

Public Consultation
Draft REGDOC-2.4.3, Nuclear Criticality Safety
 July 11, 2017 – Sept. 14, 2017

Table A: Comments on the “Request for Information” that was included for comment with the draft document:

	Reviewer	Section or Para. #	Reviewer’s Comment and Proposed Change	CNSC Response
I	No comments were received on the “Request for Information”.			

Table B: Comments received on the draft document

	Reviewer	Section or Para. #	Reviewer’s Comment and Proposed Change	CNSC Response
1	Bruce Power	General	Bruce Power appreciates the CNSC’s efforts to seek stakeholder input and has worked collaboratively with our industry peers at Ontario Power Generation, New Brunswick Power, Canadian Nuclear Laboratories and the Nuclear Waste Management Organization to review this draft. Bruce Power thanks the CNSC for consideration of these comments. Our shared goal is excellence in nuclear safety and the CNSC’s efforts to ensure this document’s expectations are clearly written and fully understood before publication is greatly appreciated.	Thank you. The CNSC welcomes the input and the considered review of the document.
	Canadian Nuclear Association (CNA)		The Canadian Nuclear Association (CNA) and its members would like to thank the CNSC for the opportunity to comment on REGDOC-2.4.3.	
	Canadian Nuclear Laboratories (CNL)		Canadian Nuclear Laboratories (CNL) would like to thank the CNSC for the opportunity to comment on the draft REGDOC-2.4.3, <i>Nuclear Criticality Safety</i> .	
	NB Power		NB Power’s Point Lepreau Nuclear Generating Station has collaborated with industry to review the proposed regulatory document in detail. [NB Power] appreciates the opportunity to provide input to strengthen the licencing process.	
	Nuclear Waste Management		NWMO has reviewed this document collaboratively with industry peers. NWMO appreciates the opportunity to	

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	Organization (NWMO)		comment on draft REGDOC-2.4.3.	
	Ontario Power Generation (OPG)		OPG appreciates the opportunity to provide comments during the development of this regulatory document, and has reviewed this draft in conjunction with other licensees.	
2	OPG	General	<p>The purpose of this email is ... request further opportunity for review, once the draft has been revised.</p> <p>...</p> <p>Because of the substantive nature of these comments, OPG requests an opportunity for further review of this REGDOC once the draft has been revised to address stakeholder comments.</p>	<p>No change. Although the CNSC is always willing to engage in discussion with our licensees, and to organize workshops to ensure that all perspectives are heard, we do not see a strong value in a workshop for a fairly straight-forward revision to a regulatory document that has been published within our regulatory framework since 2010 (as RD-327, <i>Nuclear Criticality Safety</i> and the companion document GD-327, <i>Guidance for Nuclear Criticality Safety</i>). All comments received during public consultation and “feedback on comments received” have been addressed in finalizing the revisions.</p>
3	Bruce Power	General	<p>As currently written, this draft Regulatory Document blurs the distinction between guidance and requirements. Much of this can be attributed to the merging and copying of content from RD-327, <i>Nuclear Criticality Safety</i> and GD-327, <i>Guidance for Nuclear Criticality Safety</i>, which will be superseded by this Regulatory Document upon publication. In doing so, all of the <i>shall</i> statements from guidance document GD-327 appear to have been copied verbatim and now read as if they are new requirements rather than existing guidance. We strongly encourage the CNSC to carefully review this document and clearly distinguish guidance from requirements to avoid misunderstandings and potential compliance issues.</p>	<p>No change, except in some areas the terminology has been revised for clarity about whether an item is “requirements” or “guidance” (for example, in some sentences, the word “guidance” has been replaced with “information”).</p> <p>While RD-327, <i>Nuclear Criticality Safety</i> and GD-327, <i>Guidance for Nuclear Criticality Safety</i> have been merged into one regulatory document, there has been no change to the licensing basis of all licensees who are affected by REGDOC-2.4.3 based on their nuclear criticality safety program, where each site-specific licensing basis has been reviewed and concurred with by</p>

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	CAN, CNL		The merging and copying of content from the previous RD 327 and GD 327 has made it difficult to distinguish between requirements and guidance. In addition, the continual use of “shall” instead of “should increases the potential for confusion, misinterpretation or errors. The CNA [CNL] suggests the CNSC make the necessary changes [highlighted in the attachment] to create a clear distinction between requirements and guidance.	CNSC staff (that is, all licensees are currently in compliance with REGDOC-2.4.3).
	NWMO	The REGDOC is unclear which parts are requirements and which are guidance (attached, item 1)		
	OPG	The draft REGDOC contains extensive direction that was previously guidance. For example, guidance that was provided in GD-327 has been converted into requirements in the draft REGDOC and should be converted back to guidance. Having a clear distinction between requirements and guidance is important to enable licensees to avoid compliance issues with REGDOC-2.4.3 once it is published.		
4	Bruce Power	General	Adding to the confusion [related to comment 3, above], the preface of this draft contains the following statement: “Licensees are expected to review and consider guidance; should they choose not to follow it, they should explain how their chosen alternate approach meets regulatory requirements. This is a recurring issue with Regulatory Documents and gives the false impression that guidance is actually a requirement. This is not true. Guidance is guidance and needs to be very clearly identified as such.	See response to comments 3 and 7.

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5	Bruce Power	General	Requirements from cited standards have not always been transcribed verbatim into this draft Regulatory Document. This is particularly true in some of the tables in this draft. For instance, Tables 10-1 and 10-2 on subcritical mass limits do not match the most recent edition of American National Standards Institute (ANSI) / American Nuclear Society (ANS) standard ANSI-ANS 8-15. Some values cited in this draft are from an outdated edition of the ANSI/ANS standard while helpful footnotes from the current edition have not been included at all. To avoid confusion and prevent incorrect limits from being used in a criticality safety analysis, industry encourages the CNSC to ensure all elements from ANSI/ANS-8-15 (2014 edition) are fully and accurately copied into future drafts of this Regulatory Document. That includes all appropriate tables and their footnotes.	Tables in section 10 have been reviewed and revised as appropriate to reflect the requests for changes.
	CNA, CNL		CAN/CNL would [like to] draw attention to the tables in Section 10. It would appear that requirements taken from the American National Standards Institute (ANSI) have not been copied verbatim into the REGDOC. To avoid confusion and possible errors, CAN/CNL would encourage the CNSC to ensure that all elements of ANSI/ANS-8-15 (2014) are fully and correctly copied into the REGDOC, including all appropriate tables and footnotes.	
	OPG		The draft REGDOC does not always correctly transcribe technical requirements verbatim from American Nuclear Society (ANS) Standards. If requirements are not consistent, licensees face the potential of using incorrect information which could have safety implications.	

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6	Bruce Power	General	This draft contains duplicate requirements already documented in CSA N286, <i>Management system requirements for nuclear facilities</i> . Section 12 of this document lists administrative practices for nuclear criticality safety, including management, supervisory and staff responsibilities. Defining roles and responsibilities is not necessary in this Regulatory Document since it duplicates CSA N285 requirements already contained in the licensing basis. This also applies to section 2.3.2.1, which similarly lists management requirements already covered by CNSC N286.	No change. The CNSC licenses sites and activities that are not within the definition of “nuclear facility” (as defined in the <i>Nuclear Safety and Control Act</i> or in the <i>Nuclear Terrorism Act</i>); for example, nuclear laboratories and some medical sites. The licenses for those sites and activities may not include a reference to CSA N286, <i>Management system requirements for nuclear facilities</i> . REGDOC-2.4.3 applies to all licensed sites and activities where nuclear criticality safety must be considered. Licensees for nuclear facilities may discuss this issue with their CNSC point of contact and develop a site-specific resolution.
	CNA, CNL		CNA/CNL notes that the draft REGDOC contains management system requirements already documented in CSA N286 and already contained in the licence framework. This unnecessary duplication has the potential to lead to confusion and inconsistencies.	
	OPG		Some of the content contained within this draft REGDOC (eg in Sections 2.3.2.1 and 12) duplicates requirements documented within CSA N286-12, Management System Requirements for Nuclear Facilities. Requirements which are already contained in the licensing basis should not be duplicated in additional REGDOCs.	
7	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	General	There are significant issues related to the merging and copying of content from <i>RD-327, Nuclear Criticality Safety</i> and <i>GD-327, Guidance for Nuclear Criticality Safety</i> into this draft REGDOC. This has blurred the distinction between requirements and guidance throughout the document. Many sections in <i>RD-327</i> are relatively short. However, these same sections have been expanded in this document without indicating which parts of the expansion are requirements and which are guidance. With the RD/GD documents, it was generally easy to distinguish between requirements and guidance. This is not the case with the new REGDOC, which has the potential to create confusion or errors. For additional context and specific examples, please see	REGDOC-2.4.3 includes the same number of requirements as were included in <i>RD-327, Nuclear Criticality Safety</i> and <i>GD-327, Guidance for Nuclear Criticality Safety</i> . There are no additional requirements and, for those licensees who are currently required to have nuclear criticality safety programs in place, these requirements are captured in their licensing basis programs. Each requirement is clearly denoted by a “shall” statement, and recommendations/guidance is denoted by a “should” statement. Prior to merging to create REGDOC-2.4.3, each of the 16 chapters of <i>RD-327</i> , when considered together with a corresponding chapter of <i>GD-327</i> , is consistent with one of the ANS/ANSI-8 series standards. Chapters 4-16 of

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			<p>comments 31, 37-39, 42, 44, 47, 49, 63, 74, 76-79 & 85. [now comment 13 (consolidated)].</p> <p>Suggested change: Revise the document to replace <i>shall</i> with <i>should</i> as appropriate to clearly distinguish between requirements and guidance. This distinction could also be improved by restructuring the document so:</p> <ul style="list-style-type: none"> • Requirements appear in the main body and guidance appears in an appendix, or • in each section, have the requirements appear first with guidance listed later under a separate, clear "Guidance" heading. <p>Impact on industry: Having a clear distinction between requirements and guidance will help licensees avoid compliance issues with REGDOC-2.4.3 once it is published.</p>	<p>RD-327 were relatively short because explicit references were proved to the corresponding chapters of GD-327, where a full text of an underlying ANS/ANSI-8 is published. For example, chapter 16 of RD-327 refers to chapter 16 of GD-327, where the full text of ANSI/ANS-8.23 Standard is published. The full text of ANSI/ANS-8.23 Standard (that is, the texts of RD-327 and GD-327), rather than an introductory summary of it (that is, the text of RD-327) was made mandatory through a process of inclusion of a nuclear criticality safety program into the licensing basis. Namely, as per section 12.8 of RD-327, a prospective licensee prepares a nuclear criticality safety program that:</p> <p>"1. identifies applicable nuclear criticality safety standards, guidelines, and the CNSC requirements (including the applicable sections of this regulatory document)</p> <p>"2. lists the requirements that must be met to comply with the applicable standards, guidelines, and the CNSC requirements</p> <p>"3. ..."</p> <p>and submits the nuclear criticality safety program for CNSC staff to review for concurrence before inclusion into the licensing basis.</p> <p>Compared to the combined contents of RD-327 and GD-327, the merged REGDOC-2.4.3 contains essentially the same number and the same text of requirements (that is, "shall" statements) and recommendations (that is, "should" statements).</p> <p>Consequently, now that RD-327 and GD-327 have been merged into one regulatory document, there has been no change to the licensing basis of all licensees who are affected by REGDOC-2.4.3 based on their nuclear criticality safety program, where each site-specific</p>

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				licensing basis has been reviewed and concurred with by CNSC staff (that is, all licensees are currently in compliance with REGDOC-2.4.3).
8	International Safety Research	General (Important note, page i)	<p>These definitions HAVE A HUGE IMPACT on what used to be "requirements" and what used to be "guidance". GD-327 prefaced with the statement that it "provides information on how the requirements of RD-327 MAY be met." The SCOPE of that document reiterates this intent for guidance versus requirement.</p> <p>If you go to section 2.3 Nuclear Criticality Safety Practices here now, it states "Operations with fissionable materials SHALL meet the requirements AND follow the recommendations of this document." This statement alone based on the 'shall' definition provided in this document now could easily be interpreted as all recommendations in this document are now also a requirement.</p> <p>The words "shall", "should", and "may" have very specific meaning in the ANSI/ANS standards as well (and likely are the basis for these definitions herein) however, we can spend years debating EVERY SINGLE use of these verbs in a particular standard to ensure consistency and understanding of the impact in the criticality safety community as well as whether the appropriate level of regulation is applied (i.e. a shall makes something both an NRC and DOE requirement). Each time these verbs are used, the consensus committee for that standard agrees with the verb's usage with the understanding of it being a 'requirement' versus a 'recommendation'.</p> <p>Simply merging GD and RD-327 together without reviewing the use of these verbs throughout will have HUGE LONG-TERM IMPACTS across all of the criticality safety community in Canada as is currently. There are more than 100 uses (I quit counting and</p>	<p>See response to comment #7.</p> <p>The specific text cited has been revised to state "Operations with fissionable materials shall meet the requirements of this document and should follow the recommendations of this document." In some areas, the terminology has been revised for clarity about whether an item is "requirements" or "guidance" (for example, in some sentences, the word "guidance" has been replaced with "information").</p> <p>As stated in the response to comment #7, above, all licensees are currently in compliance with REGDOC-2.4.3.</p>

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			<p>highlighting them around section 11.4) of "shall" in GD-327 that are NOT in RD-327 at all. This alone implies that the new REGDOC is intending to implement more than 100 NEW LICENSEE REQUIREMENTS by taking the 'shall' statements of GD-327 and reprinting them exactly while also implementing this definition of 'shall'. While this may not affect anyone now, any new licensee or licence renewal group will have to deal with this in the future as well the CNSC and other regulators who are interpreting the requirements.</p> <p>I realize that this REGDOC currently says 'where this document is part of the licensing basis...' so the impact of this is down the road but regulators will start using this definition here as well to review criticality safety programs to this level (i.e. all shall statements will become requirements).</p> <p>As a result, the CNSC needs to assemble a group of criticality safety experts to review the whole REGDOC-2.3.4, with emphasis on GD-327 statements with 'shall', 'should' and 'may' and modify these verbs appropriately to the correct level necessary or at least ensure all uses are commiserate with their intent both for new licensees and for ensuring appropriate requirements are in place to continue ensuring the safety of the worker, facility, and public.</p>	

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9	Bruce Power, CNA, CNL, NB Power, NWMO, OP	General	<p>In keeping with comment 1 – and with comments made on several previous REGDOCs - the statement below from the preface also gives the impression that guidance is actually a requirement: <i>'Licensees are expected to review and consider guidance; should they choose not to follow it, they should explain how their chosen alternate approach meets regulatory requirements. An applicant or licensee may put forward a case to demonstrate that the intent of a specification is addressed by other means and demonstrated with supportable evidence.'</i></p> <p>Suggested change: Rewrite to say, <i>'Licensees are expected to review and consider guidance. should they choose not to follow it, they should explain how their chosen alternate approach meets regulatory requirements. An applicant or licensee may put forward a case to demonstrate that the intent of a specification is addressed by other means and demonstrated with supportable evidence.'</i></p> <p>Impact on industry: Industry appreciates the CNSC intends to address this long-standing issue, but as currently written some CNSC staff will interpret this statement to mean guidance within this document is a requirement. This is not true. Guidance is not a requirement. This has major impacts on licensees in the time spent in discussion with CNSC staff as to why guidance is not followed in certain cases</p>	No change to preface. This text is standard in the preface of all regulatory documents. It serves to remind readers that the guidance provided in regulatory documents should be considered when the applicant or licensee is deciding how to demonstrate that they meet the requirements.
10	CNA, CNL	General, for used nuclear fuel and deep geological	It was not clear to CNA/CNL, which parts of the document would apply to a facility for long-term storage of Canada's used fuel. It would be beneficial to clearly define requirements associated with various phases of the nuclear fuel cycle.	No change. The regulatory document is structured, intentionally, in parallel with the ANSI/ANS standards. Nuclear criticality safety applies to all areas where criticality could conceivably occur (outside of a reactor

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	NWMO	repositories	<p>The exemption or application to used CANDU fuel is not clear (attached, items 12 & 65) [comments 24 and 69 in this consolidated table]</p> <p>The report is not clearly organized to identify which parts of the REGDOC would apply to a deep geological repository (attached, item 3) [now comment 10 in this consolidated table]</p>	<p>core). Each licensee’s site-specific licensing basis may include clarification of which sections of REGDOC-2.4.3 apply during which lifecycle phases of the facility or activity.</p> <p>See section 12.8, <i>Nuclear criticality safety program</i> for information on how the licensee commits to applicable sections of this regulatory document.</p>
	Bruce Power, CNA, CNL, NB Power, NWMO, OPG		<p>As currently written, it is not clear which parts of the document would apply to a facility for the long-term storage of Canada’s used nuclear fuel. Specifically:</p> <ul style="list-style-type: none"> • Section 2 is entitled “Nuclear Criticality Safety in Operations with Fissionable Materials Outside Reactors”; • Section 6 is entitled “Nuclear Criticality Safety in the Storage of Fissile Materials”; • Section 7 is entitled “Criteria for Nuclear Criticality Safety Controls in Operations with Shielding and Confinement”; • Section 8 is entitled “Nuclear Criticality Control and Safety of Plutonium-Uranium Fuel Mixtures Outside Reactors”; • Section 10 is entitled “Nuclear Criticality Control of Special Actinide Elements”; and • Section 11 is entitled “Criticality Safety Criteria for the Handling, Transportation, Storage and Long-Term Waste Management of Fuel Outside Reactors” <p>Based on the titles, it would appear all of these sections apply to activities which are focused on the handling and long-term management of irradiated fuel outside reactors. If so, the requirements are too disparate and should be better collated.</p> <p>Suggested change: One option is to rearrange the document so requirements that apply in all situations appear in one section. Additional</p>	<p>See also comments 24 and 69.</p>

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			<p>requirements for special circumstances can then appear in additional sections together with an improved description of when those additional requirements apply.</p> <p>This would be somewhat analogous to the Regulations under the <i>Nuclear Safety and Control Act</i>, in which the <i>General Regulations</i> apply and specific additional requirements appear in other supplemental regulations.</p> <p>Another option would be an ordering related to (1) Handling, (2) Transportation (3) Storage and (4) Long-Term Storage. Special cases, such as Operations with Extensive Shielding and Confinement, could appear as subsections within the applicable section.</p> <p>Impact on industry: By clearly defining requirements associated with the applicable activities for the various phases of the nuclear fuel cycle, licensees can systematically interpret and implement requirements associated with physical constraints and limits on fissionable material to ensure nuclear criticality safety.</p>	

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11	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	General	<p>This current draft uses several different descriptors related to water (light water, heavy water and ordinary water). Licensees seek consistency when specifying the type of water to avoid potential confusion or errors.</p> <p>Examples: Section 2.3.3.6 on neutron reflection says, “... <i>which may be more effective neutron reflectors than water</i> ...” The ‘water’ here refers to light water only. Section 6.4 says, “<i>These arrays are reflected on all faces by 200 mm of ordinary water.</i>” This should be replaced by ‘light water.’</p> <p>Suggested change: Since heavy water plays an important role in the CANDU industry, this document should mention light water and heavy water where appropriate instead of just ‘water.’ Also, for consistency, licensees suggest the document not introduce another terminology such as ‘ordinary water.’</p> <p>Another alternative is to specify in the Glossary that water refers to light water unless otherwise noted.</p> <p>Impact on industry: As currently written, this draft may generate confusion related to applicable types of water. It is not much of a concern for the ANS standards, since facilities covered by those standards do not have significant amount of heavy water. However, it is a concern for Canadian nuclear facilities.</p>	<p>Text has been revised as follows:</p> <ul style="list-style-type: none"> - in section 1.2, “Scope”, the following note has been added: <p>Note: In the context of nuclear criticality safety, the term “water” refers to light water unless otherwise noted. Where the term “ordinary water” is used in the chemical context, it refers to light water.</p> <ul style="list-style-type: none"> - in sections 4.3.2.1 and 6.4, “ordinary water” has been replaced by “light water” for additional clarity.

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12	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	General	<p>Minor editorial issues throughout the document, including:</p> <ol style="list-style-type: none"> 1.The term <i>frequency</i> is regularly used instead of <i>probability</i>. 2.Inconsistent spelling and unit abbreviations. 3.Lack of numbering for equations. <p>Suggested change:</p> <ol style="list-style-type: none"> 1.Use the term <i>probability</i> instead of <i>frequency</i> as appropriate. 2.Change meter to metre in equations in Section D.3.2 & sec to s in equations in Section D.3.3. 3. All equations should be numbered for ease of referencing. <p>Impact on industry: Clarification</p>	<p>Comments have been addressed as follows:</p> <ol style="list-style-type: none"> 1. No change to text. The term “frequency of occurrence” is established, well understood, and used in conformity with the IAEA standards and other international references (for example, SSR-2/1, Requirement 13) 2. Equations have been revised as suggested. 3. No change. The equations can be referenced by section number or subsection number.
13	Bruce Power, CNA, CNL, NWMO, OPG	Section 4, section 5, section 6, section 7, section 8, section 9, section 10, section 11, section 13, section 14, section 15, section 16, appendices C through G	<p>[These] section[s were] presented as guidance in GD-327, and is not regulatory in nature. Furthermore, this section provides guidance and contains detailed technical information from other sources that is subject to change.</p> <p>Suggested change: These sections should be presented as guidance</p> <p>Impact on industry: To avoid potential issues related to compliance with REGDOC-2.4.3, these sections should be clearly presented as guidance (per the earlier RD-327/GD-327 documents).</p>	<p>No change. This text provides information that should be considered when the applicant or licensee is deciding how to demonstrate that they meet the requirements. The information provided is based on the ANSI/ANS standards.</p>

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14	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	Preface	<p>The preface indicates this document “provides information for the prevention of criticality accidents” but its contents go beyond prevention to set requirements and offer guidance on accident emergency planning and response.</p> <p>Suggested change: Revise the preface to include the whole scope of the document.</p> <p>Impact on industry: Clarification</p>	No change. Section 16, “Nuclear Criticality Accident Emergency Planning and Response” was part of both RD-327, <i>Nuclear Criticality Safety</i> and GD-327, <i>Guidance for Nuclear Criticality Safety</i> . There have been no changes to the requirements or the guidance in this revision to incorporate both RD-327 and GD-327 into one REGDOC.
15	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	Preface	<p>Inconsistent wording between the Preface and section 1.2, Scope.</p> <p>Suggested change: Amend the 1st sentence of the 3rd paragraph in the preface to read “... <i>abandonment of the licensed facility and with respect to the handling, storing, processing and transportation of certain fissionable materials.</i>”</p> <p>Impact on industry: Clarification</p>	Text in the preface has been revised as requested. Thank you for noting that.
16	International Safety Research	Preface	<p>The word "clarifies" comes from GD-327 and was appropriate since it was a supplement to the requirement document. Now this document does not clarify, it provides as it is the full program now.</p> <p>Also "clarifies" also implies the limits are listed elsewhere and this document expounds upon the limits listed elsewhere. Please change this verb to "provides".</p>	No change. The word “clarifies” is still appropriate.

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17	International Safety Research	1.1 and throughout – “transportation”	<p>Section 11 of this document is from ANS-8.17 which states "for off-site transportation, abnormal conditions that could credibly exist use 10CFR 71..." which was not cut and paste into this document, as appropriate, however, the ANSI standard further provides off-site requirements for the US transportation regulations. Additionally, 8.17 is applicable to LWR fuel handling ONLY, not CANDU fuel which is not transported off-site currently in Canada unless in individual bundles per basket location (PEGASES flasks). While there are current analyses being performed for CANDU fuel transport as modules (UFTP by NWMO), it is not complete AND has more requirements for safe transport than those required for LWR fuel which is transported as individual assemblies or rods (a fuel unit as stated in 8.17).</p> <p>Throughout this document transportation is referenced in a generic sense with only a few places where "on-site" is specified (section 11.3.1 for example). This needs to be clarified throughout the document that this document is only applicable to on-site transportation of fissile material as none of the off-site requirements for criticality safety for category type packaging is included here. Off-site transportation is not in the scope of a licensee (facility) and is regulated by other requirement documents.</p> <p>Additionally, Section 11 needs to be reviewed and revised appropriately for Canadian conditions and fuel types. A LWR fuel unit (as specified in ANSI/ANS-8.17) refers to a single LWR assembly and cannot, for example, be simply extrapolated to a CANDU module (multi-bundles configuration) without specific analysis being performed. This generic use of transportation requirements from the standard for LWR fuel is not bounding of CANDU fuel.</p> <p>As a result, REGDOC-2.3.4 should specify that it is applicable to only ‘on-site’ transportation and specifically</p>	<p>No change except text from RD-327, <i>Nuclear Criticality Safety</i> specifying “outside the licensed site” and “within the boundaries of the licensed site” has been copied into REGDOC-2.4.3, <i>Nuclear Criticality Safety</i> (see comment 66).</p> <p>The second paragraph of section 11 explicitly identifies Canadian and IAEA regulations that establish requirements for off-site transportation.</p> <p>Throughout this document, transportation is referenced in a generic sense, which is consistent with best international practices as documented in ISO standards on nuclear criticality safety.</p> <p>As stated above, detailed requirements that apply for offsite transportation are established by specific Canadian and IAEA regulations.</p> <p>As stated above, throughout this document, transportation is referenced in a generic sense, which is consistent with best international practices as documented in ISO standards on nuclear criticality safety.</p>

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			direct the reader to other guidance/requirements for 'off-site' transportation. Additionally, the requirements of Section 11 needs to be revised appropriately for Canadian fuel types to ensure the requirements bound the existing conditions to ensure the continued safety of the worker, facility, and public.	
18	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	1.2	Lack of clarity in the 3rd paragraph. Suggested change: Add the word 'all' after operations so it reads “ <i>...applies to all operations with ...</i> ” Impact on industry: Clarification	No change. The existing text is fully consistent with section 2 of ANSI/ANS-8.1-2014, <i>Nuclear Criticality Safety in Operations with Fissionable Materials Outside Reactors</i>
19	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	1.4	It's unclear if the latest status of ANS references has been captured in parts of this draft. For example, <i>ANS-8.7</i> is stated as reaffirmed in 2007, although the standard was actually reaffirmed again in 2012. Specific examples are noted in later comments. Suggested change: Check all references to confirm they are up-to-date and incorporated in this REGDOC Impact on industry: Clarification	Text has been revised to reference the most up-to-date version, which was re-affirmed yet again in 2017.
20	International Safety Research	1.4, standards	ANSI/ANS-8.26, "Criticality Safety Engineer Training and Qualification Program" needs to be added and/or another appropriate training standard for the nuclear criticality safety staff. Currently there are zero requirements or guidance in Canada for the training and/or qualification of nuclear criticality safety staff. Section 13 of this document is directly from ANSI/ANS-8.20 which is NOT APPLICABLE to nuclear criticality safety staff (as quoted verbatim in Section 13.2 Scope here as well). As the co-	No change. The addition of a new section on this topic would constitute an excessive regulatory rigor, unrelated to actual hazards.

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			<p>chair of ANSI/ANS-8.20, I can also state we are currently in a major re-write of this standard and it will more clearly demonstrate that this standard is less than adequate for ANY nuclear criticality safety staff and specifically written for those who handle fuel and work with those who handle fuel.</p> <p>It is a requirement in most OECD countries (personally worked on US, UK, and France programs and at OECD in Paris) for there to be some type of training program for the Criticality Safety 'Engineer' or 'Physicist' or as referenced in this document 'nuclear criticality safety staff'. Basically, the individual who is performing the safety assessments requires to be trained and qualified to do their job. Additionally, without this training, the ability to make safety assessment conclusions is a guesstimate at best and there are no credentials to evaluate against. The ability to even understand the requirements and guidance within this document is questionable without some baseline training for the nuclear criticality safety staff - otherwise how does a regulator determine that the assessments, alarm coverage, validations, etc. are adequate when the staff implementing them has zero training requirements. The nuclear criticality safety staff and the nuclear criticality safety program is the first line of defense as they determine the requirements necessary for safety - how can that be done without some qualifications? Reactor Operators go through rigorous training in order to understand reactivity and the effects different parameters have on it.</p> <p>Criticality Safety Engineers should also require this understanding with respect to the materials of concern within their facilities. The ability to interpret the experimental conclusions used to determine the safety of similar systems is required. The ability to model systems and interpret the results, make the parametric studies required to verify results, create appropriate facility controls</p>	

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			<p>that actually provide safety functions all require in-depth knowledge. This knowledge base can be acquired in several different methods, but is necessary to understand the functions of the Criticality Safety Engineer/nuclear criticality safety staff. How can a Criticality Safety specialist create training for fissionable material handlers and determine the requirements for them (per Section 13) when they have zero requirements of their own? This is an oversight that needs to be addressed. Otherwise, the requirements in this document are just words as they have no real meaning. Section 13.2 specifically excluding nuclear criticality safety staff leaves a gaping hole for those requirements.</p> <p>Therefore, the requirements of ANSI/ANS-8.26, "Criticality Safety Engineer Training and Qualification Program" needs to be added and/or another appropriate training standard for the nuclear criticality safety staff. Certainly a graded approach can be applied but the CANADIAN nuclear criticality safety staff should be trained to do their jobs, especially since they are directly responsible for determining the safety case for the worker, the facility, and the public.</p> <p>As an additional aid, suggest an Appendix with an outline of a basic nuclear criticality safety staff training program or qualification matrix to aid facilities with a graded approach for this.</p>	
21	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	2	<p>This section outlines the scope of the document and presents requirements for Nuclear Power Plants. Subsection 2.3.1.4, item 2, says a program shall be established. The program requirements then given in Section 12.8 (and Appendix G) appear to impose onerous requirements for both new fuel storage and spent fuel storage.</p> <p>Suggested change:</p>	<p>No change.</p> <p>The information in REGDOC-2.4.3 applies to all facilities where nuclear criticality safety must be considered. The term “nuclear power plant” appears only once in the document (in section 16). Exemptions for licensed sites with natural uranium are included in section 2.3.1.1 and 11.3.</p>

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			<p>Confirm that a simplified approach can be used where there is no potential for criticality (such as at CANDU Nuclear Power Plants using natural uranium as fuel). Provide examples relevant to licensees involved in various phases of the nuclear fuel cycle. Or, alternatively, provide a generic example which could be used industry-wide.</p> <p>Impact on industry: This has the potential to develop additional program and reporting requirements with no appreciable impact to nuclear safety.</p>	<p>Section 12.8 provides information about the expected content of a nuclear criticality safety program for any facility where nuclear criticality safety must be considered.</p> <p>As stated in the Preface, “A graded approach, commensurate with risk, may be defined and used when applying the requirements and guidance contained in this regulatory document. The use of a graded approach is not a relaxation of requirements. With a graded approach, the application of requirements is commensurate with the risks and particular characteristics of the facility or activity.”</p> <p>It is the licensee’s responsibility to develop a nuclear criticality safety program that satisfies the information requirements (items 1 and 2 in section 12.8.2) Appendix G provides an example that is one of a number of acceptable ways to satisfy those information requirements. As also stated in the Preface, “Licensees are expected to review and consider guidance; should they choose not to follow it, they should explain how their chosen alternate approach meets regulatory requirements. An applicant or licensee may put forward a case to demonstrate that the intent of a specification is addressed by other means and demonstrated with supportable evidence.”</p>

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22	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	2.3	<p>The statement, <i>“Operations with fissionable materials shall meet the requirements and follow the recommendations of this document”</i> belongs in section 2.2, Scope.</p> <p>Also, it is not always Operations that has to apply criticality safety requirements.</p> <p>Suggested change: Move the statement to section 2.2 from section 2.3 and amend to read, <i>“Operations with Fissionable materials shall meet the requirements and follow the recommendations of this document.”</i></p> <p>Impact on industry: Clarification</p>	<p>No change.</p> <p>The phrase “Operations with fissionable materials...” has not been moved. That phrase is the title of the ANS 8-1 standard, and has been used everywhere for consistency. As in the earlier publications RD-327, <i>Nuclear Criticality Safety</i> and GD-327, <i>Guidance for Nuclear Criticality Safety</i>, the term “operations” is used generically to include all activities performed to achieve the purpose for which a nuclear facility was constructed (see REGDOC-3.6, <i>Glossary of CNSC Terminology</i>). It is acknowledged that some facilities may have a department or division that is referred to as “Operations”; however, this does not preclude using the generic terminology in context.</p>
23	International Safety Research	2.3	<p>[“Operations with fissionable materials shall meet the requirements and follow the recommendations of this document”]</p> <p>This statement alone based on the 'shall' definition provided in the front of this document means all recommendations in this document are now also a requirement.</p> <p>Again, the words "shall", "should", and "may" have very specific meaning in the ANSI/ANS standards as well (and likely are the basis for these definitions herein) however, we spend years debating EVERY SINGLE use of these verbs to ensure consistency and understanding of the impact in the criticality safety community as well as whether the appropriate level of regulation is applied (i.e. a shall makes something both an NRC and DOE requirement).</p> <p>Therefore, this statement should be reworded as such “Operations with fissionable materials shall meet the requirements and should follow the recommendations of this document.”</p>	<p>Text has been revised as follows:</p> <p>The sentence now states “Operations with fissionable materials shall meet the requirements of this document and should follow the recommendations of this document.”</p>

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24	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	2.3.1.1 & 11.3	<p>It is confusing to have exemption criteria in multiple places. Also, the exemption criteria do not cover an unlimited quantity of natural or depleted uranium irradiated in a thermal nuclear reactor as stated in section 11.3. See comment 64 for additional context.</p> <p>Suggested change: Collect all exemption criteria in one place, preferably section 2. Also, include exemption criteria for all activities associated with an unlimited quantity of natural or depleted uranium irradiated in a thermal nuclear reactor.</p> <p>Impact on industry: Clarification</p>	<p>Text has been revised for clarity by adding a note to step 2 of section 2.3.1.1.</p> <p>No change to the structure of the regulatory document. It is structured, intentionally, in parallel with the ANSI/ANS standards.</p> <p>In particular, the exemption (mentioned in the comments) is not a generic one; it applies only to specific conditions stated in section 11.3.</p>
25	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	2.3.1.1	<p>Licensees are concerned with the use of the term ‘operating’ in the last paragraph of this section and elsewhere in the document. This REGDOC should be applied to more than just operations.</p> <p>Suggested change: Amend to read, “<i>Licensed sites operating with exempted quantities of fissionable materials are exempt from ...</i>”</p> <p>Impact on industry: Clarification</p>	<p>Text has been revised as suggested, for improved clarity.</p> <p>This editorial change does not affect the intent of the sentence. The subject is now “licensed sites with exempted quantities of fissionable materials”, and these subjects are exempt from the requirements and recommendations of this document.</p>

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26	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	2.3.1.4	<p>It’s not clear that the term “<i>in the licensed site</i>” can be applied to specific, defined areas <i>within</i> a licensed site.</p> <p>Suggested change: Amend to read, “...# <i>within the licenced site</i> ...”</p> <p>Impact on industry: Clarification</p>	<p>No change.</p> <p>For the purposes of section 2.3.1.4 of this REGDOC, the term “in the licensed site” <u>cannot</u> be applied to specific, defined areas “within a licensed site”.</p> <p>The main purpose this section is to assess the overall potential for the criticality hazard of the whole site. Note that the last statement in subsection 2.3.1.4 states that “applicability of the criticality safety program to separate areas of the licensed site should be based on the categorizations in section 2.3.1”.</p>
27	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	2.3.2	<p>Use of the term ‘management’ versus ‘Management’ is confusing.</p> <p>Suggested change: Change the title of section 2.3.2 to “Program practices” or “Program administrative practices”</p> <p>Impact on industry: Clarification</p>	Text has been revised as suggested.
28	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	2.3.2.1	<p>This section overlaps with the requirements in <i>CSA N286 - Management system requirements for nuclear facilities</i></p> <p>Suggested change: Remove section 2.3.2.1</p> <p>Impact on industry: This section duplicates requirements already contained in the licensing basis.</p>	No change. See response to comment 6.

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29	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	2.3.2.2	<p>This section sets prescriptive requirements for process analysis to include “<i>both normal and credible abnormal conditions that have frequency of occurrence equal to or greater than 10e-6 per year.</i>”</p> <p>These requirements appear to be independent from any assessment of the potential safety or radiological hazards. As such, they constitute a deviation from the graded approach to safety as defined in the preface of this and other CNSC documents. This approach ensures the stringency of the design measures and analyses applied are commensurate with the level of risk posed by the facility. It is also a deviation from the principle of optimization of protection described in <i>IAEA Fundamental Safety Principles SF-1</i>, section 5, item 3.24.</p> <p>Suggested change: The document should apply a graded approach. Industry suggests a categorization scheme depending on the potential safety and radiological hazards in the facility, similar to the approach suggested in section 3.10 of <i>IAEA SSG-30 - Safety Classification of Structures, Systems and Components in Nuclear Power Plants (2014)</i>.</p> <p>Impact on industry: Excessive regulatory rigor, unrelated to actual hazards, leads to unjustified use of resources not only for the analysis itself, but for the resulting safety controls, their implementation and maintenance.</p>	<p>No change. This requirement was a previously-existing one, and has been implemented in the licensing basis of all facilities where the potential exists for a criticality accident. The wording of the requirement is consistent with national and international standards, such as IAEA SSR-4, ANS-8.1, and CSA N292 series.</p> <p>Section 2.3.1 categorizes activities and facilities with various quantities, and the Preface describes the graded approach:</p> <p>“A graded approach, commensurate with risk, may be defined and used when applying the requirements and guidance contained in this regulatory document. The use of a graded approach is not a relaxation of requirements. With a graded approach, the application of requirements is commensurate with the risks and particular characteristics of the facility or activity.”</p>

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30	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	2.3.2.2	<p>Industry seeks additional clarification with the passage, <i>“These limits shall be applied only when the surrounding materials, including other nearby fissionable materials, can be shown to increase the effective multiplication factor (k_{eff}) no more than it would be increased if the unit were enclosed by a contiguous layer of water of unlimited thickness.”</i></p> <p>Where is this criterion derived or the technical basis given? At minimum, if it was derived in ANSI-8.1, reference should be given to reflect that. Light water is used in ANSI documents. It should be specific if this is still the case, as heavy water would present different application limits.</p> <p>Can risk metrics provided by existing PSA performed in compliance with REGDOC-2.4.2 be used for assessing event frequencies and double contingencies in response to various initiating events?</p> <p>Suggested change: Provide clarification on water type and any tie-ins with REGDOC-2.4.2.</p> <p>Impact on industry: Clarification</p>	<p>No change. This requirement was a previously-existing one, and has been implemented in the licensing basis of all facilities where the potential exists for a criticality accident. The wording of the requirement is consistent with national and international standards, such as IAEA SSR-4, ANS-8.1, and CSA N292 series.</p> <p>The wording describes a well-known fact of basic reactor physics.</p> <p>As evident from the wording, this requirement is purely deterministic; hence, a probabilistic safety assessment is not involved.</p>
31	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	2.3.2.2 & B.3	<p>The administrative margin is currently express in two different manners: + 5% in Section 2.3.2.2 + 50 mk in Section B.3</p> <p>Suggested change: Suggest using either 5% or 50 mk.</p> <p>Impact on industry: Clarification</p>	<p>No change to section 2.3.2.2. For improved consistency, sections B.3 and G.2 have been revised to state “50mk (5%)”.</p> <p>Note that both units are widely used in nuclear criticality safety and reactor physics.</p>

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32	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	2.3.2.2 & 7.3.2.1	<p>Licenses believe there is a need to be consistent with the criteria of the trigger level: is it temporary public evacuation as stated in section 2.3.2.2 or temporary public sheltering as stated in section 7.3.2.1?</p> <p>Suggested change: Consistent criterion should be used.</p> <p>Impact on industry: Clarification</p>	No change. Section 2.3.2.2 stipulates a generic requirement, whereas section 7.3.2.1 applies only to those licensees who choose to conduct operations in compliance with specific requirements of section 7.
33	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	2.3.2.2 #1,	<p>The USL can be a SPL, or 80% of a MCM. <u>Note:</u> Section 10.4, the USL = SPL. This approach should be consistent for the SPL values in <i>ANS-8.1</i></p> <p>Suggested change: This bullet should be reworded to cover all other SPL values from <i>ANS-8.1</i>. Or, a new bullet should be added regarding other SPL values from <i>ANS-8.1</i>.</p> <p>Impact on industry: This document confuses the issue of using SPL for USL. If bullet “i” clearly states that USL can be SPL or 80% of a MCM then there will be no more confusion.</p>	No change. This requirement was a previously-existing one, and has been implemented in the licensing basis of all facilities where the potential exists for a criticality accident. The wording of the requirement is consistent with the CSA standards N292 series and with the <i>Nuclear Liability and Compensation Act</i> and regulations made under that Act.

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34	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	2.3.2.2 #3	<p>A 2007 CNSC letter describes how to calculate the representative criticality accident for mitigation of off-site dose purposes. However, the information from this letter is incorrectly in the emergency planning section of this document rather than section 2.3.2.2.</p> <p>Suggested change: The definition given on Page 91 (section 16.4.1) on how a representative nuclear criticality accident should be calculated, needs to be moved to section 2.3.2.2 #3</p> <p>Impact on industry: “Representative criticality accident” is used to determine mitigation measures (off site dose from a representative criticality accident) and not for emergency planning in areas with CAAS.</p>	Text has been revised for clarity by adding a note to section 2.3.2.2 (in step 3) that a representative nuclear criticality accident is as defined in section 16.4.
35	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	2.3.2.2, #4	<p>Licenses have concerns with the line in the second bullet which reads, “<i>the validity of the argument must not depend on any feature of the design or materials controlled by the facility’s system of criticality safety controls, or management measures.</i>” It is confusing that features of a facility’s design or materials cannot be used to argue that certain abnormal conditions should be excluded.</p> <p>Suggested change: Industry suggests amending the section to read, “<i>the validity of the argument must not <u>solely</u> depend on any <u>one</u> feature of the design or materials controlled by the facility’s system of criticality safety controls, or management measures</i>”</p> <p>Impact on industry: Clarification</p>	No change. This requirement was a previously-existing one, and has been implemented in the licensing basis of all facilities where the potential exists for a criticality accident. The wording of the requirement is consistent with best international practices; for example, US NRC document NUREG-1520.

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36	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	2.3.2.2 #4	<p>This section presents a numerical limit (less than 10⁻⁷/year) for low probability events involving inadvertent criticality. This differs from the approach given in the referenced CSA standards <i>N292.1</i> and <i>N292.2</i>.</p> <p>Suggested change: Industry suggests harmonizing this REGDOC with <i>CSA N292.1</i>.</p> <p>Impact on industry: As currently written, the direction in this draft REGDOC is inconsistent with the current licensing basis, that of the referenced CSA standards and <i>REGDOC-2.5.2</i>.</p>	<p>No change.</p> <p>In REGDOC-2.4.3, section 2.3.2.2, #1 is fully consistent with the current licensing basis of all facilities where the potential exists for a criticality accident and with CSA N292.1, <i>Wet storage of irradiated fuel and other radioactive materials</i>.</p> <p>In Section 2.3.2.2, #4, 10⁻⁷/year is the probability of an external initiating event (such as a meteorite strike) leading to a criticality accident below which mitigation measures are not required to be in place. This approach is consistent with best national and international practices.</p>
37	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	2.3.2.5	<p>Assumptions made in what?</p> <p>Suggested change: Change to read, "... <i>assumptions made in the NCSE to ensure...</i>"</p> <p>Impact on industry: Clarification</p>	<p>Text has been revised for clarity. It now states "with the assumptions <i>that were</i> made to ensure subcriticality".</p> <p>There may be other documents (not titled as NCSE) that might also have some assumptions.</p>

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38	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	2.3.3.2	<p>Under the Redundancy subtitle, the paragraph says the principle of redundancy <i>should</i> be applied, but then says designs <i>shall</i> meet the principle.</p> <p>Under the Independence subtitle, the 2nd sentence is the same as that under the redundancy areas. The sentence does not fit here and appears to have been duplicated in error.</p> <p>Suggested change: Amend the 2nd sentence of the Redundancy passage to read, "<i>The design shall <u>should</u> ensure ...</i>"</p> <p>Delete the last two sentences under Independence.</p> <p>Impact on industry: Clarification</p>	<p>Text has been reviewed, and has been revised to address these issues. See revised text in draft document.</p> <p>See also response to comment # 51.</p>
39	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	2.3.3.3	<p>The last paragraph in this section is from <i>ANS-8.1</i>. This is an incorrect reference.</p> <p>Suggested change: Remove the reference.</p> <p>Impact on industry: Clarification</p>	<p>The reference has been removed.</p>

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40	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	2.3.3.4	<p>Clarification is sought on allowance for crediting of burnable neutron poisons within fuel or fuel bundles when their primary function is not criticality control, but the effects directly affect other criticality safety controls.</p> <p>Suggested change: Potentially add a statement on allowance for crediting burnable poisons within fuel when their primary purpose is not criticality safety.</p> <p>Impact on industry: Clarification</p>	No change. Clarification and additional information on this topic is provided in section 11 and in appendix E.
41	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	2.3.3.7	<p>Insertion of neutron moderation between fissionable units will greatly reduce sub-criticality margin and the minimum critical mass required of fissionable fuel, having the opposite of intended effects for neutron interaction.</p> <p>Suggested change: Remove the use of moderation from this statement. For clarity, amend the final line in this section to read, “ ... <i>by insertion of neutron absorbing material or a less effective neutron moderating material ...</i> ”</p> <p>Impact on industry: Clarification</p>	No change. The text is not a requirement, but provides guidance or additional information by means of a technical discussion. The text makes reference to “suitable neutron-moderating and absorbing materials”, which is an accurate statement.

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42	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	2.4	<p>The 1st paragraph makes reference to section 2.3.2.2, but does not clarify what part of that section it refers to. The way this is written, it sounds like one should apply a margin of 20% to the SPL which contradicts the statement in item 1, bullet 2 i) in Section 2.3.2.2 (see previous comment for 2.3.2.2 #1, 2nd bullet, i). The 20% margin should only be for MCM.</p> <p>Suggested change: Remove the 1st paragraph.</p> <p>Impact on industry: Clarification</p>	No change. Section 2.3.2.2 describes the full text of the only requirement for USL. Various sections (such as this section 2.4) provide technical information, which could be used for USL as long as a licensee is able to demonstrate compliance with the requirement specified in section 2.3.2.
43	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	2.4 & 2.5	<p>These sections were presented as guidance in GD-327, and are not regulatory in nature. Furthermore, these sections provide guidance and contain detailed technical information from other sources that is subject to change.</p> <p>Suggested change: These sections should be presented as guidance.</p> <p>Impact on industry: To avoid potential issues related to compliance with REGDOC-2.4.3, these sections should be clearly presented as guidance (per the earlier RD-327/GD-327 documents).</p>	No change. As established during various compliance verification activities, sections 2.4 and 2.5 provide important guidance and information in ensuring nuclear criticality safety.

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44	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	3.3.2.1	<p>Points 2 and 3 are very situation-dependent. A large number of variables will influence the sub-criticality and minimum critical mass calculation.</p> <p>Suggested change: Refine the scope and coverage criteria to allow for graded approach assessment as per the preface of this document. Some technical basis and explanation on where the 10cm boundary and 50g/m² density are derived would help with understanding and applying this section of the REGDOC.</p> <p>Impact on industry: Clarification</p>	<p>No change. This requirement was a previously-existing one, and has been implemented in the licensing basis of all facilities where the potential exists for a criticality accident. The wording of the requirement is consistent with best international practices; for example, ANS-8.3, <i>Criticality Accident Alarm System</i> standard and ISO 7753-1987, <i>Nuclear Energy – Performance and testing requirements for criticality detection and alarm systems</i> (reference [8] in REGDOC-2.4.3).</p>
45	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	3.3.3	<p>A decibel limit is phrased as a “should” based on industrial safety concerns. This seems out-of-bounds for the document.</p> <p>The relevance to criticality safety is that the alarm needs to be heard over the maximum ambient noise.</p> <p>Suggested change: Remove the two paragraphs about noise levels and excessive noise levels. Replace with generalized wording that the criticality alarm shall be heard over the maximum ambient noise level in the area.</p> <p>Impact on industry: Currently, the only way to meet this requirement is to conduct an assessment of the dB level. Exact measurements are not required to ensure criticality safety, so this is an expense that has no corresponding benefit from a criticality safety aspect. There is only a need to be able to hear the criticality alarm when it sounds.</p>	<p>No change. This requirement was a previously-existing one, and has been implemented in the licensing basis of all facilities where the potential exists for a criticality accident. The wording of the requirement is consistent with best international practices; for example, ANS-8.3, <i>Criticality Accident Alarm System</i> standard.</p>

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46	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	3.4.1	<p>What is acceptable to consider as highly reliable as referenced in the 1st paragraph?</p> <p>Suggested change: Clarify what licensees should consider as highly reliable.</p> <p>Impact on industry: Clarification</p>	<p>No change at the current time. CNSC staff will review the comment and consider adding a definition of “highly reliable” to the next revision of REGDOC-3.6, <i>Glossary of CNSC Terminology</i>.</p>
47	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	3.4.6	<p>What is the definition/technical basis for nominal shielding?</p> <p>Suggested change: Define or provide reference to requirements for nominal shielding in this context.</p> <p>Impact on industry: Clarification</p>	<p>No change.</p> <p>Section 3.4.6 provides information and guidance that can be used to understand what the nominal shielding could be. Section 7 provides further information on specific operations with a non-nominal shielding.</p>
48	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	3.4.7	<p>In the 1st paragraph, it is not clear what the minimum duration transient is. If it's the minimum duration of the radiation transient, and assumed to be 1 ms, then the first line should just state 1 ms.</p> <p>Suggested change: Amend to read, “<i>Criticality alarm systems shall be designed so that the alarm actuation shall occur within 1 ms of the minimum duration of the radiation transient.</i>”</p> <p>Impact on industry: Clarification</p>	<p>Text has been revised to state “Criticality alarm systems shall be designed so that alarm actuation shall occur as a result of the minimum duration of the transient.”</p>

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49	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	6.3.2	<p>The 4th paragraph says fissile materials shall be stored in such a way that accidental nuclear criticality resulting from fire, flood, earthquake or other natural calamities is not a concern. It is not always possible to envision a natural event that could cause a problem. This should be limited to credible fire, flood etc.</p> <p>Suggested change: Amend to read, "<i>Fissile materials shall be stored in such a way that accidental nuclear criticality resulting from a <u>credible</u> fire or from a credible flood, earthquake, or other natural calamities is not a concern.</i>"</p> <p>Impact on industry: It is not always possible to envision a natural event that could cause a problem. Adding credible provides the ability to focus on only those credible natural events.</p>	<p>No change.</p> <p>Section 2 stipulates explicit requirements with respect to such initiating events as fire, flood, earthquake or other natural hazards. Section 6 is intended to supplement section 2 by providing storage criteria applicable to many fissile materials, and provides a cross-reference to section 2.</p>
50	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	6.3.2, 9th paragraph	<p>There is a lack of clarity with the 9th paragraph, which says a criticality alarm shall be provided in accordance with Section 3.</p> <p>Suggested change: For clarity, industry suggest adding in the words "<i>if required</i>" at the end of the sentence/ paragraph.</p> <p>Impact on industry: Clarification</p>	<p>No change.</p> <p>Explicit requirements with respect to applicability of all sections, including section 3, are stipulated in section 2, which is cross-referenced in the beginning of this section (see section 6.3.1).</p>
51	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	7.4	<p>There is a lack of consistency in the frequency of events to be considered for criticality safety consideration. The document cites different values -- 10^{-5}, 10^{-6} per year frequency cut off -- in addition to the Double Contingency Principle.</p> <p>10^{-5}: Section 7.4 "... <i>that criticality not occur under normal and</i></p>	<p>Text has been revised as follows:</p> <ul style="list-style-type: none"> • For the document to only apply one frequency cut-off, the second paragraph in section 7.4 has been removed. • There is no direct link between the double contingency principle and the frequency cut-off

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			<p><i>abnormal conditions with frequency of occurrence equal to or greater than 10^{-5} per year.</i>"</p> <p>10^{-6}: Section 2.2.3.2: "... will be subcritical under both normal and credible abnormal conditions that have frequency of occurrence equal to or greater than 10^{-6} per year." Also in Sections 12.8.1, 12.8.2, and G.2.</p> <p>Double Contingency Principle: "Process designs should incorporate sufficient factors of safety to require at least two unlikely, independent, and concurrent changes in process conditions before a criticality accident is possible."</p> <p>Suggested change: The document should only apply one frequency cut-off and make a link between the Double Contingency Principle and frequency cut-off.</p> <p>Impact on industry: Events being analyzed are inconsistent with the intent of the requirements given in the original standards (ANS).</p>	<p>because non-engineered controls may be applied, too. For clarity, the text has been revised to include information from IAEA Safety Standard SSR-4, <i>Safety of Nuclear Fuel Cycle Facilities Specific Safety Requirements</i> [1]. Specifically (and outlined in more detail below), the double contingency principle applies only to engineered nuclear criticality safety controls, which comprise only [as far as reasonably achievable] part of all available controls.</p> <ul style="list-style-type: none"> Specifically, the text has been revised by adding the following information from IAEA SSR-4, section 6.138 to REGDOC-2.4.3, section 2.3.3: Nuclear criticality safety is achieved by controlling one or more parameters of the system within subcritical limits and by allowances for process contingencies. Control-Prevention of criticality may be exercised through: ... "4. reliance on a natural or credible course of events, such as a process whose nature is to keep the density of uranium oxide less than a specified fraction of maximum theoretical density "5. administrative procedures, such as requiring that a mass not exceed an established limit "6. other means Nuclear criticality safety shall be ensured by means of preventive measures that are, as far as reasonably achievable, established in the design; that is, by engineered nuclear criticality safety controls. Also, the text has been revised by adding the following information from IAEA SSR-4, section 6.139 to REGDOC-2.4.3, section 2.3.3.2: <p>Double contingency principle</p>

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				For the prevention of criticality by means of design, the double contingency principle shall be the preferred approach. For application of the double contingency principle, the design for a process Process designs should incorporate sufficient factors of safety to require at least two unlikely, independent, and concurrent changes in process conditions before a criticality accident is possible.
52	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	8.4.1	<p>As written, the statement in the last sentence is incorrect. Uranium (natural uranium, which is what is being referred to) does not contain any Pu-239. The statement from <i>ANS-8.12</i> is actually, "<i>All limits are valid for uranium containing no more than 0.71 wt% of U-235 with Pu-239.</i>"</p> <p>Suggested change: Reword to say, "<i>All limits in Table 8-1 are valid for homogeneous mixtures of plutonium and uranium oxides containing no more than 0.71 wt% U-235.</i>"</p> <p>Impact on industry: The statement as written is incorrect.</p>	<p>Text has been revised as follows:</p> <p>"All limits in Table 8-1 are valid for homogeneous mixtures of plutonium and uranium containing..."</p>
53	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	8.4.2	<p>This section/statement is not required. It is just a restatement of the first sentence in Section 8.4.1.</p> <p>Suggested change: Remove Section 8.4.2.</p> <p>Impact on industry: Clarification</p>	<p>No change. The intent of sections 8.4.1 and 8.4.2 is different, and emphasizes different technical issues. Section 8.4.2 provides additional clarity.</p>

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54	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	10	<p>The term Special Actinide Elements is not consistent with industry (<i>ANS-8.15</i>).</p> <p>Suggested change: Change title to, “<i>Nuclear Criticality Control of <u>Selected</u> Special-Actinide Nuclides</i>”</p> <p>Impact on industry: Clarification</p>	Text has been revised as suggested. At time of posting for public consultation, there were some discrepancies in the published name for that ANS standard. The discrepancies appear to have been resolved in favour of “selected actinide nuclides”.
55	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	10.1	<p>Formatting for listing of isotopes is not standard. The Z and A numbers should be aligned. For example: instead of $^{241}_{94}\text{Pu}$, the format should be ^{241}Pu</p> <p>Suggested change: Use the correct formatting; otherwise, do not have to type in the atomic number (just list ^{241}Pu instead of $^{241}_{94}\text{Pu}$).</p> <p>Impact on industry: Clarification</p>	No change. Thank you for the comment; your staff have some publishing expertise. However, for easier updates and future e-publishing options, CNSC staff prefer to leave the format “as is” for now. This change will be considered for future updates.

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56	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	10.4.3 & 10.4.4	<p>Both sections refer to tables which, according to the text, provide information on multiple nuclides. This information does not appear in the tables. Table reference is not formatted correctly.</p> <p>Also, Table 10-3 is not for Diluted Systems (see comment below for Table 10-3). Table reference is incorrect. The SCM limits for oxides are now incorporated into Table 10-1.</p> <p>Suggested change: Check all tables for consistency with the text in <i>ANS-8.15</i> and revise as appropriate.</p> <p>Impact on industry: If references are not consistent, licensees face the potential of using incorrect tables.</p>	As stated in response to comment #5, the text and tables in section 10 have been reviewed and revised as appropriate to make them consistent with the current revision of ANSI/ANS-8.15, <i>Nuclear Criticality Safety Control of Selected Actinide Nuclides</i> .
57	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	Table 10-1	<p>The tables have not been transcribed verbatim from <i>ANS-8.15 2014</i> tables 1 and 4.</p> <p>Suggested change: Copy tables 1 and 4 from <i>ANS-8.15 2014</i> verbatim, including footnotes, into this REGDOC and remove table 10-1.</p> <p>Impact on industry: Unreflected SCM limits are included in <i>ANS-8.15</i>. Section 10 should match <i>ANS-8.15</i>. Otherwise, this will cause confusion and the potential for errors.</p>	See comments 5 and 56. Text and tables have been updated to be consistent with the current revision of ANSI/ANS 8.15.

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58	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	Table 10-1	<p>Chemical form is not useful as a separate column. Unreflected SCM limits from <i>ANS-8.15</i> are useful and need to be added here.</p> <p>Suggested change: Change title of first column to “Nuclide/Oxide” Remove Chemical for column and add a column for unreflected SCM limits.</p> <p>Impact on industry: Unreflected SCM limits are included in <i>ANS-8.15</i>. Section 10 should match <i>ANS-8.15</i>. Otherwise, this will cause confusion and the potential for errors.</p>	See comments 5 and 56. Text and tables have been updated to be consistent with the current revision of ANSI/ANS 8.15.
59	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	Table 10-1	<p>Am₂O₃ values are from the previous revision of <i>ANS-8.15 (1981)</i>. They are not included in the new revision of <i>ANS-8.15</i>.</p> <p>Suggested change: Delete Am₂O₃ values to be consistent with the current revision of <i>ANS-8.15</i></p> <p>Impact on industry: Clarification</p>	See comments 5 and 56. Text and tables have been updated to be consistent with the current revision of ANSI/ANS 8.15.

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60	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	Table 10-1	<p>The table provides limits for various nuclides, but does not explain how to handle combinations. This is a change, as GD-327 contains instruction on how to handle combinations. Has this instruction become invalid?</p> <p>Suggested change: Retain the guidance from GD -327 section 10.5.</p> <p>Impact on industry: Clarification</p>	<p>Text has been revised as suggested:</p> <ul style="list-style-type: none"> - Table 10.1 has been revised to be consistent with the formatting and quantities from ANSI/ANS 8-15 [2014] - The information from GD-327 section 10.5 has been reinstated, with the following changes to match ANSI/ANS-8.15-2014: <ul style="list-style-type: none"> - The title has changed from “Multiparameter limits” to “Isotopic mixtures of Pu, Am and Cm” - The first paragraph has been deleted (“Operations involving...”) - The paragraph about “The mass limit of Table 10-2 for pure ²³⁹Pu is...” has been deleted - The table numbers have changed from table 10.3 and 10.4 (in GD-327) to table 10.5 and 10.6 (in REGDOC-2.4.3).

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61	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	Table 10-1	<p>A footnote should be added regarding the water-reflector thickness. According to <i>ANS-8.15</i>, it is 15 cm of water (not the standard 30 cm that industry usually uses for full reflection).</p> <p>Suggested change: Update table and footnotes to match the updated <i>8.15-2014</i> standard.</p> <p>Impact on industry: Usually, full reflection is considered 30 cm so the footnote needs to be added to avoid any confusion. Also, it needs to match <i>ANS-8.15</i>. There could be a major impact on industry if licensees assume the values are fully reflected by 30 cm in a criticality safety analysis when it is 15 cm in this draft document.</p>	See comments 5 and 56. Text and tables have been updated to be consistent with the current revision of ANSI/ANS 8.15.
62	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	Table 10-2	<p>The table does not match the standard and only certain information has been added. As per comment 54, the table has not been transcribed verbatim from <i>ANS-8.15 2014</i> table 2.</p> <p>Suggested change: Copy table 2 of <i>ANS-8.15 2014</i> verbatim, including footnotes, into this REGDOC and remove table 10-2 as it is currently written.</p> <p>Impact on industry: Incorrect SCM limit for selected system could be used in a criticality safety analysis. Major impact on industry if a safety analysis is incorrect. This draft does not include unreflected or steel-reflected SCM limits used in industry. Industry would have to refer back to <i>ANS-8.15</i>.</p>	See comments 5 and 56. Text and tables have been updated to be consistent with the current revision of ANSI/ANS 8.15.

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63	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	Table 10-2	<p>Water-reflected has been chosen (see title of Table 10-2) when the steel-reflected SCM limits are more restrictive/conservative. The limit for 239Pu listed is for <u>steel-reflected</u> and needs to be changed to 600g for <u>water-reflected</u> (title indicates for water-reflected).</p> <p>Suggested change: Change 450g limit for 239Pu to 600g OR Update table to include the same three columns from the standard: SCM for unreflected, water-reflected and steel-reflected.</p> <p>Impact on industry: Incorrect SCM limit for selected system could be used in a criticality safety analysis. Major impact on industry if a safety analysis is incorrect. This draft does not include unreflected or steel-reflected SCM limits used in industry. Industry would have to refer back to <i>ANS-8.15</i>.</p>	See comments 5 and 56. Text and tables have been updated to be consistent with the current revision of ANSI/ANS 8.15.
64	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	Table 10-3	<p>1.Reference to Table 10-3 in the document should be for Diluted Systems and not Americium. 2. Need to keep section 10.5.2 of GD-327 and tables referenced in section 10.5.2 of GD-327.</p> <p>Suggested change: 1.Include table for Diluted Systems. 2.Keep the table for Americium and add information from GD-327 section 10.5.2, including referenced tables.</p> <p>Impact on industry: Missing SCM limits for Diluted Systems. Industry would have to refer back to <i>ANS-8.15</i>. Also, Americium SCM limits are already in the <i>ANS-8.15</i> standard and industry would have to refer back to it to apply these limits as well.</p>	See comments 5 and 56. Text and tables have been updated to be consistent with the current revision of ANSI/ANS 8.15.

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65	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	Table 10-4	<p>1.Reference to Table 10-4 in the document should be for operation with oxides and not Curium.</p> <p>2.Need to keep section 10.5.3 of GD-327 and tables referenced in section 10.5.3 of GD-327.</p> <p>Suggested change:</p> <p>1.Include table for operation with oxides.</p> <p>2.Keep the table for Curium and add information from GD-327 section 10.5.3, including referenced tables.</p> <p>Impact on industry:</p> <p>Cm SCM limits are already in the ANS-8.15 standard and industry would have to refer back to ANS-8.15 to apply these limits.</p>	See comments 5 and 56. Text and tables have been updated to be consistent with the current revision of ANSI/ANS 8.15.
66	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	11	<p>GD-327 provides clear instruction as to the expectations for transportation of used fuel both within the licensed site and external to the boundaries of the licensed site. This distinction no longer appears in this draft REGDOC.</p> <p>Suggested change:</p> <p>Restore the wording from section 11 of GD-327 to provide the distinction between rules that apply to transfer within the licensed site and transportation outside the licensed site boundary.</p> <p>Impact on industry:</p> <p>Clarification</p>	Text has been revised as suggested. Text from RD-327, <i>Nuclear Criticality Safety</i> specifying “outside the licensed site” and “within the boundaries of the licensed site” has been copied into REGDOC-2.4.3, <i>Nuclear Criticality Safety</i> .

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67	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	11	<p>Reference information related to transportation.</p> <p>Suggested change: Consider adding <i>REGDOC-2.14.1, Information Incorporated by Reference in Canada's Packaging and Transport Regulations</i> as a reference.</p> <p>Impact on industry: Clarification</p>	<p>This regulatory document has been added as a reference, as requested.</p>
68	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	11.3	<p>As per comment 12 [comment 24 in this consolidated table], it would be beneficial to explicitly exempt storage of unlimited quantities of natural or depleted uranium new/fresh fuel to the newly-added line, <i>'At a licensed site for short- or interim-term (dry or wet) storage, an exempted quantity of fissionable materials (defined in Section 2.3.1.1, list item 2) may include an unlimited quantity of natural or depleted uranium irradiated in a thermal nuclear reactor [6].'</i></p> <p>Suggested change: Amend slightly to read, <i>'At a licensed site for short- or interim-term (dry or wet) storage, an exempted quantity of fissionable materials (defined in Section 2.3.1.1, list item 2) may include an unlimited quantity of <u>natural or depleted uranium new/fresh fuel</u> or <u>fuel</u> irradiated in a thermal nuclear reactor [6].'</i></p> <p>Impact on industry: Clarification</p>	<p>No change. The suggested revision introduces significant deviations from existing limits in the unsafe direction. The existing limits are consistent with best national and international practices.</p> <p>However, the text has been revised for clarity by adding cross-references between sections 2.3.1.1 and 11.3.</p>

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69	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	11.3	<p>Why reference short- or intermediate-term storage in this subsection when section 11 applies to long-term waste management? The new clause, cited in comment 66, is not helpful for activities which are focused on handling and the long-term management of irradiated fuel outside reactors.</p> <p>Suggested change: Revise the exemption criterion to clarify what is exempt and what is not exempt at a licensed facility for the long-term waste management of fuel outside reactors.</p> <p>Impact on industry: Clarification</p>	
70	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	11.3	<p>This 2nd paragraph is useful, but could be missed as it is buried in Section 11.3.</p> <p>Suggested change: Move (or copy) this passage to section 2.3.1.1 as part of bullet 2. A small footnote could be created.</p> <p>Impact on industry: Clarification</p>	<p>Text has been revised as follows:</p> <p>2. an unlimited quantity of natural or depleted uranium or natural thorium, if no other fissionable materials nor significant quantities of graphite, heavy water, beryllium, or other moderators more effective than light water are allowed in the licensed site (note: see section 11.3 for additional information on short- or interim-term storage (dry or wet) of spent fuel); or</p>

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71	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	11.3.2	<p>The 2nd paragraph says the as-built conditions shall conform to the design limits specified in section 11.3.1. However, section 11.3.1 does not specify any limits. It says licensees need to identify the limits as part of the NCSE.</p> <p>Suggested change: Suggest replacing “specified” with “identified” so the paragraph reads, <i>“Prior to commencing operation, the licensee shall verify that the as-built conditions conform to the design limits as identified in Section 11.3.1.”</i></p> <p>Impact on industry: Clarification</p>	Text has been revised as suggested.
72	International Safety Research	11.3.4	<p>The ANSI standard for burnup of LWR provides requirements on taking credit of burnup for criticality safety. This document provides no requirements for CANADA’s use of burnup other than an allowance of credit. Requirements must be included in this document if credit is taken for ANY burnup. Otherwise, this document does not provide the appropriate safety margin for the use of burnup in criticality safety evaluations. As a result, a limit that is not bounding could result thereby providing a non-conservative limit and potentially unsafe or unanalyzed configuration.</p> <p>Therefore, a minimum baseline of requirements for the use of burnup credit for criticality safety appropriate for CANDU fuel should be provided prior to allowing the use of burnup credit in criticality safety calculations used for evaluations to ensure the continued safety of workers, facility, and public.</p>	<p>No change.</p> <p>The suggested “minimum baseline of requirement for burnup credit for criticality safety appropriate for CANDU fuel” has low importance due to the fact that this fuel is exempted from criticality safety requirements (as stated in section 11.3 of the draft REGDOC-2.4.3 posted for public consultation).</p>

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73	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	12	<p>Defining roles and responsibilities in this REGDOC duplicates <i>CSA- N286</i> requirements, which are already in the license framework</p> <p>Suggested change: Delete section 12</p> <p>Impact on industry: This duplicates requirements already contained in licensing basis, which will lead to inconsistencies, confusion and potential duplication.</p>	No change. See response to comment 6.
74	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	12.1	<p>In the 2nd paragraph, “codification” is not a commonly-used word.</p> <p>Suggested change: If this section is retained, suggest changing to “amalgamation.”</p> <p>Impact on industry: Clarification</p>	Text has been revised from “represents a codification of” to “codifies”. While this phrasing does use the same base word, it may clarify the intention. Amalgamation does not convey the correct meaning.
75	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	12.2	<p>Isotopes are not special as described in the 3rd paragraph.</p> <p>Suggested change: If this section is retained, remove the descriptor “special.” Change the title if section 10 title is changed.</p> <p>Impact on industry: Clarification</p>	Text has been revised. The text in the 3rd paragraph now matches the revised title for section 10, <i>Nuclear Criticality Safety Control of Selected Actinide Nuclides</i> .

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76	International Safety Research	12.3.3	<p>The words 'provide technical guidance' implies a level of competency but again, there are no training requirements, education requirements, etc. for this group in this document. They have no tools to succeed and the facilities are not guaranteed adequate reviews if staff is not qualified or trained.</p> <p>Therefore, ANSI/ANS-8.26 should be referenced and used as an outline to establish these requirements for CANADA.</p>	No change. See response to comment 20.
77	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	12.4	<p>The 2nd bullet of the final paragraph, which reads, “<i>Practices that favourably affect nuclear criticality safety</i>” does not sound correct. The phrase “favourably affect” could be misinterpreted.</p> <p>Suggested change: If this section is retained, remove the term “favourably affect.” Other words that might be less confusing are <i>reinforce, support, or coincide with</i>.</p> <p>Impact on industry: “Favourably affect” could be misinterpreted as industry wanting to have an out-of-core criticality instead of trying to avoid a criticality.</p>	Text has been revised to state “practices that support nuclear criticality safety”.
78	International Safety Research	12.5, 2 nd paragraph	<p>The criticality safety staff needs training to do this appropriately. As a result, implement a qualification program for nuclear criticality safety staff to include this requirement.</p>	No change. See response to comment 20.

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79	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	12.8	<p>This section is overly prescriptive.</p> <p>Suggested change: Delete section 12.8</p> <p>Impact on industry: Regulatory documents should only set requirements and not be prescriptive as to how licensees conduct their business.</p>	No change. The section lists the information that will support a licensing submission and facilitate a regulatory review, but does not prescribe how that information is to be collected or presented.
80	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	13	<p>This section presents training requirements which are already (or could be) in place under other programs.</p> <p>Suggested change: This document should clarify that the essential elements of criticality safety training may be incorporated into existing programs where appropriate (i.e. at Nuclear Power Plants).</p> <p>Impact on industry: This has the potential to create additional program and reporting requirements with no corresponding benefit to safety.</p>	No change. See response to comment 13.

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81	International Safety Research	13.2	<p>This leaves a huge gap as there are NO REQUIREMENTS in this document for training for nuclear criticality safety staff. Add the appropriate ASNI/ANS standard minimums at least to require facilities to implement a training or qualification program for the nuclear criticality safety staff. Otherwise, they are the ONLY group with no requirements whereas they should have the most since they are the first line of defense (determining PEC, ADMIN requirements, training for fissionable material handlers, evaluations of fissile configurations for safety, dose determinations, shielding requirements, etc.).</p> <p>Ensure REGDOC-2.3.4 adds requirements for nuclear criticality safety staff training and qualification to ensure they have the appropriate understanding of the requirements listed in REGDOC-2.3.4 for the continued safety of workers, facility, and public.</p>	No change. See response to comment 20.
82	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	13.6.6	<p>In the first paragraph, the term “facility management” is used, though the rest of the document uses the term “management.”</p> <p>Suggested change: Change to “<i>Management’s nuclear criticality safety policy...</i>”</p> <p>Impact on industry: Clarification</p>	<p>Text has been revised for clarity, as follows:</p> <p>The facility management's nuclear criticality safety policy shall be described (for details, see section 12.3.1, Management responsibilities).</p>

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83	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	16	<p>This Section presents emergency response requirements which are already (or could be) in place under other programs</p> <p>Suggested change: Change section to clarify that the essential elements of criticality emergency response may be incorporated into existing programs where appropriate (</p> <p>Impact on industry: This has the potential to develop additional program and reporting requirements with no significant benefit.</p>	No change. See response to comment 20
84	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	16.2	<p>Licensees do not support the removal of the final line, which reads, "<i>This section does not apply to off-site accidents, or to off-site emergency planning and response.</i>"</p> <p>Suggested change: Retain the sentence from <i>GD-327</i>.</p> <p>Impact on industry: Clarification</p>	Text has been retained as requested.

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85	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	16.4.1	<p>Under the Note, a description of a representative nuclear criticality accident is needed for off-site dose mitigation and not emergency response planning.</p> <p>Suggested change: Move the Note to section 2.3.2.2 #3</p> <p>Impact on industry: The representative accident discussed here is used for offsite dose mitigation assessments, not emergency response planning for onsite personnel. The criticality accidents defined for onsite emergency response planning are different than this representative accident and have different fission yields. This representative accident is not the one used to establish immediate evacuation zone and evacuation routes.</p>	No change to this text; however, a note has been added to section 2.3.2.2 that a representative nuclear criticality accident is as defined in section 16.4. (see comment 34).
86	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	16.7.1	<p>The final paragraph is self-obvious and offers no added value to licensees.</p> <p>Suggested change: Delete the paragraph.</p> <p>Impact on industry: Clarification</p>	<p>No change. The final paragraph was added to the draft to maintain consistency with the underlying standard.</p> <p>It is acknowledged that the recommendation could be self-obvious to licensees with established nuclear criticality safety programs; however, it could be useful information for new applicants or licensees.</p>
87	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	Appendix B.4	<p>The text in Appendix B.4 is not consistent with the original requirement given in Appendix B.3.</p> <p>Issue 1: The original definition of Δk_p includes allowance for “Uncertainties due to limitations in the geometric or material representations used in the computational method” while 2σ is defined as “statistical or convergence uncertainty at 95% confidence level”.</p> <p>Issue 2: $k_p + 3\sigma \leq 0.95$ is LESS conservative than the original requirement of $k_p + \Delta k_p \leq k_c - \Delta k_c - 0.05$ when $k_c < 1.00$</p>	<p>No change. This guidance was pre-existing, and reflects an approach followed in certain legacy projects.</p> <p>As evident from the draft and acknowledged in the comment, the text of Appendix B.4 provides alternative approaches to meet the original requirement given in B3. Note the original requirement does not prescribe whether 2σ or 3σ is to be used.</p> <p>Illustrative calculations, which are provided in the comment, confirm that use of the alternative approach</p>

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			<p><i>Example:</i> $k_c = 0.9900$ $\Delta k_c = 0.0001$ $k_p = 0.9400$ $\Delta k_p = 0.0003$ Applying the original equation: $0.9400 + 0.0003 \leq 0.9900 - 0.0001 - 0.05$ $0.9403 \leq 0.9399$ is not met (not meeting the criticality safety requirement). However, based on App. B4, since $\square (0.0003/2 = 0.00015$ is $> \Delta k_c$) the analyst is allowed to apply $k_p + 3\sigma \leq 0.95$ criteria: $0.9400 + 0.00045 \leq 0.95$ $0.94045 \leq 0.95$ (meets the requirement)</p> <p>Suggested change: Suggest keeping the original requirement as given in the ANS standards by removing the last two paragraphs in section B.4 starting with "If in the criticality evaluation) Additional formulation should be justified: * should not neglect the allowance for geometric/material representation * should include k_c in the formulation: $k_p + 3\sigma \leq k_c - 0.05$</p> <p>Impact on industry: The alternative approach for compliance with the USL does not meet the original requirement given in the ANS standard.</p>	<p>leads to negligible differences compared to the safety margin itself.</p>

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88	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	Appendix E	<p>Under E.4 Moderator conditions, there is a need to add <i>“possibility of intrusion of small amount of heavy water into the light water in the irradiated fuel storage bay.”</i></p> <p>Suggested change: Add text for completeness on issue relevant to heavy water reactors.</p> <p>Impact on industry: Clarification</p>	<p>Text has been revised as follows: Moderator conditions include:</p> <ol style="list-style-type: none"> 1. credible conditions of moderation within and between fuel units; for example: <ul style="list-style-type: none"> • inclusion of plastic shims or other moderating material (fog, snow, mist, or personnel) for dry storage of fuel units • water density and temperature including consideration of void formation by boiling for storage of fuel units under water • introduction of heavy water into the irradiated fuel storage bay
89	International Safety Research	Appendix G	<p>This program includes nothing for the use of burnup credit, nothing for the training of nuclear criticality safety staff (recall section 13 specifically states they are out of scope of that section), and uses the verbs 'shall', 'should', and 'may' in accordance to the previous RD and GD, not the new definitions per-say.</p> <p>As a result, update this appendix appropriately to aid facilities with their programs based on all of the previous comments.</p>	<p>No change.</p> <p>Appendix G provides a generic example of a fictitious facility where some of the topics, mentioned in the comment, may or may not be relevant. Regardless of the provided example, licensees are responsible for identification and proper implementation of all the applicable requirements, as stated in section 12.8.</p>

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90	Bruce Power, CNA, CNL, NB Power, NWMO, OPG	Glossary	<p>There are important differences in definitions in this REGDOC with REGDOC-3.6, Glossary of CNSC Terminology. These include:</p> <ul style="list-style-type: none"> -CASA – criticality accident sequence assessment should be added -CSC -nuclear criticality safety control term should revert to Criticality Safety Control (CSC) as used in industry -Fissile material – Use definition in GD-327 -Neutron absorber and neutron poison have the same definition. Use definitions in GD-327 <p>Suggested change: Correct this draft REGDOC as per the items noted in the industry issue.</p> <p>Impact on industry: Clarification</p>	<p>Thank you for the observations. These will be addressed as follows:</p> <ul style="list-style-type: none"> - no change to REGDOC-2.4.3, <i>Nuclear Criticality Safety</i> - for CASA: in REGDOC-3.6, <i>Glossary of CNSC Terminology</i>, CASA will be added to appendix A, Acronyms and Abbreviations in a near-future update - for CSC: no change. In REGDOC-3.6, this term is sufficiently cross-referenced for clarity. The CNSC's preferred term (for clarity in all situations) is "nuclear criticality safety control" but if industry's preferred term is "criticality safety control", they are welcome to use it. Within the context of industry's use, CNSC staff do not expect that there will be any issues with clarity of use for that term. - for "fissile material", CNSC staff will consider adding the definition from GD-327 to the current definition in REGDOC-3.6 in a near-future update - for "neutron absorber" and "neutron poison": no change. The definition in GD-327 states that a neutron absorber is "also referred to as a neutron poison", indicating that it is a synonym. The cross-functional technical team that developed REGDOC-3.6 is of the opinion that these two terms are not necessarily synonyms, and that the definition in REGDOC-3.6 clarifies the usage.

Table C: "Feedback on comments" (opportunity to provide feedback on the comments received):

	Reviewer	Section or Para. #	Reviewer's Comment and Proposed Change	CNSC Response
a)	No feedback on comments was received.			