

Are We on the Brink of an Energy Revolution? Can Solar Energy Replace Fossil Fuels?

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In a much-anticipated April 30th, 2015 presentation, Elon Musk, CEO of Tesla Motors and Chairman of SolarCity, predicted that solar energy could supply all US energy needs and much of the world's needs. In other words, the transition from fossil fuels to solar power would be within our reach.

The announcement could not have been better timed. It was revealed, a few days later, that CO₂ in our earth's atmosphere had reached an unprecedented high of 400ppm, significantly beyond the 350ppm considered to be the "point of no return". We might still be saved if we could switch from polluting fossil fuels to clean energy renewables such as solar power.

Musk presented two new batteries for home use, called Powerwalls - 7kWh (Kilowatt hours) and 10kWh, to be used in conjunction with solar panels. Unlike the usual batteries we are used to, the 10kWh battery is a sleek, 6 inch-thick, 3ftx4ft that can be hung on a wall, either indoors or outdoors. It includes a DC to AC converter. Several of these can be hung together, depending on the owner's estimate of back-up needs in case of grid failure. After the solar panels have charged up the batteries, the homeowner can sell the surplus electricity that these panels generate back to the grid.

Although each 10kWh battery costs \$3,500, their purchase can be considered a capital in



vestment in one's home, to be repaid over several years, adding to the value of one's property.

Musk estimated that very little open land would be needed to generate the needed solar energy in the U.S. since, apparently, at least half the rooftops would be viable candidates. In the future, the energy generated by shared rooftop solar panels will undoubtedly be a much-discussed issue.

Musk observed that these batteries, combined with solar panels, would be useful in those regions of the world that are not served by an electrical grid. He compared this situation to the present use of cell phones that completely overtook the need for landlines.

The much larger battery that was presented, the Powerpack (PP), is designed for businesses, industries, even public utilities. It is sized at 1 GWh (gigawatt-hour). An interesting, even critical observation was that the Powerpack is designed to scale infinitely,

meaning that no matter how many of these you combine, their output will be merely additive. There will be no change in the nature of the output.

Musk stated the following:

160 million PP (16,000 GWh) would transition the U.S. to renewables
900 million PP (90,000 GWh) would transition the world to renewables
2 billion PP (200,000 GWh) would transition transport, heating, electricity generation to renewables

GIGAFACTORY1 that is being built in Nevada is designed with the capability to manufacture such batteries. However, to produce the enormous number anticipated, other battery-producing companies will also be needed.

All of us should consider whether these bold initiatives will significantly reduce global warming. For example, electric cars (with

much improved batteries) should be less polluting than our present-day models. However, will they be recharged from non-polluting sources? How will they be manufactured? Admittedly, our present gasoline-powered cars and trucks are terribly inefficient - their internal combustion engines that convert heat energy generated from polluting fossil fuels to mechanical work are no more than 50% efficient. The same drawbacks also apply to our fossil-fuel burning electric power plants. Will the solar panels (including their manufacture) be able to return enough electricity to the local grid to make it significantly less dependent on fossil fuels?

Let's hope that these new batteries will truly usher in a fossil-free renewable energy dependent era. Reducing our ridiculously wasteful use of energy would help!

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