

LESSON 3:

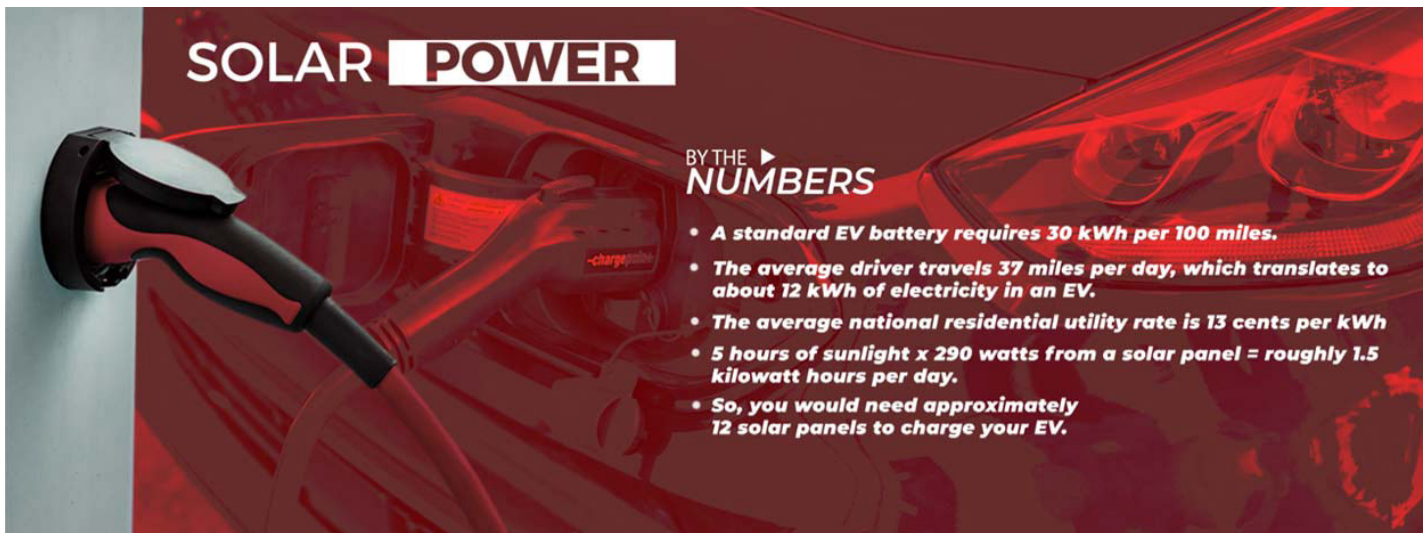
ALTERNATIVE FUEL VEHICLES

NEXT GENERATION SCIENCE STANDARDS

- 4-PS3-3** Make observations to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution.
- 4-PS3-1** Use evidence (e.g., measurements, observations, patterns) to construct an explanation.
- 4-PS3-4** Apply scientific ideas to solve design problems.

Time: 2 50-60 minute class periods

Now that we've established the cost for electricity, let's determine the cost of a trip in an electric car. The video shows a brief description of how to calculate this cost:



SOLAR POWER

BY THE NUMBERS

- A standard EV battery requires 30 kWh per 100 miles.
- The average driver travels 37 miles per day, which translates to about 12 kWh of electricity in an EV.
- The average national residential utility rate is 13 cents per kWh
- 5 hours of sunlight x 290 watts from a solar panel = roughly 1.5 kilowatt hours per day.
- So, you would need approximately 12 solar panels to charge your EV.

As stated, an average EV battery requires about 30 KW·hr per 100 miles, and the cost for electricity is about \$0.13/KW·hr. Give your students the opportunity to apply prior knowledge in order to answer the following questions:

EV Problem

Let's assume that your family drives your EV to your favorite camping spot which is 200 miles round trip. Determine the cost for electricity to power this car.

ANSWER: $(60 \text{ KW}\cdot\text{hr})(\$0.13/\text{KW}\cdot\text{hr}) = \7.80

LESSON 3: ALTERNATIVE FUEL VEHICLES (CONTINUED)

Gas Powered Car Problem

Let's compare this to the cost of a gas powered car. A typical small car gets about 25 miles/gallon and the cost of gas is about \$3.00 per gallon. How much would this cost? Give students the opportunity to figure this out.

ANSWER: $200 \text{ miles} / 25 \text{ miles/gallon} = 8 \text{ gallons of gas}$, $(8 \text{ gallons})(\$3.00/\text{gallon}) = \24.00

Compare and contrast the cost of powering the two vehicles.

This one example shows how electric cars can be cheaper to drive than gas cars and definitely better on the environment. There are several other types of alternative fuel vehicles such as hydrogen, biodiesel, ethanol, natural gas and propane which may have some of the same advantages as the electric car. To meet the challenge given in the video, have students research each of these fuel types and compare and contrast them before coming up with their own design.

After researching each alternative fuel type have students address each of the following:

- A)** Give advantages and disadvantages to each type of fuel source.
- B)** Determine the cost for fuel to take a 200 mile trip with a car powered by each energy source.
- C)** Determine the impact on the environment with each fuel source.
- D)** The video discusses torque in a car. Determine how each fuel source impacts torque.

