SOCIETY OF ACTUARIES®

Article from

Risks and Rewards

August 2018
Issue 72

Fossil Fuel Replacement Will Take Longer Than We Think

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Editor's note: This article is a personal opinion only and does not reflect the views of the author's firm or any other organization.

Renewable energy has seen huge growth in recent years, with some sources estimating that wind farms are now the cheapest source of energy[1] and solar becoming more competitive every year. While some people proclaim that the end of fossil fuels is near, this article will argue that fossil fuels will continue to be a substantial part of the energy mix for the foreseeable future.

First, let's look at power generation, which is potentially the easiest place to make a case for renewable energy. Data on electricity generation from the U.S. Energy Information Administration[2] shows that in 2017, about 63 percent of electricity was generated by fossil fuels, split roughly 50/50 between coal and natural gas. The 17 percent of electricity generation due to renewables includes 7.5 percent hydropower, 6.3 percent wind, and about 3 percent other (including solar). Despite the rapid growth in solar (and positive publicity), solar still produces only about as much electricity as biomass (mostly wood). Hydropower is not likely to grow substantially, as many of the most suitable sites are already in use. So to displace fossil fuels, wind and solar will have to expand their share of electricity generation massively, from a combined 7 percent to 8 percent today to 70 percent to 80 percent, assuming nuclear power continues to produce its current 20 percent.

But producing 70 percent to 80 percent of electricity from wind and solar power brings up the need for baseload capacity. What powers the grid at nighttime or when the wind is not blowing? The potential technologies suggested as future solutions to this issue (grid-scale battery storage, fuel cells, hydrogen, pumped storage hydropower, thermal storage using molten salt) are all still experimental, and it is unclear whether any of them will be practically and economically feasible over the intermediate term. Producing electricity from wind/solar may be inexpensive, but it is unclear whether running a reliable electric grid on wind/solar will be.

Second, let's talk about home heating. Roughly 50 percent of homes in the United States are heated with natural gas, with another 10 percent or so heated by fuel oil or propane/liquified petroleum gas (LPG).[3] Presumably a "renewable energy" world would involve heating homes with electricity generated from wind/solar, greater energy efficiency, better insulation, and more use of "passive solar." While it seems likely that we will see newer construction adopt renewable energy approaches more often as costs fall, there is a huge existing housing stock that would require renovation, substantial overhaul and replacement of home mechanicals at great expense to the homeowners. That may happen over time, but it will not be a fast process absent regulation or other substantial government intervention.

Regarding government intervention, there is vocal opposition in the United States to "letting government pick winners and losers." Any substantial push toward mandating renewable energy is likely to be met with well-organized and well-funded lobbying campaigns. It is difficult to see how a mandate requiring homeowners to retrofit their houses to use electric heat at huge expense would ever get any traction. (And if it did, it would likely result in a lot of politicians being voted out and replaced by people who would overturn the mandate.)

Government intervention can impede the adoption of alternative energy to the benefit of well-connected incumbents.

> Too much infrastructure is built around fossil fuels for them to be discarded lightly.

Despite the opposition to letting government pick "winners and losers," incumbent operators are happy to hire lobbyists to gain advantages so they can continue to "win." Electric utility companies have lobbied in recent years to restrict the ability of rooftop solar to hurt their bottom lines, coal operators have lobbied for relaxed treatment of emissions rules from power plants to try to maintain profitability, and oil/gas companies have argued for expanded drilling access. Renewable energy is capable of being hugely disruptive to very well-entrenched, profitable companies' business models, so there will be intense lobbying and efforts to change the rules to maintain fossil fuels companies' advantages and limit the growth of renewables. Renewables' growth may be inevitable over the long run, but it can be delayed and hampered by government actions.

Finally, transportation is an even more difficult issue for renewable energy advocates to address. Roughly 50 percent of a barrel of crude oil eventually turns into gasoline and goes to power automobiles. (An additional 25 percent is refined into diesel fuel.[4]) While numerous articles have chronicled the drop in price of electric vehicles and expressed the view that they will be cost-competitive with gasoline vehicles in a few years, as of 2017, plug-in electric vehicles made up just over 1 percent of the U.S. market.[5] Even if electric vehicles become cost-neutral with gasoline vehicles, it is likely that gasoline vehicle sales will predominate as long as charging is slow, range is limited, and gasoline is cheap. With gasoline, you can get 500 miles of range in less than 5 minutes, and all the necessary infrastructure is already available. Until the electric charging infrastructure is as well-developed as the gasoline infrastructure, electric vehicles will be more the exception than the rule. And that means gasoline will still be around.

Additionally, how far can electric vehicle sales scale up before running into shortages of key battery materials or other technological limitations? There are well over one billion vehicles on the road worldwide, roughly 250 million of which are in the United States.[6] Are they all going to be electric? If so, how much additional electrical generation capacity will be required? Add that to the "power generation" demanded of wind/solar.

And then there is air travel. Jet fuel comprises about 12 percent of the refined yield of a barrel of oil.[7] Even if there were an alternative propulsion source, a huge amount of work, time and expense would still be needed to retrofit engines and planes to use that source. Even if power generation demand and motor vehicle demand for fossil fuels were to go away completely, which seems unlikely, expanded air travel demand is likely to result in substantial fossil fuel usage for the foreseeable future.

In short, renewable energy is very promising, growing fast and becoming more cost-competitive. That said, the economy runs on fossil fuels, is built to run on fossil fuels and is likely to continue to run on fossil fuels for the foreseeable future. Too much infrastructure is built around fossil fuels for them to be discarded lightly, and the cost of migrating existing uses from fossil fuels to renewable energy is likely to delay adoption. On the transportation side, it is hard to see electric cars fully replacing gasoline-powered cars without government intervention (or electric cars becoming not only as inexpensive, but as convenient as gasoline-powered cars), and it is unclear what technology will replace jet fuel. Fossil fuels will be here for a while yet. ■

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ENDNOTES

1 Lazard. 2017. *Lazard's Levelized Cost of Energy Analysis—Version 11.0. http://www.lazard.com*.

2 U.S. Energy Information Administration. 2018. *Frequently Asked Questions—What is U.S. electricity generation by energy source? http://www.eia.gov*.

3 U.S. Department of Energy, Energy Saver. *Home Heating Systems.* Retrieved from *http://www.energy.gov*.

4 U.S. Energy Information Administration. 2017. *Oil: Crude and Petroleum Products Explained*. *http://www.eia.gov*.

5 Environmental and Energy Study Institute. 2017. *Fact Sheet – Plug-in Electric Vehicles (2017). http://www.eesi.org*.

6 International Organization of Motor Vehicle Manufacturers (OICA). *World Vehicles In Use—All Vehicles*, *http://www.oica.net*.

7 U.S. Energy Information Administration. 2017. *Oil: Crude and Petroleum Products Explained*. *http://www.eia.gov*.