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**Fueling the Electric Vehicle Movement**

Driving the push for electric cars is the vision of a worldwide fleet of vehicles with no tailpipes and a near pollutant free environment that would naturally arise from such a drastic change in mode of transportation. But where does the electricity come from? When you see an electric vehicle running with no emissions you are just seeing the front end. If all of that energy is produced at coal power plants, then internal combustion engines outperform electric engines regarding amount of pollution per mile driven.1 The decision to adopt electric vehicles should take into account how the electricity of the area where the car will likely be driven is produced, and from there determine if we’re doing the environment any favors.

There exists a “tipping point” of sorts at which electric vehicles become viable. That is, there is a point in electricity production efficiency when electric vehicles become better for the environment than internal combustion engines. To demonstrate this idea, let’s consider two extreme cases: India and Paraguay. India is one of the worst offenders when considering the cleanliness of electricity production. In fact, the country gets about 70% of its electricity from coal.2 Due to this unusually large coal dependence, electric cars in India emit 370 gCO2e/km, well over what the vast majority of internal combustion engines release.Paraguay is on the other end of the spectrum, getting most of its electricity from hydroelectric power plants. Just about all of the emissions from an electric car in Paraguay would come from the manufacturing process, which is significantly more polluting than that of an internal combustion engine (about 30gCO2e/km more polluting). Even with that manufacturing process, however, electric vehicles in Paraguay emit a mere 70gCO2e/km, much more efficient than any existing internal combustion engine.3 Paraguay clearly produces clean enough electricity that it surpasses the tipping point and would benefit greatly from the widespread adoption of electric vehicles. India, on the other hand, is better off sticking with their tradition gas powered vehicles until they can clean up their electricity production.

The United States definitively falls on Paraguay’s side of the tipping point, getting about 40% of its electricity from coal (which is around upper-average).2This doesn’t mean that electric vehicles are the best to use – just better than internal combustion engine vehicles. A recent Carnegie Mellon study has actually demonstrated that Hybrids are the cleanest vehicles in some parts of the country. This is because the United States power grid is made up of sub power grids that get their electricity from different sources, so using electricity in some areas of the country is not as clean as in others.4 This is analogous to how electricity is not as clean in countries that use a lot of coal to produce their electricity, suggesting that the best solution in some countries may not be electricity or gas, but somewhere in between. More specifically, countries near the tipping point likely would find that they can minimize their vehicle fleet pollution by calculating the balance between electricity and gas power would be most efficient for their specific situation. From this, they could design hybrids that match that determined balance or just encourage the adoption of an existing hybrid model that is the best solution.

The emission of greenhouse gases is not the only concern, however. If a country uses nuclear energy to produce a large portion of their electricity, other factors have to be considered. A power plant meltdown could release huge amounts of radiation, endangering all people along the path of the fallout. In fact, this has already happened in the past at the infamous Fukushima power plant disaster.5 In addition to this, there are security issues. For example, in the future nuclear power plants could become the targets of potentially disastrous terrorist attacks. Measures to prevent this should be considered before expanding nuclear energy production. Three quarters of France’s energy already comes from nuclear power.6 How much faith are we willing to put into nuclear power as well as the steps that will be taken to minimize its risks go hand in hand with the proliferation of electric vehicles.

With this knowledge in mind, it is important to take into account not only the likely changes a country’s energy supply will sustain in the future but also the sustainability of those changes. France, for instance, expects to reduce its nuclear energy production share from 75% to 50% by 2025.6 That prediction substantially mitigates the dangers of radiation be released into the environment, but it also raises the question of what will be taking the place of that 25% that will no longer be nuclear energy: greenhouse gas emitting coal, clean hydroelectric power, or another alternative. Changes in sources of energy could easily make or break the viability of electric vehicles in any given country. Even when we think we know how the sources will change, is it safe to extrapolate the expected trends? The truth is we’ll never know for sure, and uncertainty should be taken into account. This uncertainty is particularly evident in countries like Saudi Arabia. With the country’s electricity production putting electric car emissions at 269 gCO2e/km, electric cars are only marginally better for the environment.3 If it was expected that their sources would improve and electric vehicles surged in response, then emissions could get even worse if the energy sources failed to change as predicted by the projected trends. Electric cars that alleviate pollution today could just as easily drive it in the future.

Thus, the adoption of clean energy sources is just as significant as the adoption of emission-free vehicles, as those vehicles only help if they are fed clean energy. We may be working at the wrong end of the transportation process altogether. Instead of paying so much attention to the electric vehicles, it would be more impactful to innovate upon the sources of energy or focus on transitioning to sources we know to be cleaner. Take natural gases, for example. They are by no stretch clean energy sources, but they emit half the carbon dioxide that coal does, so just by trading coal for natural gas we could greatly decrease the release of pollutants.7 Then of course you have the renewables such as hydro, wind, and solar that would bring us very near zero carbon production. The technology exists, we just have to make a stronger push to make clean not just encouraged, but expected. Through public policy, businesses and buildings can be forced to use or produce cleaner sources of energy. This can be seen in the Energy Efficiency Mandates passed in California this past September 12th, which most notably demands “a 50 percent increase in energy efficiency in buildings, and for 50% of the state’s utility power to be derived from renewable energy, all by 2030.”8 Although it may nominally cut into the profits of big businesses, by forcing the transition to better sources of energy electric vehicles can become the mode of transportation many think they inherently are.

Just because you can’t see the pollution being produced doesn’t mean that it doesn’t exist. If you really want to be clean, you have to take into account the process as a whole. Some countries just aren’t ready for electric vehicles. Even in countries that are, it is integral that we determine the prospects that they will continue provide clean enough electricity in the future. The adoption of clean energy sources must be made the priority, and then electric vehicles should follow from and compliment the transition to those sources.

**Sources:**

1. Idea of electric vehicles fueled dirty electricity being worse than internal combustion engine vehicles comes from “Coal-Powered Electric Cars Out-Pollute Fossil Fuels” at <http://bigthink.com/ideafeed/if-powered-by-coal-electric-cars-worse-than-fossil-fuels>
2. Electricity production percentage from coal by country statistics found at <http://data.worldbank.org/indicator/EG.ELC.COAL.ZS>
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