

How real is the Green New Deal?

Anthony J. Marolda

A few weeks ago, U.S. Sen. Ed Markey, D-Massachusetts, and Congresswoman Alexandria Ocasio-Cortez, D-New York, introduced a resolution to Congress "Recognizing the duty of the Federal Government to create a Green New Deal." The package is focused on creating a "green economy" that deals with climate change, and simultaneously addresses a range of social issues. More specifically, it calls for a complete transition to clean, renewable energy, along with a host of far-reaching, socialist-inspired economic programs. All within a 10-year period.

There are two primary reasons why the Green New Deal will pass Congress. First, the probable costs to implement such a program are astronomical. Second, and just as problematic, the laws of physics inhibit its enactment. More about that later.

The document is a sprawling set of resolutions to get tough on fossil fuels and to promote racial and economic equity. You may have heard that, if the Green New Deal were implemented, it would result in a ban on travel by airplanes in favor of high-speed rail, and the elimination of gasoline-powered cars in favor of electric-powered vehicles. Another implication would be the elimination of all cattle, because they emit methane, a major greenhouse gas.

The resolution also includes several socialist-like goals for providing all Americans with housing, single-payer health care and "economic security." For example, according to Ocasio-Cortez, everyone would have a guaranteed minimum income paid by the government, even if they were "unwilling to work."

To be clear, this group of specific actions are not expressly included in the wording of the resolution. They came, instead, from the documentation provided by Rep. Ocasio-Cortez on her website. She was trying to explain how the resolution's goals would be achieved in legislation. Her plan received such a mocking reception, however, that she soon took it down.

Instead, the resolution states several national goals to be accomplished during a 10-year mobilization. In that sense, it would be like President Franklin Roosevelt's New Deal ideas that he implemented in the 1930s in order to fight the Great Depression. This level of mobilization, the Green New Deal sponsors said, is necessary to prevent the potential "disaster" of climate change. The top goal, therefore, is to reach net-zero greenhouse gas emissions in 10 years.

The cost of implementing the Green New Deal is hard to estimate at this point. Still, it is obvious that the costs would be enormous. One conservative think tank did an estimate of \$50 trillion to \$90 trillion over 10 years. Or, about \$5 trillion to \$9 trillion per year. This compares to the 2020 total federal government budget of \$4.7 trillion! Larry Kudlow, the president's economic adviser, said "The Green New Deal



Associated Press file photo

In this Feb. 16 photo, Rep. Alexandria Ocasio-Cortez, D-N.Y., delivers her inaugural address following her swearing-in ceremony at the Renaissance School for Musical Theater and Technology in the Bronx borough of New York.

will literally destroy the economy."

There are many aspects of the resolution Republicans find troublesome. One of the most problematic is the goal to "meet 100 percent of the power demand in the United States through clean, renewable, and zero-emission energy sources" in order to get to net-zero greenhouse gas emissions, and do it within the next 10 years. This is where the laws of physics inhibit the implementation of the Green New Deal.

In the U.S. we currently only have about 5 percent of our power coming from solar and wind. So, how could we possibly make the switch to 100 percent renewables in such a short time?

Many of the people behind the Green New Deal believe we are on the cusp of a technology-driven, energy revolution that will replace all hydrocarbon-based sources. They believe that solar and wind technologies are improving at a rate like the rate of change historically achieved by information technology. For example, the capabilities of computers and communication systems grew exponentially over the last fifty years, resulting in dramatic increases in performance, while, at the same time, spectacularly lowering costs.

However, the laws of physics will not allow solar and wind to grow at similar rates in the future. For example, silicon photovoltaic cells, the basis of solar cells, have a physics boundary that results in a maximum of only 34 percent for the conversion of photons into electrons (the Shockley-Queisser limit). We are currently at more than 26 percent in the best commercial products. So, improvements are still possible, but nowhere near the level of the exponential increase talked about by the Green New Deal proponents.

There is a similar physics boundary for wind turbines. The so-called Betz limit shows a maximum capture of only 60 percent of the kinetic energy from moving air. Commercial turbines today are at greater than 40 percent capture. So, again, long-term, exponential increases are not possible in wind technology.

Another technology, not often discussed, but necessary to achieve 100 percent renewable power sources, is energy storage. When the sun doesn't shine and the wind doesn't blow, the solar and wind sources don't produce any power. Today, when that happens, fossil fuel plants are utilized. But, without the hydrocarbon plants, it will be necessary to have some type of energy

storage technology to take over when necessary.

The basic problem is that all the storage technologies now being considered cannot compete with hydrocarbons in terms of energy density. Unlike hydrocarbons, renewable sources are captured dynamically from the sun and wind. Therefore, they cannot be stored and transported as easily as fossil fuels.

For example, one kilogram of crude oil contains almost 50 mega-joules of chemical potential energy. In comparison, considering the physics of advanced lithium batteries, their maximum, theoretical potential is only about 6 percent of crude oil! This would imply that the size of such batteries to store utility amounts of energy would be prohibitively huge.

There are several other types of energy storage technologies, such as electric fields using capacitors, and magnetic fields using superconductors, that have been considered for large scale energy storage. Currently, these technologies are only capable of energy storage of a mere 0.01 mega-joules per kilogram, 20 times less even than the lithium battery, and a tiny fraction of the 50 mega-joules per kilogram of hydrocarbons.

On March 26, Senate Majority Leader Mitch McConnell, scheduled a vote on the Green New Deal resolution. Republicans were against the resolution, saying it proposed "a government takeover of the economy that could bankrupt the nation with an unrealistic goal of obtaining net-zero carbon emissions within 10 years." Four Democrat Senators voted with the Republicans.

But despite all their talk in support of the resolution by the Democratic senators running for president in 2020 -- Harris, Booker, Warren and Gillibrand -- none voted in the affirmative for the resolution. Not even Sen. Markey, who was the sponsor! Instead, they avoided taking a stand and voted "present."

To summarize, the Green New Deal, would be enormously expensive and, because of the laws of physics, is not even remotely practicable or possible over the next ten years. The Senate has unanimously voted it down, 0 to 57. And, since it would probably receive a similar result in the House of Representatives, Speaker Pelosi is unlikely to schedule a vote in her chamber. Therefore, it is safe to say that "The Green Dream," as she once called it, is dead.

Anthony J. Marolda has degrees in physics and is a resident of Annisquam.