Whatever happened to the nuclear renaissance?

Despite numerous setbacks and challenges, some argue the nuclear renaissance is far from dead.

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Early in the 21st century, the term "nuclear renaissance" entered our lexicon. The future of nuclear power looked brighter than ever in the West, as fossil fuel prices rose and concern over global warming grew in the public's consciousness.

Riding the wave of new-found enthusiasm for nuclear power, plans were made to deploy new units in Europe and in the United States using a new generation of nuclear reactor designs like Areva's EPR design and Westinghouse's AP1000. In Europe, construction of the first EPR began in 2005 at Olkiluoto in Finland, followed in 2007 by another EPR unit at Flamanville in France. In the United States, two AP1000 units commenced limited construction at Plant Vogtle (Georgia) in 2009 and two more AP1000 units entered the construction stage in 2013 at the V.C. Summer plant (South Carolina). In the UK, starting in 2008, potential new build projects were identified at sites in Somerset, Wylfa, Moorside, Oldbury, and Bradwell.

Fast forward to 2017, and none of the plants mentioned above has generated a single kilowatt of power. Olkiluoto 3 should have entered service in 2009, but it is now projected to be on line sometime towards the end of 2018, a staggering 13 years after construction started and bearing an eye-watering price of €8.5 billion -- a cost overrun of €5.3 billion.

Likewise, Flamanville 3 is now expected to start operations by the end of 2018, six years late and at least €7 billion over budget, assuming technical issues with metallurgy are sorted out.

In the United States, the owners of the V. C. Summer plant have abandoned the project after sinking about $9 billion into it, and the Vogtle units are struggling with cost and schedule overruns. In the UK, the project in Somerset – Hinkley Point C – is the farthest along, with some initial ground works under way, and a planned operating date between 2025 and 2027.

Despite the fact that the majority (255 of 449 worldwide) operating nuclear power plants are located in North America and the European Union, in some Western countries, such as Germany and Austria, anti-nuclear activism has kept public support for nuclear low for some time, with anti-nuclear sentiments exacerbated by the Fukushima Daiichi incident in Japan. Switzerland has announced that it is phasing out its nuclear programme, and even long-time nuclear supporter France has recently announced that it will be reducing its reliance on nuclear energy.

Making things even more difficult for those countries with plans to pursue new nuclear, Austria has vowed to fight any new nuclear projects anywhere in the European Union, and has challenged the state aid granted to the Hinkley Point C project in the UK. Although nuclear is the only source of low emission baseload power, governments in the West have limited their financial support to renewables, putting nuclear on an uneven playing field.

So is it safe to say the nuclear renaissance is dead? Not by a long shot. The nuclear renaissance is alive and well, but its epicentre has shifted eastward. In countries like India, China, and the United Arab Emirates, nuclear power has been embraced as the clean energy of the future. Russia is steadily constructing reactors domestically, while also establishing itself as a leading supplier of nuclear technologies and services.

For rapidly growing economies, nuclear provides reliable baseload energy to power quickly growing industries. China since the early 1990s has invested into importing nuclear technologies, as well as developing its indigenous nuclear industry. The country now wants to reap the benefits of this investment and has stated its intention to become a leading nuclear reactor exporter, offering Chinese designs with innovative and advanced design features as well as manufacturing and construction support for Western designs like the EPR and the AP1000.

India, on the other hand, has relied, since 1974, on its domestic industry after it was banned from the global nuclear community post a nuclear weapon test. Since it was recently re-admitted to that community, India is seeking to benefit from an ability to import foreign technologies, equipment and technical support to grow its already impressive industry. South Korea has been developing its nuclear expertise for decades, and its designs are a development of technology originally imported from the United States via a technology sharing agreement with Combustion Engineering, a US company that later was acquired by Westinghouse.

So is the East moving ahead of the West in the nuclear power race? Many indicators would say yes. New nuclear construction is surging in the East. Of the more than 50 reactors under construction today, the vast majority are being deployed in the East, including 20 in China, seven in Russia, five in India and four in the UAE. Further, China plans to quintuple its nuclear capacity to 150 GWe by 2030, while India seeks to add 17 GW of nuclear by 2024. In addition, the UAE is well on its way to completing a four-unit project at Barakah; Turkey has just kicked off the construction of its first plant at Akkuyu; and countries in the MENA region, such as Egypt, Jordan and Saudi Arabia are in advanced planning stages for new nuclear.

Zabielski: new nuclear construction is surging in the East

Recent and ongoing nuclear new build projects have given countries like China, Russia, and Korea – which has added over 5 GW of nuclear capacity domestically in the past six years and is building the Barakah project in the UAE – valuable nuclear construction experience, much of which has been lost in the West due to more than three decades of no new nuclear development. In addition, China has pursued an aggressive localisation programme, boosting its reactor design, manufacturing, engineering and construction capabilities to make it increasingly independent from the West in pursuing nuclear growth domestically and developing nuclear export capabilities.

The fundamental difference between the East and the West when it comes to nuclear power is largely one of will. In China, high energy demand growth and record air pollution are such great concerns that the country is deploying all available clean energy sources to address these concerns. In India, where GDP grew an impressive 7.1 per cent in 2016 alone, additional baseload capacity is desperately needed to power the country's rapidly expanding industrial base and burgeoning population. In the UAE and Saudi Arabia, both countries rich in energy resources, the governments realised that every barrel of oil they burned to generate electricity was one less barrel available to export. These governments all made a very conscious and thoughtful decision to pursue nuclear power and its many benefits.

The West, on the other hand, has for the most part ignored the important climatic benefits of nuclear energy. In the US, subsidised solar and wind energy, combined with the abundance of cheap (but greenhouse gas emitting) natural gas have forced less economical single-unit nuclear plants to prematurely shut down. Germany, in a knee-jerk reaction to the Fukushima Daiichi incident, decided to phase out its nuclear programme with little consideration of the long-term climactic impacts.

So has the East beaten the West? Not yet – thanks to the UK. From a nuclear power development perspective, the one shining light in the West is the UK, where the government has taken climate change very seriously and has recognised the advantages of carbon-free baseload generation that can operate 24/7. The UK has extended the same contract-for-difference scheme used to ensure the viability of wind and solar projects to nuclear new build. This scheme recognises the environmental benefits of carbon-free power, and provides the developer with a guaranteed price for the electricity generated.

The UK government's Education & Skills Funding Agency has also recognised the need for skilled nuclear workers, and has developed nuclear apprenticeship programmes. In the 2015 Spending Review, the UK government committed to invest in a nuclear research and development programme as part of its wider energy innovation initiative, which by 2021 will reach over £400 million ($542 million) per year.

In November 2016, a £20 million programme was launched that supports innovation in the civil nuclear sector across several major areas, including advanced nuclear fuels, research on next-gen reactor technology, nuclear materials, and advanced manufacturing methods, including small modular reactors (SMRs). The Department for Business, Energy & Industrial Strategy has also created a competition to identify the best value SMR design for the UK. In a nutshell, the UK is poised to become a major powerhouse in the global nuclear renaissance – if it keeps its political resolve.

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Teplinsky: the nuclear renaissance is alive and well, but its epicentre has shifted