

Monday Missive 2021.09.13 Renewables vs. Replaceables

Hello Everyone,

Scotty to Captain Kirk: "I'm givin ya all the power I can Captain, I've realigned the dilithium crystals and I can only get warp 8.5 out of her. I'm not a miracle worker."

Energy and miracles are our subject today as the Monday Missive goes where many have gone before...green energy.

Over the past several months I have traveled extensively across New Mexico. It is hard not to be struck by how much energy it takes to support our civilization.

Thankfully New Mexico is an energy state.

Beyond the obvious oil and gas industries, it is mind boggling to watch the semi-trucks hauling those massive blades for the wind turbines. And those turbines are springing up like thousands of dandelions after a summer rain.

When flying over our desert, it is startling to see the large solar panel grids that dot the landscape---- sight unseen from the highways.

Then, passing by Trinity Site is reminiscent of our nuclear connection...even though it has been decades since a new nuclear reactor was built in the US.

Waxing philosophic, the history of humanity is the history of energy. And vice-versa. If energy is abundant, civilizations prosper. When energy falters, civilizations retreat.

Fortunately, humanity is good at transitioning from one energy source to another.

We transitioned from wood to coal rather quickly...and just in time to avoid an ecological disaster. Then, just as it was taking too much coal to get the coal, petroleum came on the scene. In almost every way oil was superior to coal.

And now we look to “green energy” or as many like calling it renewable energy.

I believe the name is wrong. Green energy isn't really renewable. It is replaceable.

Let me explain.

The word renew implies something that remakes itself. It renews. (Voila!)

Creating these “renewables” takes an immense amount of metal, minerals, chemicals, and energy. Then, once created, the “renewables” must be maintained. That takes energy.

Then, every 10-30 years, the **replacement part** kicks in. That phase requires mining the planet for lithium, cobalt, copper, aluminum, etc. There isn't much “green” about that.

In addition, since the source of the “green” energy (typically wind or sun) is intermittent, the energy must be stored. Currently, batteries are the preferred choice...though mechanical and chemical storage can also be an option.

The point is---to even make a dent in our energy needs, billions (!) of batteries will be needed to store the electricity. Then, those batteries must be replaced every decade or so. There is some

hope of recycling; but with current technologies, recycling is expensive and difficult. Every step there requires more energy.

Let's just say if we want a seamless transition from hydrocarbons to "green" energy, the scale required to replace our current energy usage with "replaceables" is staggering.

Mark Mills' (Manhattan Institute) wrote an extensive (and well researched) article entitled, "***The New Energy Economy: An Exercise in Magical Thinking***". Here are some excerpts.

- *The annual output of Tesla's Gigafactory, the world's largest battery factory, could store three minutes' worth of annual U.S. electricity demand. It would require 1,000 years of production to make enough batteries for two days' worth of U.S. electricity demand. Meanwhile, 50-100 pounds of materials are mined, moved, and processed for every pound of battery produced.*
- *Solar technologies have improved greatly and will continue to become cheaper and more efficient. But the era of 10-fold gains is over. The physics boundary for silicon photovoltaic (PV) cells, the Shockley-Queisser Limit, is a maximum conversion of 34% of photons into electrons; the best commercial PV technology today exceeds 26%.*
- *Wind power technology has also improved greatly, but here, too, no 10-fold gains are left. The physics boundary for a wind turbine, the Betz Limit, is a maximum capture of 60% of kinetic energy in moving air; commercial turbines today exceed 40%.*

In short, the idea that wind and solar advances will be as "disruptive" as what we have seen in the information-technology sector is not reasonable.

That doesn't mean a great advance in hydrogen or fusion (or some other exotic advancement) isn't out there. We all hope there is. But that great advancement is only rumor mill fodder now. Until that manifests, we could cover the earth with solar panels and wind turbines, and it will not give us the seamless energy transition the new-green-deal crowd promises.

If, however, it is any consolation, humanity's struggle with a reliable energy source will stretch well into the future. Hardly a Star Trek episode went by without Scotty complaining about his fickle dilithium crystals.

**Signed, Your Misses-The-Days-When-"I-Need-Another-Shot"-
Meant-"Pass-The-Tequila" Financial Advisor,**

Greg

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