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ASTRONOMY

Earthly energy sources have their origins in the cosmos

Tuesday, June 24, 2008 2:55 AM

By Tom Statler



Gasoline is \$4 a gallon in the United States, and even more expensive in most of the rest of the world. To understand why, we should be following the money.

But since this is the science page, we'll follow the energy instead.

Fossil fuels such as oil are exactly that -- the fossilized, or chemically altered, remains of organisms. Most of Earth's oil started out as ocean plankton. Most of the coal began as plants on dry land.

When you burn wood, you're releasing solar energy that was stored by a tree as chemical energy during its lifetime. The solar energy came from the fusion of hydrogen nuclei, deep in the core of the sun.

It took a million years for that energy to flow up to the solar surface, and eight minutes to travel, at the speed of light, to Earth.

The reason we don't power cars, factories and airplanes by burning wood is that doing so releases a fairly small amount of energy. Fossil fuels have many times more energy packed into each kilogram of material.

That energy-packing happened during millions of years, as the dead material was compressed and heated underground. The work done by the slow crushing of the overlying rock was stored in the chemical bonds of hydrocarbon molecules.

Really, it was Earth itself that did the work, by lifting up a few miles' worth of rock and putting it on top of the dead plants.

The energy came from the planet's deep interior. A tiny fraction is leftover heat from Earth's formation and molten years, but most comes from naturally occurring radioactive elements such as uranium and thorium.

Like the iron in your blood, these elements date to long before the formation of our solar system. They were formed in the cores of massive stars and blasted into interstellar space by supernova explosions at the moment of stellar death.

We are, as Carl Sagan wrote, "star stuff." What's more, we eat it, walk on it, live in it ... and burn it.

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