

Watt's Happening? #135

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The New Energy Revolution



Every year the sun delivers 15,000 times more energy than is consumed by the entire human population. Planet Earth is powered by sunlight, including the weather and everything that lives here. Now, at last, the end of “energy scarcity” is in sight, and the solar revolution has begun.

Renewable energies like solar and wind are revolutionary because they throw away the old paradigm of “scarcity.” If energy falls freely from the sky and blows around us in the wind (which it does) and if we know how to harvest this free energy efficiently (and we do) then energy is plentiful and everywhere, not limited and controlled.

Unlike old-fashioned carbon fuels, renewables are cheap (and getting cheaper quickly), widespread (everybody has some

sunlight and some wind), abundant (every year the sun delivers 15,000 times more energy than is consumed by the entire human population) and they last forever (the sun is expected to keep shining for several more billion years).

Oh, and it’s the cleanest energy too, because nothing is burned to produce it.

OLD ENERGY

Historically energy has been clearly tangible to the human senses. Wood

can be harvested, cut with saws, carried and stacked, and burned to create heat, light, smoke and ash.

We understand gasoline as liquid energy that can be pumped and stored in a tank. We know that a machine using that energy will make noise, emit exhaust, and generate heat, all made possible by a host of complex chemical reactions and an array of interacting mechanical parts.

Energy in the traditional sense, then, is clearly real to our senses: we can see it, hear it, smell

it, taste it, pile it, pump it and burn it. It has been that way for a very, very long time, and we're comfortable with that.

But when billions of people are using old energy like there's no tomorrow, problems arise. Big problems. You've probably heard about them.

NEW ENERGY

Now let's consider sunlight-generated electricity, or photovoltaic (PV) power. Its rapid adoption around the world is encouraged by its many advantages: with no moving parts it requires no maintenance over many decades of use; it emits no polluting exhaust, and uses only sunlight for fuel, which pours freely from the sky.

But how can the thin sheets of metallic crystal in a solar panel actually do anything? While a solar panel is "working" I can't hear it, I can't see anything moving, there is no exhaust, and I do not have to keep pouring a prepared fuel into it to keep it working, nor deal with the usual waste products and never-ending maintenance of many moving parts. Our senses say that solar power just can't be real and practical, and our lifetime of experience seems to confirm it.

Trying to make solar power "real" by explaining it isn't easy either. It took a big brain like Einstein to explain the photoelectric effect. For this he won the 1921 Nobel Prize in physics (surprisingly, not for his theory of relativity).

Nothing is used up in the PV process, and everything happens in the invisible realm of sub-atomic

quantum mechanics, completely beyond our human senses and at the very edge of our understanding. Yet out pours electricity.

EVERYWHERE ENERGY

Planet Earth is powered by sunlight, including our weather and everything that lives here. The amount of solar energy falling upon one acre of the Earth is about 9,400,000 kilowatt-hours per year. Today's PV cells can convert 15 to 20 percent of this energy into electricity, with a theoretical limit of about 50 percent.

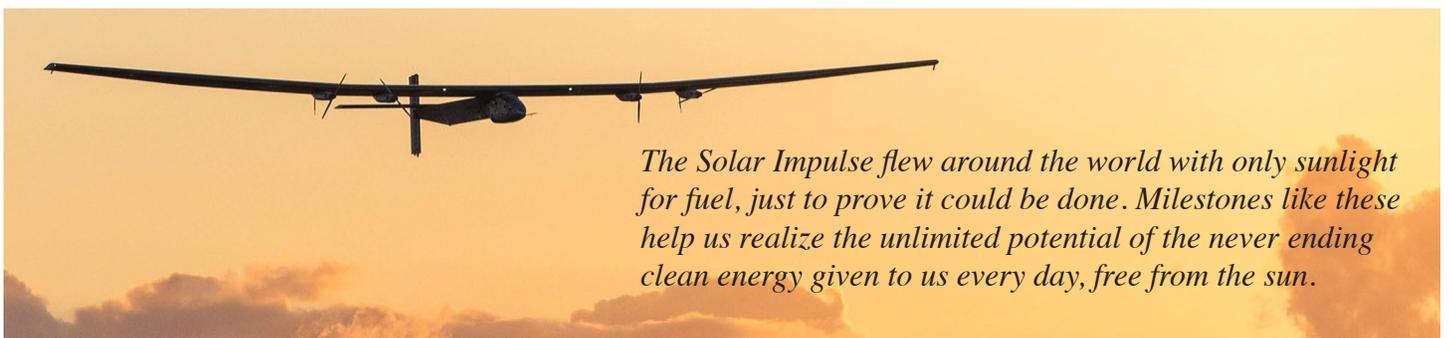
That's a lot of energy "income" for the harvesting.

About a million solar roofs are being installed around the world every year, and the solar ball is just getting rolling. Already there are solar roof tiles, solar walls, solar windows, solar patio tiles and flexible solar panels. Soon, solar power will be invisibly integrated into every surface exposed to light: roofs, walls, windows, roads, sidewalks, cars and trucks, airplanes, even clothing! Solar energy will soon be ubiquitous yet invisible, without apparent source. Always there, always available, always plentiful, like the oxygen in the air we breathe.

At that point we will be living on the Earth's limitless energy income rather than its finite energy capital. It will be "the end of energy" as we know it because energy will be invisible, yet as real and useful as the virtual money in your bank account.

(But probably more plentiful, since sunlight, unlike your bank account, is automatically renewed every day!)

About a million
solar roofs are
installed around
the world every
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begun to roll.



The Solar Impulse flew around the world with only sunlight for fuel, just to prove it could be done. Milestones like these help us realize the unlimited potential of the never ending clean energy given to us every day, free from the sun.