NUCLEAR POWER AND CLIMATE: WHY NUKES CAN'T SAVE THE PLANET

TOO MANY REACTORS, NOT ENOUGH CARBON REDUCTIONS

Major studies (from MIT, Commission on Energy Policy, and International Atomic Energy Agency, for example) agree that about 1,500-2,000 large new atomic reactors would have to be built worldwide for nuclear power to make any meaningful dent in greenhouse emissions (less than 400 reactors now operate globally). If all of these reactors were used to replace coal plants, carbon emissions would drop by about 20% worldwide. If used entirely as new capacity instead of sustainable technologies like wind power, solar power, energy efficiency, etc., carbon emissions actually would *increase*.

TOO MUCH MONEY

Construction of 1,500 new reactors would cost trillions of dollars. New reactors cost some $7 billion to $15 billion each. Use of resources of this magnitude would make it impossible to also implement more effective means of addressing global warming. Energy efficiency improvements, for example, are some seven times more effective at reducing greenhouse gases, per dollar spent, than nuclear power.

TOO MUCH TIME

Construction of 1,500 new reactors would mean opening a new reactor about once every two weeks, beginning today, for the next 60 years—an impossible schedule and even then too late to achieve necessary carbon reductions. The world's nuclear reactor manufacturers currently are capable of building less than half that amount. Since reactors take 6-10 years to build (some U.S. reactors that began operation in the 1990s took more than 20 years), a nuclear climate plan is already years behind schedule and would fall farther behind. Addressing the climate crisis cannot wait for nuclear power.

NEW REACTOR DESIGNS: TOO SLOW, NO DEMAND

Some otherwise knowledgeable climate scientists advocate using new, supposedly safer, reactor designs as a climate solution. These untested designs, such as the IFR (Integral Fast Reactor), PBMR (Pebble Bed Modular Reactor), thorium reactors and others, including "small modular reactors, won't help either. The designs—all of which have been around for decades—exist only on paper and it would take decades to bring them to commercial operation. To achieve even that would require utilities to want to build them, but none do. Their costs would be even higher than current reactor designs—one reason utilities aren't interested. Safety-wise, the designs are unproven and would require extensive and time-consuming testing before the federal Nuclear Regulatory Commission could license them. Waiting for such reactors to materialize would forestall much faster and cheaper climate solutions.

TOO MUCH WASTE

Operation of 1,500 or more new reactors would create the need for a new Yucca Mountain-sized radioactive waste dump somewhere in the world every 3-4 years. Yucca Mountain was under study for nearly 20 years and was dropped by President Obama as a non-viable waste solution. International efforts to site radioactive waste facilities are similarly behind schedule and face substantial public opposition. For this reason, the U.S. and other countries are attempting to increase reprocessing of nuclear fuel as a waste management tool—a dangerous and failed technology that increases nuclear proliferation risks.

TOO LITTLE SAFETY

Odds of a major nuclear disaster are said to be on the order of 1 in 10,000 reactor-years, but experience shows accidents occur even more frequently. Operation of some 1,500 reactors could result in a Fukushima-scale nuclear accident every five years—a price the world is not likely to be willing to pay. And more reactors means more potential terrorist targets.

TOO MUCH BOMB-MAKING MATERIALS

Operation of 1,500 or more new reactors would require a dozen or more new uranium enrichment

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plants, and would result in the production of thousands of tons of plutonium (each reactor produces about 500 pounds of plutonium per year), posing untenable nuclear proliferation threats.

NUKES ARE NOT CARBON-FREE

While atomic reactors themselves are not major emitters of greenhouse gases, the nuclear fuel chain produces significant greenhouse emissions. Besides reactor operation, the chain includes uranium mining, milling, processing, enrichment, fuel fabrication, and long-term radioactive waste storage, all of which are essential components of nuclear power. At each of these steps, transport, construction and operation of nuclear facilities results in greenhouse gas emissions.

Taken together, the fuel chain greenhouse emissions are more than double solar power emissions and some six times higher than wind power—not to mention emissions-free energy efficiency technologies.

NOT SUITED FOR WARMING CLIMATES

Unlike solar power, nuclear power does not work well in warming climates. Reactors require vast quantities of water to keep their cores and steam condensers cool; changes in water levels, and even water temperatures, can greatly affect reactor operations. Reactors in the U.S. and elsewhere have been forced to close during heat waves, when they're needed the most. Ever-stronger storms, like Hurricane Sandy, also threaten to inundate both coastal and inland reactors. More frequent and more powerful tornados, ice storms and related loss-of-power accidents, and other indicators of climate change also imperil reactors. The Fukushima accident was caused primarily by loss-of-power, not damage from the earthquake/tsunami. Rising sea levels threaten coastal reactors with flooding even without mega-storms.

WHAT WE *CAN* DO: A NUCLEAR-FREE, CARBON-FREE FUTURE

Most people don't realize just how fast clean renewable energy is growing nor how low its costs are plummeting. Just a few years ago, solar and wind power weren't competitive with either nuclear power or fossil fuels. Now, both are usually cheaper than the polluting power choices.

Increasingly, it is both feasible and economical for homeowners to install their own solar power plants on their rooftops—a new solar rooftop system is installed in the U.S. every four minutes, a number that will reach every 90 seconds during 2016.

Smart grids, distributed generation and other 21st century technologies enable the large-scale use of renewables despite their intermittent nature. On one day in May 2014, 74% of Germany's power was provided by renewables, a level skeptics said could never be reached.

And advances in battery and other electricity storage technologies mean that both rooftop solar and larger-scale renewable power plants increasingly and affordably provide power 24/7—just like the behemoth nuclear and coal "baseload" power plants of the 20th century.

Investing our resources in clean energy—renewables and energy efficiency--gives us much more bang for the buck: instead of a 20% reduction in carbon emissions with nuclear power, we can get a 100% reduction—and that's a goal worth working for. Numerous studies show conclusively that a nuclear-free, carbon-free energy system is both attainable and affordable before mid-century. The technology is not the issue; only political will stands in the way.

Our choice is stark: we can choose nuclear power, or we can address global warming. We can't do both. Fortunately, the choice is an easy one.
--*Michael Mariotte, June 2014*

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