



Duluth Transit Authority

Alternative Fuel Fleet Transitions

March 8, 2022



DTA ELECTRIC BUS PROGRAM

- The DTA volunteered to be an early adopter of battery electric transit buses to evaluate their performance in Duluth's extreme weather and challenging topography
- With the help of supplemental funds from MN DOT, the DTA purchased seven battery electric buses that went into regular service in October 2018
- 10% of the DTA fleet is now battery electric
- DTA shares its performance data with independent third parties such as the National Renewable Energy Lab ("NREL") and CALSTART for analysis and comparison with other agencies to advance awareness and adoption of alternative fuel technology





PARTNERSHIPS

- Demonstrating good environmental stewardship is a core principle at the DTA
- We are committed to continuing to work with manufacturers and government agencies to evaluate technology enhancements that will ensure that low emission vehicles will succeed in our use profile and climate
- Our experience with the electric buses produced tangible recommendations for manufacturers to improve their performance in our environment
- This effort benefits all transit agencies going forward



SHARING OUR KNOWLEGE

- We often share our experience with other transit agencies on the benefits of battery electric vehicles in their system
- We serve as a resource for questions and host government agencies for tours and discussions when requested
- As we continue to operate these vehicles, the public is assured that alternative fueled vehicles are viable for all types of uses
- We invite you to visit us when you are in Duluth to observe the buses firsthand



FLEET TRANSITION

- Government grant programs are supporting the transition to alternative fuel technology for transit fleet vehicles
- The Federal Transit Administration now requires transit agencies to develop a Zero-Emission Transit Plan to purchase alternative fuel vehicles
- The DTA's transition to alternative fuel vehicles will be dependent upon available funding in the coming years
- As we rely more on electric vehicles, other factors must be addressed such as preparation for a major disaster resulting in an extended power outage



PLANNING FOR FUTURE COSTS

- Costs for battery electric buses are becoming more competitive, but at approximately \$900,000 each, they are still much higher than standard diesel buses that cost approximately \$500,000 each
- On average, the diesel bus lasts about 12 years, battery electric buses may exceed that life, but there are no examples to draw upon yet
- Costs for alternative fueling infrastructure or battery charging is considerable
- Funding for mid-life battery replacement costs are substantial, but they extend the life of the bus significantly



Cost to install the charging infrastructure at the DTA was almost \$300,000.

Our infrastructure is large enough to support up to 20 battery electric buses.

This 500 kW back up generator can only charge a few buses at a time. A larger generator was too costly.

DTA is considering constructing a solar array to generate additional back up power to be stored in the old electric bus batteries when the warranty is up.



CHARGING COSTS

- MN Power has been an exemplary community partner
- Evaluated DTA power needs
- Advocated with MN Public Utilities Commission for a fair and reasonable rate to ensure we can sustain the electric fleet
- Demand charges remain the largest concern among public agencies operating battery electric buses
- Future tax on electric charging could be a challenge



Cost for charging the DTA electric bus fleet:
Oct 2021 \$3,310
Nov 2021 \$3,588
Dec 2021 \$3,218
Total \$10,119

Seven diesel buses operating the same number of miles as the electric buses would have cost the DTA approximately \$10,565 dollars in diesel fuel (at \$3.01 per gallon.)

As diesel fuel prices rise, so does the savings.

ENVIRONMENTAL IMPACTS

Tailpipe emissions reduced to date	
Diesel gallons avoided	55,842
GHG (lbs)	1,281,570
CO2 (lbs)	1,249,741
CO (lbs)	424
NOx (g)	24,459
VOC (g)	2,290
PM2.5 (g)	1,005
PM10 (g)	1,117

Total Greenhouse Gas Reductions (lbs)	
Diesel GHG avoided:*	1,281,570
Grid Emissions for charging electricity:**	887,822
Diesel Heater GHG Emissions:	47,717
Overall GHG emissions reduction (factoring in grid emissions from generation and diesel heater):	346,031

The greenhouse gas emissions reduction to date is equal to:	
Carbon removed from the air by this many tree seedlings grown for 10 years	4,025
Carbon removed from the air by this many acres of U.S. forests in one year	184.7
The weight of this many Proterra buses	12.6

Chart Notes

The first chart shows the tailpipe emissions avoided by use of the electric buses. The middle chart shows the true grid emissions and overall GHG emissions reduction taking into account emissions from the grid. The third chart compares this amount to various other metrics.

Note that these metrics are calculated to the end of the billing period ending during the reporting period (e.g. December 10 in the case of the December 2019 KPI Report.)

*Based on observed MPG in March 2019-February 2020.

**Carbon intensity of Minnesota grid comes from the [U.S. Energy Information Administration](https://www.eia.gov).



DTA STRATEGIC PLAN

- DTA is streamlining routes to provide more frequent service to business districts and popular destinations within our service area
- This type of transit service has been proven to reduce the number of cars on the road
- Transit in high density population areas allows developers to allocate more land to housing and retail instead of parking
- Utilizing electric buses reduces greenhouse gas emissions in densely populated areas
- The electric bus is also much quieter, enhancing the DTA rider experience



MOVING FORWARD

- At the DTA, a well-trained workforce is our highest priority
- As the technology on these buses become more sophisticated, the workforce must be able to adapt to new ways to fix them
- Training programs that attract a new tech-savvy workforce are critical to the future of the industry
- Building resiliency in our public systems, including disaster response, is vital
- Implementing incentives for training, reusing old batteries, reducing greenhouse gas emissions are all positive steps



Questions?

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