From:
To: Consultation (CNSC/CCSN)
Subject: REGDOC-1.1.5 Feedback on comments
Date: November-16-18 3:48:13 PM
Attachments: Winfield CNSC comments on REGDOC-1.1.5.docx
Winfield CNSC comments on REGDOC-1.1.5.pdf

Please find comments submitted as part of public feedback on REGDOC-1.1.5 comments, prior to the Nov. 20 deadline, in MSWord and pdf format.

Please confirm satisfactory receipt.

D.J. Winfield

November 16, 2018

From: David J. Winfield
To: Directorate of Regulatory Improvement and Major Projects Management
Canadian Nuclear Safety Commission

Sent by email: cnsc.consultation.ccsn@canada.ca

Re: Feedback on comments on CNSC's Draft: REGDOC-1.1.5, Licence Application Guide: Small Modular Reactors.

Please find my feedback on comments with respect to REGDOC-1.1.5 and also, to a smaller extent the Stakeholder Workshop Report. The feedback and comments represent my own personal opinions. I am not affiliated in any way with any industry group, NGO or any other organised group.

I have some relevant technical experience as the AECL's Safety and Licensing Manager for the Slowpoke Demonstration Reactor Project, 1997-2000 and from 2008 to 2011 I was the Technical Officer responsible for the production of IAEA SSG-22, Specific Safety Guide for the Application of the Graded Approach, 2012.

I attach both a pdf and an MSWord version for your convenience.

Thank you for the opportunity to provide feedback and comments.

D.J. Winfield

Ontario

1. Consistency with international practices is claimed in REGDOC-1.1.5 preface. No commenters though mention lack of any reference to relevant IAEA publications, where recommendations and guidance on regulatory body application of a graded approach to the licensing process are provided? [e.g. IAEA Specific Safety Guides, *SSG-22 (2012); Use of a Graded Approach in the Application of the Safety Requirements for Research Reactors* and *SSG-12 (2010); Licensing Process For Nuclear Installations*].

The more detailed SSG-22 covers research reactors and critical assemblies, but excludes reactors used for the production of electricity, desalination or district heating. SMR balance-of-plant systems are thus not included. Nevertheless, as the former IAEA Technical Officer responsible for the production of SSG-22, I can confirm the IAEA intent was to provide a graded approach specific safety guide for research reactors initially, rather than one for power reactors, because of the very large variety of research reactor designs, power levels and fuel/coolant types, etc. Hence, based on this logic, the concepts presented in SSG-22 are also applicable for the large variety of SMR nuclear designs. Indeed, the CNSC documents already list the same specific grading factors listed in SSG-22 and other IAEA safety guides. I therefore suggest Comment #4, identically submitted from all the industry commenters asking if some SMRs can be licensed as a research reactor facility is a valid question, even if SMRs are not connected to a power grid, as far as graded approach application is concerned.

There are also no comments pointing out that the REGDOC provides no guidance or mention of any features that the CNSC would consider to be non-gradable in principle? Such guidance would presumably aid to screening proposals with unrealistic claims at an early stage. There also appears to be no comments on qualification requirements for pre-screening SMR license proponents (e.g. financial, technical, security, nuclear experience, company status/credibility etc.) and none are mentioned in the REGDOC.

2. Stakeholder Workshop Report, November 24, 2017, Section 2.1; reference to DIS-16-04 Appendix A.

In contrast to the previous comment on the lack of IAEA references, DIS-16-04 Appendix A references an SMR report giving the impression it is an official IAEA publication.

The publication legal disclaimer however indicates it is not an official IAEA document and should not be quoted or listed as a reference. Regardless, no commenters point out that Figure 1 conveys the false impression that Canada is currently a Member State with two SMRs**.** A related Northwatch comment p.7 was that the e-link provided to this document is non-functioning (it is though available via a web search) and hence leaves the reader with the incorrect assumption it was an official IAEA document.

I suggest it is not appropriate for this publication to be referenced and e-linked from within the context of current public CNSC SMR documentation.

3. Commenter Northwatch p. 6 requested that in future publications, the CNSC '*…should include a history of this reactor class, and of any past deliberations of regulatory actions or initiatives...".*

No other REGDOC commenters, workshop report, or other contemporary SMR licensing literature seems to mention AECL's historical ventures into small heating reactors; particular those optimistically and actively promoted for remote communities and urban locations. Despite the construction of and the successful, but very short, operational performance of a (very) small heating reactor prototype, using existing demonstrated technology, insurmountable problems still precluded full power licensing and hence any prospect of prototype commercialization. The heating reactor program was thus terminated about 20 years ago, despite significant program expenditures and a successfully built and functioning reactor.

Some reflections on this history would thus seem prudent in future publications, as Northwatch requests. All the historically difficult issues still remain, most now intensified in today's more pluralistic society.

4. REGDOC-1.1.5, Waste Management, 2.2.11.

(i) No commenters have mentioned that Canada has an international obligation to comply with the *Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management International Law Series No. 1, 2006.* The Joint Convention has requirements for siting, design, assessment and operations that must be adhered to. It seems appropriate that such information should be included in the waste management standards mentioned.

Additional, new licensing requirements may also be required for both fresh and spent fuel transportation, to address initial fueling and refuelling concepts, possibly arising from some modular designs where core components and fuel have to be shipped as modules?

(ii) Comment #14 from all the industry commenters (identically) validly requests information regarding licences to decommission to abandon. In view of the different location sites proposed, compared to large power plant sites, some additional mention should perhaps be provided in section 2.2.11 to recognize and define the eventual end-state of an SMR facility site, whether it be 'brownfield' or 'greenfield'. The end-state will need to be accepted by the host community at the site licence approval stage, with the regulator ensuring end-state issues are addressed.

5. Definitions and Clarity.

Industry commenters (identical comment #1, and an NGO public participant group, Northwatch, pp. 3- 5) have clearly noted that important omissions are: the lack of an SMR definition and lack of reference to the IAEA definition. Also noted was lack of clarity with other items (Industry comments #5, 6, 8, 12, 13, 17, 27, 28 and MeV200 Consulting Inc. comments # 5, 7, 22, 25).

REGDOC-3.6 Glossary of CNSC Terminology should also (as mentioned by Northwatch p.4) surely include the SMR acronym definition, in place of, or at least in addition to the two other, seldom used, SMR acronyms. The acronym itself does not though descriptively capture the significant diversity of SMRs. For instance the generic use of 'small' might well be seen, particularly among the general public, as disingenuous or deceptive, especially in view of the very few SMR's actually being built, such as the KLT-40S, HTR-PM and CAREM-25 for example. These examples are not, by any realistic measure, physically small. SMR footprints do not necessarily scale down uniformly with power rating, compared to those of large power reactors, as might be expected by using 'small' as a generic descriptor.

As the SMR acronym now seems unlikely to change it is suggested that, in addition to the IAEA SMR textual definition, as commenters mentioned above have noted, that sufficient clarifying descriptive information be provided to explain the large variety of designs and that they indeed may neither be small, nor modular, despite the now-established SMR acronym.

Additionally, the impression provided to the public by use of the term 'advanced' seems to stray more into marketing enthusiasm than demonstrated reality. In the absence of any substantial operational experience with SMRs to date (other than perhaps military submarines, marine reactors and the HTR-10) such usage of 'advanced' will invite justifiable skepticism.

Two additional examples (not exhaustive) of items with lack of clarity and seemingly lack of usefulness, that are recommended to be modified, or removed, are:

- Lack of clarity statement (Stakeholder Report, Section 3.2.2). *... 'risks…… should be infinitesimally small…',* used in context as a high level safety objective. Does this imply the CNSC is supposed to validate / affirm this objective? This seems an impossible goal. Utilizing well-established high-level statements from the IAEA Safety Fundamentals, SF1, would be more appropriate and credible.

- *'Longest decay time of the sources'*, REGDOC Section 2.2.7. Decay time is a very rarely used term, as an alternative to half-life or decay constant. Regardless, this requirement, as well as other quotes such as *'the number of sources of radiation'* and Section 2.2.1, *'number and size of radioactive or nuclear sources',* does not provide a good impression of clarity or useful technical relevance.

6. REGDOC-1.1.5, SCA areas, Sections 2.2.4, 2.2.5, 2.2.6, 2.2.7

In a similar vein to the previous comment, repetitive, identical or similar requirements in these listed (and other) SCA sections requesting numbers of various SMR characteristics (e.g. *number of design provisions to reduce risk; number of process systems; number of active safety systems; total activities involving risk*) taken out of context with any overall design, seems not very useful for a licensing application guide, (see also MeV200 Consulting Inc. SCA-related comments #7, 11 and12). The impression given is then that the approach to safety analysis, Section 2.2.4 in particular, is that of a tick box approach, rather than a traditionally staged progression of comprehensive safety case/reports from design concepts to 'final', reflecting appropriate features as licensing progresses.

Most topics in the SCA areas do seem more appropriate for, and are heavily weighted towards, an existing mature power reactor facility e.g. *fitness for duty, configuration management, document control, periodic inspection,* rather than for novel SMRs at the early site and construction licensing stages and more importantly at the nuclear commissioning stage (see also Mev200 Consulting Inc, related comments #7 and 25).

A prototype SMR will need an extensive and very time-consuming R & D and testing program. Many of the generic SCA topic areas listed, let alone some of the aforementioned detailed content items, would be expected to be of limited importance for an SMR prototype unless the intent is to operate it for many years. There is silence on guidance for licensing during prototype commissioning. At this stage 'normal' operational limits will need to be exceeded (unless computer predictions are accepted by the regulator) to demonstrate Limiting Conditions for Safe Operation and Safety System Settings to establish acceptable operating margins below Safety Limits.

The responsibility of the vendors in this process is well recognized by the Stakeholder Report, Section 4, bullet 3 comment. AECL's small heating reactor incompleted commissioning tests come to mind if SMR licensing similarly precludes a prototype being used as a test reactor. The alternative process is captured well I think by Stakeholder Report Section 4, bullet 5 open question *'How can stakeholders demonstrate to the regulator that the computer modeling of inherent safety features is close enough to reality that less experimental data or no prototypes are required*. Other than noting that 20 years ago, the regulator soundly dismissed use of the term inherent safety, this query is I feel important for the CNSC to address. Termination of the two MAPLE reactors in 2008 revolved around the issue of predictive calculations of the power coefficient of reactivity. These predictions were not in complete agreement with results from successful commissioning test data for the real reactor and further testing was not pursued. In this case the inability of computer codes to accurately predict reality, influenced the decision to discontinue the MAPLE reactors. The ultimate failures of the above three reactors all occurred at the final commissioning testing stages. The importance therefore of being able to perform prototype commissioning tests as part of the licensing process, recognizing that such tests might well involve exceeding nominal power limits, cannot be overemphasized in my view.