WHITE & CASE

Why managing dispute risks in NPP projects is important

Understanding dispute risks inherent in all new nuclear power plant projects could go a long way in helping all involved to manage these disputes when they arise

Why managing dispute risks in NPP projects is important

When it comes to building a nuclear power plant, it's a case of how soon—not if—a dispute will arise. Partners **Andrew McDougall**, **Daniel Garton**, **Richard Hill**, **Kirsten Odynski** and **Dipen Sabharwal QC** of global law firm White & Case discuss the importance for nuclear power plant owners and reactor suppliers to manage dispute risks inherent in these highly complex projects.

In June 1954, about 100 kilometers southwest of Moscow, the Obninsk reactor became the world's first nuclear power plant to send nuclear-generated electricity to a power grid, and a whole new industry was born. Ever since, the nuclear sector has existed in the full gaze of the public, media, politicians and campaigners. Nuclear power is a safe, clean and sustainable source of energy, but major incidents such as Chernobyl and Fukushima have ensured that it remains at the forefront of our societies' thoughts.

Away from the broader arguments around nuclear power, the industry has also proven to be a fertile ground for commercial disputes, giving rise to some of the most high-profile arbitration cases in recent years. Few industry sectors face sterner regulatory oversight or deal with greater technical complexity. Nuclear power is a highly sophisticated industry whose projects are prone to cost overruns and delays. So when it comes to building a nuclear power plant (NPP), it's almost a case of when—not if—a dispute will arise. Of the 449 nuclear power reactors currently in operation around the world, only two were completed on budget and on time.

The construction boom

Construction of nuclear power plants peaked during the 1970s energy crisis, with 234 reactors under construction by 1979. The early 1980s saw an unprecedented wave of new projects around the world, when 218 power reactors started up: an average of one every 17 days.

But by the mid-1980s—following the accidents at Three Mile Island in Pennsylvania and Chernobyl in the Ukraine—the industry fell into a lull, driven by increased opposition from environmental groups, rising construction costs and lower fossil fuel prices. This lull would continue into the early 2000s, when the rapid industrialization of the developing economies, especially China, led to a realization that energy demand would soon far outstrip capacity, and nuclear came back to the forefront.

The latest impetus comes amid renewed concerns about energy security and raising awareness of the impact of carbon emissions, and builds on the availability of a new generation of nuclear power reactors—called Generation III, III+ and now IV NPPs.

9

nuclear reactors started up in 2018 (seven in China and two in Russia)

Source: *World Nuclear Industry Status Report 2019*

> **Few industry sectors face sterner regulatory oversight or deal with greater technical complexity than nuclear power**

The growth outlook

Currently, the 449 nuclear power reactors that operate in some 30 countries around the globe provide roughly 10 percent of the world's power supply. The majority of the installed capacity is in Western countries, but according to the International Energy Agency (IEA), a significant shift to developing countries, and predominantly Asia, is forecast over the next two decades. This growth is massively overshadowed by China, which moved to embrace nuclear power at breakneck speed to fuel its rapidly growing economy and the needs of the emergent middle class.

About 75 percent of today's capacity is in advanced economies, with the US, France and Japan the biggest users of nuclear power. Yet these countries have aging plants and there is currently uncertainty about plans for lifetime extensions, the pace of retirement and plans for replacement.

Developing economies drive "nuclear renaissance"

However, the opposite is the case in developing economies. These nations are expected to see their share of nuclear power jump from 25 percent to more than half in the next two decades, with China on course to become the biggest nuclear power generator by the end of the 2020s. India is another nation on the move. As of March 2018, India had 22 nuclear reactors in operation,

with seven further reactors under construction, seeking to increase the contribution of nuclear power to overall electricity generation capacity from 2.8 percent to 9 percent by the middle of the 2030s.

Currently, approximately 50 nuclear power reactors are being built across the globe, with 100 more on order or planned, and a further 300 at proposal level. About 30 countries have plans or aspirations to build their first nuclear power plant.

Why disputes occur

There is intense scrutiny on all aspects of nuclear plant construction from both a safety and security perspective. Reactor suppliers, contractors and day-to-day operations are likely to face critical observation from the nuclear regulator in a fashion that is unrivaled in other construction projects. The tension between the regulator, the owner and the supplier is always there.

2.4%

Nuclear power generation in the world grew by 2.4% in 2018

Source: *World Nuclear Industry Status Report 2019*

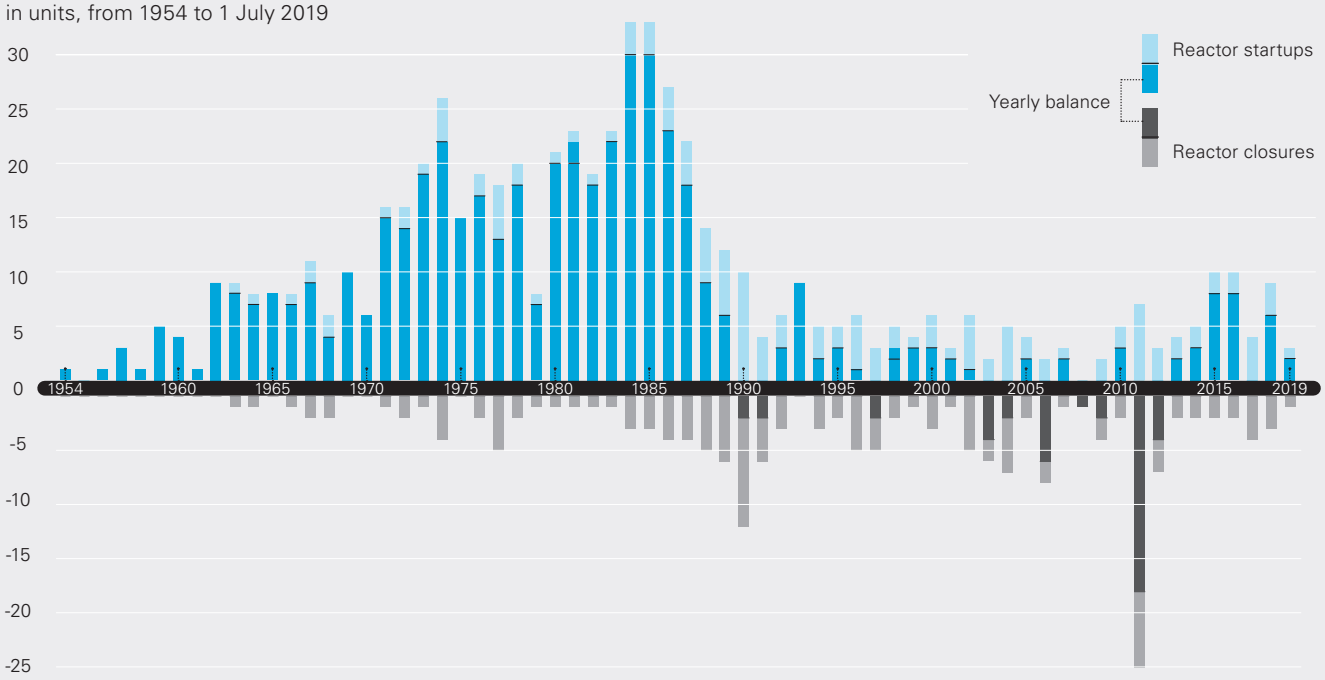
The design and construction of a nuclear power plant is a notoriously complex task, with tens of thousands of documents, thousands of personnel and hundreds of suppliers, contractors and subcontractors

But even projects that face no obstacles can expect to take the best part of a decade from conception to operation, historically averaging at least eight years to complete. For context, a nuclear power plant typically consists of six to ten major buildings surrounding a central structure that sits on a reinforced concrete base and houses the reactor itself. These sites can occupy more than approximately 37,000 square meters (400,000 square feet) in total, and all come with extremely robust codes and standards. In highly complex projects like these, overruns are often the norm.

And with overruns come disputes about who is responsible and for how much. Given the nature of the nuclear industry and the costs involved, these disputes—which are costly affairs themselves—tend to be played out in a very public way and often take a very long time to resolve.

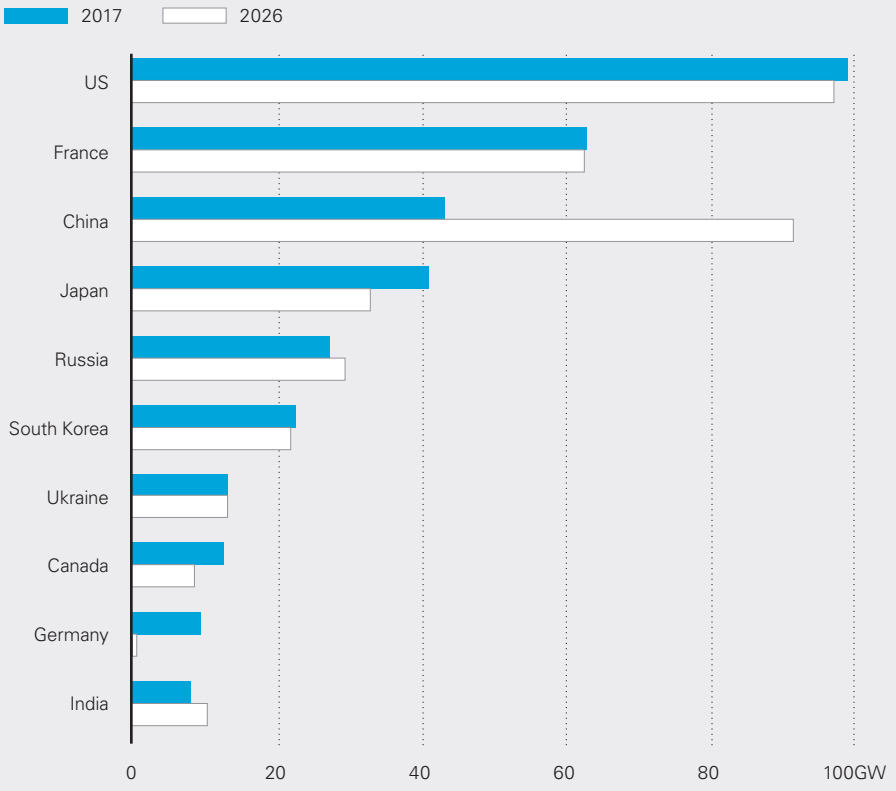
Reactor startups and closures in the world

in units, from 1954 to 1 July 2019



Sources: WNISR – Mycle Schneider Consulting; *The World Nuclear Industry Status Report 2019*

China on path to challenge US as home of atomic power



Sources: BMI Research

> **With conventional large-scale construction projects, time, cost and quality are the key considerations; but when it comes to nuclear, a completely new layer of safety constraints is imposed over the top of these traditional concerns**

Licensing risks

With conventional large-scale construction projects, time, cost and quality are the key considerations; however when it comes to nuclear, a completely new layer of safety constraints is imposed over the top of these traditional concerns.

Licensing risk is one of the critical areas for new nuclear projects and this often generates headlines across the public forum due to their politically sensitive nature. Through the process, an initial license to develop a new plant may be required, followed by a construction license, followed by licenses to permit the transportation of nuclear fuel, and finally an operational license to run the plant. And every one of these steps presents an environment for delays and cost overruns.

Scott Newberry, a former US representative to the International Atomic Agency Nuclear Safety Standards Committee, believes that these challenges are compounded by the different regulatory approaches that exist across the globe. "While there are numerous international safety and regulatory standards published by the IAEA, particular countries may have different approaches, which introduces a real challenge for designers to sell their facility and then present it to the regulator to get approved," he said.

A further problem that Newberry highlights is that in some countries with nuclear aspirations, no regulatory authority for licensing a reactor exists, or it is very nascent in its development. Building regulatory frameworks in developing nations can take time, but is possible to achieve. Countries such as China have built up expertise themselves through partnering with Western nations, gaining knowledge and then repatriating it back to China. Other regions, such as the United Arab Emirates, have brought in experts of various nationalities to build regulatory and technical expertise. However, this has a financial cost attached to it, which more developing nations are less likely to be able to afford, especially since there has been a dwindling supply of key personnel.

59%

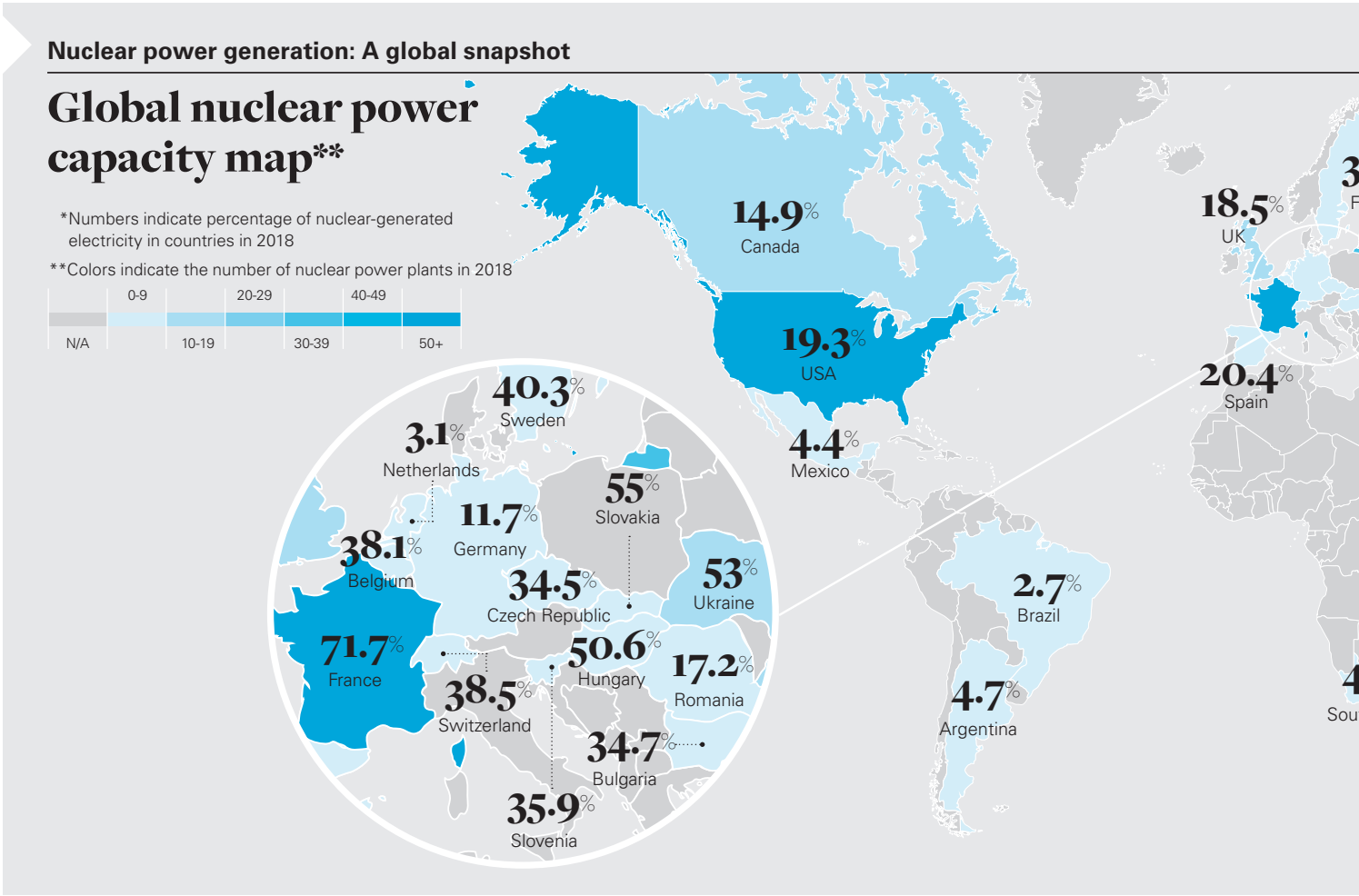
of the 46 reactors currently under construction globally at least 27 (59%) are delayed

Source: *World Nuclear Industry Status Report 2019*

Lost expertise and knowledge gap

During the nuclear industry's first heyday, from the 1960s to the 1980s, countries such as the US, France and the UK developed deep and institutional expertise in the field of nuclear planning and construction. Much of that skill base has subsequently been lost since the boom of the 1970s and the early 1980s, with many equipment and service suppliers exiting the nuclear industry. By the early 2000s, only a relatively limited supply chain to support renewed interest in NPP construction remained, with many

Nuclear power generation: A global snapshot



leading experts long past retirement age. This left many countries with established expertise in operating and decommissioning nuclear plants, but a real shortage of know-how in the planning and construction phase. This skills gap extends to the wider support industries, including essential legal support and financing expertise.

This shortage of expertise adds further risk to the planning and construction of new plants and has now become a political issue in many countries, with the UK government setting out a Nuclear Industrial Strategy in 2013 that included plans to develop stronger capabilities in building the future fleet of domestic and global reactors now and in the future.

449

Nuclear reactors in operation across the globe as of October 2019

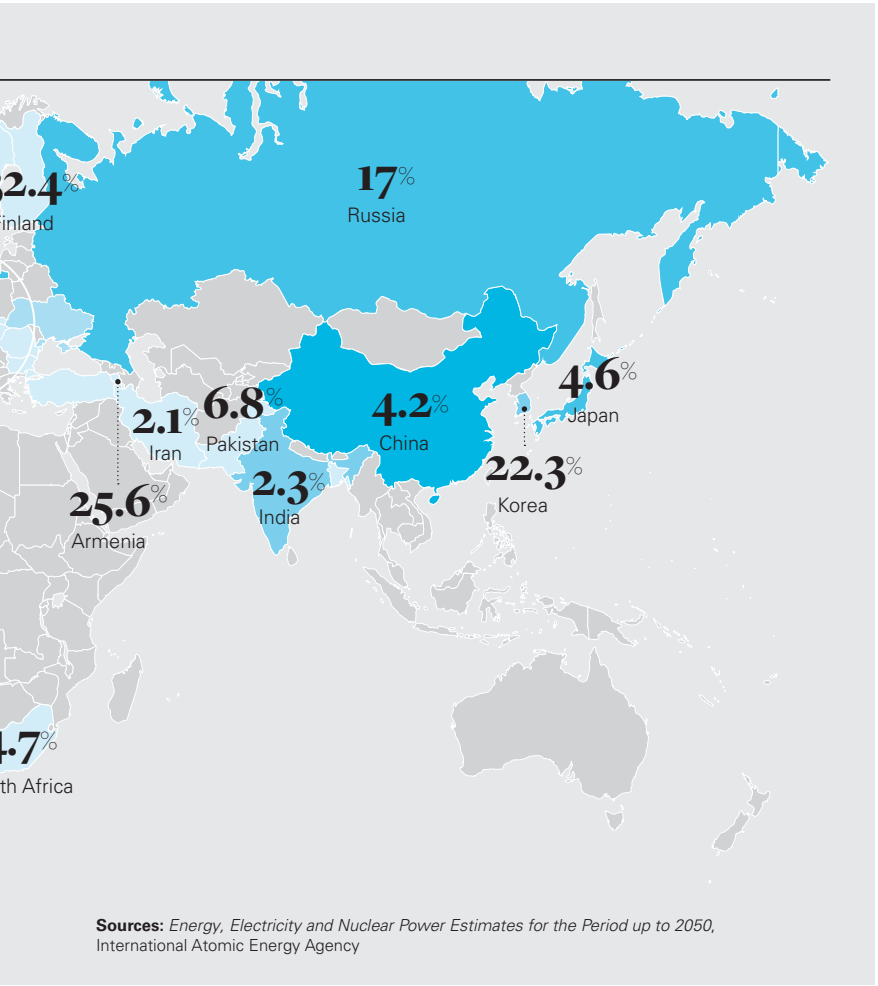
Source: *IAEA Power Reactor Information System*

> **Given the technical expertise required in the construction of new NPPs and the regulatory frameworks that must be worked within, the sheer volume of documentation involved is unmatched in the construction industry**

Size can be underestimated

Given the technical expertise required and the regulatory frameworks that must be worked within, the sheer volume of documentation involved is unmatched in the construction industry. Just managing, storing and accessing documentation that is generated in the planning, licensing, construction and commissioning stages of the project requires incredible organization and expertise.

One of the clearest examples of the challenges associated with



Sources: *Energy, Electricity and Nuclear Power Estimates for the Period up to 2050,* International Atomic Energy Agency

> **The more detailed and prescriptive the documentation is at the early stages of any NPP project, the more precise the wording in the contract, the greater the chance of avoiding delays and disruptions later on**

is the world's most dependent country on nuclear power: 72% of the country's electricity comes from nuclear energy

Source: *International Atomic Energy Agency Report 2019*

building a new NPP project is the case of Olkiluoto-3 in Finland. It was billed by Areva and Siemens as a showcase for next-generation pressurized water reactor technology known as the "EPR" when construction started. It was to be the world's biggest reactor and the first with EPR technology.

The Areva-Siemens consortium began physical construction of Olkiluoto-3 in 2005 under a turnkey contract signed with Finland's TVO in late 2003. Completion of the reactor was originally scheduled for 2009, when it would be able to power about three million homes, but the project suffered various setbacks. Under the latest schedule, the start of regular electricity generation is due to begin in 2020, more than a decade later than expected.

One of the challenges of the project was the fact that it was the first of its kind, so there was insufficient existing engineering and safety analysis documentation to reference for the designers, according to Newberry.

A similar reactor under construction for French utility EdF in Flamanville, France, is also years behind schedule and billions over budget due to a string of major technical problems, including weak spots in its steel and faulty welding.

As one nuclear power plant owner explained: "Understanding the size of the project at the beginning is crucial, because any changes made to the design once the project has started can bring unwanted surprises in later years."

One of the most important stages of any NPP project is during the design and planning phase. The more detailed and prescriptive the documentation is at this stage, the more precise the wording in the contract, the greater the chance of avoiding delays and disruptions throughout the entire construction project. This also gives an opportunity to clarify each party's obligations and ensure that any slip in the schedule can be identified and remedied quickly.

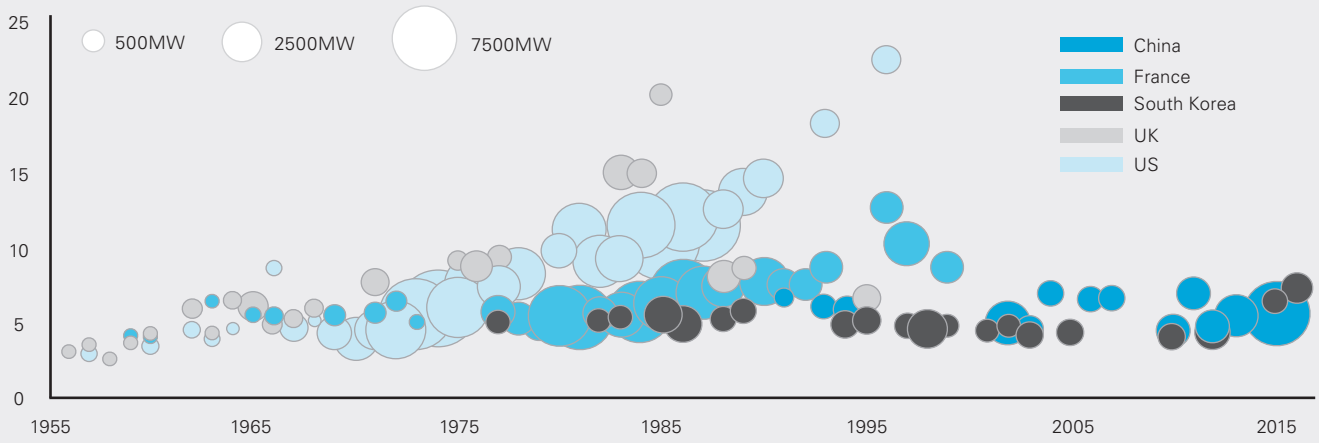
International regulatory coordination

Throughout the construction of any nuclear plant, there are likely to be alterations or variations at the request of the regulator. These requirements differ greatly from country to country, and since there is no choice but to follow these variations, it is essential that detailed documentation is in place to determine who carries the burden for cost or schedule impacts. A proper system can help mitigate the impact these demands can have on the project.

Regulatory requirements do add further hurdles that designers and developers must meet, but it seems less clear whether a more streamlined and harmonized international regulation is on the horizon. The same nuclear

Annual capacity additions and construction times

Average construction duration for reactors coming online between 1955 and 2016. The size of the bubble is proportional to the capacity added that year



Sources: IAEA PRIS database and Carbon Brief analysis. Chart by Carbon Brief.

power plant owner describes the prospect of standardized regulation as "the will of the industry," and an "essential step in achieving a common understanding, because the documentation is often the most complex and difficult part of the whole process." He adds, "Different regulatory requirements do not add to nuclear safety, they add to complexity."

Newberry, however, points out that attempts to standardize regulation have not come to fruition over many years due to differences in national practice, and that ensuring a sufficient level of safety through one set of global rules is a challenging task. National regulators vary greatly in their approach and apply different levels of stringency. For example, in the aftermath of the September 11 attacks, Finland's regulatory authority mandated that any nuclear power plant built in the country must be able to withstand the crash of a large commercial aircraft and safely shutdown.

10.15%

Global share of nuclear power in commercial electricity generation in 2018

Source:
World Nuclear Industry Status Report 2019

Nuclear power is here to stay

Nuclear power—while still a small proportion of global electricity production—will remain at the forefront of debate around energy supply for decades to come. Given the significant risks inherent in any new NPP project, mitigating these risk factors from the outset should be one of the key considerations for all involved. The greater the understanding of issues that could arise and the earlier these issues are understood, the less likely these risks are to evolve into disputes—or at least the better prepared those involved will be to manage those disputes. This foresight could go a long way to reducing the significant cost increases and extended construction schedules that currently challenge the industry.

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