NEW FLYER

Zero-Emission Buses

NASEO
National Association of State Energy Officials

2016 NASEO Mid-Atlantic Regional Meeting
Williamsburg , VA
June 21, 2016

David Warren
New Flyer of America Inc.
Director of Sustainable Transportation

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New Flyer Industries Inc. – New Flyer and MCI

North America's leading Transit Bus Manufacturer and Parts Supplier

North America's leading Motor Coach Manufacturer and Parts Supplier

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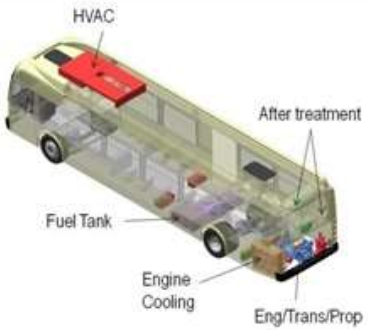
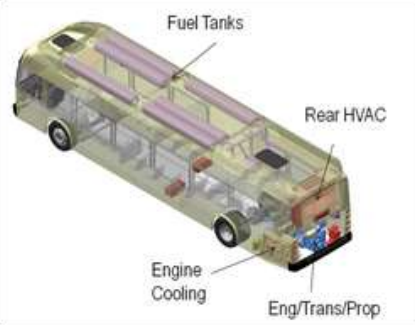
New Flyer is the Market Leader in Propulsion Options

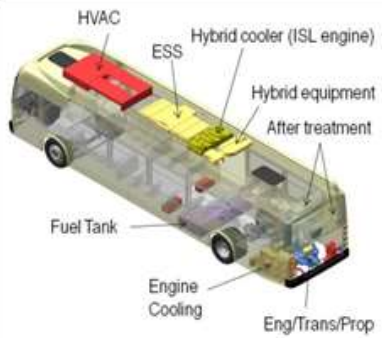
Clean Diesel



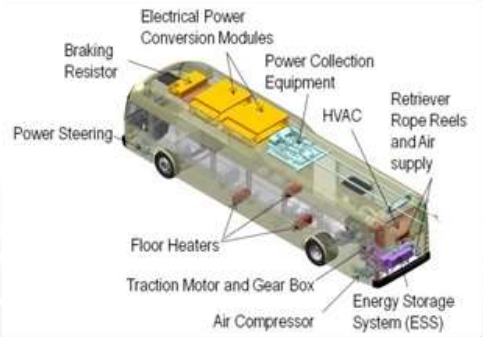
Natural Gas



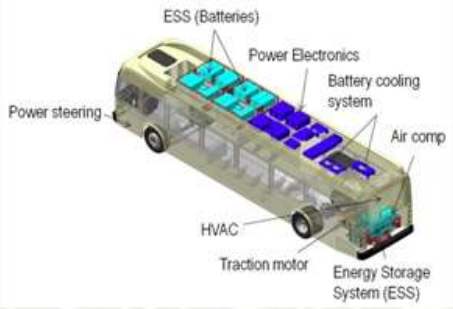
Hybrid-Electric



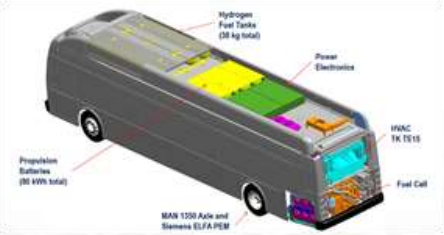
Electric-Trolley



Battery-Electric



Hydrogen Fuel-Cell



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Overview

- Two types of complementary technologies are transforming transit bus propulsion
  - Battery-Electric
  - Fuel Cell (Hydrogen) Electric
- Zero-Emission buses offer many benefits to Universities and Local Communities
- The technology works!

Benefits of Zero-Emission Buses

- Clean
  - Savings of 100-160 tons of greenhouse gas per year compared to a diesel bus
- Fuel Savings
  - Potential savings of up to $400,000 over the 12-year life (for a Battery-Electric Bus depending on regional energy costs)
- Quiet
  - Passengers and Communities will notice a significantly quieter bus – interior and exterior

Zero-Emission Buses Have Higher Initial Purchase Costs

- Battery-Electric Buses are approximately $275,000 to $350,000 above the cost of a clean-diesel bus
- Fuel Cell buses are coming down rapidly in cost
  - 2010 - Approximately $2.0 million
  - 2016 - Approaching $1.2 million
- Government Grants and Incentives are available to offset the higher initial purchase costs
  - Federal Transit Administration Low and Zero Emissions Grant Applications are due May 13, 2016
  - Purchase Incentive Programs available in California, New York State and Chicago

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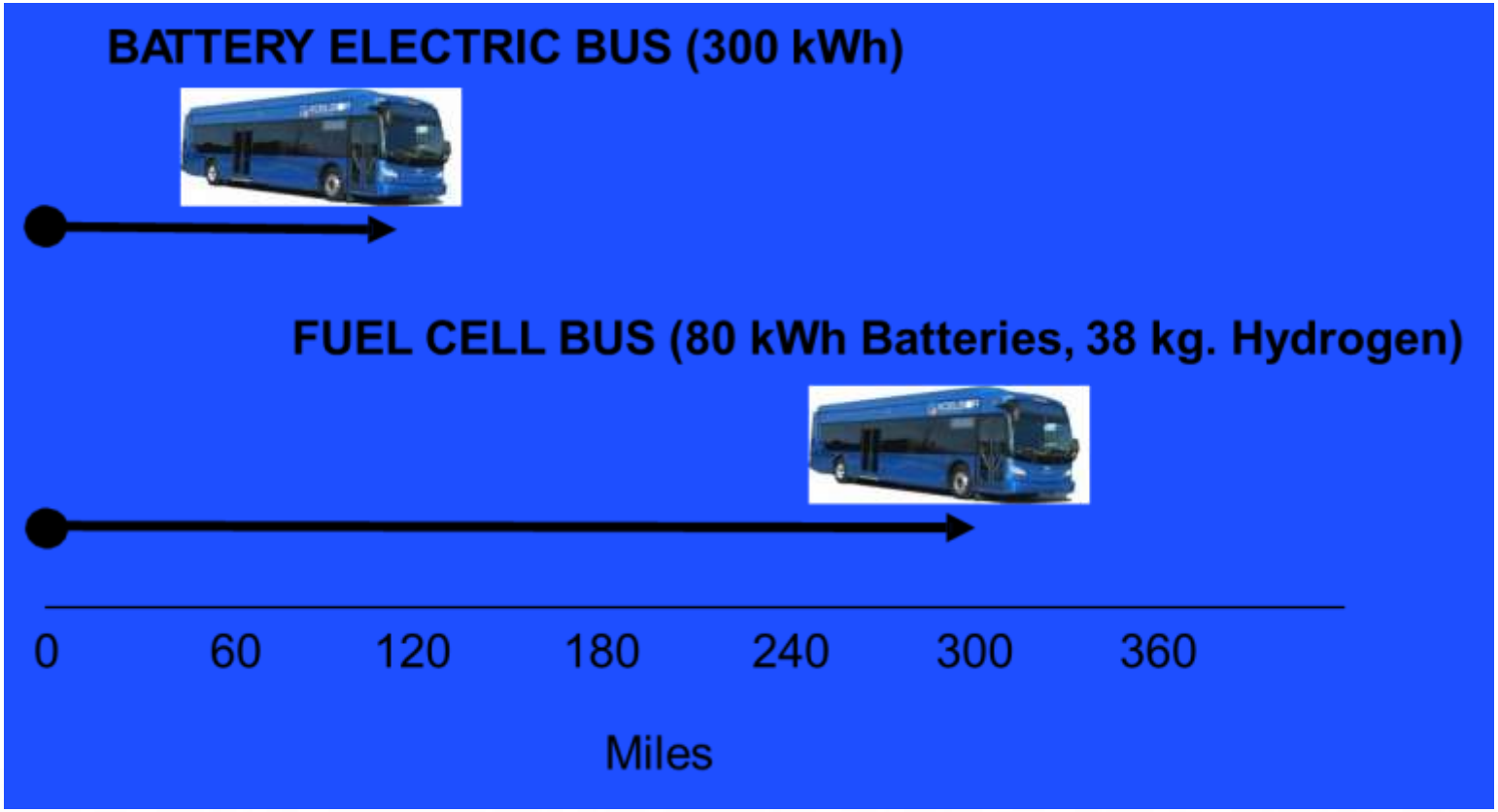
Range of Zero-Emission Buses



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Auto Fuel Cells Will Drive Costs Lower and Help Grow Hydrogen Infrastructure

TOYOTA
Let's Go Places

HYUNDAI

HONDA

Available 2018

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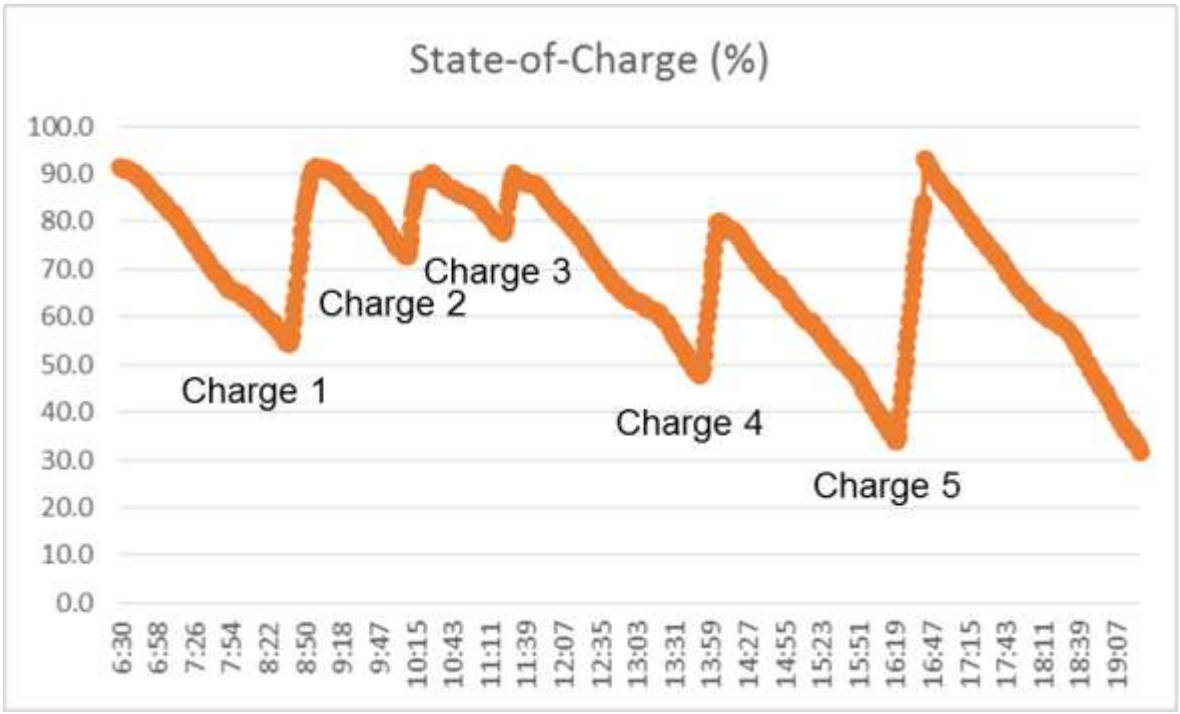
On-Route Charging of a Battery Electric Bus Extends the Range



DATA SHOWN FOR FEBRUARY 5, 2016

Winnipeg Transit Bus 997
Outside Temperature = 12°F
Distance Traveled = 123 miles
Time On-Route = 12.5 hours
Rapid Charging – 5 Opportunity Charges during the day

Rapid Charging

Telematics Tracking``

Battery-Electric Buses Are Successfully Operating Daily

Chicago Tribune

CTA to Buy More Electric Buses

By: Brianna Gurciullo – Contact Reporter

January 22, 2016

"The CTA has operated two 40-foot buses, powered by lithium-ion batteries, on routes across the city since October 2014. The buses have carried 100,000 passengers on 13 routes." "The CTA expects to request proposals from manufacturers later this year. New Flyer Industries Inc., based in Canada with facilities in the United States, made the first two buses used by the CTA".

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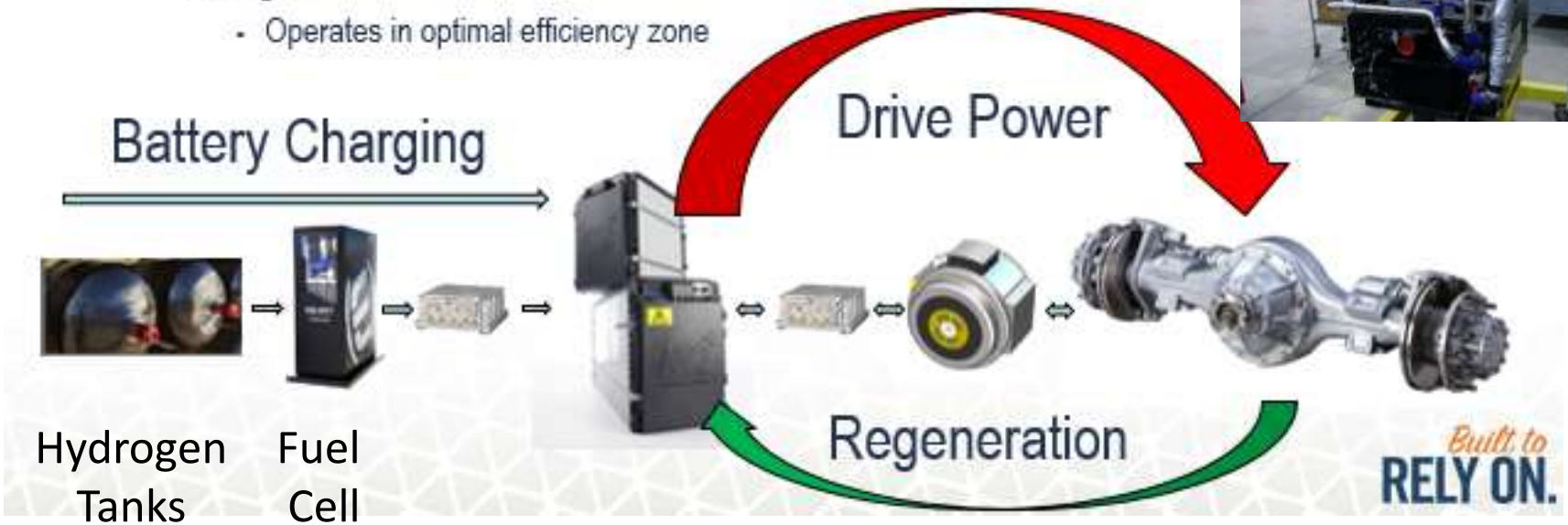
Electric Propulsion for a Zero-Emissions Fuel Cell Bus

- Battery Dominant Hybrid
  - Battery provide bus with short term power and energy
    - Highly efficient +95%
  - Fuel Cell acts like steady-state battery charger
    - Operates in optimal efficiency zone

Hydrogen Tanks

Fuel Cell



North America's First 60 Foot Fuel Cell Bus Debut in April 2016

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Summary

- Battery-Electric buses are here to stay

  They work well!

  - Key challenges are cost (improving), range, peak demand power cost, and charging infrastructure/standards

- Fuel Cell buses are following close behind

  They too will work well!

  - Key challenges are cost (volume related), developing hydrogen infrastructure, and the current cost of hydrogen

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Thank You

For Additional Information

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