ENERGY-WORK-POWER

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& New York Times January 22, 2016 by Tom Voelk

Chevy *Volt Impresses With Tech, Design and Driving Pleasure*

INTRODUCTION: The objective of this application is to confirm the very high efficiency of 59 to 62 % for electric cars. $P_{OUTPUT} = W_{OUTPUT}/t$ where output work goes to cars kinetic energy $K = ½ m v^2$.
X = car efficiency = P_{OUTPUT}/P_{INPUT} . Thus,
X $P_{INPUT} = P_{OUTPUT}$, $X P_{INPUT} = ½ m v^2/t$ eq. 1
From the Chevy Web site the weight of Volt is listed as 3543 lb.

HINTS: 60 mph = 88 ft. /s , m = weight/g , g = 32 ft./s^2
1 HP = 550 ft. lb./s.

The second-generation Volt adds refinement and efficiency. It now looks less like a mash-up of the Chevrolet Camaro and a science experiment and more like a Honda Civic. THE concept of the first Chevrolet Volt was simple — drive 40 miles or so on battery power alone and then continue the journey with a **gas-powered generator.** In short, driving to Duluth could be a drop-of-the-hat decision. From Anchorage. Despite its impressive technology, I believe the Voltec powertrain, the official name given to the tech under the skin, never received the praise warranted when it was introduced in 2011. (Full disclosure, I own a Voltec-powered Cadillac ELR.) The more efficient second-generation Volt should right this injustice with assistance from General Motors' design department, as it looks less like a Camaro science experiment mash-up and more like Honda Civic's svelte cousin, albeit with Numbers are dry, but the new Volt's are notable. Starting at $33,995 (before a **$7,500 federal tax credit**) it easily costs $1,000 less than its predecessor and drops some 350 pounds. The government-rated battery range of 53 miles is 25 percent more efficient, rated at **106 miles per gallon equivalent**. It's more fuel-efficient too, **rated at 42 m.p.g.** on standard grade gas. The bulk of this article could be stuffed with details of the all-new Voltec system, from a larger, lighter four-cylinder to dual electric motors using far less rare earth material and a smaller, more powerful lithium-ion battery spanning the car's spine. But the most impressive attribute of the new Volt is this: It looks and operates like a normal car. Luddites could simply plug it in at night (my grandmother did that in northern Minnesota with her Ford LTD during the winter) and, other than its eerie silence, they may never care (or know) that it's a plug-in hybrid. No funky transmission joystick, no fear of being marooned. Chevy even got rid of the cabin's Tomorrowland touch panel for honest-to-goodness buttons and knobs. With **149 horsepower** and 294 pound-feet of torque, the Volt feels fast, reaching 30 miles an hour in about 2.5 seconds. Velocity is less urgent afterward, with 0 to **60 m.p.h. arriving in 8.5 seconds,** half a second faster than the first-generation Volt.. Gifted from the Cadillac ELR, a paddle on the back of the steering wheel activates aggressive power regeneration. **Spent batteries charge in 13 hours on 110-volt current or in 4.5 hours on 220 volts.**.

QUESTIONS: (a) Find mass of car in slugs? , (b) Find Input power (P_{INPUT}) in units of ft. lb./s. ?, (c) Find efficiency X of the volt electric car? Use equation 1 above. (d) How well does the computed value for this electric car efficiency compare to the US Government stated efficiency of this car?

ANSWERS: (a) 110.72 slugs , (b) ~ 81,950 ft. lb./s. , (c) efficiency = X = 0.615 or ~ 61.5 %
(d) At the US Government site (fueleconomy.gov) it is said….."Electric vehicles convert about 59% to 62% of Electric energy from the grid to power at the wheels." Thus, the computed value for the volt's efficiency of 61.5 % is within range of the US Government stated efficiency of electric vehicles. Thus, physics works here. JC