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The Intelligent Customer: considerations around build-own-operate business and licensing models for small modular reactors in Canada

An organization planning a proposal for a build-own-operate business model needs to address expanded licensee responsibilities under this model, associated regulatory impacts and how this affects their role as an ‘intelligent customer’. This is particularly important for cases where builder-owner-operators plan to manufacture factory-fuelled designs and ship them to a site for installation and operation.

The primary responsibility for safe conduct of licensed activities rests with the licensee. A build-own-operate model expands the scope of licensed activities to include design, manufacturing, transport, construction, and operation. The licensee must be able to demonstrate they are qualified to conductall licensed activities including sufficient competent resources within the licensee’s organization to oversee(‘Intelligent Customer’) any work it commissions externally and the subsequent flow down through of the supply chain.

This paper examines aspects thatorganizations need to assess the suitability of approaches that it may take to maintain in-house expertise for the control and oversight of licensed activities at alltimes. It considers the approach to identification of:

- core capabilities the licensee would need to understand its safety case under a build-own-operate model to manage licensed activities in accordance with requirements under the Nuclear Safety and Control Act
- a licensee’s ‘intelligent customer’ capabilitiesin particular around understanding, specifying, overseeing and accepting work undertaken on its behalf by contractors

While this paper is focused on small modular reactors, being an intelligent customer applies to large commercial or research reactors equally; the size of reactor is immaterial.

Intelligent Customer

What is an Intelligent Customer? Also referred to as Smart Buyer the term was first coined by the United Kingdom’s Office for Nuclear Regulation and has gained international acceptance. It is defined by the IAEA for the purpose of new build reactors as:

"An organization (or individual) that has thecompetence to specify the scope and standard of a required product or service and subsequently assess whether the supplied product or service meets the specified requirements." [1]

Who needs to be an intelligent customer?

First time organizations with a first-of-a-kind small modular reactor concept, such as:

- universities
- ex reactor vendor personnel
- nuclear research facilities
- private enterprises
- individuals

Not all are expected to have nuclear projectexpertize or experience, just the 'bright idea'. However, that does not relieve them of their responsibilities.

Core capability

The licensee should be able to identify and maintain the core capability that it needs to maintain effective management for nuclear safety. CNSC expects the licensee to, within its own organization, have sufficient competent persons to be able to maintain control and oversight of safety at all times. This 'core capability' will include technical (e.g. design authority, engineering, safety case capability), operational and managerial elements. Together they combine to ensure that the safety case for the installation is understood and maintained, and that the site, and plants or projects are operated in accordance with the safety case and the conditions of the applicable licence.

The licensee should be able to demonstrate that it is sustaining its core capability and that this capability is resilient – in other words, the licensee understands challenges to its retention of this capability and has put in place measures to mitigate them. Such measures may include vulnerability analysis, progression planning, review of the availability of external capability etc.

The most secure source of core capability is generally direct employment of competent staff. CNSC recognizes that direct employment by the licensee organization may not be the preferred model for some licensee organizations and its core capability may include staff seconded from

parts of a parent/partner company. In such instances, the licensee must be able to demonstrate that it has formal arrangements in place to ensure that it will, at all times, have access to sufficient, competent staff and that those staff cannot return to the parent/partner company individually or en bloc unless sufficient notice is given by the parent/partner company to allow alternative arrangements to be made by the licensee to ensure continuity of core capability.

The licensee should put arrangements in place to assure itself that key decisions relating to the size of the core capability are subject to robust challenge and scrutiny. It should also be actively involved in assessing the implications, and monitoring the subsequent implementation, of proposed organizational changes where key activities with the potential to impact on nuclear safety may be outsourced or the size of the core capability significantly reduced.

Licensees whose primary objective is to build-own-operate new nuclear reactor facilities should:

- Take into consideration their core capability needs commensurate with stages of the project. In the pre-construction stage, CNSC acknowledges that some of the knowledge of plant design may reside withincontractor organizations. The licensee should develop an appropriate core capability to manage the totality of its activities as a licensee which includes sufficient resource to act as an ‘intelligent customer’ for the services the contractor provides. It is important to note that, although the contractor organizations may have an enduring role, it should always be regarded as a key external resource and not a part of the licensee’s core capability.

- Be able to demonstrate that they understand when and how much core capability they need to develop in house or transfer into the licensee organization from the contractor as the project progresses including a strategy to achieve this. It is expected that the licensee’s core capability will increase and the role of the contractor will diminish as the project progresses through the pre-construction, construction and commissioning phases, and into operations.

Overseeing and accepting work undertaken on its behalf by contractors

There are some broad principles which underpin a licensee’s arrangements for the use of contractors and the supply chain for retaining control of nuclear safety. These are summarizedbelow and then interpreted in the sections that follow:

1. The licensee shall retain overall responsibility for, and control of, the nuclearand radiological safety and security of all its business, including work carriedout on its behalf by contractors.

2. Licensee choices between sourcing work in-house or from contractors shouldbe informed by a clear policy that takes due account of the nuclear safetyimplications of those choices.

3. The licensee should maintain an “intelligent customer” capability for all workcarried out on its behalf by contractors that may impact upon nuclear safety

4. The licensee should ensure that it only lets contracts for work withnuclear safety significance to contractors with suitable competence,safety standards and resources.

5. The licensee should ensure that all contractor staff are familiar withthe nuclear safety implications of their work and interact in a well-coordinated manner with its own staff.

6. The licensee should ensure that contractors’ work is carried out to therequired level of safety and quality in practice.

The licensee is directly responsible for managing its contractors, and thisrequirement should be reflected in contractual arrangements between theparties. “Relevant Arrangements” between the licensee and Tier 1 contractorsmust also cascade down into contracts throughout the supply chain.

CNSC recognizes in today’s ‘Global Community’, reactor vendors – and by extension their partners and supply chain,in particular factory-built, fuel-loaded and shipped to site reactor vessels, may be in different countries. While this poses some regulatory challenges, from an Intelligent Customer perspective international borders should not be an impediment.

It is the responsibility of licensees and higher tier contractors to fully interpret thenuclear regulations and licence conditions which are applicable to the contractwhich they are seeking to place. The contracting entity should document allrelevant requirements clearly and precisely without over reliance on referencingout to other documents. Lower tier contractors have a duty to ensure that theyhave a general understanding of nuclear regulation and application of licenceconditions so they can appreciate the context in which the higher tier contractor’srequirements are set. This understanding will allow subcontractors to askintelligent questions to clarify, correctly interpret and implementall relevant requirements.

Although it is the responsibility of the licensee to ensure compliance withlicense conditions, each tier within the supply chain should be made aware of, andunderstand, the nuclear safety significance of the work that it is doing, and be ableto demonstrate that it has arrangements to comply with the contract specification.Each link in the supply chain should therefore ensure that its staff, and any subcontractors,are suitably trained and briefed on their responsibilities under

therelevant licence conditions, and that suitable measures are implemented to assurecompliance with contract specifications.

The licensee must have a “make or buy” policy to determine whether work shouldbe undertaken “in house” by its own resources or outsourced from the supplychain. It must have an in-house capability to fully understand the nuclear safetysignificance of any purchased expertise or equipment, specify requirements,supervise the work, and technically review the output before, during and afterimplementation. This is known as the Intelligent Customer capability.

A contractor should have an “intelligent contractor” capability to understand thetechnical and quality process requirements of his customer. The contractor shouldbe aware that failure to meet safety significant requirements could have severeconsequences for its customer, other organizations further up the supply chain(up to and including the licensee) and potentially members of the public in theevent of a major failure. A company in the supply chain may need to act as bothintelligent contractor and intelligent customer e.g. a Tier 2 contractor may useits own supply chain to meet the needs of its Tier 1 customer, and will need toprocure goods or services ‘intelligently’. Figure 1 illustrates the Intelligent Customer and Intelligent Contractor lin-of-sight throughout the supply chain.

Tier 1 companies should fully brief their sub-contractors on the nuclear safetysignificance of the products or services they are supplying. This should includerequirements set out in relevant CNSCRegulatory Documents (REGDOCS) which are available on the CNSC website; aswell as Canadian Standards Association (CSA) N series of standards. These briefings should be formal and attendance should be mandatory.Signed attendance records should form part of the contract quality pack. It is theresponsibility of the contractors to ensure any new staff joining the project aresimilarly and adequately briefed.

Lower Tier contractors should have management and working arrangements tocover their activities. This will require all contractors throughout the supply chain to have aformal management system preferably certified to a recognizedqualitymanagement standard or can be demonstrated to meet the intent of the standard.If lower Tier contractors do not have certification, their Tier 1 contractoris likely to conduct a form of in-depth audit of their management system to ensure it is robustand will seek evidence that management system arrangements are being followed.

Contractors at all levels in the supply chain should expect to be audited by theircustomer on a regular basis as part of the contractual arrangements. Audits fromorganizations higher up the supply chain are also possible. It should be noted thata contractor at any level in the supply chain could be visited by the CNSC as part ofa regulatory oversight, particularly if the equipment they are manufacturing hashigh nuclear safety significance.

Licensees and contractors should have demonstrably competent staff with theright qualifications, knowledge and experience to carry out the duties expectedof them. Records should be available to demonstrate personnel are competent to fulfil their allocate tasks.

Examples of services that can be contracted

- Manufacturing
- Project management
- Design (including turn-key design)
- Construction
- Commissioning
- Radiation protection
- Operation
- Maintenance
- Security
- Training
- Dosimetry
- Examination
- Waste management
- Safety assessments
- In-service inspections
- Fuel supply
- Fuel post irradiation

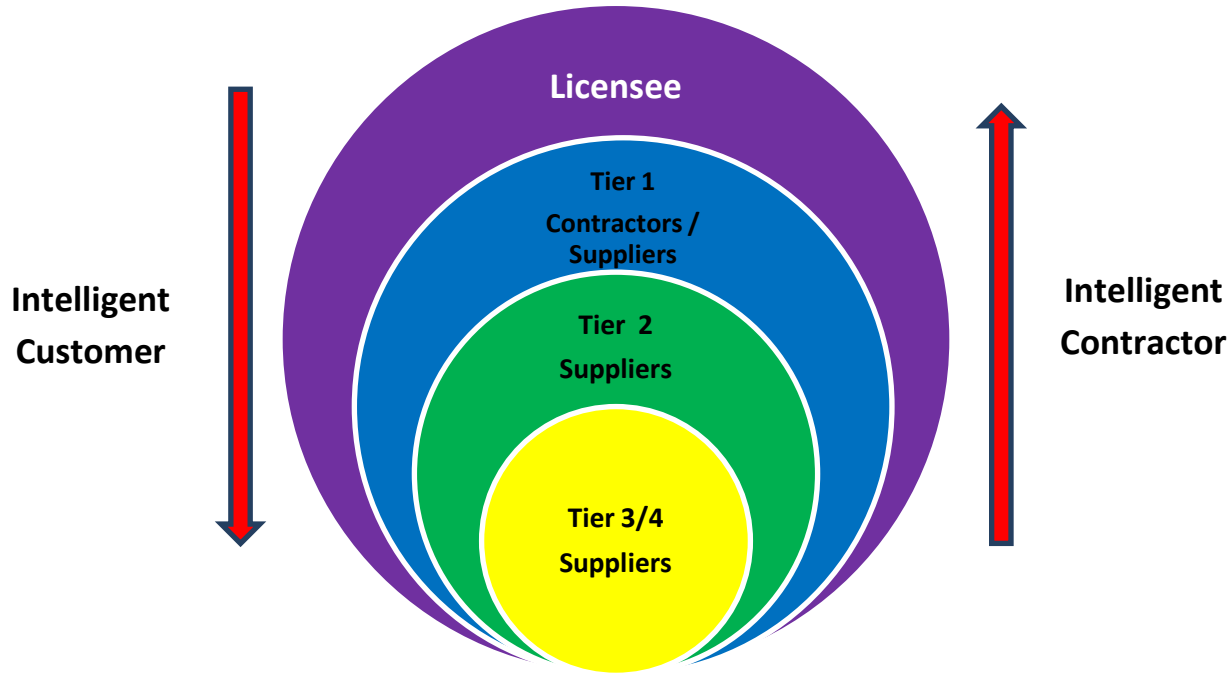

Figure 1: Illustrates the Intelligent Customer and Intelligent Contractor line-of-sight throughout the supply chain.

References

[1] IAEA Nuclear Energy Series, No. NG-T-3.10, Workforce Planning for New Nuclear Power Programmes, 2011.