
Nuclear power plant financing – focusing on key nuclear risks

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Section one: Risk analysis in the context of nuclear new build

Risk analysis in the context of nuclear new build

- ▶ Significant CAPEX
- ▶ Reputation for being developed over timetable and over budget – historical and current examples
- ▶ Projects must be “bankable” – the acceptability of the fundamental structure and underlying risk profile to financiers
 - Traditionally financed on the balance sheet of large utilities
 - Emerging nuclear markets seeking to move towards “project financing” – heightened scrutiny of the project’s underlying risk profile

Nuclear power projects – unique risks

- ▶ Conventional power plant project risks: most are enhanced in the context of a nuclear power plant
- ▶ Specific nuclear power project risks: not addressed in project structure for conventional power projects

Specific nuclear power project risks: a non-exhaustive list

| Risk | Issues |
|---|---|
| Political | Nuclear power is politically sensitive and requires long-term government commitment. |
| IAEA Safeguards | State's compliance with IAEA Safeguards Agreement: obligations will be passed down to project participants. IAEA inspections. |
| Regulatory | Specialist nuclear regulator controls all stages of nuclear power project development – siting, design, manufacture, construction, operation and decommissioning. |
| Licensing and permitting: design and construction | Obtaining reactor design certification. Does the regulator undertake detailed design review during construction? Obtaining a construction licence. Terms and conditions of licence (subject to amendment?). |
| Construction | Delay and cost overrun during long construction period. Supply chain – supply of critical components and equipment. Ongoing regulatory review. |
| Operation | Permitting risk - requirement to obtain/renew operating licence. |
| Safety and security | Focus on safety and security and corresponding regulatory control. |

Specific nuclear power project risks: a non-exhaustive list (continued)

| Risk | Issues |
|---------------------------------|---|
| Fuel supply | Initial fuel load and for the life of the plant; long term obligations management and funding obligations. |
| Change of law | Significant international commitments – also subject to change. |
| Nuclear liability and insurance | Is the state a party to an international regime for third party liability for nuclear damage? Is this regime properly implemented in national legislation? Can insurance/financial security be obtained? |
| Human resources | Competent and experienced local and international human resources for specialised regulator and all project participants. |
| Radioactive waste management | Short term responsibility of the operator. Long term responsibility of the state. Funding obligations for waste management? |
| Decommissioning | Government scheme in place for long-term funding? Owner responsibility? Ability to determine costs and liabilities from initial fuel load throughout life of the plant? |

Section two: Political risk

Political risk – bankability checklist

- ▶ Nuclear power is an inherently politically sensitive subject – on a national and international level
- ▶ Is the state a “responsible international nuclear citizen”?
 - Is it a party to the NPT and does it have an IAEA Safeguards Agreement in place?
 - Has it ratified all other international nuclear instruments?
- ▶ Is the nuclear power programme backed by strong and stable political support and government policy? What forms of government support will be offered?
- ▶ Is there public support for nuclear power plant development?
- ▶ Does it cooperate with other governments through bilateral arrangements? Supplier state governments are particularly active in emerging nuclear markets.

Japanese nuclear bilateral relations in MEA

JORDAN

- ▶ MoU signed in relation to infrastructure including nuclear power (2009)
- ▶ Cooperation agreement covering uranium exploration, nuclear reactor construction, protection against nuclear radiation and the management of nuclear waste (September 2010)



KUWAIT

- ▶ Cooperation agreement on potential development of peaceful nuclear power (September 2010)

UNITED ARAB EMIRATES

- ▶ Cooperation agreement on potential development of peaceful nuclear power (2009)

French bilateral relations in MEA

TUNISIA

- ▶ Cooperation agreements in 2006/2008/2009 (includes aid package)

LIBYA

- ▶ Cooperation agreement in 2007 (re-activated in 2010)
- ▶ Desalination cooperation agreement 2007

MOROCCO

- ▶ Partnership indicated for NPP construction and uranium exploration in 2007
- ▶ Cooperation agreement (2010)

ALGERIA

- ▶ Cooperation agreement



JORDAN

- ▶ Cooperation agreement
- ▶ Shortlisted for NPP construction

KUWAIT

- ▶ Cooperation agreement in 2010

UNITED ARAB EMIRATES

- ▶ Cooperation agreement 2008

SAUDI ARABIA

- ▶ Discussions on cooperation in 2009

US bilateral relations in MEA

JORDAN

- ▶ Cooperation agreement

MOROCCO

- ▶ Section 123 Agreement

SAUDI ARABIA

- ▶ Memorandum of Undertaking in May 2008

ALGERIA

- ▶ Memorandum of Understanding

LEBANON

- ▶ Cooperation Agreement in 2008

DJIBOUTI

- ▶ Memorandum of Understanding in 2008



TURKEY

- ▶ Section 123 Agreement
- ▶ Civil nuclear cooperation agreement May 2008

BAHRAIN

- ▶ Memorandum of Understanding

EGYPT

- ▶ Section 123 Agreement

KUWAIT

- ▶ Memorandum of Cooperation June 2010

UAE

- ▶ Cooperating agreement concerning peaceful uses of nuclear energy January 2009
- ▶ Section 123 Agreement

SOUTH AFRICA

- ▶ Cooperation agreement September 2009

Russian bilateral relations in MEA

JORDAN

- ▶ Cooperation agreement
- ▶ Unsuccessful bid to construct research reactor

LIBYA

- ▶ Cooperation agreement 2008
- ▶ Russian research reactor

CAPE VERDE

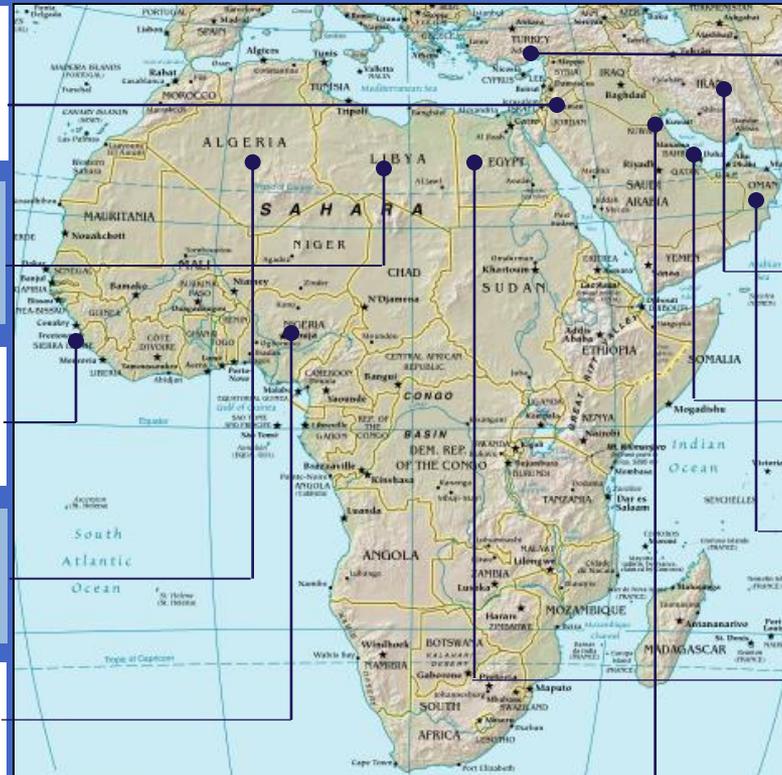
- ▶ Interested in a mini floating nuclear power plant

ALGERIA

- ▶ Joint cooperation declaration in 2009

NIGERIA

- ▶ Cooperation agreement 2009 (including mining and uranium exploration)
- ▶ Considering a new Russian research reactor



TURKEY

- ▶ Agreement signed for the construction of Turkey's first NPP (May 2010)
- ▶ Cooperation agreement 2009

IRAN

- ▶ Russia constructing NPP

BAHRAIN

- ▶ MOU with State Atomic Energy Corporation 2008

OMAN

- ▶ Cooperation agreement 2009

EGYPT

- ▶ Agreements in 2004 and 2008
- ▶ Russian research reactor
- ▶ Plans to take part in tender for NPP

KUWAIT

- ▶ MoU with Russia's Rosatom State Atomic Energy Corporation (September 2010)

Section three: Legal and regulatory risk

Legal and regulatory risk – bankability checklist

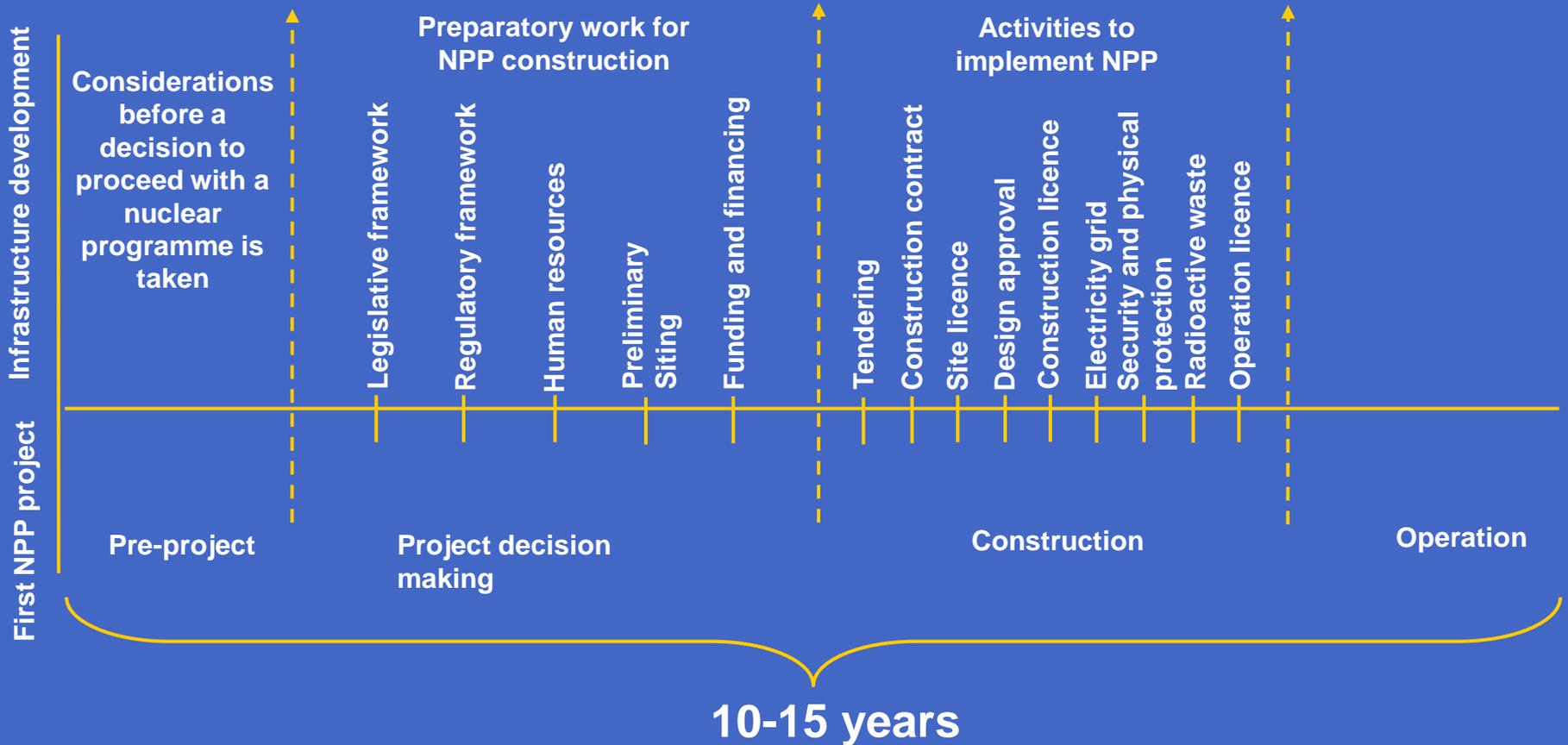
- ▶ Are the three layers of the necessary legal infrastructure for nuclear new build in place?
 - International nuclear instruments
 - National nuclear law, including the establishment of a regulatory authority
 - Implementing regulations
- ▶ Is the legal infrastructure comprehensive, internationally compliant and transparent for all stakeholders?
- ▶ What are the key regulatory controls during the development phase and to what extent will they impact on ability to deliver the project on time and on budget?

IAEA milestones: development of the infrastructure for a nuclear power programme

Milestone 1: ready to make a knowledgeable commitment to a nuclear power programme

Milestone 2: ready to invite bids for first NPP

Milestone 3: ready to commission and operate first NPP

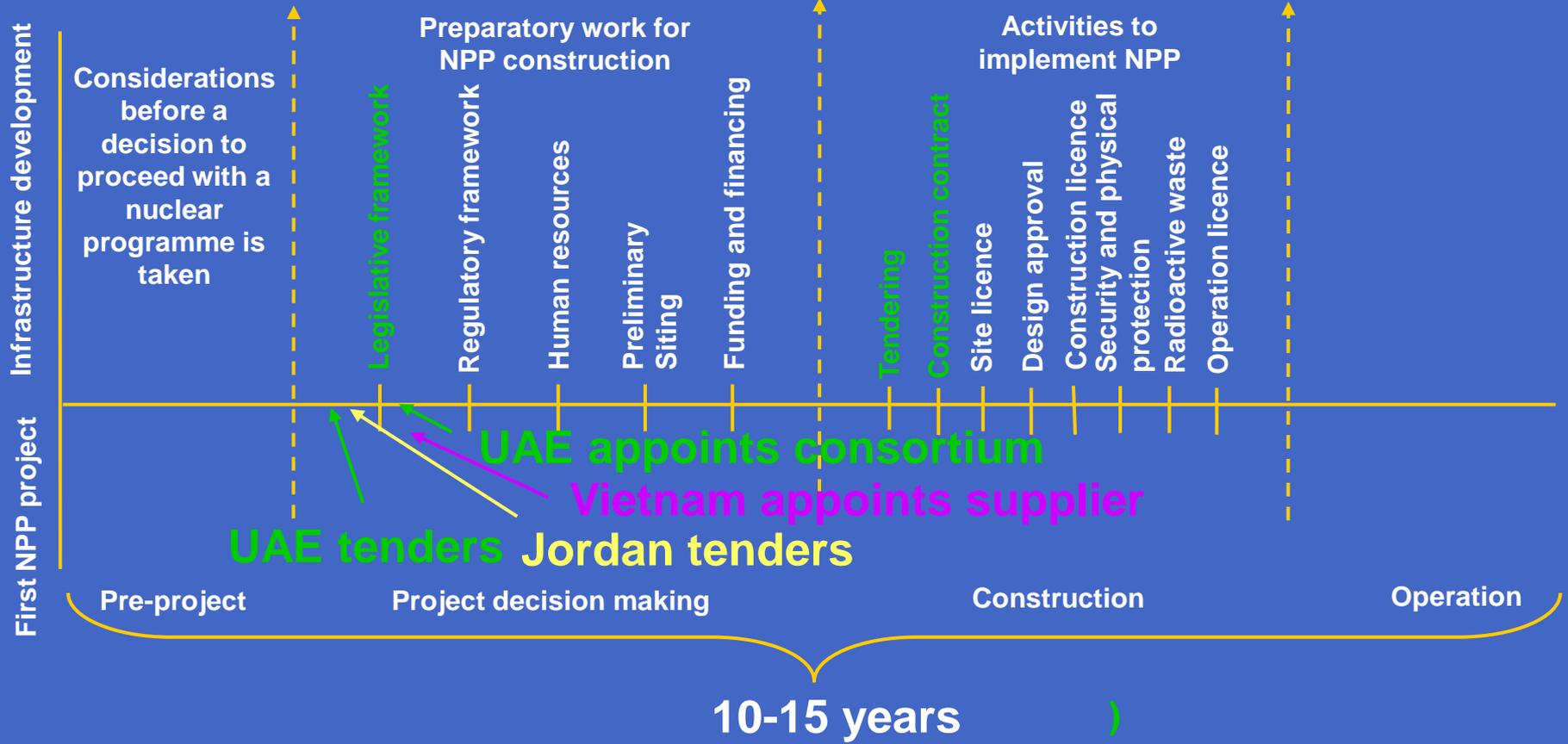


Fast tracking - the paradigm shift to focus on procurement in emerging nuclear markets

Milestone 1: ready to make a knowledgeable commitment to a nuclear power programme

Milestone 2: ready to invite bids for first NPP

Milestone 3: ready to commission and operate first NPP



Potential consequences of a focus on procurement in emerging markets

- ▶ Ability to negotiate key project contracts in the absence of a complete legal infrastructure?
 - Identification of key project risks
 - Allocation of key project risks - may result in inappropriate allocation with consequent affect on contract price; subsequent contract variation orders
 - Quantification of broad project risks - potential impact on contract price and cost of financing?

Potential consequences of a focus on procurement in emerging markets

- ▶ Ability to commence construction in the absence of legal infrastructure?
 - Licences required for design, site, manufacture and construction
 - Licensing process potentially affects price (delay = cost overrun)
 - Progressing the project without liability regime in place. Can reactor and component parts be shipped without adoption of nuclear liability regime?

Section four: Nuclear liability risk

Nuclear liability risk – bankability checklist

- ▶ Is the state a party to an international regime for third party nuclear damage?
- ▶ Has the state given national effect to the regime through national legislation? How has the state dealt with issues of capping liability (option under the Vienna convention)?
- ▶ What regime is in place in the countries of the supplier state and other project participants' state? Have all states linked their regimes via the Joint Protocol?
- ▶ What nuclear liability regime is in place in neighbouring countries?
- ▶ Is there a market for nuclear insurance?

Significance of third party liability for nuclear damage

- ▶ Deals with most serious project risk – liability for nuclear damage and the problems surrounding its potentially unquantifiable and transboundary nature
- ▶ Key principles of international regimes:
 - Requires funds to be available to protect potential victims
 - The operator of a nuclear installation is exclusively liable for nuclear damage (“channelling principle”). The liability is strict (subject to limited exceptions)
 - Liability is limited in amount (a minimum amount is set and each state may set a maximum amount) and liability is limited in time
 - Operator must maintain insurance or other financial security covering an amount equal to its liability
 - Exclusive jurisdiction is granted to the courts of the installation state

India's nuclear liability bill

- ▶ Passed by the Indian Lower House in August 2010
- ▶ Broadly in line with most key principles of the international regime
- ▶ Concerns:
 - Limit on the operator's liability is low (approx \$110 million)
 - Liability of the operator is not strict: after paying compensation, the operator may have financial recourse to a supplier if "*the nuclear incident has resulted as a consequence of an act of the supplier or his employee, which includes supply of equipment or material with patent or latent defects or sub-standard services*" (clause 17b)

Consequences of not adopting an international nuclear liability regime

- ▶ Affects operators, suppliers, component part suppliers, carriers, civil works contractors, lenders, insurance industry, civilian populations and regional inter–state relations
- ▶ Victims may not have access to appropriate compensation
- ▶ Neighbouring states may have concerns
- ▶ International nuclear supply chain may not ship reactor/nuclear components
- ▶ International nuclear supply chain may seek government indemnities as to nuclear liability
- ▶ Project may not be able to obtain insurance
- ▶ Project may not be able to obtain financing

Section five: Licensing and permitting risk

Licensing and permitting risk- bankability checklist

- ▶ Can have a significant impact on ability to deliver a project on time and on budget
- ▶ Is there a competent regulatory authority with sufficiently experienced human resources to undertake the licensing process?
- ▶ Is the licensing and permitting process established, predictable, transparent and based on international standards and guidelines?
- ▶ How many separate licenses are required – site, design, construction, manufacture, operation, decommissioning? Is there a combined construction and operation licence?
- ▶ Is reactor design certification free-standing? Can the regulator seek assistance from an experienced national regulator? Can the regulator adopt a certification issued in another jurisdiction?
- ▶ What terms and conditions may the regulator impose in a licence and under what circumstances may the regulator suspend or revoke a licence?
- ▶ How rigorously will the regulator monitor the construction process?

Hot topics in licensing and permitting

- ▶ Cooperation between national regulators:
 - Assistance from national regulator in supplier's home country
 - Particularly for reactor design certification: for example, new Italian legislation allows Italian regulator to adopt a current design certification issued by another national regulator, subject to own independent review

- ▶ Relationship between development corporation and national regulator:
 - Extent of regulatory oversight – balance between rigorous oversight and expeditious project development
 - Information channels: responsibility for communications with regulator between development corporation and its suppliers and contractors
 - Example: Olkiluoto 3 in Finland

Section six: Construction risk

Construction risk – bankability checklist

- ▶ How are delay and cost overrun risks best allocated and mitigated during construction?
- ▶ What contracting structure should be adopted – lump sum/cost plus EPC or multi-package approach? Is the classical lump sum EPC approach the best solution for emerging nuclear markets? Will it deliver the best contract price? Will it facilitate smooth project development and avoid complex variation claims and disputes?
- ▶ Are all contractual rights, obligations and procedures clear and readily understandable by all parties?
- ▶ What claims management and dispute mechanisms have been put in place?
- ▶ How will the relationship with the regulator be managed? Does the regulator have power to undertake detailed design review during construction?
- ▶ How has access to the supply chain been assured? Can contracts for the supply of critical components and equipment be placed early?

EPC contract risks- some examples of mitigation and management techniques

| Risk | Issues |
|---|---|
| Fixed price – subsequent claims and disputes | <ul style="list-style-type: none"> ▶ Consider incorporation of pricing provisions allowing for cost plus elements with target cost and painshare/gainshare where appropriate. ▶ Clear delineation of scope of work. ▶ Design as advanced as possible- with regulatory approval. ▶ Tiered dispute resolution mechanisms. |
| Lack of control over choice of sub-contractors | <ul style="list-style-type: none"> ▶ Owner must be an “intelligent customer” – must retain a level of control over safety and security issues. ▶ Owner may want to retain veto over selection and terms of key sub-contracts. ▶ Take direct warranty protection with step-in rights in event of contractor insolvency. |
| Lack of control over progress of works | <ul style="list-style-type: none"> ▶ Consider payment against identified milestones. ▶ Incorporate obligations for contractor to mitigate delay. ▶ Ensure requirement to have sufficient human resources. |
| Allocation of risk of pricing impact of regulatory activity/changes | <ul style="list-style-type: none"> ▶ Incentivise parties for joint problem solving. ▶ Early engagement with regulator. ▶ Document management systems and streamlined communication arrangements. |

EPC contract risk – claims and disputes

- ▶ Obligations of project participants must be clear, predictable and enforceable.
- ▶ Identify and investigate before proceeding to formal claim/dispute- early notice requirements and conditions precedent to any entitlement to pursue a claim.
- ▶ Role of project managers and contract administrators.
- ▶ Selection of appropriate dispute resolution scheme – a tiered approach:
 - Mandatory senior management level discussions/resolution
 - Mediation – impartial third party to assist parties negotiate own solution
 - Expert determination – technical disputes decided by expert agreed by the parties
 - Dispute board – panel of experts appointed to make a determination within agreed timeframe
 - Arbitration – dispute referred to arbitrator for a hearing and decision, under agreed set of rules; parties agree to be bound by decision
 - Litigation - matter taken to court for judicial review and settlement

Section seven: Conclusions

Conclusions

- ▶ The risk profile for nuclear new build is unique, including significant CAPEX and period of design and construction risks
- ▶ Nuclear new build is conducted within a framework of stringent international and national legal and regulatory infrastructure to ensure non-proliferation, safety and security
- ▶ Emerging nuclear markets focusing on procurement (paradigm shift) must ensure that the development of their supporting infrastructure keeps pace – not an easy task
- ▶ Unknown how far a project can be developed in the absence of a comprehensive legal and regulatory infrastructure – consider impact on project risks