# Nuclear project development: The lawyer's perspective

*by Ákos Frank[*] and William Fork[**]*

*It is a bright and sunny morning as you stride through your nuclear vendor company's entrance. You have just settled at your desk when the company's general counsel appears at your door with a stern expression. "We just received the draft contract from our customer for the new nuclear power plant! 3 000 pages. It is a top priority project for our company – and we are counting on you! Please have a key-points analysis and a presentation prepared for management by next week." You recline in your chair… your plans for the week just changed.*

This could be a scenario that happens to you as in-house counsel to a nuclear vendor. *How should you conduct this analysis? What points are important for corporate management? What is important to the General Counsel? How far can we deviate from the draft contract? What are the most concerning issues for our customer? What will our competitors do?...* This article explores the answers to these questions based on the differing perspectives of:

- a lawyer working for a civil nuclear vendor that builds and modernises nuclear power plants; and
- a lawyer who advises owners of new build civil nuclear programmes regarding legal requirements and best practices.

## Part I. Synthesising public law knowledge into private law transactions

### *A. Moving from public to private law*

*On which norms do transactional lawyers in the civil nuclear industry focus?* Private law commercial transactions must be consistent with a broad framework of public law instruments. The long-standing distinction between public and private law, discussed in Roman law and other

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historical legal treatises, is helpful in understanding these norms. As a general matter, private law is concerned with relations between individuals and corporate personalities.[1] In contrast, public law is concerned with state functions and includes laws, regulations and administrative procedures of a host country, criminal laws, and laws that incorporate international obligations and norms. Relevant instruments that shape civil nuclear projects include public procurement laws, nuclear licensing and permitting laws, environmental laws and laws governing private international transactions.

Unique hazards associated with nuclear power stations require the highest levels of regulation to ensure public safety and nuclear security. Typically, in the planning stages of a new build project, a utility owner or operator will lead an effort to map relevant public law regulations and translate them into private law procurement strategies and contract terms. The necessary procurement process may also be prescribed by national law (often transposing international treaties or supranational law). The subsequent procurement process establishes the scope, parameters and risk allocation between the owner and nuclear vendor.[2] The parties achieve a major milestone when they conclude a private law transaction for the engineering, procurement and construction of a nuclear power plant.

Considered another way, public and private law is distinguished because public law is relatively fixed; nuclear projects are constrained by detailed and often complex laws and regulations. For this reason, nuclear lawyers spend significant effort mapping applicable public law requirements to ensure permitting and contract success in new build projects. In contrast, private law provides flexibility. It enables commercial negotiations between contracting parties on, e.g. allocation of risk, work scope and rules related to project execution. The largest volume of legal work in the civil nuclear industry relates to private law relationships, including negotiating and managing contracts.

## *B. Nuclear law, nuclear contract law, international nuclear contract law*

Nuclear contract law is a specialised area of law that relates to the sale and purchase of goods and services for nuclear power projects. Not only does this area of law encompass all aspects of traditional nuclear law – nuclear safety, regulation and licensing, security and transport, safeguards, non-proliferation and export control, environmental and radiological protection, and nuclear liability and compensation – but it also differs from "conventional" contracts for power generation plants or other large infrastructure projects in a number of ways.

The nuclear industry today is international. Over the past 60 years, the nuclear industry has evolved, expanded and fragmented. It is hard to conceive of a new build nuclear project today constructed with only domestic supplies and services. The overwhelming majority of the larger transactions involve the transboundary movement of goods, services and technology. Therefore, practitioners dealing with international nuclear contract law must look beyond the provisions of a single country's national civil codes and domestic regulations.

1. See Nicholas, B. (1962), *An Introduction to Roman Law*, Oxford Univ. Press, Clarendon Law Series.

2. Examples include the Agreement on Government Procurement (1994), 1915 UNTS 103, entered into force 1 Jan. 1996; and the Directive 2014/25/EU of the European Parliament and of the Council of 26 February 2014 on procurement by entities operating in the water, energy, transport and postal services sectors and repealing Directive 2004/17/EC, *Official Journal of the European Union* (OJ) L94 (28 Mar. 2014), p. 243.

### *C. Large nuclear projects*

The work of nuclear lawyers today is concentrated in the domain of large nuclear projects. These projects are diverse. As of 2021:

- Some 52 reactors are under construction, translating to approximately 54 GWe net installed electric capacity.[3]
- In addition to Generation III and III+ reactors, promising new technologies will increasingly reach international commercial markets in the form of small modular reactors and Generation IV reactors.
- However, large nuclear projects extend beyond new build projects. Today, the IAEA counts 444 land-based nuclear power reactors in operation.[4] Legal work associated with plant modernisation, power uprate and major plant refurbishment and plant lifetime extension will continue in the future.
- Another area of legal activity involves work associated with reactors in permanent shutdown (today, nearly 200 units),[5] which will be decommissioned, placed in long-term safe storage or entombed.
- The last main category of large nuclear projects relates to the other facilities of the nuclear fuel cycle infrastructure: enrichment, milling, mining, reprocessing and encapsulation, as well as interim and final repositories.

## Part II. Developing nuclear new build power programmes

The legal process for the procurement of a new build nuclear programme is most typically framed in the context of a competitive bidding process, which applies in many cases. However, other procurement approaches include "strategic partners, sole suppliers and direct negotiations through intergovernmental agreements."[6]

### *A. The owner's goal is safe and reliable power – the vendor's goal is safety and profitable project delivery*

As a threshold matter, we assume that all major civil nuclear technologies that are available for large electricity generation procurement today are safe; thus, the owner must plan its contracting procedure to enable competition and to procure the nuclear plant that is best adapted to its unique procurement aims and objectives. To enable a successful project, the owner and the vendor should create a relationship in which they are *partners* rather than working within an adversarial framework to meet the owner's goal of safe and reliable power and the vendor's goal of safe and profitable project delivery.

Legal planning can be a major contributing factor to programme success. This is because the work of all other disciplines is organised around the creation, negotiation, execution and management of key contracts. Minimising overall project risk – both in terms of cost and schedule – is a key issue for the vendor and the owner.

3. IAEA (n.d.), "Power Reactor Information System (PRIS), The Database on Nuclear Power Reactors", https://pris.iaea.org/PRIS (accessed 4 May 2021).
4. *Ibid*.
5. IAEA (n.d.), "Power Reactor Information System (PRIS): Permanent Shutdown Reactors", https://pris.iaea.org/PRIS/WorldStatistics/ShutdownReactorsByCountry.aspx (accessed 4 May 2021).
6. IAEA (2015), *Milestones in the Development of a National Infrastructure for Nuclear Power*, IAEA Nuclear Energy Series No. NG-G-3.1 (Rev. 1), IAEA, Vienna, Foreword.

## *B. Lawyer's role at a nuclear vendor and a nuclear owner*

The role of transactional legal counsel in advising a nuclear owner and a nuclear vendor can differ significantly. The owner's lawyer (or external legal counsel) is typically embedded within the highest-level owner organisation and its procurement planning process. Nuclear power plant permitting and contracting is so strictly and densely regulated that mapping of the process is only possible with experienced counsel. Multiple legal disciplines are involved, including commercial experts, regulatory experts, legislative experts, public international law experts and contracting specialists. A greenfield new build procurement may employ dozens of in-house and external legal experts at its peak.

In contrast, the vendor's legal experts sell nuclear power stations for a living. Guiding the nuclear vendor through the procurement processes and negotiation of the contracts is their full-time activity, often in multiple countries at the same time. The vendor's legal team will typically consist of one or two lead in-house counsels and a few external lawyers in specialised areas of national or international law. Additional specialist lawyers can assist to handle vendor purchasing requirements and contracts as the vendor identifies its sub-suppliers and partners for a new build project.

## *C. Areas of legal interest*

The IAEA has identified a list of 19 "infrastructure issues" to analyse in each step of a nuclear development programme. "Insufficient attention to any of them may compromise safety or lead to costly delays or even project failure."[7] These are:[8]

1. national position
2. safeguards
3. nuclear security
4. nuclear safety
5. public law legal framework (including international legal instruments)
6. regulatory framework
7. funding and financing
8. management (including organisation, staff, management system and strategy)
9. industrial involvement
10. procurement
11. emergency planning
12. electrical grid
13. nuclear fuel cycle
14. radioactive waste management
15. site and supporting facilities
16. human resource development
17. environmental protection
18. radiological protection
19. stakeholder involvement

In nuclear project development, the key legal areas of interest must be considered that affect the main procurement contract for engineering, procurement and construction, which can also govern nuclear operations and fuel procurement.

7. *Ibid*., p. 1.

8. *Ibid*., p. 7. The order and category names have been modified by the authors.

The above list provides a good starting point for legal counsel to use in commencing their work. Special emphasis is given to the public law environment, necessity of regulating certain topics in the private law contract, scope of the future contract and procurement strategy.

## *D. Organisation and stakeholders*

The owner and its staff are in the centre of a web of diverse relationships. These relationships range from the supranational (e.g. IAEA, Euratom) through international (e.g. banks, shareholders) to national (e.g. government, regulatory authority, media) and to the local level (e.g. local community and emergency response). The owner must carefully manage a myriad of relationships and contracts.

The main procurement contract with the nuclear vendor is perhaps the most important legal instrument governing the most important of these relationships. The most significant legal work in a new build project is typically expended in the drafting, negotiation and subsequent management of this agreement.

The counterparty to this contract is the nuclear vendor. However, the nuclear vendor is not a single monolithic entity. It manages a professional supply chain of many certified subcontractors and suppliers and integrates their work. In some cases, the vendor may exist as a special purpose vehicle containing multiple vendor companies. Thus, "below" the surface of the main contract are hundreds, if not thousands, of local and international subcontracts.

The owner and vendor organisations themselves are dynamic in terms of size as the project develops. In the early stages of a nuclear programme, an owner's "task force" organisation might derive from select personnel from the nuclear energy programme implementing organisation (NEPIO)[9] or a handful of new personnel. By the end of the procurement process, the owner's organisation can grow to well over a hundred individuals responsible for all aspects of the programme. The size of the project team within the vendor's organisation can also include a core team of 20 personnel, supported by over 60 part-time experts who provide specialised support during key points in the procurement bid and negotiation process.

## *E. Contracting and procurement*

The main parameters of a nuclear procurement process are highlighted in this section. Valuable insights are summarised in the IAEA Nuclear Energy Series publication relating to the *Invitation and Evaluation of Bids for Nuclear Power Plants*[10] and supporting IAEA materials.

### 1. Forms of agreements

Typical forms of agreement are used at the different phases in the development of a nuclear power programme. These include the use and peculiarities of the:

- Memorandum of Understanding (MoU): This agreement, which is typically non-binding, allows the parties to express a willingness to enter into a contract before or at the commencement of negotiations and can include an indicative project conceptual plan and schedule, among other clauses. Often the first written contract document between the parties, an MoU can provide symbolic power and influence subsequent agreement terms.

9. *Ibid*., p. 6.

10. IAEA (2011), *Invitation and Evaluation of Bids for Nuclear Power Plants*, IAEA Nuclear Energy Series No. NG-T-3.9, IAEA, Vienna.

- Early Works Agreement (EWA): This agreement is typically designed to enable certain works (e.g. conceptual engineering, site survey and studies) before conclusion of a final award or project agreement. An EWA is a complete and standalone contract and often includes "easy termination" and limited cancellation cost provisions.
- The Main Contract or Prime Contract: This is a single contract or package of contracts resulting from a tendering process covering the entire project. Mutually binding, the main contract is difficult to terminate and directly governs the parties' relationship for about ten years. The main contract can cover engineering, procurement and construction, as well as finance, operations, nuclear fuel supply and other key contractual terms.
- Follow-on Contracts: These typically relate to fuel supply and service and maintenance agreements.

### 2. The IAEA milestones and private contracts

To describe the progression of a national nuclear programme, the IAEA milestones framework provides an internationally accepted reference system:

> The three phases in developing the infrastructure necessary to support a nuclear power programme are:
>
> - Phase 1: Considerations before a decision to launch a nuclear power programme is taken;
> - Phase 2: Preparatory work for the contracting and construction of a nuclear power plant after a policy decision has been taken;
> - Phase 3: Activities to implement the first nuclear power plant.
>
> The completion of each phase is marked by a specific milestone at which the progress of the development effort can be assessed, and a decision can be made to move on to the next phase. These milestones are:
>
> - Milestone 1: Ready to make a knowledgeable commitment to a nuclear power programme;
> - Milestone 2: Ready to invite bids/negotiate a contract for the first nuclear power plant;
> - Milestone 3: Ready to commission and operate the first nuclear power plant.[11]

The key private law contracts that an owner must develop over the term of the programme's development (between 10 to 30 years) can be superimposed over the IAEA milestone framework. This model can be extended until the end of the plant's operating lifetime and subsequent decommissioning. The time between the commencement of a civil nuclear programme and the decommissioning of the resulting first nuclear power plant can span 100 years. During this time, strong and lasting ties are established between the vendor and the owner, the regulatory authorities of their respective host states and even their governments.

11. IAEA (2015), *supra* note 6, p. 5.

### 3. Different delivery models and scopes

A decisive moment in the development of a new build programme is the decision regarding the plant delivery model. Common categories are used to describe typical delivery models. These provide a good orientation regarding delivery strategy and organisation, but the details must be carefully defined in each type of contract:[12]

- The "turnkey" contract (EPC: engineering, procurement, construction), whereby a single contractor or consortium of contractors assumes overall responsibility for completing all parts and all phases of the project design and construction.
- Split package contract (EPCM: engineering, procurement and construction management), also referred to as the "Island Approach", whereby the overall responsibility for design and construction of the project is divided among a relatively small number of contractors, with each contractor being separately in charge of a large section of the work.
- The multiple package contract or "Components Approach", whereby the plant owner, possibly with the assistance of an architect-engineer or consultants, assumes overall responsibility for managing the project design and construction. Multiple contracts are issued to various contractors that carry out work under the project.
- Build, own and operate (BOO) or build, own, operate and transfer (BOOT), whereby the investor-vendor must plan, construct, operate and provide the financing for the plant. This investor must also assume the risk over the entire plant life, or part of the risk.

The main drivers of this strategic choice include:[13]

- the national nuclear programme;
- economic considerations;
- owner experience and capability in handling such a project;
- potential vendors and their experiences and attributes;
- development of national engineering and industry capability;
- availability of qualified management, co-ordinating and engineering manpower;
- plant design criteria and engineering features;
- standardisation and proven quality;
- warranty and liability considerations, including nuclear liability;
- government and industrial relationships domestically and in the supplier's country;
- financing possibilities (foreign investment);
- subsequent projects and technology transfer; and
- export controls.

The consequences of the choices may affect:

- operational complexity and interfaces;
- licensing complexity;
- owner involvement and responsibility;
- owner's "hands-on experience"; and
- owner's future independence from vendors.

12. IAEA (2012), *Project Management in Nuclear Power Plant Construction: Guidelines and Experience*, IAEA Nuclear Energy Series No. NP-T-2.7, IAEA, Vienna, p. 20.

13. *Ibid*.

### 4. Some standard contracts

A defining moment occurs when the owner's lawyer decides to produce the main contract draft. *Should you start with a sheet of white paper and start typing? Should you research earlier, similar transactions? Will you use an international standard contract and adapt it?* This choice is probably the single most consequential decision the owner's lawyer will make related to a power plant project; it will affect the most important legal relationship in the project for over a decade. The vendor's lawyers will live with this draft and the vendor will deliver under its terms.

Today, no standardised international model contract exists for nuclear new build projects. Accordingly, the in-house and external lawyers' role in negotiating the prime contract is significant for both sides. To understand how this assessment is made, some standard forms of construction contracts can be explored:

- the recommendations of the IAEA;[14]
- International Chamber of Commerce (ICC) Model Turnkey Contract for Major Projects;
- Fédération Internationale des Ingénieurs-Conseils (FIDIC) Yellow Book and Silver Book;
- New Engineering Contract (NEC3) Engineering and Construction Contract;
- Orgalime Turnkey Contract for Industrial Works; and
- Institution of Civil Engineers (ICE) Conditions of Contract Design and Construct.

The choice of the contractual baseline is a paramount decision and, in practice, its importance is not always recognised. Corporate traditions and country-specific requirements may prevail, resulting in suboptimal solutions. While standard contracts can be a starting point, tailoring of any non-nuclear standard construction contract to a nuclear project is a long, collaborative task requiring management, commercial, technical and legal experts.

### 5. Visible and invisible contract documents

What does one find in a final contract? A signed contract package includes the terms of the contract (generally 150 to 200 pages); technical and commercial appendices and schedules (generally 3 000 to 10 000 pages); and in some cases codes, standards and regulations are also included in appendices. While a contract package can be printed and held physically, it also contains an "invisible component" that can be equally important:

- the law applicable to the terms of the contract (contract law of a chosen country);
- the applicable mandatory law in the host country (e.g. environmental protection, safety at work, procurement law, tax law); and
- the applicable mandatory laws relevant to the vendor and its sub suppliers (e.g. export control, anti-bribery laws and laws with universal jurisdiction).

## *F. Negotiation of the prime contract*

Prime contract negotiations involve reaching agreement regarding the parties' scope of work and terms and conditions. The owner and the vendor make hundreds of risk-allocation choices during this process. Some are made consciously while some obligations can be hidden outside the language of the contract and industry best practices.

14. IAEA (2000), *Economic Evaluation of Bids for Nuclear Power Plants*, IAEA Technical Reports Series No. 396, IAEA, Vienna, p. 28.

### 1. What about risk management?

"Risk and opportunity" management is an important task of the lawyer. *Which risks belong on the risk list? Where should you start? How deeply are you, as the lawyer, involved in risk management?* The steps of risk management are identified as:

- identification (known unknowns, unknown unknowns);
- evaluation and monitoring;
- avoidance;
- management;
- assumption;
- control; and
- transfer.

Legal risks within a civil nuclear project are assessed and quantified within the same framework as other risks. Typically, this effort includes an analysis of the probability of occurrence weighted against estimated financial consequence. Various legal and management tools exist to mitigate and prevent risks. We emphasise the importance of risk transfer and thorough preparation for the period when risks materialise.

Risk analysis should consider lessons learnt as a matter of best practice. For example, a useful review is provided in the analysis of high-level risks explained in the World Nuclear Association (WNA) document *Structuring Nuclear Projects for Success – An Analytic Framework*.[15] The same methodology that is used for risk mapping should be used for identifying opportunities, i.e. identifying possible actions during the execution of a project that can improve the project objectives. The nuclear industry and governments have identified key drivers with significant potential to decrease costs in nuclear projects.[16] These can guide lawyers and decision makers for future nuclear projects.

### 2. Key drivers of a contractual deal

A challenge for lawyers advising both owners and vendors is to identify key drivers for the commercial deal. These drivers affect project team and management decisions. The lawyers serve a crucial role in guiding and moderating the decision-making process for risks:

- Which are handled at an individual expert level?
- Which require the involvement of multiple disciplines?
- Which must be reported to (and evaluated by) the entire team?
- Which need top-level management approval?

*Do you decide this allocation? Do corporate internal policies allocate risks to a particular decision-making level? Can the risk ever be "all encompassing"? How do you know which risks to include in your "key-points" presentation to senior leadership? How will you document your choices for the lawyers that succeed you?* Some of the key "business levers for top management"[17] are highlighted below.

15. WNA (2012), *Structuring Nuclear Projects for Success an Analytic Framework*, WNA Report, available at: www.world-nuclear.org/our-association/publications/online-reports/structuring-nuclear-projects-for-success.aspx (accessed 21 May 2021).

16. Ingersoll, E., et al. (2020), *The ETI Nuclear Cost Drivers Project: Full Technical Report*, Energy Systems Catapult, Birmingham, United Kingdom, available at: https://es.catapult.org.uk/reports/nuclear-cost-drivers (accessed 21 May 2021).

17. von Branconi, C. and C.H. Loch (2004), "Contracting for major projects: eight business levers for top management", *International Journal of Project Management*, Vol. 22, Issue 2, Elsevier BV, Amsterdam, pp. 119-130.

*a. Single point of responsibility*

If issues arise during construction, the owner ideally looks to a single party, the vendor, to address them. A vendor is traditionally responsible for all design, engineering, procurement, construction, commissioning and testing activities. The vendor can be a single entity or can be a consortium. If the vendor is a consortium, the prime contract can provide that all entities comprising the consortium are jointly and severally liable to the owner.

*b. Technical specification*

The technical specification is essentially the "scope" of the contract; however, it is usually divided into the owner's requirements and the vendor's offer describing its solution. Key here is the legal challenge of adequacy, completeness and consistency of the description of the contract's scope of work, as well as the challenge of consistency between technical and commercial contract provisions. Multiple legal and techno-commercial items must be considered, such as:

- acceptance tests (test structure, hold-points, witness points);
- quality management system (inspections, audits, supply chain); and
- documentation requirements (a key element in every nuclear project).

Defining a "reference plant" is important to avoid disputes regarding the agreed scope. Additionally, in a prime contract, the vendor will normally be responsible for completing gaps between allocated scopes of work as well as performing additional services. The owner can, for example, contract for a nuclear power plant that meets broad requirements (i.e. requirements for safety, quality, security, delivery of power to the grid by a certain date, legal and regulatory compliance, project management, technology and workforce), rather than specified scopes of supply and services. Ultimately, an owner is seeking to purchase a nuclear power plant that will operate in accordance with projected electrical outputs, rather than separate systems, equipment and services. The vendors are able to promise this, but they require clarity regarding what is included in the price and what will be paid for under variation orders.

*c. Price and payment terms*

There are three types of price mechanisms, each of which is typically deployed for different aspects of contract work:

- fixed price: where a fixed amount per unit of supply is agreed (e.g. a fixed price cost for major aspects of the delivery of a nuclear unit, operating support services, specialised engineering work or fuel fabrication);
- fixed-rate price: a fixed amount per unit of a variable quantity of a unit of supply or unit construction work (e.g. metres of piping); and
- cost reimbursable price: where a vendor is paid for the full proven costs incurred in conducting work plus profit, up to an agreed maximum.

Crucial for long-lasting nuclear projects are the chosen price adjustment and escalation mechanisms for labour, materials and cost protections related to currency fluctuations.

*d. Schedule and delays*

Historically, large nuclear construction projects are prone to delay. Planning integration and creating a mechanism to handle delays are essential. Manufacturing and construction completion risks are compounded by unplanned events, including design changes and quality issues, that can

require the performance of additional or amended work scopes. Lawyers are integral to the risk assessment process, including analysis of the:

- achievability of key (intermediate and final) completion dates and related milestones. Important to this analysis is exactness and certainty of key definitions;
- impact of possible project delay/acceleration costs relative to contractual liquidated damages;
- liquidated damage caps and the exclusivity of liquidated damages; and
- possible bonus rules and project alliancing provisions.

Prime contracts normally include a guaranteed completion date. This date can either be a fixed date (e.g. 1 January 2028) or a fixed period after the commencement of the prime contract (e.g. 60 months). If the vendor does not deliver the unit by the guaranteed completion date, the vendor can be liable to the owner for delay liquidated damages. Delay liquidated damages are designed to compensate the owner for loss and damage suffered as a result of delay in commercial operation.

*e. Guaranteed performance parameters*

Prime contracts typically contain guarantees that the power station will meet certain performance criteria, e.g. electrical output, efficiency and reliability. Such guarantees are essential for the owner because the owner's revenue from the sale of electricity will depend on the ability of the power station to meet projected performance indicators.

Performance guarantees provided by the vendor can be backed by performance liquidated damages, which the vendor pays to the owner if it fails to meet the performance guarantees, up to a certain tolerance limit. Typically, parameter tolerances are defined by the parties to measure the economic performance of the installed technology and its ability to generate electricity.

*f. Warranties after take-over*

Depending on the legal tradition (civil law vs. common law) extensive warranties can be agreed upon in the contract with corresponding agreement regarding repair or replacement of unsuitable or defective equipment or defects in service. The parties typically agree on a limited and defined set of remedies and the financial liabilities in addition to the repair obligations, excluding indirect consequences. Typical areas of interest also include warranty of continuing technical support, spare parts availability and service and response time warranty. Often, a "general equipment warranty" is agreed with a set of longer warranties for narrowly defined characteristics of major equipment.

*g. Conventional liability and nuclear liability*

Executives are keen to understand the maximum exposure of the company deriving from a transaction. "Non-nuclear" liability in nuclear projects can be handled in a similar manner to conventional power plant contracts:

- The contract must set the maximum extent of the contractor's total liability (including contractual and tort liability) towards the owner under the contract. The practice shows that this amount can vary materially from transaction to transaction.
- The contract must exclude liability for incalculable and uncontrollable damage, such as liability for indirect and consequential damage. This includes, for example, loss of production, the price for replacement energy, loss of profit and revenue and loss of business opportunity.

Intense negotiations often define the (few) exceptions to the generality of the above and various sub-caps for other forms of liability (e.g. delay, performance guarantees and – if allowed – penalties).

With respect to nuclear liability, the standard practice under the international conventions is to channel nuclear liability to the operator and to procure insurance. The conventions are intricately drafted. For simplicity, the following distinctions can be made:

- nuclear third party liability (which generally applies to damage "outside the fence" of the power plant), where liability is channelled by the international conventions and national laws to the operator;
- nuclear liability for damage to the installation itself, where the contract may ensure that there is a channelling by contract if the conventions do not already provide this; and
- nuclear liability for property on the site of the installation, which property is used in connection with that installation, where again, contractual channelling is necessary, e.g. by agreeing on indemnification by the operator to the vendor.[18]

This is a specialised area of law for which the international and national nuclear liability provisions must be complemented with the provisions of the contract. Insurance generally rests with the owner.

#### *h. Securities*

Nuclear new build projects are of such financial magnitude that they can force both vendors and operators into economic ruin. How does a nuclear vendor ensure its performance towards the owner? How does a nuclear utility ensure its payment obligations towards the vendor? The contracts therefore establish a set of instruments, which correspond to the assessed commercial risks. These typically can include deposits, bank guarantees, letters of credit, parent company guarantees and state guarantees. These often overlap with certain insurance products (e.g. export credit insurance), impact on the project's financing and ensure protection of the parties regarding performance.

### 3. Bid evaluation and awarding of the contract

Ideally, at this stage of the process, there are still multiple competing vendors. The analysis of the final bids is an extensive task "generally taking not less than six months to complete."[19] The aim is to select the best overall proposal for the owner and, with that, the host nation (i.e. compatibility with the national nuclear programme).

18. Convention on Third Party Liability in the Field of Nuclear Energy of 29 July 1960, as amended by the Additional Protocol of 28 January 1964, by the Protocol of 16 November 1982, and by the Protocol of 12 February 2004, Art. 3(a), entered into force 1 Jan. 2022, unofficial consolidated text available at: NEA (2017), "Convention on Third Party Liability in the Field of Nuclear Energy of 29 July 1960, as amended by the Additional Protocol of 28 January 1964, by the Protocol of 16 November 1982 and by the Protocol of 12 February 2004", NEA Doc. NEA/NLC/DOC(2017)5/FINAL (Revised Paris Convention); Vienna Convention on Civil Liability for Nuclear Damage (1963), IAEA Doc. INFCIRC/500, 1063 UNTS 266, entered into force 12 Nov. 1977, Article II, para. 1 and Article IV, paras. 5(a) & (b); Protocol to Amend the 1963 Vienna Convention on Civil Liability for Nuclear Damage (1997), IAEA Doc. INFCIRC/566, 2241 UNTS 302, entered into force 4 Oct. 2003, Article 6, para. 2; Convention on Supplementary Compensation for Nuclear Damage (1997), IAEA Doc. INFCIRC/567, 36 ILM 1473, entered into force 15 Apr. 2015, Annex, Article 3, paras. 1, 7(a) & (b).

19. IAEA (2011), *supra* note 10, p. 27.

By this time, the contracts have been extensively negotiated and they are diverging on significant points between the vendors. Therefore, establishing comparability is a challenge. Typically, "first of a kind" and "first in country" reactors are constructed on a turn-key basis. Clauses requiring "is equal to or better than the reference plant" are commonly used. The owner's legal advisers will prefer a largely fixed price contract in normal circumstances. In contrast, a vendor's advisers will typically insist on variable prices regarding terms like site-specific construction adaptations and the support work necessary for the licensing of the plant by the owner with its regulatory authority.

Bid evaluation is often split into technical, economic, commercial, contractual and organisational components, each in a multi-stage approach. On the owner's side "the total number of personnel required is typically around 70 people."[20] Normally, this analysis should include not only submitted material, but also involve a review of the safety of each technology with its home country regulator; the bidder's performance with other foreign buyers; and each vendor's price books (if requested by the owner) to verify applicable price components.

A legal analysis (for both owner and vendor) is essential in this final stage. Lawyers advising the vendor are involved in modelling the evaluation and providing advice regarding the offer strategy and price implications for each contractual deviation. Contractual deviations may also influence the technical, economic and commercial evaluation. Conversely, technical, economic and commercial risks may be solved by contractual provisions. Therefore, the lawyers must legally contribute to and understand these "non-legal" workstreams.

*How to best organise this internal interface? How deep are the lawyers involved in the review of non "purely legal" documents?* The owner's legal team will be leading the contractual evaluation. This team will endeavour to ensure the risk assessment results developed during the contract negotiation process are reflected in the weighing criteria for the contract evaluation. Since the contracts are not identical, a lower price may be counterbalanced by risks that a particular vendor is not willing to accept. The legal team quantifies, documents and briefs senior management regarding these items.

## *G. Conventional and nuclear insurance*

There are additional legal relationships with other stakeholders that are tightly connected to the main contract. This includes, for example, the insurers. As a principle, insurance must follow the liability. This can mean that parties agree on split liability, whereby parties retain certain liability risks, capped and insured at a reasonable level. However, a common insurance structure in large nuclear construction projects is an "owner controlled insurance programme" (OCIP), which provides umbrella insurance over the site controlled by the owner. This insurance can then be supplemented by generic and project-specific insurances.

A local insurance leader is needed early in the project, along with a regional or international insurance pool. The cost of insurance is significant and must be carefully assessed and planned. Financing also depends on reasonable insurance levels. This includes special insurance regimes, like export risk coverage programmes (often backed by intergovernmental agreements). Nuclear insurance obligations and requirements will vary on national laws and international obligations.

20. *Ibid*., p. 29.

### *H. Financing*

External financing can play an important role in professionalising projects as well as strengthening a project's financial viability and bankability. Financiers ask key questions about economic viability, stability risk assessment and risk allocation. To date, no nuclear power plant has been fully project financed, though there have been a variety of hybrid financing models. In the nuclear sector, financing arrangements are typically a blend of state and commercial sources, cross-border in nature and often involve banking consortia and intergovernmental loan agreements (IGAs). IGAs are particularly used in the context of "build, own and operate" structures where financing is provided by the vendor.

Financing structures also have a strong impact on the contractual arrangements. Some state-owned companies can finance a new build project from their balance sheet. Others create project companies for this purpose.

### *I. Export controls*

The owner's host country is responsible for creating a legal and political environment in which nuclear vendors may successfully operate. Civil nuclear exports require careful analysis and a strong legal foundation, including corresponding bilateral nuclear co-operation agreements. Vendors typically condition nuclear technology and equipment exports on assurances regarding export control compliance. Among other things, nuclear vendors generally insist, as a matter of best practice, that "nuclear power plants and related materials, equipment, and technology shall be provided to and used by Customer States exclusively for peaceful purposes, consistent with the Treaty on the Non-Proliferation of Nuclear Weapons, and in conformity with Nuclear Suppliers Group Guidelines and pertinent United Nations Security Council Resolutions."[21] The lawyers and export control professionals on both sides of a new build project must understand the national legislation in the vendor and customer states, and the national regulatory authority's processes.

## Part III. Nuclear lawyers for nuclear projects

### *A. What is so special about nuclear?*

Considering the foregoing review of legal areas of interest in the development of nuclear projects, are nuclear contracts justified in having their own megaproject category? Are they, in fact, special when compared to contracts in large oil and gas, infrastructure, or conventional power projects? In short, the answer is yes. Some of the main distinguishing features are:

- highly complex projects in an intense regulatory environment;
- national security and diplomatic considerations and requirements;
- an elevated need for government political support;
- regulatory intervention as requirements evolve in parallel to the lengthy construction period;
- in the case of large nuclear projects involving existing plants: after decades of operation and ongoing modernisation, plants can require extensive redesign to meet state of the art for lifetime extensions;

21. Carnegie Endowment for International Peace, Interim Secretariat for the Nuclear Principles (2015), "Nuclear Power Plant and Reactor Exporters' Principles of Conduct, Seoul, Korea January 1, 2015", Principle 5, pp. 7-8, available at: www.mhi.com/company/aboutmhi/domain/power/exporter/pdf/March2015.pdf (accessed 21 May 2021).

- front-heavy financing costs coupled with long project times (more than five years), which typically require state financing support; and
- fuel price is not the primary operational cost driver.

Certain sectors of the international nuclear industry are overcoming some of these challenges, including lack of standardisation in project execution, insufficient integration of time schedules, and lack of competencies on the part of the owner ("operation is not a large project"), vendor ("first of a kind," "first in the country") and regulator.

## *B. Lawyers' role*

Experienced legal counsel can significantly contribute to the success of a civil nuclear project. Experience in the process is important regarding:

- documents for each step of the process;
- advice on what is available;
- advice on key project risks;
- knowledge of industry practices; and
- advice on how to structure transactions to facilitate financing.

This knowledge saves time on the front end, enables agreements to be drafted in a short time, streamlines negotiations and enhances compliance with key IAEA recommendations.

## *C. Conclusions*

*Three years have passed since that sunny morning in your office when you were tasked with your new build project. You are excited because today is the signature ceremony: your company won the bid! Maybe you are one of the few people who can better predict how things will go from here. One thing is for sure: nuclear project development does not stop once the prime contract is signed – it is only the beginning of the next exciting phase.*

The following are key takeaway points from the foregoing review of the contracting process:

- Lawyers can make a significant contribution to the success of a civil nuclear power project.
- Lawyers must venture beyond "purely legal" questions and understand a wide spectrum of project issues, including risk management, process thinking, finance, and technical limitations.
- The owner is in the "driver's seat" of the process: vendors adapt to the owner's rules and documents.
- "Turn-key" never means "hands-off": intense owner and vendor co-operation is necessary for project success.
- Take all the time necessary to obtain an informed and well-founded decision to build a nuclear plant.
- Significant changes will occur – "be prepared" and make sure that the contracts have the necessary mechanisms to deal with changes.

Ultimately, a new nuclear build programme is a marriage that lasts for more than 100 years. What is drafted on paper will have an enormous impact on this long-term relationship between the companies, countries and people involved in the project.