# PSTA Replacement Buses

Decision-Making Guide for PSTA Board

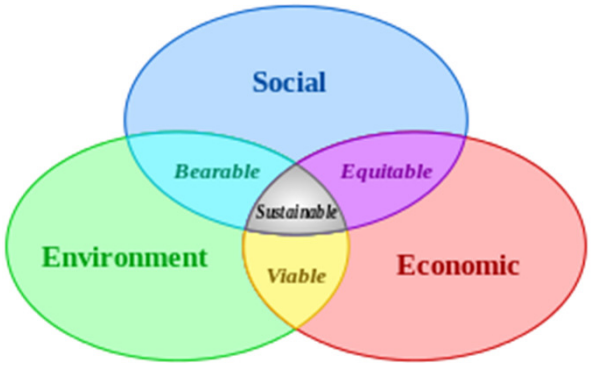
Pinellas Suncoast Transit Authority (PSTA)
St. Petersburg, Florida

# Review

- **PSTA Adopted Sustainability Policy & 2013 Hybrid Bus Analysis**
- **PSTA's Total Capital Improvement Program**
- **Bus Options**
  - Emission Comparisons
  - Financial Comparisons
  - Operational Comparisons
- **Sample Scoring System**: Possible Recommendation

# PSTA Sustainability Policy

- Adopted February 2014 Policy Requires Comprehensive Decision-making:
  - Financial
  - Environmental
  - Social




- October 2013 Staff Recommendation to Approve Hybrid-Only Purchase Policy Not Approved By Board (Bujalski, Scott) to maintain future flexibility.

# PSTA's Sustainable Plans

- **Greenlight Plan** set aside $46M to fund hybrid-bus replacement assumption through 2020.
- **Path Forward Plan**:
  - Cut $7M in other programmed projects
  - Plan to Privatize services to reduce fleet size
  - Extended replacement cycle from 12 to 15+ years
  - Sets Aside $28.5M for replacement buses through 2020.

# Why is a Fleet Plan Important?

- Must have sufficient working buses to provide schedule.
- Older buses more costly to maintain than newer buses.
- “No Plan” historically added burden to local funding. Now lack of planning adds burden to all funding.
- Fleet planning permits smarter investments
- FTA/FDOT requirement

- PSTA’s Plan Provides Time for Advocacy/Partnerships before “Cliff” in 2019/2020 arrives.

# Adopted Capital Improvement Program

- $13M Annual Federal Formula Funds – No Increases
- 40% Allocated to Operations to Maintain Service
- 35% Allocated for Customer Amenities/Customer Service
- 25% to Bus Replacements
- Privatized Express Service & Trolleys & Reductions Reduces Fleet to 201 Buses:
  - 190 / 12 Years = 16 Buses Per Year
  - 190 / 15 Years = 13 Buses Per Year
- Path Forward Plan Balanced through at least 2019.

# Sustainable Fleet Replacement Plan

| Year | Fleet | FY2016 | FY2017 | FY2018 | FY2019 | FY2020 | FY2021 | FY2022 | FY2023 |
|---|---|---|---|---|---|---|---|---|---|
| 2001 | Gillig 40' | 6 | | | | | | | |
| 2002 | Gillig 40' | 9 | 9 | 6 | | | | | |
| 2003 | MCI 40' | 9 | 9 | 9 | | | | | |
| 2005 | Gillig 40' | 8 | 8 | 8 | 8 | | | | |
| | Gillig 35' | 7 | 7 | 7 | 7 | | | | |
| | Gillig 29' | 5 | 5 | | | | | | |
| 2006 | Gillig 40' | 35 | 35 | 35 | 24 | 24 | 15 | 4 | |
| | Gillig 35' | 12 | 12 | 12 | 12 | 12 | 5 | | |
| 2007 | Gillig 40' | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 |
| | Gillig 35' | 7 | 7 | 7 | 7 | 7 | 7 | 7 | |
| | Gillig Trolley 35' | 3 | 3 | 3 | 3 | 3 | 3 | | |
| 2008 | Gillig 40' | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 |
| | Gillig 35' | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| | Gillig Trolley 35' | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| 2009 | Gillig Hybrid 35' | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| | Gillig BRT 35' | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| | Gillig Trolley Hybrid 35' | 7 | 7 | 7 | 7 | 7 | 7 | 6 | 6 |
| 2010 | Gillig 35' Hybrid | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 |
| 2012 | Gillig 40' Hybrid | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| | Champion Cutaway | 8 | 8 | | | | | | |
| 2013 | Gillig 40' Hybrid | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| 2014 | Gillig 40' Hybrid | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| 2015 | Gillig 40' Hybrid | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 |
| | El Dorado Cutaways | 2 | 2 | 2 | 2 | 2 | 2 | 2 | |
| 2016 | Gillig 40' Hybrid | | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| | Gillig 29' Shuttle | | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Gillig 40' OTR Coach | | | | | | | | |
| 2017 | Gillig 40' Hybrid | | | 5 | 5 | 5 | 5 | 5 | 5 |

# 2007 Buses Like This Must Run to 2024


CUSTOMER | GOVERNANCE | FINANCIALLY SUSTAINABLE | CAPITAL | SERVICE | EXPANSION | VISIONARY

# Bus Technology Options

- **Hybrid-Electric**
  - PSTA has 60 Gillig Hybrids (1/3rd of Fleet)
  - Proven Technology
- **Diesel**
  - Future Engines Much Cleaner than Existing PSTA Buses
  - Proven Technology
- **All Electric**
  - Proterra/BYD/New Flyer & Future Gillig
  - Promising Technology
  - Requires Charging Stations
- **Refurbished Electric**
  - Custom Coach Works/ZEP Bus
  - Few in service showing reliability issues.
- **CNG**
  - Gillig offers CNG Option
  - Proven Technology
  - New Financing Arrangements Spread Up-Front Compressor Costs

# Emission Comparison*

| | Diesel | Hybrid | Electric | CNG |
|---|---|---|---|---|
| **Fuel Economy** | | 10%-20% Better than Diesel | Best | Same as Diesel |
| **Air Quality** | Much better than Old Diesels | Better Fuel Economy Leads to Slightly Better than Diesel | Best | Lower NOx<br>Higher CO<br>Low PM/NMHC |
| **Climate Impacts** | | Better than Diesel or CNG | Best | Total GHC emissions slightly higher than Diesel |

**Comparison of Modern CNG, Diesel and Diesel Hybrid Electric Transit Buses Efficiency & Environmental Performance, mjbradley.com, November 2013.*

# Financial Comparison

| | Diesel | Hybrid | Electric | Refurb Electric | CNG |
|---|---|---|---|---|---|
| **Purchase Cost** | $500,000 | $695,000 | $840,000 | $580,000 | $540,000 |
| **Life-Cycle Cost** | | +$40K vs. Diesel over 500K Miles (PSTA 2013 Study) | Too New – Maintenance Costs Likely = Diesel | Old Bus presents risk. | Same as Diesel* |
| **Facility/ Charging Costs** | $0 | $0 | $350,000 Per Charging Station | $25,000 | $1M Facility Safety Revisions |

**Capital Metro CNG Implementation Study, Texas Transportation Institute, November 2011.*

# Operational Comparison

| | Diesel | Hybrid | Electric | Refurb Electric | CNG |
|---|---|---|---|---|---|
| **Reliability** | | Proven Reliability Battery Replacements? | Promising Results | Not Proven Old Bus | Proven Reliability |
| **Span of Service** | All Routes | All Routes | 15 of 40 Routes | 15 of 40 Routes | All Routes |
| **Social Issues** | Yes | Best in Urban/Beach | On-Route Charging Stations | Not Proven | Domestic Fuel |
| **Timeline** | 1 Yr. | 1 Yr. | 3-5 Years – Fed LoNo Grant May Be Needed | 2-3 Yr. | 4 Years |

# Sample Scoring (Env. Weight)

| | Diesel | Hybrid | Electric | Refurb Electric | CNG |
|---|---|---|---|---|---|
| **Emissions (3 Points)** | 0 | 2 | 3 | 3 | 0 |
| **Cost (4 Points)** | 4 | 1 | 0 | 1 | 3 |
| **Operational /Social (3 Points)** | 0 | 2 | 2 | 0 | 1 |
| **Total** | **4** | **5** | **5** | **4** | **4** |

# Sample Scoring (Cost Weight)

| | Diesel | Hybrid | Electric | Refurb Electric | CNG |
|---|---|---|---|---|---|
| **Emissions (2 Points)** | 0 | 1 | 2 | 2 | 0 |
| **Cost (5 Points)** | 5 | 2 | 0 | 2 | 3 |
| **Operational /Social (3 Points)** | 0 | 2 | 2 | 0 | 1 |
| **Total** | **5** | **5** | **4** | **4** | **4** |

# Possible Strategy - October

## Strategic Leadership

- Continue Strong Advocacy for More Federal/State Funds

## Approve Electric Bus Pilot Program

- Aggressive Pursuit of LoNo Grant Funds in 2015-2016
- Design Electric Bus Pilot Test & Identify Charging Station Locations on Specific Route

## Needed Action for Continued Sustainability

- Purchase 5 2016 Hybrid-Electric Gilligs.

# 2007 Buses Like This Must Run to 2024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# Additional Technical Information Regarding Diesel Bus Technology/Emissions

# DIESEL EMISSION REDUCTION

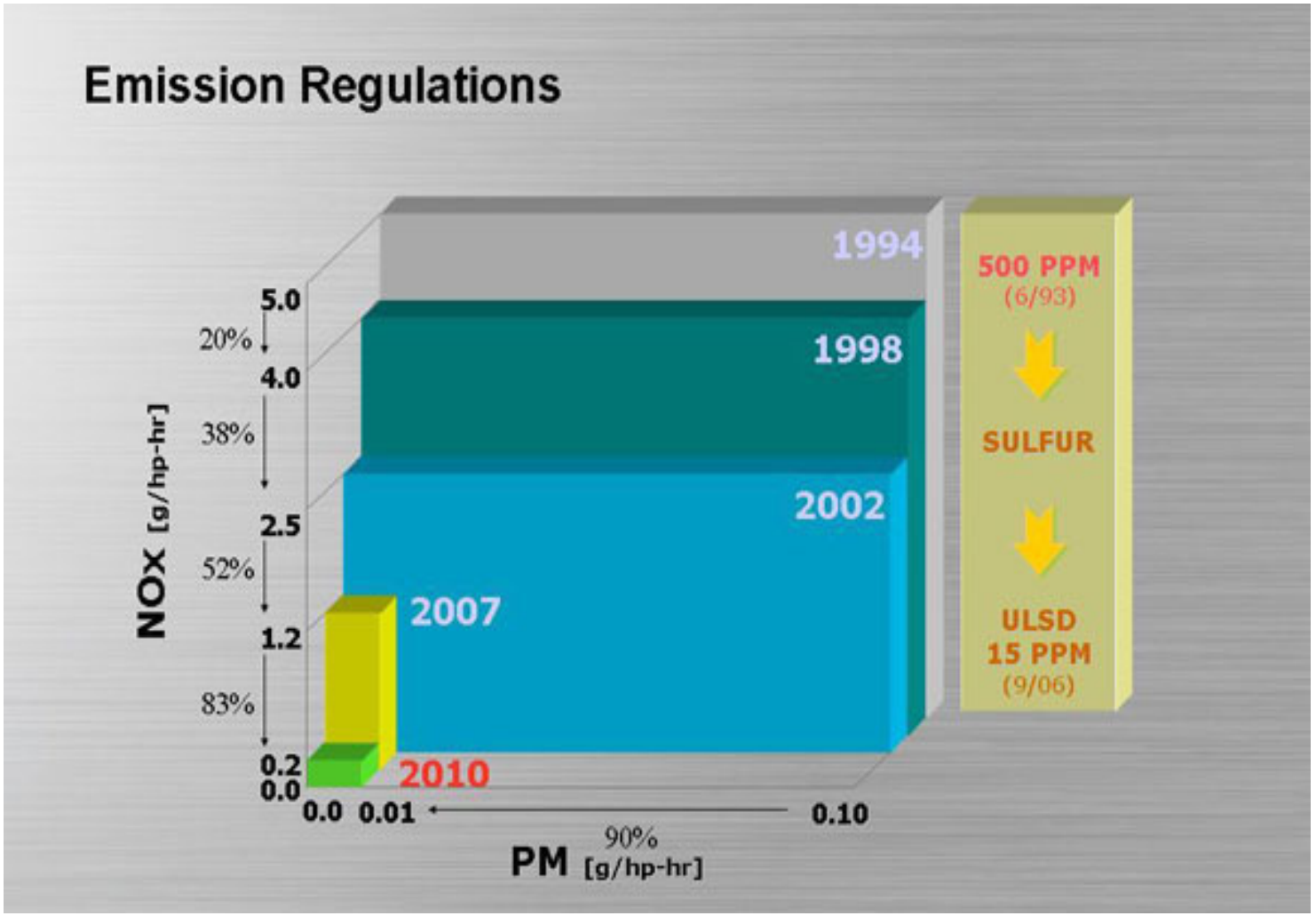
- The EPA has required over last several years to reduce Diesel Particulate Matter (PM) and Nitrogen Oxide (NOx) to almost zero.

- These items are the cause of greenhouse gasses.

- Since 1994 there has been a:
  - 97% Reduction of Sulfur (S) in Diesel Fuel
  - 83% Reduction in NOx
  - 90% Reduction in PM

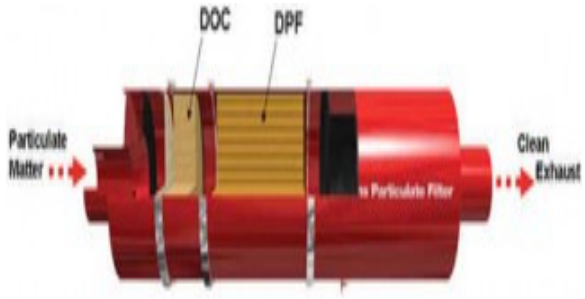
- Additional emission regulations to cap Greenhouse Gases (GHG) have been imposed in 2013 will again take affect in 2017.

# EPA DIESEL EMISSION TIMELINE



# DIESEL EMISSION COMPONENTS

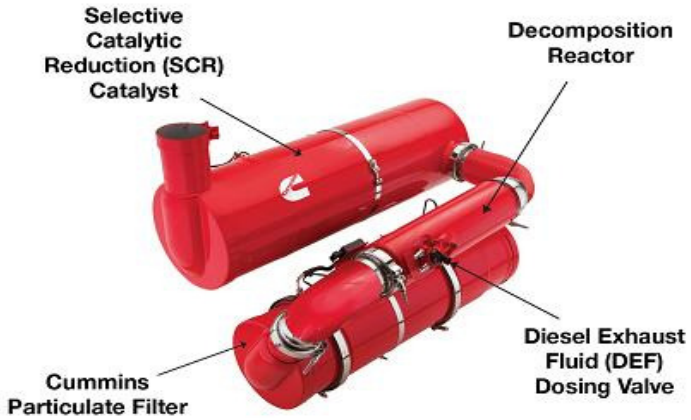
- In 2007, heavy duty diesel engines used in transit buses were equipped with new exhaust components to comply with new emission regulations.
- The Particulate Filter consists of four sections: an inlet, a Diesel Oxidation Catalyst (DOC), a Diesel Particulate Filter (DPF) and an outlet.
- As Exhaust flows out of the engine and into the Particulate Filter, it passes through the DOC and then into the DPF where Particulate Matter (PM) is collected on the walls of the DPF.
- The PM collected is then oxidized to remove it from the DPF.
- This is known as regeneration.



# DIESEL EMISSION COMPONENTS

In 2010 heavy duty diesel engines used in transit buses were again equipped with new exhaust components to comply with new emission regulations.

- Particulate Filter – uses wall-flow substrates to capture exhaust gas and remove PM or soot particles.
- Diesel Exhaust Fluid (DEF) Dosing Valve – allows a fine mist of Diesel Exhaust Fluid (DEF) to be sprayed into the hot exhaust stream.
- Diesel Exhaust Fluid (DEF) – DEF is a mixture of 32.5% urea in a solution of dionized water.
- Decomposition Reactor – converts DEF to ammonia through hydrolysis.
- Selective Catalytic Reduction (SCR) Catalyst – Significantly reduces NOx to near-zero levels by converting it into harmless nitrogen gas and water vapor.



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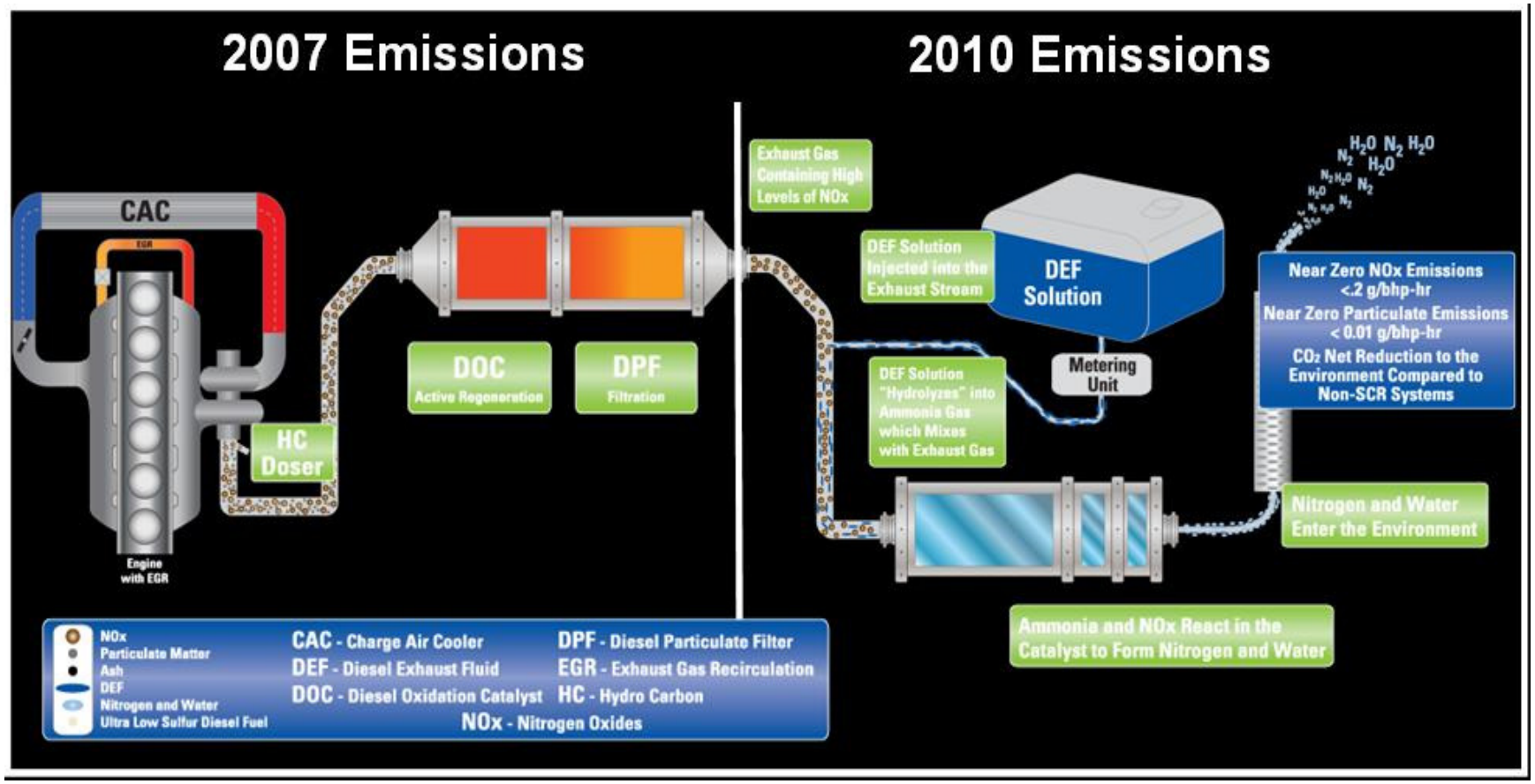
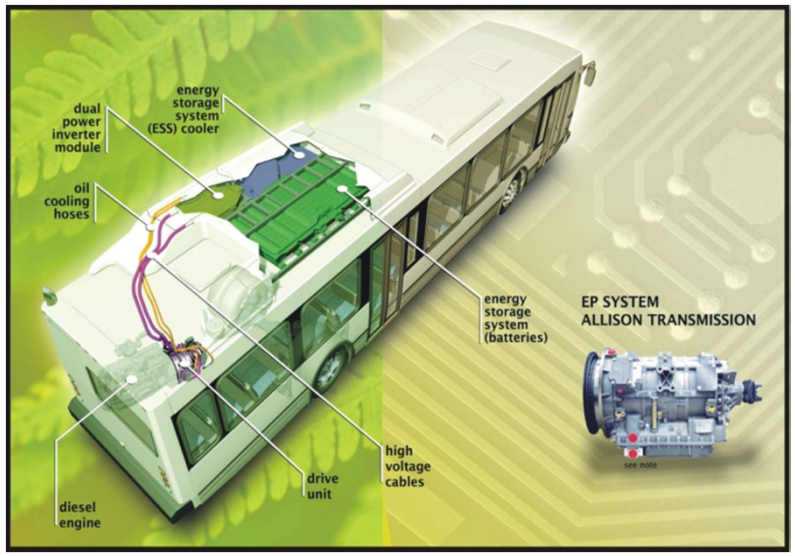


# DIESEL-HYBRID ELECTRIC EMISSION COMPONENTS

- All 2010-2015 PSTA diesel-hybrid electric buses have the same emission components as standard diesel buses.
- This is required by law in order to comply with the stringent EPA emission regulations.
- The advantage of diesel- hybrid electric buses is the ability recover energy lost during braking.
- Diesel hybrid electric buses may also benefit from using a smaller engine and reduced variable duty cycles which may result in higher fuel economy and reduced engine emissions.
- The maximum benefit of diesel-hybrid electric buses is seen from usage in low-speed stop-and-go inner city operation.



# HISTORY OF TRANSIT BUS EMISSION TESTING

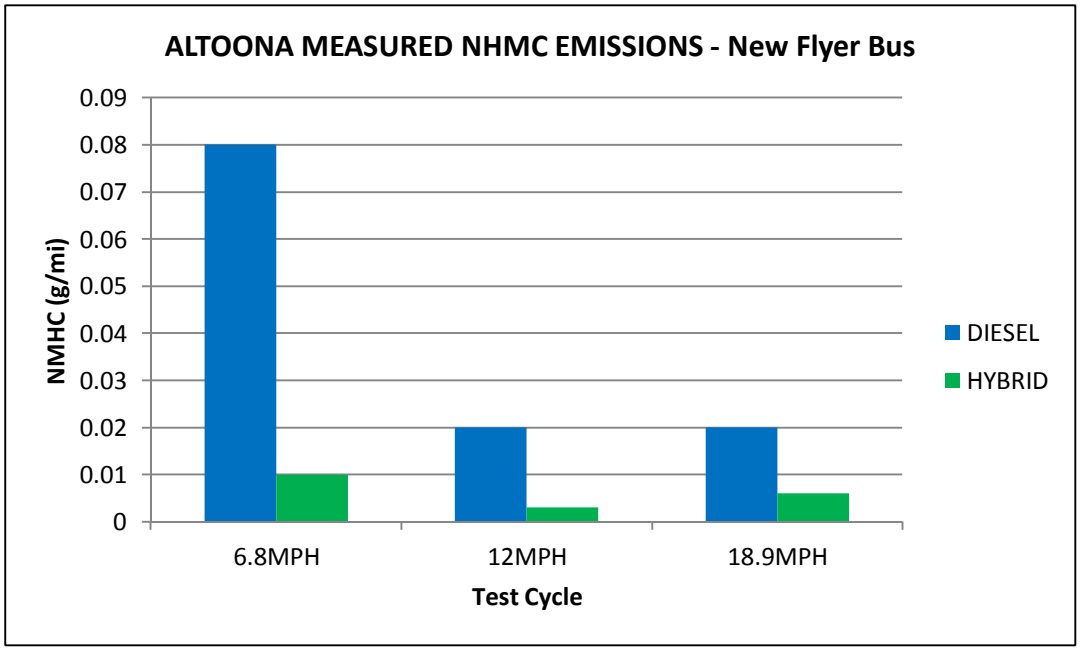
- As of 2003, the Altoona Bus Research and Testing Center did not have a heavy-duty vehicle emissions testing facility and had no prior experience measuring the exhaust emissions of heavy-duty vehicles or engines.

- Moreover, the Federal Transit Administration (FTA) had not established the formal regulations mandating exhaust emissions testing as part of the New Model Bus Testing Program and had not established a formal emissions testing protocol specifying the methodology by which transit vehicle emissions would be measured and reported.

- However, based upon evaluation of emissions measurement methods and feedback from the transit industry an emissions laboratory was installed and commissioned and became operational in January 2010.

- Since then, transit buses submitted for New Model Bus Testing would include emissions testing.

# DIESEL AND DIESEL HYBRID-ELECTRIC COMPARISON




- NMHC (Non-Methane Hydrocarbons) were highest from the diesel bus became comparable to the hybrid bus at higher rated speeds.

- However, NMHC emissions are very low from for both technologies and are well below the EPA standard of 0.66 g/mile.