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ENERGY

Rethinking the Nuclear Economy

by Lillian Dong

Nuclear energy stands at a crossroads -- its proponents must prove that it is not only safe and reliable, but also that it is economically viable over the long term. Finland's nuclear program is among the top in the world.

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The State of Nuclear Energy

After the 2011 nuclear disaster at Fukushima, Germany and many other countries reacted by pledging to phase out their own nuclear programs. But this reaction may have been premature; drawing direct comparisons between the Fukushima disaster and potential hazards in other countries can be difficult, as Fukushima's particular geological

conditions are unique. Unlike Japan – which is a region of immense tectonic activity – most of the countries that have pledged solidarity are located in zones that have nowhere near Japan's level of seismic dynamism. It would appear that the recent decline in nuclear power isn't simply a response to this singular event: it is instead indicative of a much longer and more globalized aversion to nuclear power, amplified by the devastation of 2011. Given recent events, nuclear energy stands at a crossroads – its proponents must prove not only that it is safe and reliable, but also that it is economically viable.

A Worthwhile Investment?

Despite the negative trend, there are still organizations and countries that believe in the viability of nuclear energy, and continue to invest heavily. Finland is ranked tenth in the world for the largest proportion of nuclear energy to total energy consumed. Finland derives 34.6% of its total energy from nuclear power plants, the remainder being largely derived from natural gases and Russian petroleum. It has four current nuclear reactors and is in the process of building a fifth, named Olkiluoto 3. Olkiluoto 3, located at Olkiluoto Plant on a south-west island off Finland's coast, has met with numerous production delays. Though the reactor was projected to be completed in 2009, contractors now expect construction to be complete in 2018. It has also quickly surpassed its original budget. Issues surrounding Olkiluoto 3's construction have impeded production of the country's next nuclear construction, Olkiluoto 4, and provided anti-nuclear protest groups more material to build their cases.

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So why do countries like Finland and Britain think nuclear power plants are a worthwhile investment? Proponents argue that nuclear low long-term operating costs despite the steep initial investment. Critics of this argument note that overall nuclear plant lifetime costs, assuming perfect conditions and an average lifespan of forty years, still provide no

economic incentive over traditional carbon means. In addition, nuclear energy has often required government subsidies and subsequent intervention in order to remain feasible. One particular method of intervention is *carbon taxing.*

Incentivizing Nuclear

Nuclear plants are able to bypass carbon taxes as they are not designated as carbon-producing, allowing them to profit from these trade-off privileges. Finland was the first country to pass a carbon tax in the 1990s, providing a direct benefit to their nuclear power plants. They also joined the European Union Emissions Trading System (EU ETS), aimed to reduce carbon through emissions taxes, in 2008. A scathing report of the first phase of the EU ETS (2005-2012) by UBS – and numerous other critical pieces – revealed that the program has been highly ineffective in its early years, particularly by over-allocating carbon emissions breaks. It has spent nearly $287 billion for little-to-no impact on carbon. As a result, there is little incentive for the EU to continue issuing carbon emission taxes without proof of their environmental impact and hence, little reason to continue providing tax breaks for nuclear plants.

Supporters of ETS argue that the failure of its first phase was comparable to an expensive initial investment and that it will lay the groundwork for future carbon reductions, as well as encourage the growth of the nuclear industry. Olkiuoto 3 is an example of the innovation of nuclear technology: it is one of the first European Pressurized Reactors (EPR), which differ from past reactors in that they use enhanced safety measures in order to guarantee an almost-zero chance of a nuclear disaster, longer life-span, and more efficient production with a â€œ20% savings on operation and maintenance costs thanks to EPRTM's high capacity and availability. Though the new technology has been identified as the main factor in Olkiluoto 3's delay, supporters argue that the wait is worth it as it will decrease waste and increase production in years to come. Additionally, new, theoretical nuclear technology in the form of Small Modular Reactors (SMR), is being researched: SMR's, as the name suggests, use smaller reactors that are capable of nuclear cogeneration – capturing the heat given off during reactor processes for reuse, instead of treating it as waste.

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Moving Forward

In spite of these advancements, nuclear technology still appears like a temporary solution to the problem of energy as it faces increasing scrutiny and decreasing investment. Olkiluoto 3's delay demonstrates the difficulty in constructing EPR and SMR technology. This isn't to demonize nuclear energy entirely: Finland's debilitated economy is able to keep its market afloat and stave off dependence on Russia through the production of its reactors and the town of Olkiluoto, near where Olkiluoto 3 is being constructed, has economically benefited from production. Finland's reactors have helped the country's residents reverse a three-year recession and unemployment slump.

For now, emerging technology suggests that nuclear power plants could see a glimmer of economic viability on the horizon, if their construction could be more efficient. There are even **well-funded research projects exploring the potential of nuclear fusion**, the elusive relative of the fission processes that power existing nuclear plants. But because of many existing biases, global focus may shift toward the development of other forms of renewable energy. Wind and solar power have much lower construction costs than nuclear plants, and have proven to reduce carbon emissions to a similar degree. They also have a better public image and greater ease of experimentation due to their economic viability and practicality.

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