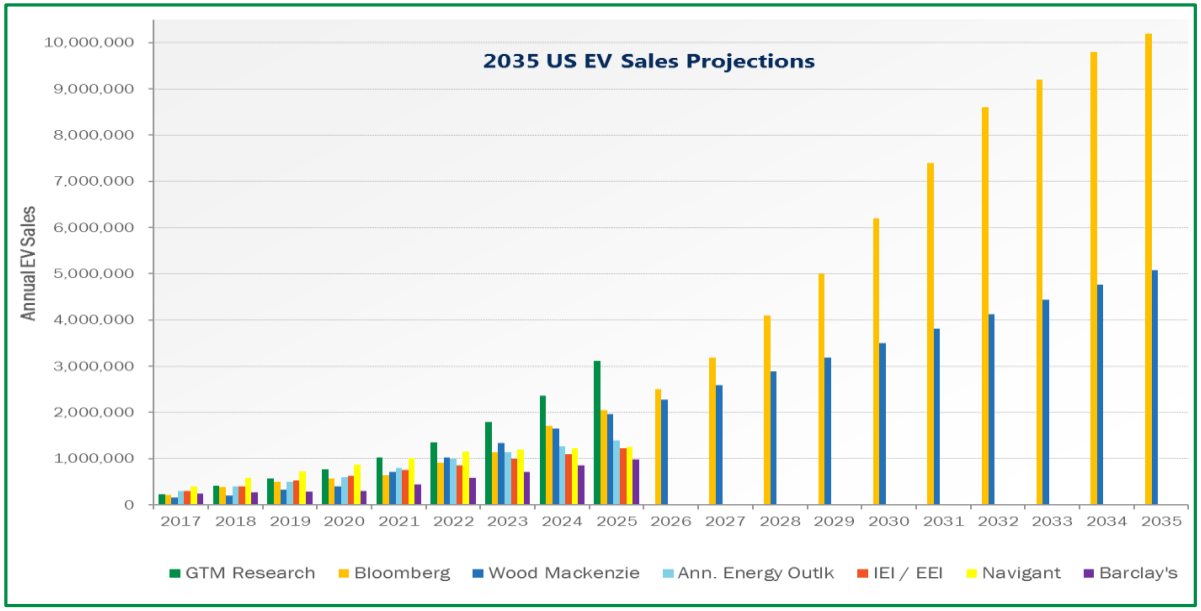
October 2, 2018

Exelon®

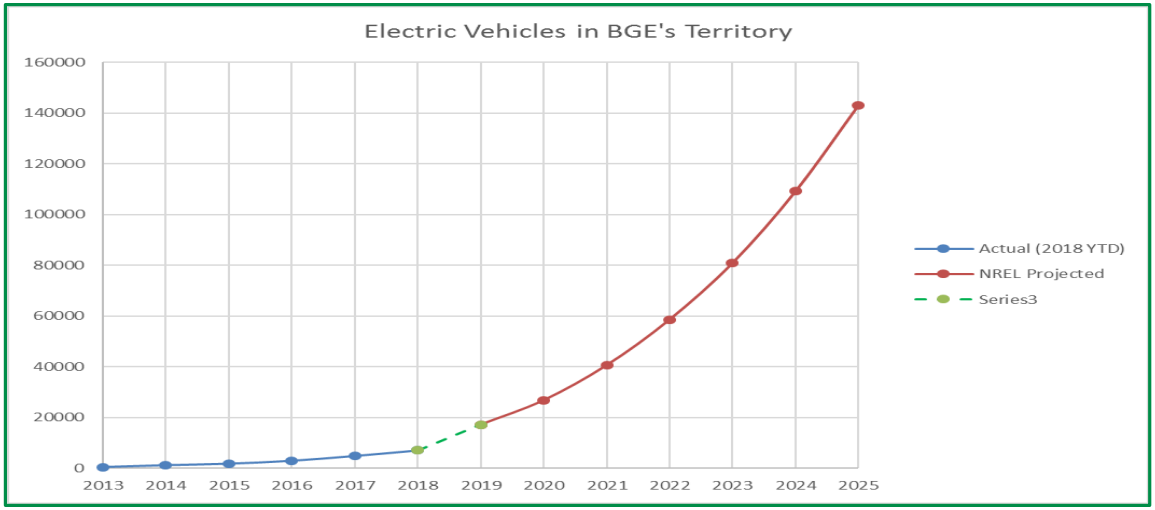
Agenda

Topic
Vehicles on the Market
EV Benefits
Chargers and Charging Infrastructure
Looking Ahead
Questions

EV Growth Forecasts



- EV's became available in Maryland in late 2010
- Currently have about 15,000
- State has signed on to California ZEV requirements, for a target of about 300,000 by 2025



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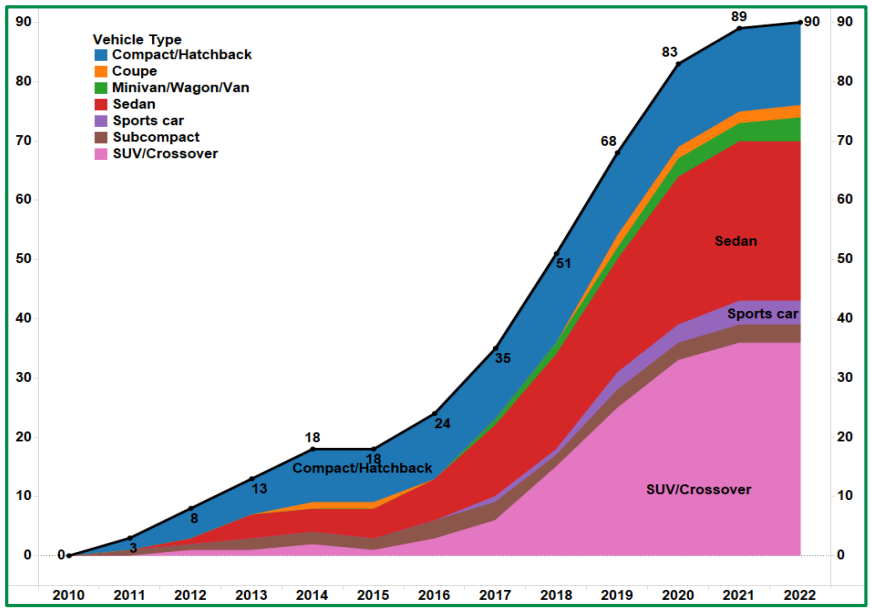
Vehicles on the Market

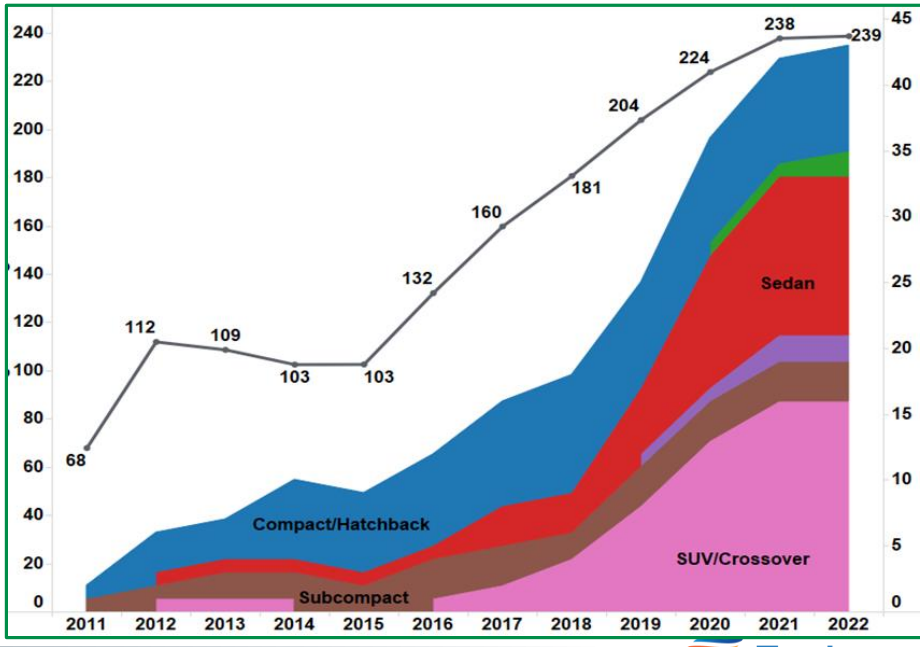
Source: EPRI Electric Transportation Program Q2 2018 Update



Customer choice increasing with as many as 97 EV models by 2023

- Seeing significant model additions in the passenger vehicle space
- Expect SUV and Light Truck in coming years
- Development of heavy duty vehicles applications also underway

Range of battery electric vehicles (BEVs) is also increasing



Updated 4/4/2018

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Electric Vehicle Benefits

Source: MJ Bradley MD PEV Cost Benefit Analysis (Dec 2016)

Figure 9 Projected GHG Emissions from the Light Duty Fleet in Maryland

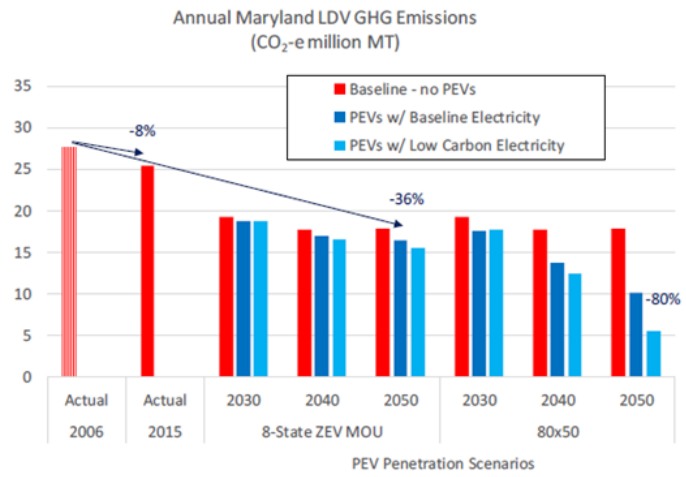
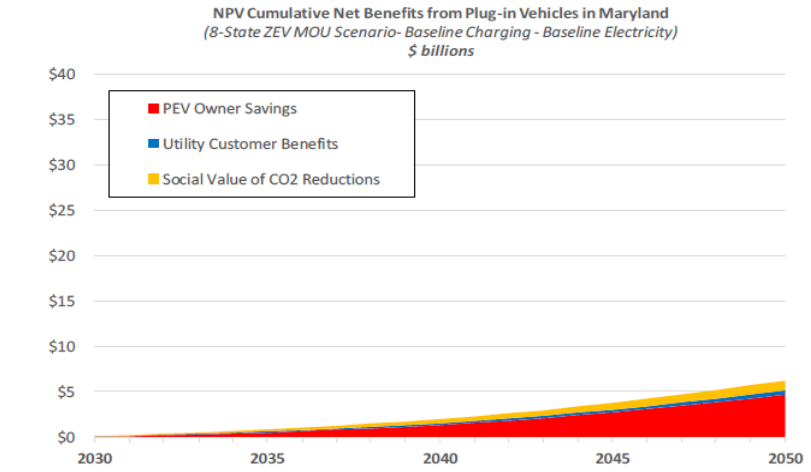


Figure 1 *NPV Cumulative Societal Net Benefits from MD PEVs – 8-state ZEV MOU Penetration*



- Maryland is looking to the transportation section for significant contributions to air and water quality goals
- Transition to electrified transportation can offer significant benefits to the EV user and State residents
- Number of Programs available or proposed to support EV adoption

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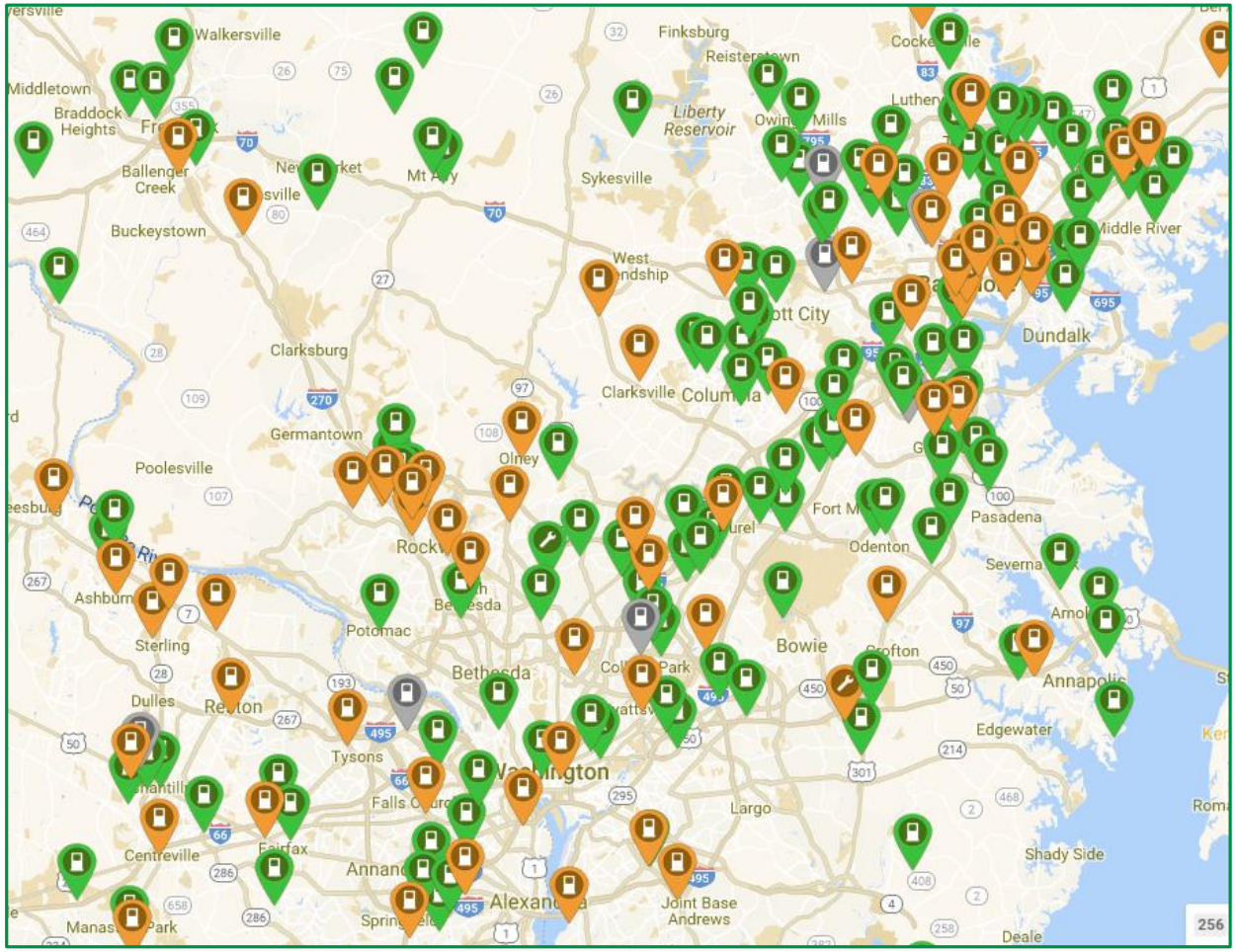
EV Chargers in Maryland

Source: Plug Share

- Availability of Chargers is improving
- More are needed:
  - 2017 NREL Gap Analysis identified potential gap of over 27,000 chargers for public, workplace and DC Fast Charging across the State to support the 300,000 vehicle target

Chargers in the Central Maryland Corridor



Updated 4/4/2018

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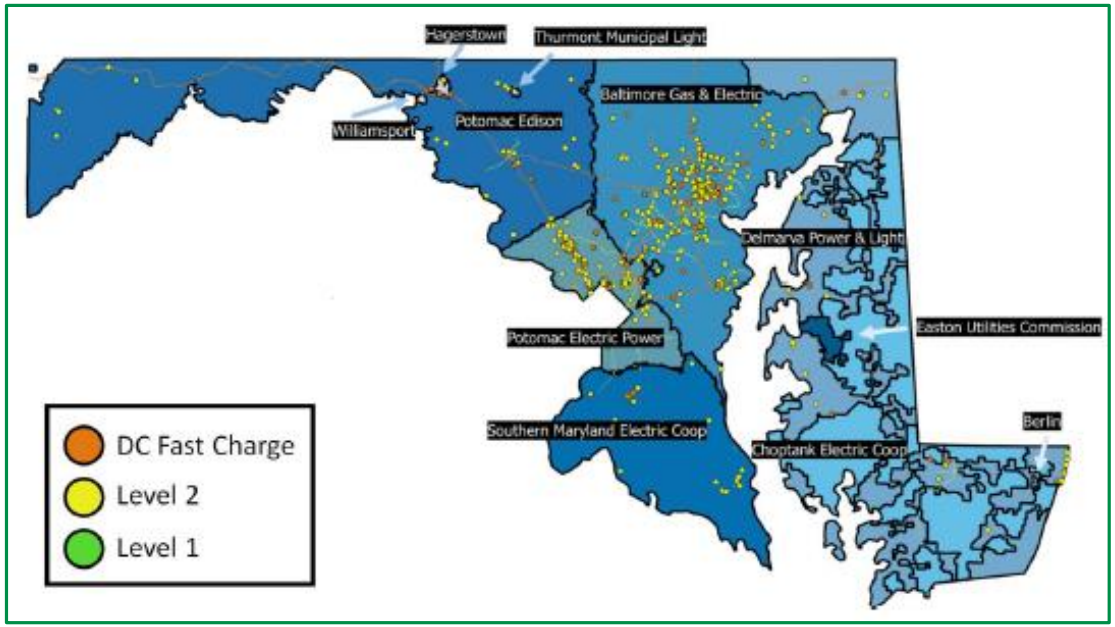
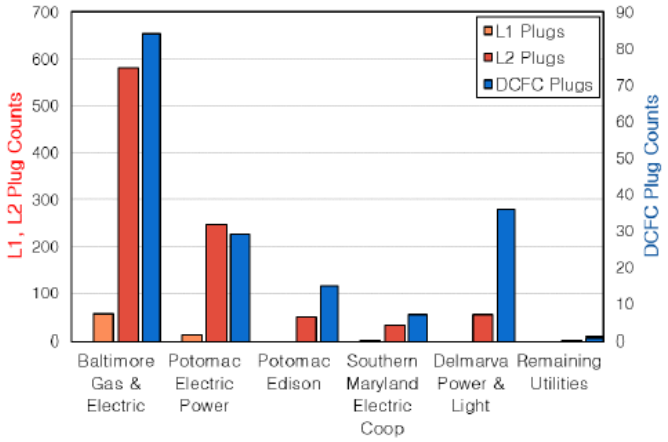
Maryland EV and EV Infrastructure Needs

Source: NREL - Meeting 2025 Zero Emission Vehicle Goals: An Assessment of Electric Vehicle Charging Infrastructure in Maryland July 2018

Notable initiatives supporting EV charging development:

- Current MEA grants and incentives
- VW Settlement funds and Electrify America investments
- MDPSC PC44 – Grid Modernization Proceeding EV Infrastructure Proposal





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Looking Ahead ..

- Significant (global) interest in advancing EV adoption across the transportation sectors
  - More than just passenger cars
  - Battery costs are falling, increasing affordability
  - Capabilities are increasing, greater range and features
  - Charging capabilities are improving
- State is looking to EV's and the other alternate fuel vehicles for significant contributions toward air and water quality goals
- Significant work underway to advance the charging infrastructure support needed
- Maryland utilities are well positioned to support the growth and help manage the charging impacts to the distribution systems.

Contact:

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Sharp Energy
AUTOGAS 101

SHARP AUTOGAS
POWERED BY PROPANE

Intro to Propane AutoGas

SHARP AUTOGAS
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AutoGas is:

- LPG or propane when used as a vehicle fuel
- The third most widely used vehicle fuel in the world with over 20 million vehicles – making it the most popular alternative fuel worldwide
- Over 250,000 AutoGas vehicles in US and rapidly growing
- An alternative vehicle fuel that helps fleets achieve:

AutoGas is Economical

SHARP AUTOGAS
POWERED BY PROPANE

Less Expensive, Lower Entry Costs

Significant Savings

- Lower Fuel Costs – AutoGas is significantly less than gasoline or diesel, **averaging $1.00 less per gallon than regular unleaded gasoline.**
- Reduced Maintenance – vehicles operating on AutoGas require less frequent maintenance, fewer oil changes and have extended engine life. Autogas vehicles run on 105-110 Octane.

Low Cost Infrastructure and Conversion

Relative to other alternative fuels: compared to ethanol, electric and natural gas

- Low cost refueling infrastructure for an AutoGas fueling station provides easy entry with scalable growth.
- For fleets interested in converting existing vehicles, the cost of AutoGas conversion is very affordable. Depending on amount of fuel consumed per vehicle, average ROI is less than 3 years.

Environmentally Friendly Fuel

SHARP AUTOGAS
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WHY CONVERT FLEET VEHICLES TO PROPANE AUTOGAS?

ECONOMICAL

- Less expensive than gasoline
- Cleaner burning = fewer oil changes

CLEAN

- 12% less carbon dioxide
- 30% less carbon monoxide
- 35% less hydrocarbons
- 60% less NOx

DOMESTIC

- Almost 98% of propane vehicle fuel is produced in the U.S

Where Does Propane Come From?

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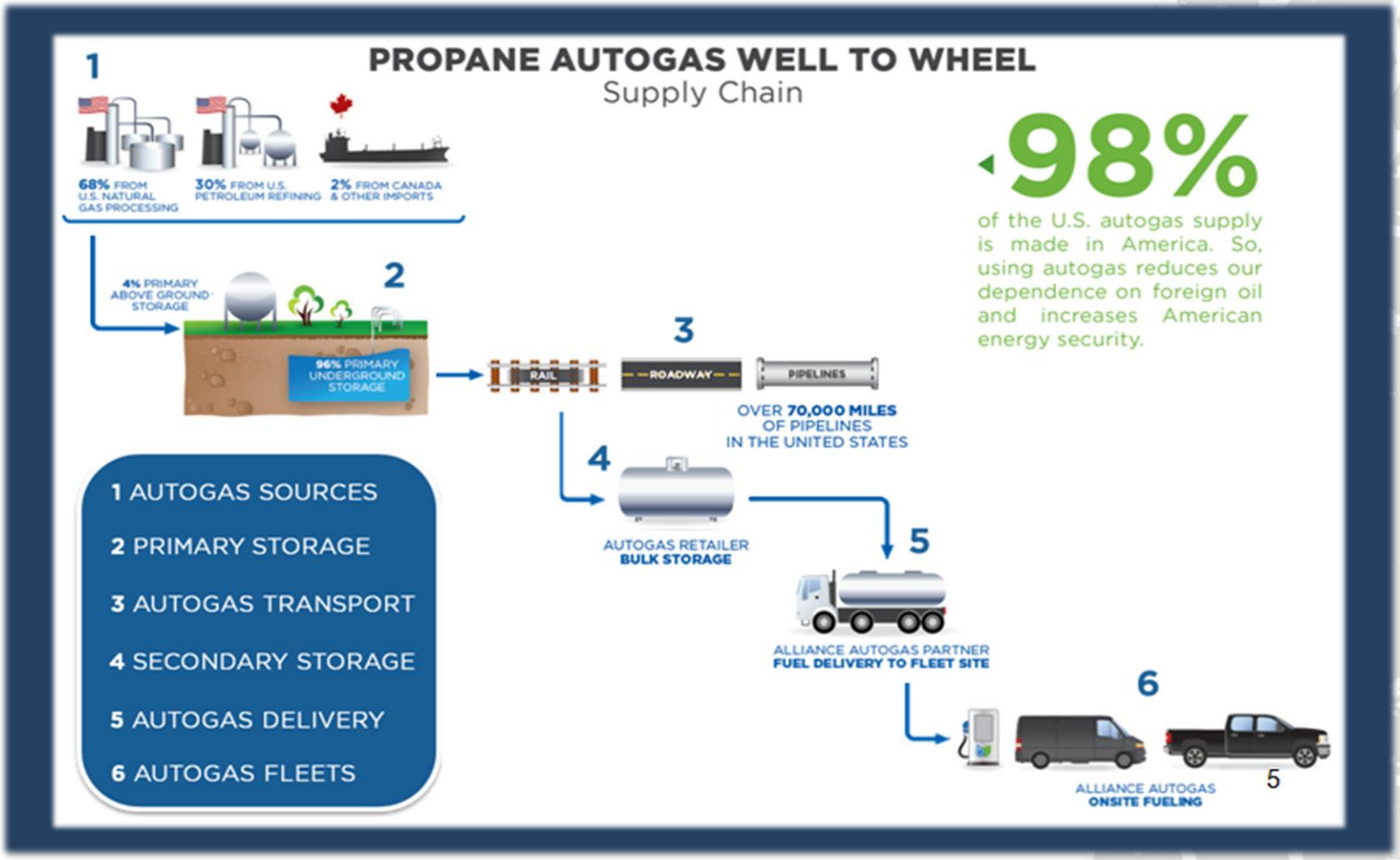

Sharp Fueling Stations & Territory's

SHARP AUTOGAS
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1. **AutoPort, Inc.**
203 Pigeon Point Rd,
New Castle, DE

2. **Sharp Energy – Dover**
5011 N. DuPont Hwy
Dover, DE 19901

3. **Sharp Energy – Georgetown**
22945 E. Piney Grove Rd
Georgetown, DE

4. **Sharp Energy – Salisbury, MD**
520 Commerce Street
Salisbury, MD

5. **Sharp Energy – Easton, MD**
9387 Ocean Gateway
Easton, MD

6. **King Limo, Inc.**
370 Crooked Lane
King of Prussia, PA

7. **Park 'N Jet**
76 Industrial Hwy
Essington, PA

8. **One Hour Heating & Air Conditioning**
653 W Bel Air Ave
Aberdeen, MD

9. **Western Auto**
1406 Main Street
Stevensville, MD

10. **Felton Hardware**
121 West Main Street
Felton, DE

11. **Nuttle Lumber**
18744 John J. Williams Highway
Rehoboth Beach, DE

12. **BWI Location**
7457 Shipley Ave
Harmans, MD

13. **Kinnamons Tire Service**
13039 Greensboro Road
Greensboro, MD 21639

14. **Delaware RV**
5710 N. DuPont Hwy
Smyrna, DE 19977

15. **IG Burton**
411 N Rehoboth Blvd
Milford, DE 19963

Sharp AutoGas Fueling

Fueling station installed at no cost to the fleet:

- Autogas station installed on-site, at fleet home base
- Or public/shared AutoGas stations installed to serve multiple fleets
- Fully scalable infrastructure to serve fleets of all sizes
    - **If your AutoGas fleet grows beyond the program or your AutoGas use increases, your infrastructure can be scaled to meet your needs**
- All necessary training for fleet personnel

Sharp AutoGas Fueling

SHARP AUTOGAS
POWERED BY PROPANE

Fueling Solution Includes:

- Spill-free fueling station at fleet facility
- No fueling equipment cost to customer with appropriate gallon requirements.
- AutoGas data integration with fuel management systems
- Continual pumping flow rate of 8-10 gallons/minute
- Permit application and required inspections
- Comprehensive AutoGas education includes extensive safety and operational training
- 24-hour safety support and technical
- Green branding message support

Sharp AutoGas Fueling

SHARP AUTOGAS
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Fueling Infrastructure Site Preparations:

- Electrical power (230v 30 amp circuit)
- Crash posts per local Fire Marshall specifications
- Communication line for data integration with fuel management systems
- Trenching if tank is separated from dispenser

AutoGas is Safe & Reliable

SHARP AUTOGAS
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Proven Safe and Reliable Worldwide

State of the Art Tanks

- Tanks are ASME tested and certified at 4 times normal operating pressure
- Propane tanks are 20 times more puncture resistant than standard gasoline or diesel.
- Check valves on tanks to prevent fuel from leaking through fill port
- Fuel tanks have a manual shut off valve.

Low Flammability Range

- AutoGas has much lower flammability range than some other fuels 2.2-9.6%
- Gasoline has an ignition temp of 350-450 degrees F, while propane has ignition temp between 900-1000 degrees. Propane must be mixed with air to ignite, propane inside a tank cant combust because of a lack of oxygen.

Non-Toxic

- Unlike gasoline, diesel, methanol and ethanol, AutoGas is non-toxic, non-poisonous and is insoluble in water
- Should a rare accidental release of AutoGas occur, it dissipates into the atmosphere with no harmful contaminants released into the air, soil or water. Propane will not pool under a vehicle.

Contact Information

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www.sharpautogas.com

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Overview of CNG - Natural Gas for Vehicles

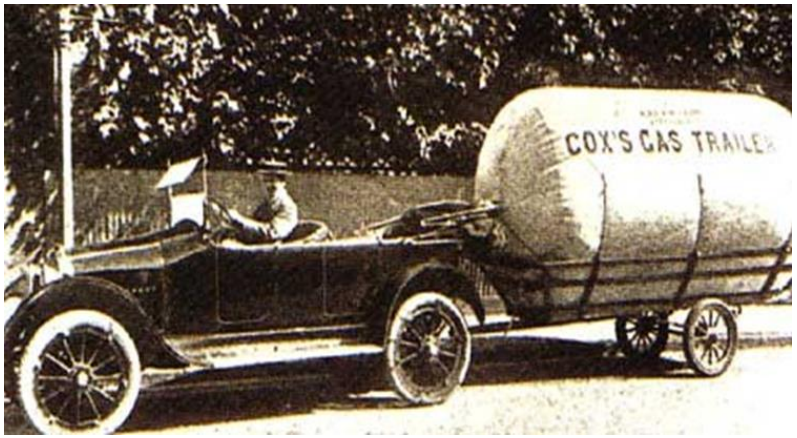
MD – DC Utilities Association

October 2, 2018

TOP WORK PLACES

CHESAPEAKE UTILITIES

What is CNG?



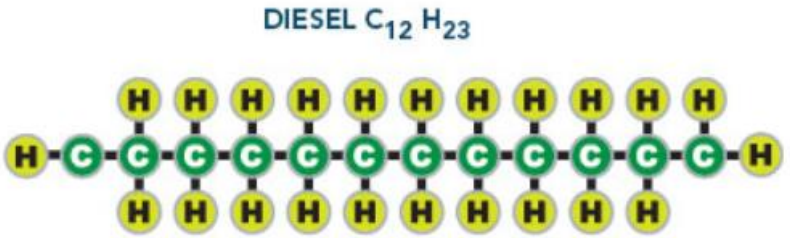
Compressed Natural Gas (CNG)

- Natural Gas for all classes of vehicles.
- Time-tested. Used as a vehicle fuel for over 60 years.
- Compressed to less than 1% of its original volume and stored at 3,600 psi.
- An abundant, domestic, clean alternative to petroleum.
- Powers more than 15 million vehicles worldwide, and about 250,000 in the US.
- Global CNG growth rate is 30%; in the US it's about 4% since 2000.

CNG is Cleaner

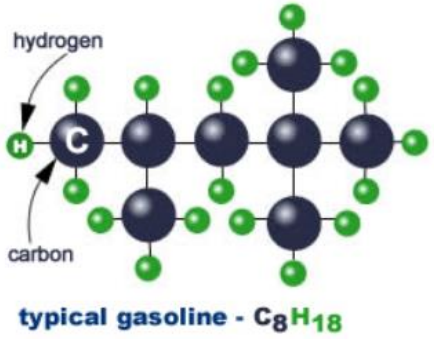
<u>CNG emits less pollution directly than gasoline or diesel when combusted</u>:

- CO_2,CO, NOx, SOx, PM and unburned hydrocarbons



<u>Lower Life-cycle emissions</u>:

- CARB: Approximately 28% lower life-cycle CO_2 emissions than petroleum (and more than 88% lower with biogas)



CNG is Safe

CNG fuel tanks are approved by the US Department of Transportation and are much safer than traditional fuel tanks.

CNG tanks are able to:

- **Survive a drop from an 8-story building**
- **Resist the blast caused by a full stick of TNT**
- **Survive a 1,500F degree fire**
- **Remain intact when shot by a bullet from a high-powered rifle**

Natural gas is lighter than air. When released it dissipates into the atmosphere, quickly moving up and away from its source. Natural gas has an ignition temperature that is 2 times higher than that of motor gasoline and a narrow range of flammability. In concentrations below 5% and above 15%, natural gas cannot ignite.

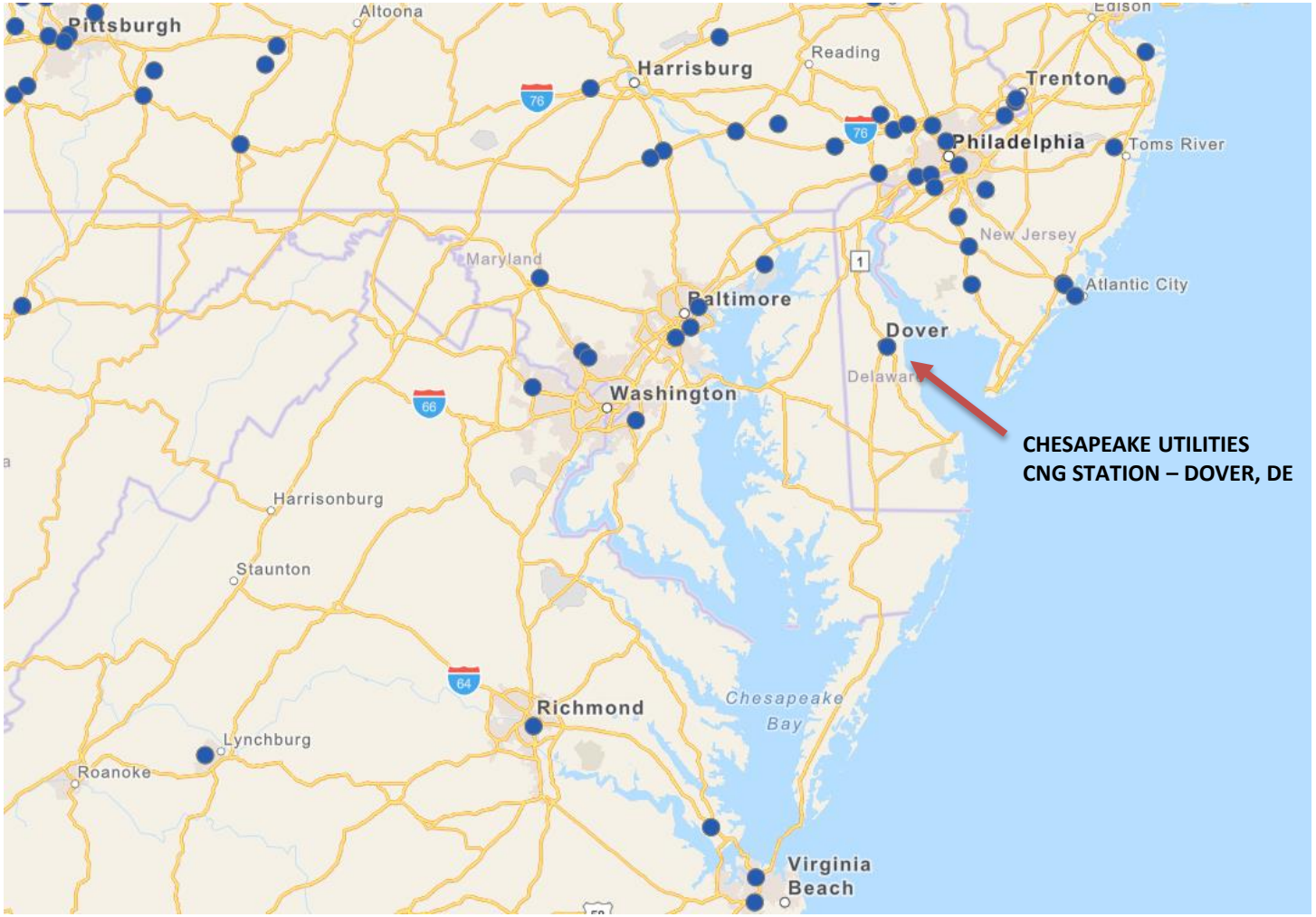
CNG Economics and Incentives

- Savings potential of up to $1.50 per gallon versus petroleum.
- Reduced Maintenance Costs: CNG eliminates DEF, SCR systems and Diesel Particulate Filters. Extended engine life.
  - City of Tyler, Texas reports spending $27,000 less per year maintaining a CNG refuse truck versus diesel.*
- Maryland Energy Administration Freedom Fleet Voucher (FFV) Program. Incentives by GVW (lbs):
  - Up to 8,500 lbs: $ 3,000
  - 8,501 – 14,000 lbs: $ 5,000
  - 14,001 – 26,000 lbs: $12,000
  - Over 26,000 lbs: $20,000

- Maryland Alternative Fuel Infrastructure Program (AFIP)
  - Up to $500,000 for new CNG Stations

*Source: http://www.tylerpaper.com "Tyler's Compressed Natural Gas Garbage Trucks make their rounds quietly."

CNG Stations – Mid Atlantic



How is CNG Produced?

Fast-fill CNG Stations

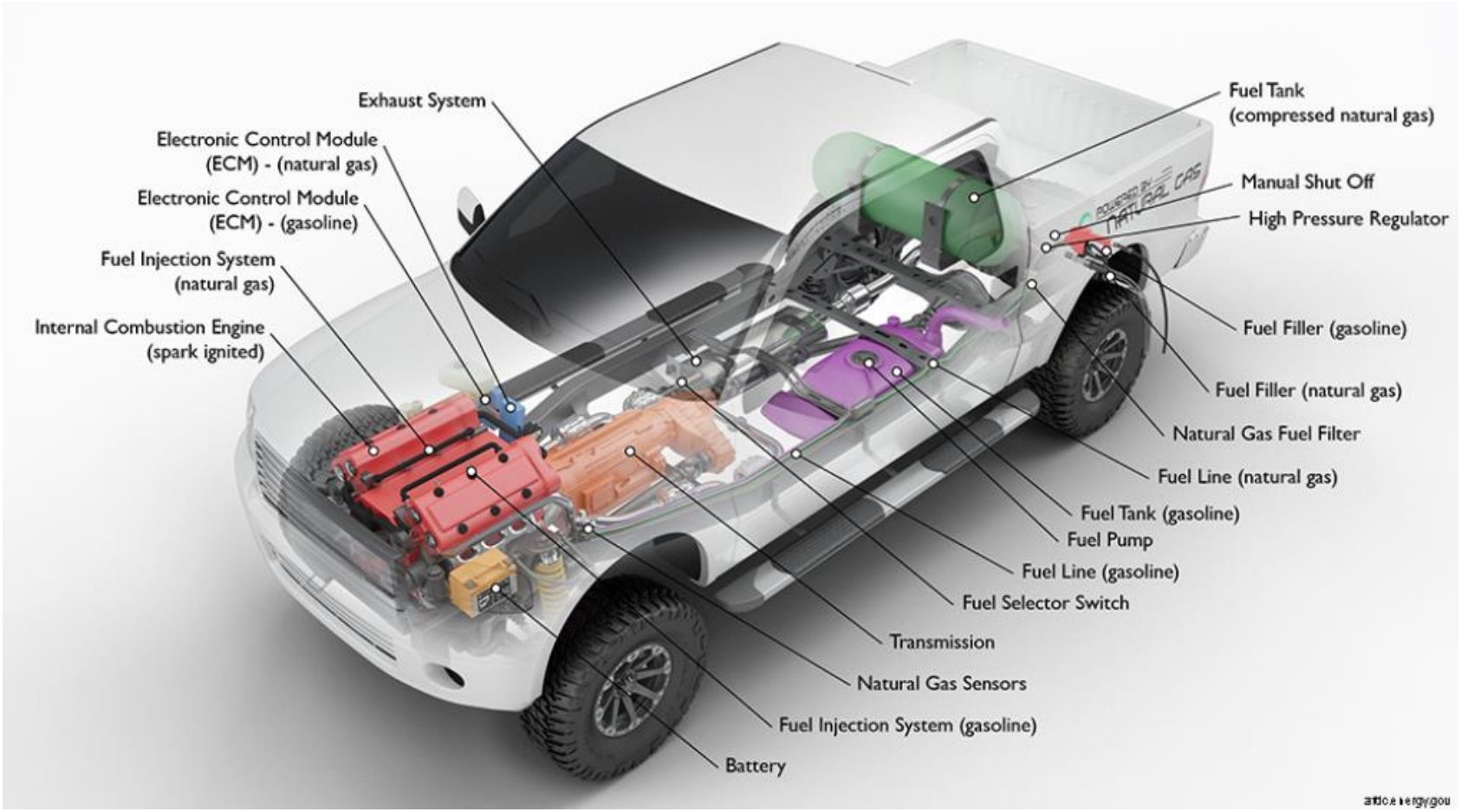
- Convenient, 24-hour access. Supports random fill-times.
- Large Compressors and storage vessels – Fill rates comparable to gasoline.
- Dispensers equipped with card-readers for a familiar retail experience.
- Higher CAPEX. Longer paybacks. Less savings per gallon.
- Current average retail CNG price in Mid-Atlantic is $2.20 per gal.
- Can supports Tube Trailer service for “virtual pipeline” customers.

Time-Fill CNG Stations:

- Ideal for fleets that are housed at a central location.
- Fill parked vehicles overnight when not in use.
- No time lost to refueling.
- Smaller compressors and minimal or no storage.
- Much lower CAPEX.
- Can be modified for some fast-fill capacity.
- Lower cost per gallon = shorter payback.

Natural Gas Vehicles (NGV)

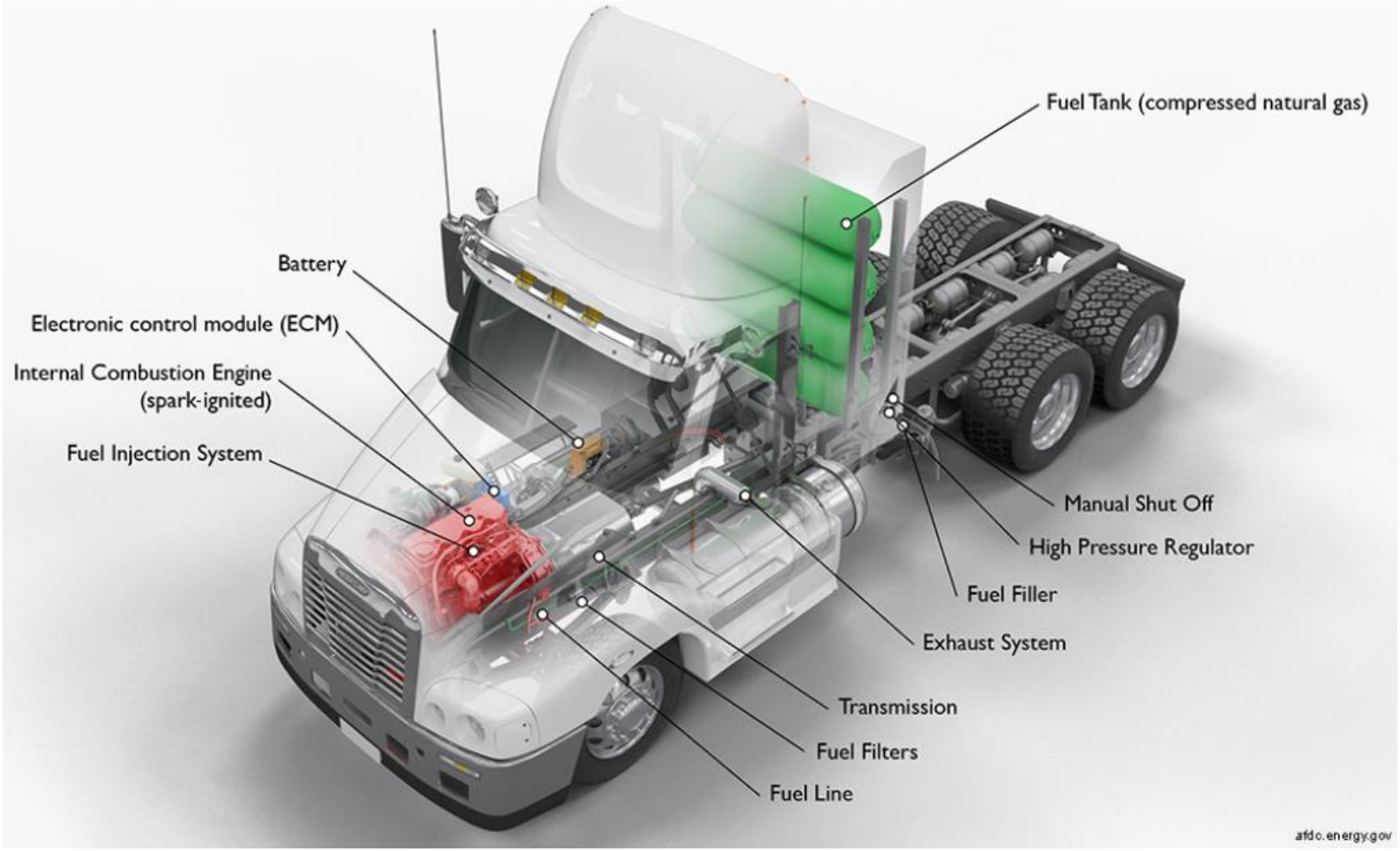
Dedicated & Bi-fuel Light- and Medium-duty NGVs



Easy Conversion Process

- **Auto Port** in New Castle, DE.
- Qualified Vehicle Modifier (QVM) for Ford and GM.
- Pre-engineered kits and tanks.
- 3-5 day process.
- Vehicle retains OEM warranty.
- Typical cost range of $7K – 11K for light- and medium-duty vehicles (Ford F-series, Transits, and comparable).

Dedicated Class-8 NGV



UPS

NJ Transit Bus

Chesapeake, VA muni refuse truck

Kane Freight – Fueling at Chesapeake station

Chesapeake Utilities' Initiatives

- 25-Year Continuous Operation of the only public CNG station in Delaware.
- Construction of a new fast-fill CNG station on S. Bay Road in Dover – Opening 2018.
- Chesapeake Fleet Conversion to CNG
- Large Private Waste Hauler – 2019.

- Proposed Muni Refuse fleets in DE receive VW funding.
- Sponsor of Kent County Tourism's CNG Mobile Visitors' Center.
- Ongoing Engagement of Key Fleet Operators.

Growth potential for CNG and NGVs on the Eastern Shore?

- **Local Fleets**
  - Utilities
  - Private & Muni Refuse
  - Municipal Medium Duty Fleets
  - Concrete Trucks
  - Asphalt and Aggregate Haulers
  - UPS, FedEX
  - Poultry Feed Trucks, Live Haul
  - State Fleet – MDOT

- **Clean Fuel Corridors – Rt. 50, Rt. 301, Rt. 13.**
- **CNG Tube Trailer service to off-main customers.**
- **CNG Facilitates the purchase of Renewable Natural Gas (RNG)**
- **The Natural Gas Grid is ready for NGVs TODAY.**

Opportunities

- Virtual pipeline operations
  - Temporary CNG supports conversions
  - Deliveries to underserved areas
- Rapid adoption by waste haulers:
  - 60% of all new Refuse trucks are CNG
- New service to a CNG fleet supports main extensions to reach other customers.
- Supports Sustainability Goals
- Growing demand for RNG
- MEA vouchers and grants
- Compression tariff (Sandpiper)

Challenges

- Refueling infrastructure cost
- Vehicle incremental cost
- Maintenance Garage upgrades
- Low gas and diesel prices
- Chicken vs. Egg problem
- Virtual pipeline operations; temporary CNG supports conversions
- Large CNG customer supports main extensions to serve others


PREFERRED
PARKING
ALTERNATIVE
FUEL VEHICLES
ONLY
Support the Delmarva
Clean Fuels Corridor
Clean Cities
U.S. Department of Energy
CHESAPEAKE
UTILITIES

Thank You!

Questions?

TOP WORK PLACES

CHESAPEAKE UTILITIES