

Energy Transition: Nuclear's Path Is Diverging In Developed And Developing Nations

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Editor's Note: This report is one in a five-part series providing insights on developments in the energy transition.

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Key Takeaways

- China plans to double the share of nuclear in its power mix by 2035 to almost 10% of generation output, whereas in the U.S. and Europe the share of nuclear power will likely reduce to 15% by then from close to 20%, according to S&P Global Commodity Insights (Platts).
- The gas and power crisis in Europe has increased the focus on security of energy supply, possibly leading to greater support for nuclear; while in the U.S., various states have contemplated incentives to extend the lifespan of nuclear plants to support the reliability of the power grid.
- From a credit perspective, S&P Global Ratings generally views new nuclear investments as high risk, not only because of uncertain returns when new builds are exposed to long-term market power prices, but also high construction risks and difficult-to-quantify nuclear asset-retirement obligations.
- We think private investors and operators will remain generally averse to taking on such risks, unless they are mitigated by explicit state backing and/or regulatory or contractual support mechanisms.

Energy security has again risen to the top of Europe's priorities in the face of rising gas and energy prices following Russia's invasion of Ukraine and the EU's pledge to reduce reliance on Russian gas. The European Parliament has just approved the labelling of nuclear as green under the EU Taxonomy, underlining the view of certain countries that nuclear should be part of the response to decarbonization and security of supply.

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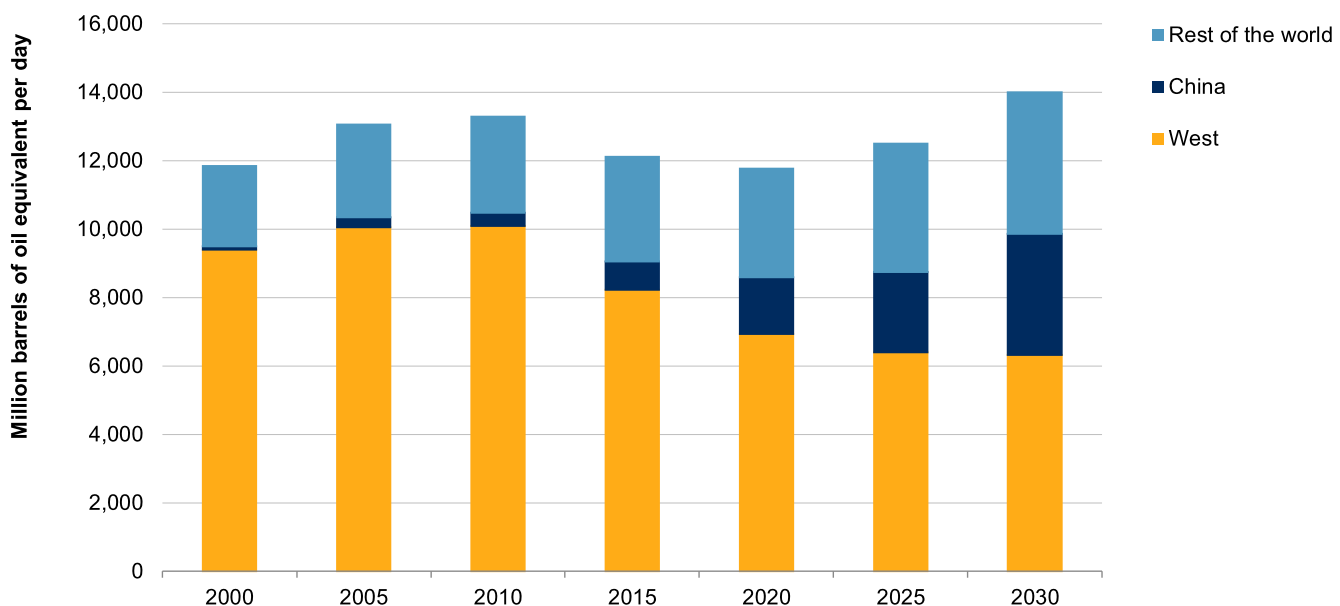
Energy Transition: Nuclear's Path Is Diverging In Developed And Developing Nations

Yet, in the near term, nuclear generation in the EU is set to decline, notably given Germany's plan to close nuclear power plants by year-end 2022 and lower nuclear availability in France because of technical issues. Similarly, nuclear generation in the U.S. is trending down, with the focus on extending plants' lifespans rather than on costly and risky new nuclear projects.

In contrast, China's nuclear capacity should reach 105 gigawatts (GW) by 2035, surpassing both the U.S. (92 GW by 2030) and Western Europe (76 GW). The current proportion of nuclear generation in developed countries (60%) versus that in developing countries (40%) is likely to reverse over the next two decades (see chart 1).

Chart 1

Share Of Nuclear In Global Primary Energy Generation



Source: S&P Global Commodity Insights - Global Integrated Energy Model
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Nuclear To Decline In Europe And The U.S. But Ramp-Up In China

Once Germany completes its plan to exit nuclear by year-end 2022 and further plants in Belgium are closed, S&P Global Commodity Insights (Platts) expects some stabilization of nuclear power output after 2025 in Western Europe. This is in view of one new build in France and one in the U.K., Belgium's recent plans to extend the operation of two reactors to 2035, and France's announcement that it would keep most of the remaining plants online into the next decade. In the U.S., some state and regulatory support is emerging to keep nuclear plants operating longer. Blackouts due to extreme weather in the U.S., for instance, have demonstrated the importance of firm power and a diverse power mix.

Still, the share of nuclear generation in Europe and the U.S. is decreasing, and will most likely

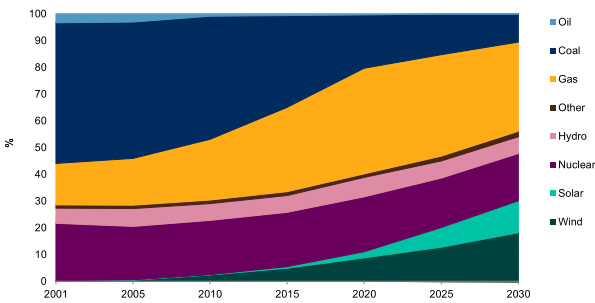
Energy Transition: Nuclear's Path Is Diverging In Developed And Developing Nations

reach about 15% of power generation by 2035 after close to 20% in 2020, according to S&P Global Commodity Insights (Platts)' reference scenario. Apart from policy reasons and the prioritization of renewables growth, another reason for this is that few nuclear new builds are being contemplated given their high costs and risks, notably for private investors and shareholders.

In contrast, we do not expect China, the developing nation that most expands its fleet, to waver from its nuclear power ambition any more than it has so far. China's 14th five-year plan (2021-2025) implies 70 GW of operational units by 2025 (up from 55.7 GW currently), which could rise to 145 GW by 2035. Hence the share of nuclear is forecast to double to close to 10% of China's power mix by 2035. Most of China's nuclear generation and new-build projects are executed by state-owned enterprises, which also explains the different momentum.

Chart 2

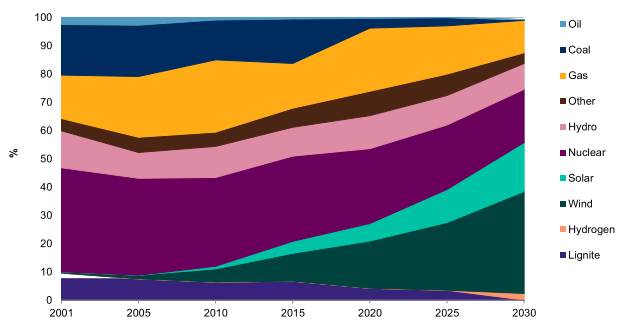
U.S. Power Mix



Source: S&P Global Commodity Insights, North America Electricity Long-Term Forecast, May 2022
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Chart 3

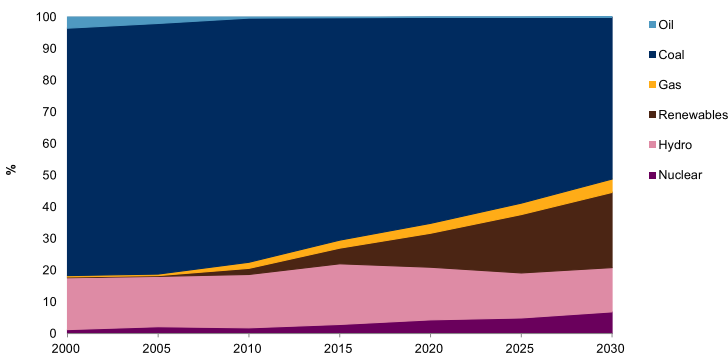
Western Europe's Power Mix



CCUS—Carbon capture, usage, and storage. Source: S&P Global Commodity Insights, European Electricity Long-Term Forecast, June 2022
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Chart 4

China's Power Mix



Source: S&P Global Commodity Insights - Global Integrated Energy Model
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Nuclear Is Still An Important Zero-Carbon, Firm Power Source

Nuclear generation is one of the least carbon-intensive ways to produce power, and given the urgency to reduce emissions, it features in several countries' energy transition plans. For instance, 1 GW of power from nuclear generation instead of from gas-fired combined cycle plants could help save close to 3 million tonnes of carbon dioxide emissions per year (or almost double that amount when compared with coal plants).

Also, even if the rollout of renewables were to become the primary means to decarbonize the power industry, power supply from renewables remains intermittent, requiring dispatchable backup sources. However, despite nuclear's advantage in generating base load power, it may not be a good candidate for use only to bridge gaps left by intermittent renewables power. This is because some nuclear plant fleets lack flexibility, while in other cases, like EDF's in France, they do not consistently operate at full planned capacity.

Without Direct State Backing Or A Contractual Framework, New Builds Entail Significant Credit Risk

Financial considerations remain an additional hurdle for nuclear power besides concerns about safety and nuclear waste management. Given the elevated costs of building a nuclear plant, which can be as high as \$10,000 per kilowatt (/kW) of installed capacity, the focus in Europe and the U.S. is on legacy fleet preservation. In China, however, new builds not only benefit from much lower capital costs, which we estimate at about \$2,500/kW, but are facilitated by indigenous technology, integrated supply chains, and access to cheap financing, since the nuclear industry is run by state-owned enterprises.

S&P Global Ratings believes that, without visibility through long-term fixed-price mechanisms or regulation, building and operating nuclear plants on a merchant basis entails significant credit risk. This is because of the very high upfront capital costs and construction risks, combined with rising interest rates and increasingly volatile long-term power prices. What's more, the rising share of renewable generation and its low marginal production costs will likely undermine long-term power prices in Western Europe, according to S&P Global Commodity Insights (Platts)'s forecasts. Direct state involvement or financial and policy support is therefore a key determinant of the future of nuclear in our view. Generally, private investors and operators appear to be averse to taking on construction risks linked to nuclear new builds unless these risks are strongly mitigated by explicit state backing and/or regulatory or contractual support mechanisms.

Some Policy Support For New Projects Or Lifespan Extensions Is Building

In this respect, the U.K. government has committed to a long-term contract for difference for Hinkley Point C, with a guaranteed price of £92.50 per megawatt hour (MWh) over a 35-year period. The U.K.'s additional, potential Sizewell C project should benefit from a more extensive regulated asset base framework, with regulated revenue during construction and significant risk-transfer mechanisms. Despite this more beneficial framework, S&P Global Commodity Insights (Platts) sees significant challenges for the U.K. in achieving its 24 GW target by 2050.

France has announced its intention to revise previous plans to reduce the share of nuclear generation to 50% by 2035 from over 70%, but this is not yet part of its energy policy. Consequently, we expect France's current nuclear capacity of just over 60 GW to remain flat through 2030. We understand that France is planning to commission new nuclear reactors by 2035 to offset the closures of plants. The funding and revenue framework of such new

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investments will however be key, since the balance sheet of national integrated power utility EDF has become strained. Furthermore, we expect the possible price re-regulation of EDF's existing nuclear plants to remain a topic of discussion with the European Commission. The near-term hurdle for EDF, however, is how to address major outages at its nuclear fleet and improve the operational reliability of aging plants.

In the U.S., a 2021 bipartisan infrastructure bill includes the Department of Energy granting nuclear plants at risk of closure \$6 billion over five years to keep them operating. California has asked whether two nuclear units could qualify for the grant, even though it has prioritized the growth of renewables. Six other U.S. states have stepped in to provide financial support or other assistance to as many as 20 at-risk nuclear reactors, representing almost 20 GW (21% of total U.S. nuclear capacity). State subsidies can involve zero-emission credits or power purchase agreements, and have typically totaled up to \$100 million per year for each reactor. At the federal level, a proposed tax provision (section 136109) contemplates the granting of a production tax credit of up to \$15 per MWh to existing nuclear power plants through the end of 2026.

China's nuclear power industry is in a new development phase compared with Europe and the U.S. The fleets are much newer than in the rest of the world, averaging nine years, with newer technology and better operating efficiency, thanks to the expertise and indigenous technology developed over the past three decades. Nuclear power will likely continue its stable development in China because it is an essential low-cost solution to decarbonize the economy, particularly in coastal provinces. Policy has remained consistent to ensure there is sufficient remuneration of capital invested by the three state-owned nuclear power generation companies (a new one was approved recently). This is important to fostering sufficient new builds at a pace that ultimately outstrips power demand growth.

This report does not constitute a rating action.

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