All Electric Buses for Transit
- Overview and Discussion

** Sierra Club Niagara Group **

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Agenda

- **Why Switch to Electric Buses?**
- **Market & Technology Overview**
- **Funding Alternatives**
- **Potential Challenges for Transit Agencies**

Why Switch to Electric Buses?

- **Buffalo/Niagara Commitment to Sustainability**
  - Western Region Sustainability Plan includes sustainable transportation
- **Cleaner air for community residents**
  - Emissions of PM, NOx and O3 by fossil fuel combustion
  - Contribute to Heart and Lung disease
  - Financial impact of emergency room costs, hospital stays, missed work
- **Energy Security for the United States**
  - Oil imports are at 40%, reduction in demand helps energy security
- **Reduce Greenhouse Gases for the planet**
  - CO2 is at an all time high, Avg earth temperature is at all time high
- **Reduced noise for riders and the community**
- **Total Cost of Ownership (TCO) is Cheaper**

Market Overview – U.S.

Transit Buses – U.S. As of June 1, 2017	Electric Buses Only	All Buses Total	% of Total
Quantity of Buses in Service	201	67,288	.3%
Number of Transit Agencies	35	858	4.1%
Quantity of Buses on Order	370	67,288	.6%
Number of Transit Agencies	48	858	5.6%

The Market for Electric Buses is Small, but Growing Fast
- 5.6% of transit agencies have ordered buses

Source: APTA and EB Start Consulting

Market Overview – by Transit Agency

- **LA Metro – California, letter from Mayor of L.A.**
  - Goal: 100% by 2030 (2,250 buses)
- **Antelope Valley – California**
  - Goal: 100% by 2018 (85 buses)
- **Foothill Transit - California**
  - Goal: 100% by 2030 (360 buses)
- **King County Metro – Seattle**
  - Goal: 120 buses by 2020 (1,400 Total Transit Agency buses including trolleys)
- **SEPTA, Philadelphia - Pennsylvania**
  - 25 buses are on order (1,440 Total Transit Agency buses)
- **Miami-Dade Transit - Florida**
  - RFP for 33 to 75 buses (800 Total Transit Agency buses)

Market Overview – Manufacturers

- **Proterra (U.S.):** Manufacturing in South Carolina, California
- **BYD (China):** Manufacturing in California
- **Complete Coach Works / CCW (U.S.):** Bus Conversions, California
- **New Flyer (Canada):** Manufacturing in the US and Canada
- **Green Power (Canada):** Manufacturing in California

Market Overview – Manufacturers

- **Buses Ranges:** 50 to 350 miles
- **Bus Charging Alternatives:** On route or Depot
- **On route charging:** Fast charge or Top off the range
- **Depot charging:** Full charging, 3 to 7 hours
- **Charging Configuration:** Overhead, Plug-in or Induction
- **Charging Power:** 40 to 350 Kw
- **Bus Length:** 30ft to 60ft, double deck

Source: Manufacturer web site or EB START estimate

Technology Overview – Performance Impacts

- **Bus Routes Impact the Performance of All Buses**
  - Passenger load (weight)
  - Route geography (ex: hills)
  - Bus speed
  - Frequency of stops
- **Battery Characteristics Impact Performance**
  - Ambient temperature (cold days and hot days)
    - Degrades range temporarily
  - Battery age
    - Slow, permanent capacity degradation
  - Charging cycles
    - Can limit battery age

Financial Perspectives - TCO

- **All-Electric Bus: Total Cost of Ownership is less expensive than fossil fuel buses**
  - Initial bus cost is higher (capital budget)
  - Maintenance and Fuel cost (electricity) is cheaper (operating budget)
  - One time infrastructure investments: Charging equipment (capital)

Funding Alternatives

- **What do we want to buy?**
  - **All-electric buses**
    - How many? Which configurations? Cost?
  - **Chargers**
    - How many? Depot? On-route? Cost?
  - **Facilities**
    - Where will the buses be housed? New Depot needed? Cost?
    - Where will the chargers be located?
      - Depot reconfiguration required? Cost?
    - What do we need from the Utility to support the chargers? Cost?
- **What do we need funding for?**
  - **Price difference between electric buses and current buses**
  - **One time cost of chargers including installation**
  - **One time cost of running power to chargers**
  - **Additional facility space and/or reconfiguration if needed**
  - **Possibly buy pilot buses**

Funding Alternatives – Grants

- **NY Truck Voucher Incentive Program - $9M**
  - Reduces capital cost of the all-electric bus
  - Up to $150k per bus
  - First come, first served
- **FTA Low or No Emissions Grant Program - $55M**
  - Very competitive federal program
  - Focus on Low and No Emission buses and supporting facilities
  - Leverage local funding sources
  - 2017 Submission Due Date: June 26, 2017
- **VW Environmental Mitigation Trust Fund - $127M for NY State**
  - Funds are "to be used for mitigation projects to offset the excess air pollution emitted"
  - Can potentially cover transit buses and initial infrastructure investment
  - Many unknowns at this time

Potential Challenges for Transit Agencies

- **Challenge: Changing Technologies is a Business Risk**
  - Transit Agencies provide a service to their customers
  - Businesses try to minimize service risk to their customers
  - Need compelling reasons to take on business risk
    - Cleaner air for community residents
    - Energy Security for the United States
    - Reduce Greenhouse Gases for the planet
    - Lower Total Cost of Ownership
  - **Solution: Education & Training is required**
    - Understand the new technology in depth
  - **Solution: Detailed Planning is needed**
    - To minimize the risk

Potential Challenges for Transit Agencies

- **Challenge: Funding the Cost of the New Technology**
  - One time, up front costs
  - Initial capital cost above the cost of diesel, diesel-hybrid, or CNG buses
  - ➢ **Solution: NY Truck Voucher Incentive Program**
    - ➢ Addresses the additional capital cost for the bus
  - ➢ **Solution: Low No Grant Program, VW Settlement or other grant funding**
    - ➢ Addresses up front costs including facilities
    - ➢ Addresses any remaining additional capital cost for the bus
- **Challenge: Assurance of the Longevity/Durability of Batteries**
  - Transit bus batteries have not been in service long enough to understand how they will function long term, and how long they will last
  - ➢ **Solution: BYD has been in the business for a long time and has a 12 year warranty**
  - ➢ **Solution: Proterra offers a lease alternative that shifts the risk to the manufacturer**
  - ➢ **Solution: Negotiate a contract that meets Transit Agency needs**

Summary

- **The Market for All Electric Transit Buses is Growing**
  - **Still in the early stages**
  - **The technology is fully developed and improving**
- **The Case for Making the Move is Compelling**
  - **Emissions, health, energy independence, planet**
  - **Total Cost of Ownership is lower**
- **Solutions Exist for Many of the Business Challenges**
  - **Financial grants/incentives cover start up costs**
  - **Battery risks can be minimized**
- **Knowledge, Education and Planning are Needed**

Thank You!

Questions?