



Electric Buses Overview

Board Transportation Committee Meeting
June 30, 2020

Tom Reynolds
Fairfax County Department of Transportation

Electric Vehicles are Not Revolutionary

- Electric-powered transit vehicles in use since 1880s
- Internal combustion engine prevailed in cars/buses
- 1990s to Present: Advances in battery storage & electric drives
- First hybrid cars/buses, now all-electric cars/buses
- Recognized as a technology to help meet environmental goals



Increasing Interest

- Two types of electric buses: Battery & Fuel Cell

Electric Bus Increases*

Year	2017	2019
Existing	76	269
Ordered	56	184

- More cities pledging to have all electric fleets
- Electric buses available from all manufacturers

- Global changes

*“China is adding a London-sized electric bus fleet every five weeks” ***

* APTA’s 2019 Transit Vehicle Database

** World Economic Forum, 4/28/2018



Considering Electric Buses

*“The Zero Emission Bus (ZEB) industry is still maturing; therefore, your transit agency should begin each deployment by researching the current technology options and any available Federal, State and Local resources.” **

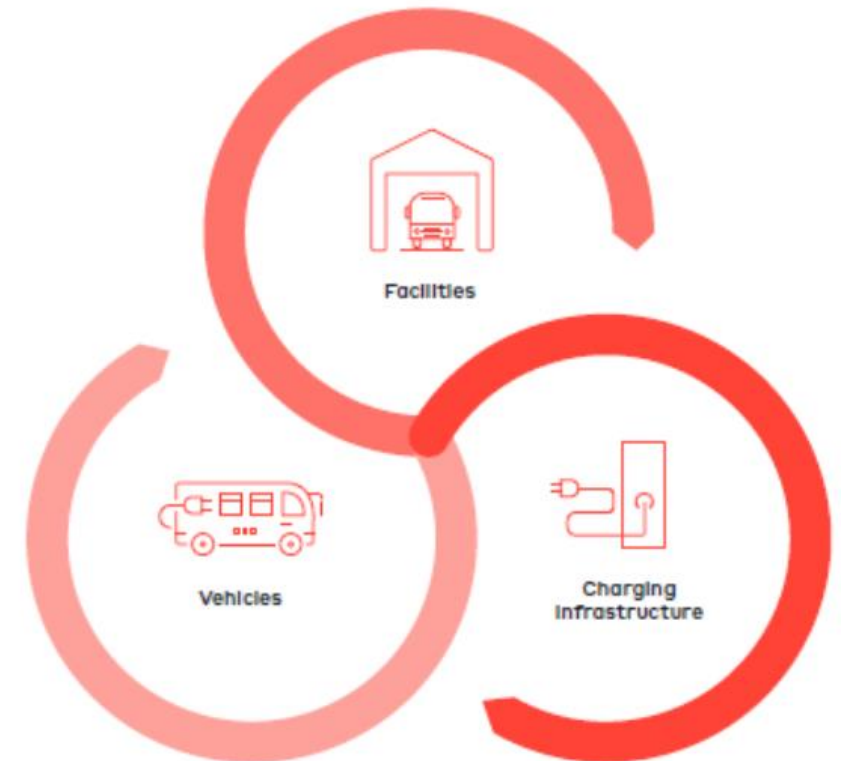
- Before you buy...
- Guidelines for evaluating future use
 - Define commitment and timeline
 - Collect data/information from current users
 - Determine how electric buses fit service needs
 - Identify grants & assistance (government/utilities)
 - Build relationships (utilities/manufacturers)



* Final Guidebook for Developing Zero-Emission Transit Buses, Transit Cooperative Research Program, April 2020

Adapting to a New Vehicle Technology

- Four major areas to look at when adopting a new vehicle technology
- Understand how the technology fits
 - Vehicles: Life-cycle, costs, range
 - Facilities: Storage requirements, safety
 - Fueling: Time, infrastructure costs, environment impacts
 - Operational: Required changes to service or current practices, training requirements, personnel safety



Advantages



- Zero vehicle emissions
- Lower dependency on fossil fuels
- Lower maintenance costs

- Hi-tech appeal
- Smoother & quieter ride
- Addresses global climate change & national energy independence



Challenges

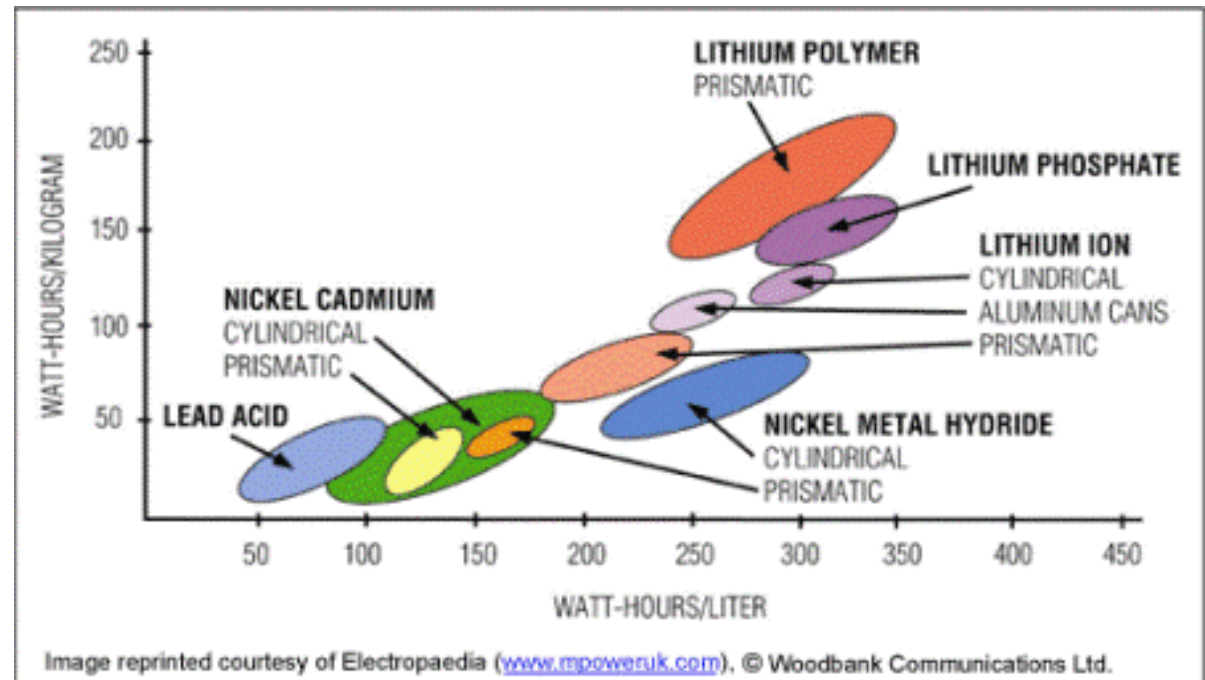
- Vehicle cost
- Limited range (miles/hours)
- Fueling infrastructure
 - Cost of new delivery system
 - Charging times
- New practices/procedures
 - Changes required to operations, maintenance and training

Bus Type	Cost	Range	Fueling
Diesel	\$0.5M – \$0.6M	475 – 525 miles	10 minutes
Diesel Electric Hybrid	\$0.7M – \$0.8M	525 – 600 miles	10 minutes
Electric (Battery)	\$0.9M – \$1.1M	175 – 250 miles	5 – 7 hours



How to Make It Work

- Costs
 - State/Federal subsidies
 - Partner w/utilities (assistance and/or negotiated rates)
- Improving range
 - Efficiencies/Lighter vehicles
 - Better Batteries
 - In-service charging
 - Regenerative braking
- Operational Changes
 - Changing duty-cycles
 - Training personnel



Charging Infrastructure

- Primary charging (parked buses)
 - Easy plug-in by Operator
- In-service charging
 - Short boosts for extended range
 - Strategic placement



- Main infrastructure issues
 - Transformers/Chargers
 - Back-up power
 - Plan for scalability

Electric Buses for Fairfax County

- Pre-existing in-house staff experience
- Current efforts:
 - Richmond Highway Bus Rapid Transit Team report on using electric buses
 - Autonomous vehicle pilot
- Future efforts:
 - FCDOT believes electric buses are the future
 - Looking into funding opportunities
 - Considering FY2022 electric bus purchases





Questions and Discussion

