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Managing risk in nuclear construction projects

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The recent resurgence of nuclear energy presents significant opportunities for businesses operating in, or seeking to enter, the nuclear construction industry. These businesses should, however, be mindful of the risks involved in construction projects in the nuclear sector and seek to mitigate these risks from the outset, and during the life of, such projects.

I. The resurgence of nuclear energy

Amid increasing energy costs and a worsening climate crisis, demand for low-carbon energy sources like nuclear power is on the rise.

This growing demand for nuclear energy has triggered an increase in construction projects for new?build nuclear power plants across the globe. Approximately 60 nuclear reactors are currently being constructed in 15 countries, including in Bangladesh, China, France, India and Turkey.[1] A further 110 nuclear reactors are planned, mostly in Asia but also in Europe, including in Poland.[2] All of this is in addition to the approximately 440 currently operational nuclear reactors in 32 countries,[3] many of which are ageing and require modernisation to extend their operating lifetimes. At the same time, rapid technological advances in the field, including the development of advanced nuclear reactors such as Generation IV reactors and small modular reactors (SMRs), are likely to lead to even further growth.

Against this background, significant opportunities exist for construction companies operating in, or looking to expand into, the nuclear construction business. But these opportunities also carry risks that must be carefully analysed and mitigated.

II. Overview of key risks

Construction projects in the nuclear sector have unique characteristics. Given the radiation risk inherent in nuclear energy generation, safety is critical. Nuclear construction projects are thus subject to rigorous regulatory scrutiny and extensive approval processes, both at the design and planning stages, as well as during construction. These regulatory requirements add a layer of complexity that cannot be underestimated. Indeed, it is often said that nuclear projects have to be built twice, first on paper and then again on the ground.

1. **Design and planning risks**

Nuclear construction projects require an extensive design and planning stage, during which the planned delivery's compliance with contractual specifications and regulatory requirements must be demonstrated.

To satisfy regulatory obligations, nuclear projects involve more stringent documentation requirements than non-nuclear projects. Producing the requisite documentation requires the regulator, licence holder and suppliers to collaborate closely, with suppliers generally submitting the required documentation to the regulator and licence holder for review and approval. This process must therefore be carefully built into the project schedule.

A key challenge for suppliers in nuclear projects is that regulatory regimes can vary significantly in different jurisdictions. Each country has its own regulatory authority overseeing nuclear projects. While some regulators have been established only relatively recently, others have decades of experience. The experience of the regulators and lessons learned from past projects may inform the approaches taken within the regulatory framework. As a result, suppliers working internationally may face difficulties in understanding the relevant regulatory requirements applicable to new projects, particularly in situations where they are working in a particular jurisdiction for the first time.

Regulatory requirements may also change over the duration of a project, requiring suppliers to stay abreast of changes that may impact their delivery.

2. **Delay risks in project execution**

Regulatory oversight of nuclear construction projects also gives rise to the risk of delay during project execution.

Regulatory requirements often dictate that working procedures must be pre-approved by the nuclear power plant owner or the regulator. Site changes may require inspections and approval from the regulator, which may require additional float in the project schedule.

There are also long lead times associated with procurement, manufacturing, and installation of certain complex components and systems (such as steam generators, heat exchangers, or instrumentation and control platforms), which must be anticipated well in advance. Long lead items are not limited to physical components and systems, but can also include complex training programmes, trained staff, and management systems. These long lead items must be contemplated and thoroughly planned at an early stage of a project to avoid negatively affecting the project schedule.

Finally, the evolution of nuclear technologies also brings unique challenges that risk having an impact on project schedules. Equipment with no or only limited prior operating experience may require additional testing and validation, which potentially carries risks of delays if these steps are not properly anticipated.

III. Management of risks

The risks outlined above apply to the entire supply chain involved in a nuclear construction project. These supply chains generally involve numerous suppliers operating internationally to manufacture and deliver equipment and components. Businesses operating within these complex supply chains, especially suppliers that are unfamiliar with the nuclear industry, should be mindful of the risks involved in nuclear construction and modernisation, replacement and retrofitting projects. While the management of such risks must be considered on a case-by-case basis, there are overarching principles that may help to mitigate them.

1. **Awareness of risks**

A thorough understanding of the applicable regulatory regime, from the early stages of a project, is essential. Particularly where a supplier is operating in a new or less familiar jurisdiction, or where a supplier has little or no experience in deliveries for nuclear applications, it is critical to be mindful of the applicable nuclear regulations. To enhance knowledge of the regulatory regime and applicable requirements, suppliers should consider engaging nuclear consultants with experience in the relevant jurisdiction to assess regulatory and other risks, as early as possible in the project, and already at the stage of contracting. Understanding the applicable regulatory requirements can be essential in setting a realistic project schedule as well as the selection and

supervision of vendors in the supply chain.

2. **Contractual allocation of risks**

Once the risks involved in a project have been identified, parties must allocate them contractually and assess the impact of that allocation. Parties should thus carefully consider how their respective roles, responsibilities, and obligations are defined; who bears the risks of compliance with regulatory requirements and/or any changes in such requirements during the course of the project; how the risk of unforeseen circumstances is to be allocated, including suitable change management provisions; and how to define appropriate limitations on liability.

While it may not always be possible to achieve a desired risk allocation during the negotiation phase, understanding the risks involved, and how they have (or have not) been contractually allocated, is critical in assessing the overall commercial transaction.

3. **Mechanisms for dispute management**

Stakeholders in nuclear construction projects should put in place appropriate mechanisms to resolve disputes and minimise disruptions to ongoing projects. There are a variety of procedures available to resolve disputes that arise during the life of a project, ranging from the involvement of senior management, the creation of standing dispute boards, or the referral of disputes to expert determination. Selecting the most appropriate procedure for the particular project at hand, and defining its key features at the outset, can greatly assist in avoiding delays and the escalation of disputes during project execution.

It is also important for all aspects of the project to be properly recorded in the event that a potential dispute should arise. In addition to maintaining a well-organised project file and safeguarding written project correspondence, it is also critical that meetings and calls be carefully documented through minutes or notes. It is not uncommon to find, at the dispute stage, that key information discussed in meetings or on calls has not been adequately captured in the available documentation, thus leaving gaps in the evidentiary record and making a reconstruction of the relevant facts more difficult.

IV. Conclusion

Although opportunities abound for companies seeking new projects in the nuclear construction industry, investing time and effort in preparing for and carefully assessing risks at the outset is critical for avoiding potentially significant consequences and disputes at a later stage.

References

[1] World Nuclear Association, ‘Plans for New Reactors Worldwide’ < https://world-nuclear.org/information-library/current-and-future-generation/plans-for-new-reactors-worldwide.aspx> last accessed 2 May 2024.

[2] *Ibid*.

[3] *Ibid*.