<table>
<thead>
<tr>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicles on the Market</td>
</tr>
<tr>
<td>EV Benefits</td>
</tr>
<tr>
<td>Chargers and Charging Infra</td>
</tr>
<tr>
<td>Looking Ahead</td>
</tr>
<tr>
<td>Questions</td>
</tr>
</tbody>
</table>
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
• 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

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

Range of battery electric vehicles (BEVs) is also increasing
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.

**Electric Vehicle Benefits**

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

Updated 4/4/2018
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

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

John Murach
Manager – Energy Programs & Services
BGE
John.J.Murach@BGE.com
Sharp Energy
AUTOGAS 101
Intro to Propane AutoGas

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

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.
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?

PROpane AUTOgAs WELL TO WHEEL
Supply Chain

98% of the U.S. autogas supply is made in America. So, using autogas reduces our dependence on foreign oil and increases American energy security.

1. AUTOgAS SOURCES
2. PRIMARY STORAGE
3. AUTOgAS TRANSPORT
4. SECONDARY STORAGE
5. AUTOgAS DELIVERY
6. AUTOgAS FLEETS
Sharp Fueling Stations & Territory's

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, MD

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. Nuttie 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
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
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
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

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

Mike Petito
Account Manager
AutoGas Specialist
(410) 251-3020
mpetito@chpk.com

www.sharpautogas.com
Overview of CNG - Natural Gas for Vehicles

MD – DC Utilities Association

October 2, 2018
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

CNG emits less pollution directly than gasoline or diesel when combusted:

- CO$_2$, CO, NOx, SOx, PM and unburned hydrocarbons

Lower Life-cycle emissions:

- 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 1,500°F 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

CHESAPEAKE UTILITIES
CNG STATION – DOVER, DE
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

- Fuel Tank (compressed natural gas)
- Battery
- Electronic control module (ECM)
- Internal Combustion Engine (spark-ignited)
- Fuel Injection System
- Manual Shut Off
- High Pressure Regulator
- Fuel Filler
- Exhaust System
- Transmission
- Fuel Filters
- Fuel Line
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.
- Chesapeake Fleet Conversion to CNG

- 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
Thank You!

Questions?