

ENERGY USE AND CO₂ EMISSIONS REDUCTION POTENTIAL USING A ZERO EMISSION VEHICLE

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There is renewed interest in using zero emission vehicles around the world as a viable strategy to minimize the greenhouse gas emissions, thereby mitigating the climate change and to reduce pollutant (i.e., particulate matter, trace metals, carbon monoxide) releases from transportation. In this research, a battery electric vehicle (BEV) (i.e., battery capacity of 24 kWh, 0.116 kWh/km, range for a single full charge as ~136 km) was used to assess the energy use and compare its CO₂-neutral mobility performance in contrast to a standard internal combustion engine vehicle (ICEV) (i.e., fuel economy 17.5 km/L) and a standard hybrid vehicle (SHV) with a fuel economy of 33 km/L. Electricity used by the BEV was recorded during January to August 2019 (i.e., eight months study period). Return distance for a single travel (i.e. home to the Sabaragamuwa university of Sri Lanka or daily traveling distance for work), total distance travel during the study period, and the predicted annual total distance were ~140, 17920 and 26880 km, respectively. The per capita carbon dioxide emissions equivalent (t CO₂e/year) from fuel combustion was calculated to evaluate the emissions. Results indicated that 2384 kWh was consumed by the BEV during the study period, therefore the estimated annual consumed energy was 3456 kWh. The estimated emission by the BEV was 0.245 t CO₂e/year as the used electricity was produced by the non-renewable energy sources in Sri Lanka. The estimated emissions for the ICEV and SHV were 4.034 and 1.755 t CO₂e/year, respectively. Hence, the results showed that a clear greenhouse gas emission reduction by using of BEVs in transportation while reducing impacts to the environment. Future studies are ongoing with considering of life-cycle assessment (LCA) methodology, thereby quantifying the net emissions from an entire life-cycle of the BEV use.

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