The Energy Mix: A Closer Look

Synthesis 30:00m

QUESTION 1

Energy for transportation comes mostly from oil with small amounts of biofuels, natural gas and batteries. Explain how this may change if more vehicles are powered with electricity.

Suggested Response

More of the raw fuel to make electricity, such as coal and natural gas, will be used to produce the electricity for electric vehicles. This may also increase the demand for non-emitting energy sources (nuclear, hydro, solar, and geothermal) to increase production of electricity.

QUESTION 2

How will the growing need for electricity to power transportation affect the availability of fuels for other purposes such as heat and electricity production? What effect will this have on the energy mix?

Suggested Response

The demand for electricity will increase with increasing electric vehicles. Solar and wind growth could help satisfy some of that demand, but more will be needed from coal, natural gas and nuclear as well. The relative demand for oil and natural gas as transportation fuels may decrease in the overall energy mix, but because the number of vehicles globally is still increasing, the need for oil and natural gas in transportation will remain strong. Because electricity demand will increase with more electric vehicles, the cost of electricity could go up as well, if supply cannot meet demand.

QUESTION 3

Natural gas is a very versatile fuel. Describe how it is used for our energy needs of electricity, transportation and heat.

Suggested Response

Natural gas is burned at a power plant to boil water, making steam to turn a turbine and then a generator, becoming electricity. A car or truck motor can be built to burn natural gas in place of gasoline or diesel. Natural gas is also needed for fertilizers, plastics and many other non-transportation and electricity uses.

QUESTION 4

The Energy Mix video identifies nine different sources of energy. Calculate the percentage of these that can be used to generate electricity.

Suggested Response

Eight of the nine can be used for electricity (only biofuels is not identified as being used for electricity generation)
8/9x 100 = 89 %

QUESTION 5

Calculate the percentage of energy sources that can be used to provide transportation.

Suggested Response

Three of the nine are used for directly as fuels in transportation, and 8/9 can make electricity to charge batteries in cars.
3/9x 100 = 33 %

QUESTION 6

Calculate the percentage of energy sources that can be used to generate heat.

Suggested Response

Four of the nine are used for heat
4/9x 100 = 44 %

QUESTION 7

Why do these add up to more than 100%?

Suggested Response

Most fuels are capable of being used for different purposes.

QUESTION 8

When any fossil fuel is burned it produces emissions of carbon dioxide and water vapor. A typical household in a developed country will use approximately 70 kWh per month of electricity for computing and electronics. Each kWh of average coal burned produces 2.23 kg of carbon dioxide emissions while natural gas produces just 0.91 kg per kWh of carbon dioxide.

How many more kg of carbon dioxide are produced by the coal plant compared to the natural gas plant from the computing and electronics alone, from a household over the course of one year?

Suggested Response

Difference in CO_2 emissions: 2.23 kg/kWh - 0.91 kg/kWh = 1.32 kg/kWh

x 70 kWh/month x 12 months/year x 1.32 kg carbon dioxide/1 kWh = 1463 CO_2/year/kWh

Or.
Coal: 2.23 kg/kWh x70 kWh/month x 12 months/year x 1.32 kg carbon dioxide/1 kWh = 2472 kg CO_2/year/kWh
Nat Gas: 0.91 kg/kWh x 70 kWh/month x 12 months/year x 1.32 kg carbon dioxide/1 kWh = 1009 kg CO_2/year/kWh
Difference: 2472-1009 = 1463 kg CO_2/year/kWh