A Proposal For a Inductively Charged Wireless Electric Bus System

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Introduction

From melting polar ice caps, to rising sea levels, to mega-droughts, to hurricanes, to heat waves, to abnormal weather patterns which damage crops, climate change is one of the gravest threats to humanity as whole and the world economic system. It is well known that rising CO_2 levels have led to an increase in global temperature which scientists claim may cause "irreversible change" in the near future which we will never be able to undo. In a 2008 paper by Solomon et al. the authors claim that irreversible impacts that could lead to reduced rainfall in dry climate areas already suffering from drought such as California and "dust-bowl like" conditions caused by lack of moisture (1). Drastic changes are necessary to our established model to avoid a global catastrophe.

Gasoline Emissions

Our society creates emissions by relying on production of electrical energy from fossil fuels. One of the most costly, ecologically damaging, and politically destabilizing sources of power is gasoline. Raw crude petroleum oil must be sourced from inaccessible areas such as deserts, oceans, tar sands and other hard to reach areas and transported by tanker or pipeline to a refinery, which by refines the gasoline by fractional distillation and then ships this tiny fraction of refined gasoline to gas stations across the country. The burning of this fuel gives off large quantities of CO2 gas which in turn, heats up the atmosphere through a greenhouse effect. The only way to avoid the toxic effects of this gas is to get off fossil fuels entirely, by replacing gasoline and diesel based methods of transport with electric based alternatives.

Rutgers Energy Challenges

According to Domenick Rizzo, the assistant manager of transportation services at Rutgers Department of Transportation, Rutgers University spends 1.5 million dollars on fuel costs for their student bus system per year (2). The average bus uses 80 gallons of diesel fuel at an average efficiency of 5-6 mpg (2). Forty foot buses average 4 miles per gallon and sixty foot buses 2 miles per gallon (2). The average mileage on all day route is 150 miles (2). According to the EPA, the average CO2 content of one gallon of diesel fuel is 22.2 pounds/gallon (3). Mr. Rizzo indicates that the cost of diesel fuel at the time his department did their study was 4.25$ per gallon (2). In order to acquire the amount of gallons of gasoline used we divide 1.5 million dollars by 4.25 dollars per gallon, equaling about 3.53*10^5 gallons of fuel. The amount of CO2 produced by this fuel is calculated by multiplying the EPA number of 22.2 pounds CO2 per gallon of diesel fuel times the number of gallons used, 3.53*10^5. The result is a whopping 7.8*10^6 pounds of CO2, which is almost 40,000 tons! Thats the weight of fully loaded aircraft carrier!

Primove

Obviously, there is something fundamentally flawed with the current system of energy generation we have in place in the United States today, however, this is not for a lack of viable alternatives. Electric trains and buses and trams as forms of energy efficient public transportation are nothing new, however, they require heavy infrastructural investment due to their reliance on overhead wires or a third rail to provide electricity to their engines, and they are stuck to fixed routes.. Fortunately, a relatively recent but effective alternative to the cost heavy and relatively inflexible electric bus and train system exists. It is called Primove, a system offered by Bombardier (4). The principle behind primove is a wireless inductive charging system which when driven over by a electric bus, charges its battery (4). The system itself is buried

underground at key stops along the buses route, allowing the bus to “refuel” during stops (4). The system could be placed at strategic points such as college avenue, where many bus routes congregate and layover as they wait for passengers.

Implementation

As the system itself consists of merely a inductive loop and the electric bus itself, the system can be installed and up and running in a matter of weeks. This can be done over the summer when demand for transport is lower, or over a winter break. The electric buses may also be slowly phased in order to educate bus drivers on their method of charging. The system itself should have no impact on existing bus schedules as it requires only ten minutes of charging per hour, which is about the average stoppage time at college ave for buses anyway. Moreover, the charging can be staggered to ensure each bus can be charged individually over the hours time. If more charging stations are needed, they can be added along the length of the college avenue stop.

Potential Savings

Besides the aforementioned $1.5 million in fuel costs and the reduction of 40,000 tons of CO2 production a year, the university would save a large amount of money on advertising, as news agencies across America would immediately pick up on the amazing story of the university which reduced its carbon emissions to near zero. The university already produces its own solar power, which ensures that the amount of extra electricity needed to power these vehicles would be negligible. Most importantly, the act of investing in electric power may have a domino effect, pushing universities and institutions across America and the world to clean up their act so to speak. It may also be possible to claim massive tax benefits and writeoffs for the use of green

energy by the university if extra solar panels/wind towers were installed to fully power the vehicles.

Hope for the Future

One of the wisest question anyone can ask is what is the difference between ignorance and apathy. The answer? “I don’t know and I don’t care”. In the same way, we keep putting our heads in the sand about the extremely damaging effects the burning of fossil fuels has on the environment, on health, and on global social, political and economic problems. According to science and without any exaggeration, if we continue down the path we are on, we may see a global catastrophe happen the likes of which hasn’t been seen since the last ice age. Therefore, it is imperative that we begin to consider other options for our energy needs today. As one can see, it is truly unnecessary to persist in using eighteenth century methods of generating energy when today we have such powerful tools at our disposal to remove the use of fossil fuels altogether. Rutgers can lead the charge in this fight against climate change, and against the harm fossil fuels bring to the world. In the process, the university will gain fame, respect, and most importantly, will save millions of dollars in energy savings per year. Additionally, the university will benefit from cleaner water, cleaner air, better health, and the gratitude of the student body for turning its campus green. We must move forward, never backward in our relentless search for a better future, and if a electric bus system can be installed at Rutgers, the future looks truly bright.

References:

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