September 27, 2016

Canadian Nuclear Safety Commission
P.O. Box 1046, Station B
280 Slater Street
Ottawa, Ontario, Canada K1P 5S9

KINECTRICS INC.
800 Kipling Avenue, Unit 2
Toronto, Ontario, Canada
M8Z 5G5

Telephone: 416.207.6000
Facsimile: 416.207.6532

www.kinectrics.com

Dear Madam/Sir;

The purpose of this letter is to provide our feedback to the Discussion Paper DIS-16-04, "Small Modular Reactors: Regulatory Strategy, Approaches and Challenges."

We thank the CNSC for the opportunity to provide comments on this Discussion Paper; provided in the attached table.

Building on our experience with various Small Modular Reactor (SMR) designs and assessing them against Canadian regulatory requirements, we found the Discussion Paper to be thorough and well thought-out, and concur the issues identified are relevant.

For the SMR designs we have evaluated, we have concluded there are no fundamental barriers within the Canadian regulatory framework that would prevent successful licensing or cause an untenable delay in the licensing process. We do not believe a fundamental change to the Canadian regulatory system is needed for licensing of SMRs in Canada.

We suggest responses to the questions raised in the Discussion Paper be developed to further increase certainty in the licensing process. This will likely necessitate further discussions between the CNSC and stakeholders.

Sincerely,

Mihaela Trandafirescu
Manager, Regulatory Affairs and Licensing
Candesco Division of Kinectrics Inc.
Telephone 416.585.2552 (279)
mihaela.trandafirescu@candesco.com

CC: Katherine Moshonas-Cole, Ross Rock, Glenn Archinoff

Candesco Comments on discussion paper DIS 16-04, Small Modular Reactors- Regulatory Strategy, Approaches and Challenges

No.	Document section	Comment	Suggested change (if applicable)	Notes
1	General	We note that Section 11 of CNSC REGDOC-2.5.2 Design of Reactor Facilities: Nuclear Power Plants allows for alternative approaches. We would suggest that if CNSC RD-367 Design of Small Reactor Facilities is going to be used by CNSC staff to evaluate SMR designs, similar text be included in an updated version of the document or a REGDOC to be developed from it. For example, the discussion paper refers to alternative approaches to address the levels of defence in depth and alternative ways to meet safety objectives. Section 1 Introduction states that "….Regulatory tools and decision-making processes are structured to enable a licence applicant for a reactor facility to propose alternative ways to meet regulatory expectations"; however this concept is not currently reflected in the regulatory document RD-367, which applies to SMRs with a power level of less than 200 MW(thermal). It might be interpreted that for SMRs with a power level of less than 200 MWt, the alternative approach is not acceptable. Hence, we suggest that regulatory documents applicable to SMRs clarify that the graded approach is applicable.	CNSC to clarify the applicability of graded approach to SMRs.	This will eliminate the confusion regarding the application of graded approach.
2	General	A clarification is needed regarding Design Extension Conditions, which are defined in REGDOC-2.5.2 but not in RD-367. It gives the impression that DECs need to be considered for SMRs if their power output is more than 200 MWt; i.e., REGDOC-2.5.2 applies.	CNSC to clarify their expectations regarding the application of DECs.	It will allow for clear interpretation of CNSC's expectations with regards to analyzed plant states.

No.	Document section	Comment	Suggested change (if applicable)	Notes
3	General	The discussion paper refers to the “graded approach” that is available to applicants. It would be useful to provide some clarity on how the graded approach would apply to CNSC reviews and the licensing timeline. It might be expected that a design with a small source term and with extensive inherent and passive safety features would require less time and effort for regulatory review and licensing than a design with a large source term that relies heavily on engineered safety features. It would be very useful for CNSC to develop guidance on how the graded approach will be applied within the CNSC, as this would inform potential applicants of CNSC expectations for level of detail in submissions, regulatory cost and schedule.	CNSC to consider developing guidance on how the graded approach will be applied during licensing process.	It will facilitate the industry in evaluating the cost and resources required to address the CNSC expectations.
4	Section 2.4	A demonstration plant may have additional safety features to facilitate licensing. Before proceeding, the applicant would want high confidence that production plants without these additional features would be licensable in a timely manner. It would be prudent to have a formal agreement in place at the time the demonstration plant is licensed, setting out performance criteria which, if met, would be the basis for eliminating the additional safety features for production plants. In our view it would be beneficial for the regulatory process to support such an agreement.	CNSC to consider supporting a formal agreement to facilitate licensing.	It will reduce the licensing risk.

No.	Document section	Comment	Suggested change (if applicable)	Notes
5	Section 2.8	CNSC REGDOC 2.4.2 Probabilistic Safety Assessment for Nuclear Power Plants defines a Level 1 PSA as: "A level 1 PSA identifies and quantifies the sequences of events that may lead to the loss of core structural integrity and massive fuel failures." It is not clear how this definition would apply to designs with fuel that is liquid or gaseous during normal operation, i.e., the concept of "fuel failure" does not apply or is not clear. In our view, there is sufficient flexibility in regulatory documents to permit the applicant to propose definitions as part of the PSA methodology, which must be submitted for acceptance by the CNSC anyway. As long as CNSC is willing to accept alternative definitions of some terms, such as Level 1 PSA, then there should be no need to change the REGDOC. An additional consideration for PSA is its applicability, usefulness and the validity of current approaches for designs that rely predominantly on inherent and passive safety as opposed to active systems and operator action. Modeling of failure of inherent safety characteristics or fully passive systems in PSAs is a topic that needs further discussion.		It will allow for clear interpretation of CNSC's expectations with regards to safety analysis.
6	Section 2.8 & Section 2.9	The discussion paper identifies defence in depth (DID) (Section 2.9), deterministic and probabilistic safety analysis (DSA, PSA) (Section 2.8) as topics for discussion. Many SMRs rely mostly on inherent and passive safety characteristics to achieve safety, rather than relying primarily on engineered safety systems as most current operating reactors do. Current thinking and regulatory expectations about DID, DSA and PSA has been shaped by current and past designs, with		It will allow the application of alternative approach depending on specific SMRs designs and features.

No.	Document section	Comment	Suggested change (if applicable)	Notes
		enhanced safety typically achieved by adding more engineered safety features, as was done widely following the Fukushima accident. There is insufficient experience with SMRs to understand how current approaches to these topics should be adapted when designs are based primarily on inherent and passive safety, which are universally agreed to be preferable to engineered safety features. There is no easy answer, but the point of this comment is that a *high level integrated approach* needs to be taken to DID, DSA and PSA, and some other regulatory topics such as system classification, when considering the fundamentally different approach to safety for many SMR designs. It may be necessary to go back to fundamental safety objectives, such as those identified in Section 3.1 of CNSC RD-367 Design of Small Reactor Facilities or Section 4.1 of CNSC REGDOC-2.5.2 Design of Reactor Facilities: Nuclear Power Plants, when attempting to interpret and apply current regulatory requirements to SMR design aspects that are very different from current designs. To illustrate with a simple example, what is the meaning of "severe core damage" if the fuel is liquid or a gas during normal operation? Is severe core damage frequency a meaningful indicator of safety for designs with such fuel and with passive safety features? As stated this is a simple example, and the answer is not found in PSA alone. A fundamental and holistic view of safety must be taken.		
7	General	We also note that the CNSC is currently engaged with stakeholders on the topic of whole site risk when there are multiple reactor units on a site. The outcome of this engagement is likely to impact regulatory requirements for SMRs when multiple units are on the same site, and		

No.	Document section	Comment	Suggested change (if applicable)	Notes
		so will likely impact regulatory documents related to SMRs. This should be recognized in any engagement with stakeholders on SMRs.		
8	Section 2.15	The discussion paper notes the potential for an SMR in a remote location where “power from the reactor would be critical infrastructure important to life”. In our view, financial guarantees should be limited to those items identified in the discussion paper as presently within the scope mandated by the NSCA. Assurance of continued power output, in our opinion, is not within the scope and should not be covered by financial guarantees. Operation of a reactor may be interrupted for any number of reasons, and arrangements should be made between the operator and the customer(s) for the reactor’s output to ensure continued supply, e.g., from alternative or backup sources, if there is an interruption of output from the reactor. In our view, assurance of continued output supply is not within the CNSC’s mandate. We do recommend, however, that the CNSC develop and publish a schedule of financial guarantees for SMR-type situations (e.g., small reactors, potentially remote locations) and that this schedule consider a complete default on the part of the owner/operator. We recognize that any actual financial guarantee would be subject to the particulars of the given situation, but publishing such a schedule in advance would provide potential SMR applicants with essential information with which to evaluate the viability of their project.		It will reduce the project and licensing uncertainty. The business risk would be defined, mitigated and managed.

No.	Document section	Comment	Suggested change (if applicable)	Notes
9	Section 2.17	This section also discusses management of spent fuel. An issue we believe should be considered is whether for novel fuel designs, CNSC should require a clear path to final disposal or only require assurance of safe storage? Would it be acceptable, for example, to licence a design whose fuel is not confirmed acceptable for disposal in the repository being developed by Canada's Nuclear Waste Management Organization, and for which there are no arrangements to repatriate the spent fuel if the fresh fuel originates from another country? What would be an acceptable level of assurance? Would an enhanced financial guarantee be an acceptable means to compensate for lack of a clear path to close the back end of the fuel cycle for a particular design? We believe these questions should be part of the discussion.		It will provide a clear understanding of CNSC expectations.