Full BEV Battery versus a Full Tank of Gasoline

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Consider a full Internal-Combustion-Engine-Vehicle (ICEV) gasoline tank of **15 gallons**. For a gasoline-gallon mas of 6 lbs, the mass of the gasoline in the tank is **90 lbs**.

Consider a full Battery-Electric-Vehicle (BEV) battery of **100 kWh**. Using Einstein's law that relates energy, E, to mass, m: **$E=mc^2$**, and using conversion of energy to mass: **100 kWh = 8.83×10^{-9} lb**. The mass of an electron in lbs is 2.01×10^{-30} lb, so a 100 kWh battery has a charge of **4.39×10^{21} electrons**.

The ratio of the mass of the gasoline in a 15-gallons gasoline tank to the mass of the energy in a 100-kWh battery is 10.1×10^{9} = 10.1 billion! The extra mass carried by a full 100-kWh BEV is negligible compared to the 90 lbs extra mass carried by a full 15-gallons ICEV.

A **30 mpg ICEV** with a **15-gallons tank** has a range of **450 miles** and a **4 miles/kWh BEV** with a **100-kWh battery** has a range of **400 miles**.

Since a gallon of gasoline when burned releases about 33.7 kWh energy, **30 mpg** is equivalent to **0.890 miles/kWh** and **4 miles/kWh** is equivalent to **135 mpg**. Thus, the BEV/ICEV ratio is 4.5.