The "eGallon"

How much does it cost to drive an EV the same distance you could go on one gallon of gas?

The average American measures the day to day cost of driving by the price of a gallon of gasoline. In other words, as the price of gasoline rises and falls, it sends a clear signal to consumers regarding the cost of driving. Today, drivers of electric vehicles possess no similar metric by which to judge the cost of fuel. To help both current and potential EV drivers better understand the fuel cost of driving an EV, we propose instituting a metric called the "electric gallon" – or "eGallon." The e-gallon represents the cost of driving an electric vehicle (EV) the same distance a gasoline powered vehicle could travel on one (1) gallon of gasoline.

Why do we need an eGallon?

The cost of driving an EV depends on the cost of electricity. Generally, consumers think about the cost of electricity in the context of monthly electricity bills – not kilowatt hours – and it is not intuitive for most consumers to make the jump from the cost of electricity per kilowatt hour, to the mile-per-mile cost of fueling an EV. The "eGallon" does this for them by providing a metric that is easily comparable to the traditional gallon of unleaded fuel – the dominant fuel choice for vehicles in the U.S.

eGallon Methodology

The "eGallon" is measured as an "implicit" cost of a gallon of gasoline. It is calculated by multiplying the average U.S. residential electricity price (EP) by the average comparable passenger car adjusted combined fuel economy (FE) by the average fuel consumption of popular electric vehicles (EC), as follows:

$$eGallon\ (\$/gal) = FE * EC * EP$$

where

FE = the average comparable[1] passenger car adjusted combined fuel economy, miles/gallon

EC = the average electricity consumption (kWh/mi) of the top 5 selling PEVs in the U.S.[2],

and

[1] "Comparable" is defined as those vehicles in the size classes in which EVs are available. For model year 2015, EVs are now available in subcompact, compact, midsize and large classes.

[2] The top 5 EVs that can execute the UDCC drive cycle on pure electricity or the number of EV models that would be required to comprise 80% of said EV sales in the U.S. market for the previous year

EP = the average U.S. electricity price, $/kWh.

For instance, if the average 2015 passenger car adjusted combined fuel economy, mi/gal[3] is 27.9 mi/gal and the average efficiency for the top selling U.S. EV brands in 2015[4] is .326 kWh/mi, the price of an eGallon would be:

*27.9 mi/gal * .326 kWh/mi * .1269 $/kWh*[5] = ***$1.15/gal***

In other words, it costs about $1 to drive an EV the same distance that an ICE vehicle can go on a gallon of gasoline.

As the EV market expands and fuel efficiency of ICE vehicles changes, "eGallon" numbers can be revised to provide consumers with more current information that will help them inform their purchasing and driving decisions.

Helping consumers make smart choices

The "eGallon" will allow consumers to make better choices regarding what vehicles they drive as it succinctly informs them of the delta between gasoline and electric fuel costs. As such, the e-gallon is a valuable tool for communicating one important benefit of electrification: cheap, stable fuel prices.

[3] EPA Light-Duty Automotive Technology, Carbon Dioxide Emissions, and Fuel Economy Trends, October 2014.
[4] This includes Tesla Model S, Nissan Leaf, Chevrolet Volt, BMW i3, and Ford Fusion Energi. . All fuel economy numbers are model year 2015.
[5] Average price of electricity in 2015, according to the Energy Information Administration: https://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_5_3

The following tables describe the assumptions included in the eGallon. Tables 3 and 4 are strictly for illustrative purposes, as the eGallon uses data on electricity and gasoline prices from the Energy Information Administration that is updated weekly.

Table 1. Plug-in Electric Vehicle (PEV) fuel economy.

PEV Model	kWh/100 Miles Combined[1]
Chevrolet Volt	35
Nissan Leaf	30
Tesla Model S	34
BMW i3	27
Ford Fusion Energi	37
Average[2]	32.6

1. Model Year 2015 Fuel Economy Guide. http://www.fueleconomy.gov/feg/pdfs/guides/FEG2015.pdf
2. Average (mean). (35 + 30 + 34 + 27 + 37) / 5 = 32.6 average kWh per 100 miles.

Table 2. Vehicle size class fuel economy.

EPA Size Class	Miles per Gallon Combined[1]
Car[2]	27.9

1. EPA Fuel Economy Trends Report. http://www.epa.gov/otaq/fetrends-complete.htm
2. Car, excluding Car SUVs

Table 3. Weekly Retail Gasoline Price (1/11/2016).

	Weekly Retail Gasoline (Dollars per Gallon, Including Taxes)[1]
Gasoline – All Grades	1.996

1. U.S. Energy Information Administration. Petroleum & Other Liquids. http://www.eia.gov/dnav/pet/pet_pri_gnd_dcus_nus_w.htm 1/11/16. Most recent retail price data available.

Table 4. Average residential retail price of electricity 2015.

Sector	Average Retail Price of Electricity (cents per kilowatt-hour)[1]
Residential	12.69

1. U.S. Energy Information Administration. Electricity Data. http://www.eia.gov/electricity/data.cfm Sales, Revenue & Prices. Retail Price to Customers. Table 5.3. Average Retail Price of Electricity to Ultimate Customers: Total by End-Use Sector (Cents per Kilowatt-hour). Most recent residential price data available.