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Only Nuclear Energy Can Save the Planet

Do the math on replacing fossil fuels: To move fast enough, the world needs to build lots of reactors

Locals fish on the Vienne River near the nuclear plant in Civaux, France, which began operating in 1999. PHOTO: SIPA/ASSOCIATED PRESS

By Joshua S. Goldstein and Staffan A. Qvist, Jan. 11, 2019 11:57 a.m. ET

Climate scientists tell us that the world must drastically cut its fossil fuel use in the next 30 years to stave off a potentially catastrophic tipping point for the planet. Confronting this challenge is a moral issue, but it's also a math problem—and a big part of the solution has to be nuclear power.

Today, more than 80% of the world's energy comes from fossil fuels, which are used to generate electricity, to heat buildings and to power car and airplane engines. Worse for the planet, the consumption of fossil fuels is growing quickly as poorer countries climb out of poverty and increase their energy use. Improving energy efficiency can reduce some of the burden, but it's not nearly enough to offset growing demand.

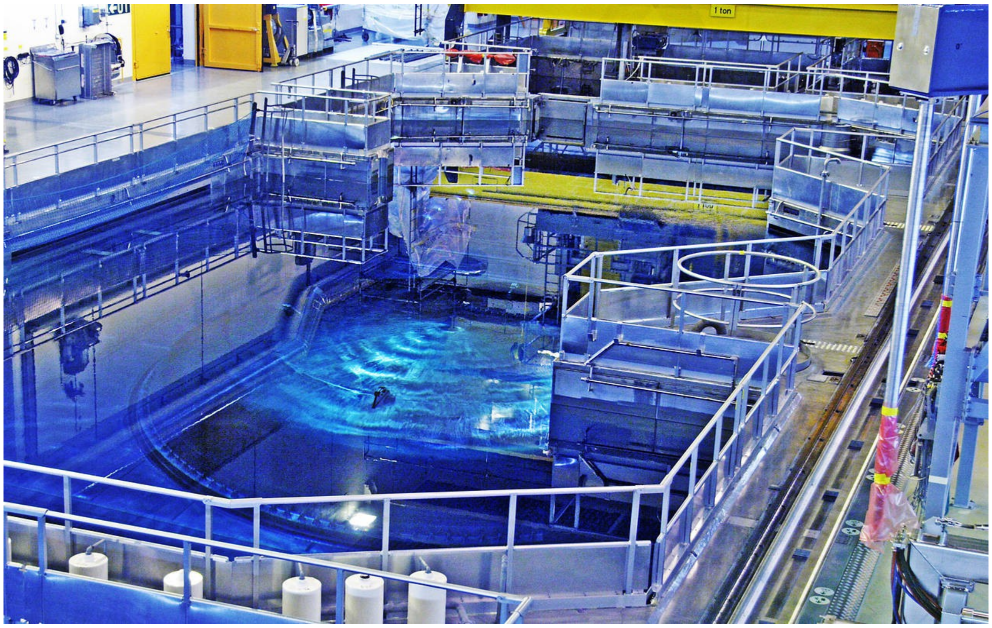
Any serious effort to decarbonize the world economy will require, then, a great deal more clean energy, on the order of 100 trillion kilowatt-hours per year, by our calculations—roughly equivalent to today's entire annual fossil-fuel usage. A key variable is speed. To reach the target within three decades, the world would have to add about 3.3 trillion more kilowatt-hours of clean energy every year.

Solar and wind power alone can't scale up fast enough to generate the vast amounts of electricity that will be needed by midcentury, especially as we convert car engines and the like from fossil fuels to carbon-free energy sources. Even Germany's concerted recent effort to add renewables—the most ambitious national effort so far—was nowhere near fast enough. A global increase in renewables at a rate matching Germany's peak success would add about 0.7 trillion kilowatt-hours of clean electricity every year. That's just over a fifth of the necessary 3.3 trillion annual target.

> Most countries' policies are shaped not by hard facts but by long-standing and widely shared phobias about radiation.

To put it another way, even if the world were as enthusiastic and technically capable as Germany at the height of its renewables buildup—and neither of these is even close to true in the great majority of countries—decarbonizing the world at that rate would take nearly 150 years.

Even if we could develop renewables much faster, huge problems would remain. Although costs have dropped dramatically for solar and wind energy, they are not a direct, reliable replacement for coal and gas. When the sun doesn't shine or the wind doesn't blow, little or no energy is collected. And when nature does cooperate, the energy is sometimes wasted because it can't be stored affordably. Bill Gates, who has invested $1 billion in renewables, notes that "there's no battery technology that's even close to allowing us to take all of our energy from renewables." If substantially expanded, wind, solar and hydropower also would destroy vast tracts of farmland and forest.



Fosmark is one of Sweden’s eight nuclear power reactors. The country repealed a ban on building new ones in 2010. PHOTO: HANS BLOMBERG/HANDOUT/REUTERS

What the world needs is a carbon-free source of electricity that can be ramped up to massive scale very quickly and provide power reliably around the clock, regardless of weather conditions—all without expanding the total acreage devoted to electric generation. Nuclear power meets all of those requirements.

When Sweden and France built nuclear reactors to replace fossil fuel in the 1970s and 1980s, they were able to add new electricity production relative to their GDPs at five times Germany’s speed for renewables. Sweden’s carbon emissions dropped in half even as its electricity production doubled. Electricity prices in nuclear-powered France today are 55% of those in Germany.

So why isn’t everyone who is concerned about climate change getting behind nuclear power? Why isn’t the nuclear power industry in the U.S. and the world expanding to meet the rising demand for clean electricity? The key reason is that most countries’ policies are shaped not by hard facts but by long-standing and widely shared phobias about radiation.

Nuclear power is the safest form of energy by far, especially compared with coal, which continues to cause hundreds of thousands of premature deaths a year from air pollution in addition to contributing to climate change.

> Reasons put forward to oppose nuclear power in no way stack up to the real dangers facing humanity from climate change.

Over six decades, nuclear power has experienced only one fatal accident, Chernobyl in 1986, which directly caused about 60 deaths and is blamed for thousands more over time from low-level radiation. That's a serious accident, but other nonnuclear industrial accidents have been worse. A hydroelectric dam failure in China in 1975 killed tens of thousands, and the 1984 Bhopal gas leak at a Union Carbide plant in India killed 4,000 initially and an estimated 15,000 more over time. We don't stigmatize those entire industries as a result.

The 1979 accident at Three Mile Island killed no one. In Japan in 2011, the fourth largest earthquake in recorded history and a 50-foot tsunami together took almost 20,000 lives—and damaged the Fukushima nuclear facility, which leaked radiation. Exposure during the incident contributed to one worker's 2016 death, according to the Japanese government; the badly handled evacuation of the area, by contrast, is blamed for much hardship and many deaths.

Nuclear power is regulated as though any amount of radiation is extremely dangerous. Yet we all walk around in a soup of background radiation, giving us an average of about 3 millisieverts (mSv) per year but ranging up to 200 in some places, with no demonstrated harm. The occupational and medical recommendations are to stay below 50 per year. At Fukushima, only 12 individuals at the plant received more than 200 mSv, and nobody outside the plant exceeded 50. It's possible to measure and track very low levels of radiation, but those levels are harmless.

Nor is nuclear waste the insurmountable problem that the public has been led to believe. The volumes are tiny, unlike the vast quantities of equally toxic waste from coal and other fuels. An American's entire lifetime of electricity use powered by nuclear energy would produce an amount of long-term waste that fits in a soda can. All spent fuel from U.S. reactors over the past 60 years would fit on a football field, stacked 20 feet high.

Today we store spent fuel at reactor sites in concrete casks (radiation does not escape the concrete) that will be safe for a hundred years. After that, the waste can be burned in reactors that are currently being designed, or it can be buried permanently.

All the reasons put forward to oppose nuclear power amount to over-hyped fears that in no way stack up to the real dangers facing humanity from climate change.

Nuclear power, if scaled up in a way that has already been shown possible, would easily compete on price with fuels that pollute far more. South Korea, which has built 10 of its reactors based on the same design, already produces nuclear power at or below fossil-fuel prices. Recent American and European efforts to build first-of-a-kind reactor designs in a hyper-regulated environment have led to large cost overruns and delays. But in the coming years, the world can build reactors centrally, at factories or shipyards, using standardized designs, and achieve costs below other fuels. We can create hundreds of reactors per year world-wide and meet the world's enormous need for clean energy.

It is a win-win strategy, giving humanity its only viable path to stop a climate catastrophe while providing poorer countries with the energy they need to grow. It's the only strategy that adds up.

—This essay is adapted from the authors' new book, "A Bright Future: How Some Countries Have Solved Climate Change and the Rest Can Follow," published by PublicAffairs. Mr. Goldstein is a professor emeritus of international relations at American University; Mr. Qvist is an energy engineer and consultant.

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