Fossil fuels, renewable energy, and electric vehicles

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The transition to an environmentally sustainable economy will take at least a generation, if not a bit longer. And at the end of the journey, we

will not emerge with a pristine planet. The goal is to minimize the damage we humans inflict on the planet; the damage will never be eliminated. There are too many of us and too little planet to eliminate destruction. We need to understand our impacts and reduce them as much as possible. Our principal goal should be to mitigate problems that are global in scale, such as climate change, biodiversity loss, virus transmission and invasive species.

A critical element of the transition is to reduce our use of fossil fuels. Fossil fuels are expensive and environmentally destructive. In the United States, most of our use of fossil fuels is for transportation. Here in New York City, where we have a population density that supports a mass transit system, most of our fossil fuel use is to power our buildings. In any case, when we switch from fossil fuels to renewable energy, we reduce but do not eliminate environmental damage. Current versions of renewable energy such as solar cells and windmills do far less damage to the environment than oil rigs, fracking, and strip mining, but they do damage the environment. Windmills can harm migrating birds, and solar cells require toxic substances to be manufactured. Battery technology currently requires lithium and other rare earth metals, which must be mined. No one should pretend that these technologies are perfect-they're not. Reporting last year in the New York Times, Hiroko Tabuchi and Brad Plumer observed that:

"Like many other batteries, the lithium-ion cells that power most electric vehicles rely on raw materials—like cobalt, lithium and rare earth elements—that have been linked to grave environmental and human rights concerns. Cobalt has been especially problematic. Mining cobalt produces hazardous tailings and slags that can leach into the environment , and studies have found high exposure in nearby communities, especially among children, to cobalt and other metals. Extracting the metals from their ores also requires a process called smelting, which can emit sulfur oxide and other harmful air pollution."

Since most of America's electricity still comes from fossil fuels, electric vehicles charged by that source of energy indirectly generate greenhouse gasses. But as our sources of electricity transition from fossil fuels, the infrastructure of electric vehicles and charging stations will be in place and will facilitate the reduction of greenhouse gasses. The trend toward electric vehicles will stimulate the reduction of greenhouse gasses but not guarantee it.

The critical element will be the development of renewable energy technology that is inexpensive and reliable. The current technologies work but have limits. They also are being subjected to disinformation campaigns fueled in part by Donald Trump's long-standing hatred of windmills. According to a recent NPR segment:

"The spread of misinformation about solar and wind energy is leading some states and counties to restrict or even reject projects. The Energy Department calls it a key threat to decarbonizing the grid."

Decarbonization will take decades, and in the case of large-scale installations like wind farms and solar farms, we will see NIMBY-style opposition to siting. Some of the opposition will be justified because these installations will have a negative impact on a community. The harm caused won't be the nutty stuff articulated by windmill conspiracy theorists, like cancer and other ailments, but these installations will have some negative environmental and community impacts. All economic development projects have negative impacts. The issue is: How do these impacts compare to the positive impacts and, in the case of renewable energy projects, how do they compare to fossil fuel alternatives?

A critical issue in decarbonization will also be the role of the electrical grid itself. Wind and solar farms are alternatives to fossil fuel-fired power plants. With current technology, these new forms of power plants require a great deal of land along with adequate transmission lines. Our

power system and its management are one of the few examples of highly centralized vertical organizational integration remaining in our economy. The growth of supply chains and networks of organizations involved in production is common in many parts of the economy, but not electricity. Enhanced, smaller and lower-priced solar and battery installations could massively disrupt this approach to electricity generation. But any look at our total energy use, its growth and centrality to modern life argues for building as many different sources of renewable energy as possible. We need off-grid and on-grid solutions.

The transition to an environmentally sound economy will be messy and slow. In many respects, the process began a little more than a half-century ago with the establishment of the U.S. Environmental Protection Agency (EPA). EPA's regulatory responsibilities expanded during its first two decades, and many forms of pollution were identified and reduced. Automobiles became more energy-efficient and less polluting. When I returned to New York City in 1981, after a decade living in other places, Manhattan's raw sewage was still being released without treatment into the Hudson River. That ended in 1984 when the North River sewage treatment plant opened. In the last two decades of the 20th century, we identified thousands of toxic waste dumps and worked to ensure that people were not in the pathways of exposure to poison. But even in 2022, many Superfund sites remain to be cleaned, and during intense storms, we still release raw sewage into the Hudson. It's always two steps forward and one step back.

Decarbonization will resemble our efforts at pollution control. We will see progress as we make the problem less bad, but we will not solve the problem. The argument that electric vehicles pollute too much is not persuasive. They pollute less than vehicles powered by the internal combustion engine. That is the only comparison that matters. Moreover, as the technology develops, it will improve. Tesla is already building the capacity to recycle batteries, and as the years pass and more electric

vehicles are put into use, the value of the rare earth minerals in motor vehicle batteries assures that many new vehicles will be built with parts of older batteries.

I am assuming that the global demand for transportation will grow as the developing world develops. I am also assuming that the attraction of mobility will continue in the developed world. Reducing mobility is infeasible and so we need to look for methods of reducing harm. Electric motors will eventually power large trucks and we should see some form of renewable energy powering air travel in the future.

The fossil fuel industry and right-wing attack on renewable energy will probably not extend to electric vehicles. First, the world's motor vehicle manufacturers are as capable as the fossil fuel companies of translating their economic power into political clout. And auto manufacturers are investing many billions of dollars in electric vehicles. These vehicles are technologically superior to vehicles powered by internal combustion engines. They need less maintenance and have already proven their attractiveness in the marketplace. It's hard to lie about EVs on social media when your neighbor has one parked in her driveway. When economies of scale are reached and prices come down, we have every reason to believe electric vehicles will drive gasoline-powered vehicles from the market.

The data indicates that this year will be a pivotal year for the growth of electric vehicles, according to a recent New York Times report by Jack Ewing and Neal E. Boudette:

"Sales of cars powered solely by batteries surged in the United States, Europe and China last year, while deliveries of fossil fuel vehicles were stagnant… Battery-powered cars are having a breakthrough moment and will enter the mainstream this year as automakers begin selling electric versions of one of Americans' favorite vehicle type: pickup trucks

…While electric vehicles still account for a small slice of the market—nearly 9 percent of the new cars sold last year worldwide were electric, up from 2.5 percent in 2019, according to the International Energy Agency—their rapid growth could make 2022 the year when the march of battery-powered cars became unstoppable, erasing any doubt that the internal combustion engine is lurching toward obsolescence."

The focus on electric pickup trucks in the United States is a brilliant strategy for automakers. Displacement of old technologies by new ones can be accelerated when the new technology can do things the old ones can't. In marketing the new pickups, auto companies have featured their extra storage space and shown them powering a home during a blackout. Just as video cassettes were replaced by DVDs and DVDs were replaced by streaming video, once adoption of a new technology begins, it can easily become unstoppable. While electric vehicles are not environmental perfection, they are an environmental improvement. Once again, demonstrating that the solution to environmental problems caused by technology will probably be addressed by new technologies. Now, I'm waiting for my low-cost, apartment-friendly solar power window kit, which enables me to generate and store enough electricity to power my home.

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