Evaluating the Additional of Electric Buses in Bryn Mawr College

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The project's goal is to do a carbon footprint and cost comparison between an electric bus and a conventional diesel bus in order to better inform the decision of changing to an all electric fleet. We will provide background into the advantages and disadvantages of an electric bus fleet and the current bus fleet. We will also look at how our situation fits within the larger context of Pennsylvania and of the United States. Lastly, we will consider Bryn Mawr College's sustainability goals.

The community partner that we worked with is Steve Green, the Director of Transportation at Bryn Mawr College. He provided the team data that would be used for the calculation of the carbon footprint and costs. His knowledge of the blue buses and of electric vehicles proved to be useful in ensuring that we understood the weaknesses and strengths of both options. During our discussion, he brought up factors that we had not initially considered.

For the cost comparison, we categorized the cost of buses into two parts: one-time acquisition cost and long-term operational cost. One-time acquisition cost involves the cost for purchasing the bus and setting up the charging/fueling infrastructure for the bus. We considered the cost for the fast DC charger. For the operational costs, we took into account the charging/fueling costs and the maintenance fees. After researching, we totaled the costs for both buses. After 10 years of usage, the total cost of an electric bus is $190,000 more than that of a diesel bus. However, in 10 years, an electric bus will have a total saving of $87,000 in the operational cost. It is important to note that in acquiring a second electric bus, the college would not have to pay for another charger because one charger can charge more than one bus at the same time. Grants and funding would be the determining factor in the college's decision. If the

college can acquire a grant of more than 190,000, then an electric bus will be the optimal choice. Numerous sources of funding are available on the state and federal level.

In calculating the carbon footprint, we had to determine how much charge a battery can hold, how many miles an electric bus can go on a single charge, how many kWh is used per mile, and the cost of each kWh. Using this information, we calculated the carbon footprint of the electric bus. For the diesel bus, we had to determine the miles per gallon, the miles used per year, and the pounds of CO2 produced from one gallon to find the carbon footprint. The carbon footprint produced by an electric bus after one year of use is around 11,500 lbs compared to diesel's 67,200 lbs. However, since the school purchases RECs, renewable energy credits, for its electricity purchases, then the electric bus's carbon footprint is essentially zero. The addition of an electric bus will help the college attain their sustainability goal of reaching carbon neutrality by 2035.

In considering such a change to the current bus fleet, some concerns must be addressed. First, the higher acquisition cost is significant, but it can be covered either partially or in full through grants and rebate programs. Next, there is the possibility that it may be more difficult to resolve maintenance issues, but there are service centers provided by the manufacturer and other companies that the buses can be sent to. Lastly, there is a risk in adopting this new technology, but the college can benefit from the growing network of support for such changes.

As for the advantages of an electric bus, they include a zero carbon footprint, low operational costs, a longer life expectancy, and a sustainable leadership impact. Our conclusion is based on the calculations made, but we also considered factors such as the health benefits of reduced pollution. We conclude after calculating the cost comparison and carbon footprint that

should the college acquire the amount specified in funding, then the addition of an electric bus would be a sound decision.