OPG Comments on Draft REGDOC 2.4.3 Nuclear Criticality Safety

#	Document/ Excerpt of Section	Industry Issue	Suggested Change (*if applicable*)	Major Comment/ Request for Clarification	Impact on Industry, ***if major comment***
1.	**General**	In keeping with comments made on several previous REGDOCs, the statement below from the preface also gives the impression that guidance is actually a requirement: *'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.'*	Rewrite to say, *'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.~~'*	**MAJOR**	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.
2.	**General**	There are significant issues related to the merging and copying of content from ***RD-327, Nuclear Criticality Safety*** and ***GD-327, Guidance for Nuclear Criticality Safety*** into this draft REGDOC. This has blurred the distinction between requirements and guidance throughout the document. Many sections in ***RD-327*** 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. As well, all of the *shall* statements appear to have been copied verbatim from ***GD-327***, but ought to have been reviewed and changed to *should* statements as appropriate for this REGDOC. 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 comments 31, 37-39, 42, 44, 47, 49, 63, 74, 76-79 & 85.	Revise the document to replace *shall* with *should* as appropriate to clearly distinguish between requirements and guidance. This distinction could also be improved by restructuring the document so: • 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.	**MAJOR**	Having a clear distinction between requirements and guidance will help licensees avoid compliance issues with ***REGDOC-2.4.3*** once it is published.

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3.	**General**	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: • 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" 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.	One option is to rearrange the document so requirements that apply in all situations appear in one section. Additional requirements for special circumstances can then appear in additional sections together with an improved description of when those additional requirements apply. This would be somewhat analogous to the Regulations under the ***Nuclear Safety and Control Act***, in which the ***General Regulations*** apply and specific additional requirements appear in other supplemental regulations. 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.	**MAJOR**	By clearly defining requirements associated with the applicable activities for the various phrases 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.

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4.	**General**	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. Examples: Section 2.3.3.6 on neutron reflection says, *"…which may be more effective neutron reflectors than water…"* The 'water' here refers to light water only. Section 6.4 says, *"These arrays are reflected on all faces by 200 mm of ordinary water."* This should be replaced by 'light water'.	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'. Another alternative is to specify in the Glossary that water refers to light water unless otherwise noted.	**MAJOR**	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.
5.	**Preface**	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.	Revise the preface to include the whole scope of the document.	Clarification	
6.	**General**	Minor editorial issues throughout the document, including: 1. The term *frequency* is regularly used instead of *probability*. 2. Inconsistent spelling and unit abbreviations. 3. Lack of numbering equations.	1. Use the term *probability* instead of *frequency* 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.	Clarification	
7.	**Preface**	Inconsistent wording between the Preface and Section 1.2, Scope	Amend the 1st sentence of the 3rd paragraph in the preface to read *"…abandonment of the licensed facility and with respect to the handling, storing, processing and transportation of certain fissionable materials."*	Clarification	
8.	**1.2**	Lack of clarify in the 3rd paragraph.	Add the word 'all' after operations so it reads *"…applies to all operations with…"*	Clarification	
9.	**1.4**	It is unclear if the latest status of ANS references has been captured in parts of this draft. For example, ***ANS-8.7*** is stated as reaffirmed in 2007, although the Standard was actually reaffirmed again in 2012. Specific examples are noted in later comments.	Check all references to confirm they are up-to-date and incorporated in this REGDOC.	Clarification	

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10.	**2**	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.	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 fuel). Provide examples relevant to licensees involved in various phrases of the nuclear fuel cycle. Or, alternatively, provide a generic example which could be used industry-wide.	**MAJOR**	This has the potential to develop additional program and reporting requirements with no appreciable impact to nuclear safety.
11.	**2.3**	The statement, *"Operations with fissionable materials shall meet the requirements and follow the recommendations of this document"* belongs in Section 2.2, Scope. Also, it is not always Operations that has to apply criticality safety requirements.	Move the statement to Section 2.2 from Section 2.3 and amend to read, *"~~Operations with~~ Fissional materials shall meet the requirements and follow the recommendations of this document."*	Clarification	
12.	**2.3.1.1 & 11.3**	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.	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.	Clarification	
13.	**2.3.1.1**	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.	Amend to read, *"Licensed sites ~~operating~~ with exempted quantities of fissionable materials are exempt from…"*	Clarification	
14.	**2.3.1.4**	It's not clear that the term *"in the licensed site"* can be applied to specific, defined areas *within* a licensed site.	Amend to read *"…~~in~~ <u>within</u> the licensed site…"*	Clarification	
15.	**2.3.2**	Use of the term 'management' versus 'Management' is confusing.	Change the title of Section 2.3.2 to "Program practices" or "Program administrative practices".	Clarification	
16.	**2.3.2.1**	This section overlaps with the requirements in ***CSA N286 – Management system requirements for nuclear facilities***	Remove Section 2.3.2.1	**MAJOR**	This section duplicates requirements already contained in the licensing basis.

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17.	**2.3.2.2**	This section sets prescriptive requirements for process analysis to include *"both normal and credible abnormal conditions that have frequency of occurrence equal to or greater than 10e-6 per year."* 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 ***IAEA Fundamental Safety Principles SF-1***, Section 5, item 3.24.	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 ***IAEA SSG-30 – Safety Classification of Structures, Systems and Components in Nuclear Power Plants (2014).***	**MAJOR**	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.
18.	**2.3.2.2**	Industry seeks additional clarification with the passage, *"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."* Where is this criterion derived or the technical basis given? At minimum, if it was derived in ANS-8.1, reference should be given to reflect that. Light water is used in ANS documents. It should be specific if this is still the case, as heavy water would present different application limits. 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?	Provide clarification on water type and any tie-ins with ***REGDOC-2.4.2.***	Clarification	

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19.	**2.3.2.2 & B.3**	The administrative margin is currently expressed in two different manners: + 5% in Section 2.3.2.2 + 50 mk in Section B.3	Suggest using either 5% or 50 mk.	Clarification	
20.	**2.3.2.2 & 7.3.2.1**	Licensees believe there is a need to be consistent with the criteria of the trigger level: it is temporary public evacuation as stated in Section 2.3.2.2 or temporary public sheltering as stated in Section 7.3.2.1?	Consistent criterion should be used.	Clarification	
21.	**2.3.2.2 #1**	The USL can be a SPL, or 80% of a MCM. Note: Section 10.4, the USL = SPL. This approach should be consistent for the SPL values in ***ANS-8.1***	This bullet should be reworded to cover all other SPL values from ***ANS-8.1***. Or, a new bullet should be added regarding other SPL values from ***ANS-8.1.***	**MAJOR**	"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.
22.	**2.3.2.2 #3**	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.	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.	**MAJOR**	"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.
23.	**2.3.2.2 #4**	Licensees have concerns with the line in the second bullet which reads, *"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."* It is confusing that features of a facility's design or materials cannot be used to argue that certain abnormal conditions should be excluded.	Industry suggests amending the section to read, *"the validity of the argument must not **solely** depend on any **one** feature of the design or materials controlled by the facility's system of criticality safety controls, or management measures."*	Clarification	
24.	**2.3.2.2 #4**	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 ***N292.1*** and ***N292.2***.	Industry suggests harmonizing this REGDOC with ***CSA N292.1.***	**MAJOR**	As currently written, the direction in this draft REGDOC is inconsistent with the current licensing basis, that of the referenced CSA standards and ***REGDOC-2.5.2.***
25.	**2.3.2.5**	Assumptions made in what?	Change to read, *"…assumptions made in the NCSE to ensure…"*	Clarification	

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26.	**2.3.3.2**	Under the Redundancy subtitle, the paragraph says the principle of redundancy ***should*** be applied, but then says designs ***shall*** meet the principle. 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.	Amend the 2nd sentence of the Redundancy passage to read, *"The design ~~shall~~ should ensure…"* Delete the last two sentences under Independence.	Clarification	
27.	**2.3.3.3**	The last paragraph in this section is from ***ANS-8.1.*** This is an incorrect reference.	Remove the reference.	Clarification	
28.	**2.3.3.4**	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.	Potentially add a statement on allowance for crediting burnable poisons within fuel when their primary purpose is not criticality safety.	Clarification	
29.	**2.3.3.7**	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.	Remove the use of moderation from this statement. For clarify, amend the final line in this section to read, *"…by insertion of neutron absorbing material or a less effective neutron moderating material…"*	Clarification	
30.	**2.4**	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 it is written, it appears 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.	Remove the 1st paragraph.	Clarification	
31.	**2.4 & 2.5**	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 are subject to change.	These sections should be presented as guidance.	**MAJOR**	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).

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32.	**3.3.2.1**	Points 2 and 3 are very situation-dependent. A large number of variables will influence the sub-criticality and minimum critical mass calculation.	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 10 cm boundary and 50g/m^2 density are derived would help with understanding and applying this section of the REGDOC.	Clarification	
33.	**3.3.3**	A decibel limit is phrased as a "should" based on industrial safety concerns. This seems out-of-scope for the document. The relevance to criticality safety is that the alarm needs to be heard over the maximum ambient noise.	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.	**MAJOR**	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. These is only a need to be able to hear the criticality alarm when it sounds.
34.	**3.4.1**	What is acceptable to consider as highly reliable as referenced in the 1st paragraph?	Clarify what licensees should consider as highly reliable.	Clarification	
35.	**3.4.6**	What is the definition/technical basis for nominal shielding?	Define or provide reference to requirements for nominal shielding in this context.	Clarification	
36.	**3.4.7**	In the 1st paragraph, it is not clear what the minimum duration transient is. If it is the minimum duration of the radiation transient, and assumed to be 1 ms, then the first line should just state 1 ms.	Amend to read, *"Criticality alarm systems shall be designed so that the alarm actuation shall occur within 1 ms of the minimum duration of the radiation transient."*	Clarification	
37.	**4**	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 are subject to change.	These sections should be presented as guidance.	**MAJOR**	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).
38.	**5**	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 are subject to change.	These sections should be presented as guidance.	**MAJOR**	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).
39.	**6**	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 are subject to change.	These sections should be presented as guidance.	**MAJOR**	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).

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40.	**6.3.2**	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.	Amend to read, *"Fissile materials shall be stored in such a way that accidental nuclear criticality resulting from a credible fire or from a credible flood, earthquake, or other natural calamities is not a concern."*	**MAJOR**	It is not always possible to envision a natural event that could cause a problem. Adding credible provides the ability to focus on those credible natural events.
41.	**6.3.2, 9th paragraph**	There is a lack of clarity with the 9th paragraph, which says a criticality alarm shall be provided in accordance with Section 3.	For clarity, add the words *"if required"* at the end of the sentence/paragraph.	Clarification	
42.	**7**	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 are subject to change.	These sections should be presented as guidance.	**MAJOR**	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).
43.	**7.4**	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. 10^{-5}: Section 7.4 *"…that criticality not occur under normal and abnormal conditions with frequency of occurrence equal to or greater than 10^{-5} per year."* 10^{-6}: Section 2.2.3.2: *"…will be subcritical under both normal and credible abnormal conditions that have a frequency of occurrence equal to or greater than 10^{-6} per year."* Also in Sections 12.8.1, 12.8.2, and G.2. 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."	The document should only apply one frequency cut-off and make a link between the Double Contingency Principle and frequency cut-off.	**MAJOR**	Events being analyzed are inconsistent with the intent of the requirements given in the original standards (ANS).

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44.	**8**	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 are subject to change.	These sections should be presented as guidance.	**MAJOR**	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).
45.	**8.4.1**	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 ***ANS-8.12*** is actually, *"All limits are valid for uranium containing no more than 0.71 wt% of U-235 with Pu-239."*	Reword to say, *"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."*	**MAJOR**	The statement as written is incorrect.
46.	**8.4.2**	This section/statement is not required. It is just a restatement of the first sentence in Section 8.4.1.	Remove Section 8.4.2.	Clarification	
47.	**9**	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 are subject to change.	These sections should be presented as guidance.	**MAJOR**	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).
48.	**10**	The term Special Actinide Elements is not consistent with industry (***ANS-8.15***).	Change title to, *"Nuclear Criticality Control of <u>Selected</u> ~~Special~~ Actinide Nuclides"*	Clarification	
49.	**10**	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 are subject to change.	These sections should be presented as guidance.	**MAJOR**	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).
50.	**10.1**	Formatting for listing of isotopes is not standard. The Z and A numbers should be aligned. For example: instead of $^{241}_{94}$Pu, the format should be $^{241}_{94}Pu$	Use the correct formatting; otherwise, do not have to type in the atomic number (just list ^{241}Pu instead of $^{241}_{94}$Pu).	Clarification	

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51.	**10.4.3 & 10.4.4**	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. 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 not incorporated into Table 10-1.	Check all tables for consistency with the text in ***ANS-8.15*** and revise as appropriate.	**MAJOR**	If references are not consistent, licensees face the potential of using incorrect tables.
52.	**Table 10-1**	The tables have **not** been transcribed verbatim from ***ANS-8.15 (2014)*** tables 1 and 4.	Copy tables 1 and 4 from ***ANS-8.15 (2014)*** verbatim, including footnotes, into this REGDOC and remove table 10-1.	**MAJOR**	Unreflected SCM limits are included in ***ANS-8.15***. Section 10 should match ***ANS-8.15***. Otherwise, this will cause confusion and the potential for errors.
53.	**Table 10-1**	Chemical form is not useful as a separate column. Unreflected SCM limits from ***ANS-8.15*** are useful and need to be added here.	Change title of first column to “Nuclide/Oxide”. Remove column on Chemical Form and add a column for unreflected SCM limits.	**MAJOR**	Unreflected SCM limits are included in ***ANS-8.15***. Section 10 should match ***ANS-8.15***. Otherwise, this will cause confusion and the potential for errors.
54.	**Table 10-1**	Am_2O_3 values are from the previous revision of ***ANS-8.15 (1981)***. They are not included in the new revision of ***ANS-8.15***.	Delete Am_2O_3 values to be consistent with the current revision of ***ANS-8.15***.	Clarification	
55.	**Table 10-1**	This table provides limits for various nuclides, but does not explain how to handle combinations. This is a change, as ***GD-327*** contains guidance on how to handle combinations. Has this become invalid?	Retain guidance from ***GD-327*** Section 10.5.	Clarification	
56.	**Table 10-1**	A footnote should be added regarding the water-reflector thickness. According to ***ANS-8.15***, it is 15 cm of water (not the standard 30 cm that industry usually uses for full reflection).	Update tables and footnotes to match the updated ***ANS-8.15 (2014)*** standard.	**MAJOR**	Usually, full reflection is considered 30 cm so the footnote needs to be added to avoid any confusion. Also, it needs to match ***ANS-8.15***. 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.
57.	**Table 10-2**	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 ***ANS-8.15 (2014)*** table 2.	Copy table 2 of ***ANS-8.15 (2014)*** verbatim, including footnotes, into this REGDOC and remove table 10-2 as it is currently written.	**MAJOR**	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 ***ANS-8.15.***

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58.	**Table 10-2**	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 steel-reflected and needs to be changed to 600g for water-reflected (title indicates for water-reflected).	600g *OR* Update table to include the same three columns from the standard: SCM for unreflected, water-reflected and steel-reflected	**MAJOR**	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 ***ANS-8.15.***
59.	**Table 10-3**	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***.	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	**MAJOR**	Missing SCM limits for Diluted Systems. Industry would have to refer back to ***ANS-8.15***. Also, Americium SCM limits are already in the ***ANS-8.15*** standard and industry would have to refer back to it to apply these limits as well.
60.	**Table 10-4**	1. Reference to Table 10-4 in the document should be for operation with oxides and **not** Curium. 2. Need to keep section 10.5.3 of ***GD-327*** and tables referenced in section 10.5.3 of ***GD-327***.	1. Include table for operation with oxides. 2. Keep the table for Curium and add information from ***GD-327*** section 10.5.3, including referenced tables.	**MAJOR**	Curium 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.
61.	**11**	***RD-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.	Restore the wording from section 11 of ***RD-327*** to provide the distinction between rules that apply to transfer within the licensed site and transportation outside the licensed site boundary.	Clarification	
62.	**11**	Reference information related to transportation.	Consider adding ***REGDOC-2.14.1, Information Incorporated by Reference in Canada's Packaging and Transport Regulations*** as a reference.	Clarification	
63.	**11**	This section was 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.	This section should be presented as guidance.	**MAJOR**	To avoid potential issues related to compliance with REGDOC-2.4.3, this section should be clearly presented as guidance (per the earlier ***RD-327/GD-327*** documents).
64.	**11.3**	As per comment 12, it would be beneficial to explicitly exempt storage of unlimited quantities of natural or depleted uranium new/fresh fuel to the newly-added line, *"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]."*	Amend slightly to read, *"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 new/fresh fuel or fuel irradiated in a thermal nuclear reactor [6]."*	Clarification	

#	Document/ Excerpt of Section	Industry Issue	Suggested Change (*if applicable*)	Major Comment/ Request for Clarification	Impact on Industry, ***if major comment***
65.	**11.3**	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.	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.	Clarification	
66.	**11.3**	This 2nd paragraph is useful, but could be missed as it is buried in Section 11.3.	Move (or copy) this passage to Section 2.3.1.1 as part of bullet 2. A small footnote could be created.	Clarification	
67.	**11.3.2**	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.	Suggest replacing "specified" with "identified" so the paragraph reads, *"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."*	Clarification	
68.	**12**	Defining roles and responsibilities in this REGDOC duplicates ***CSA-N286*** requirements, which are already in the license framework.	Delete Section 12.	**MAJOR**	This duplicates requirements already contained in licensing basis, which will lead to inconsistencies, confusion and potential duplication.
69.	**12.1**	In the 2nd paragraph, "codification" is not a commonly-used word.	If this section is retained, suggest changing to "amalgamation."	Clarification	
70.	**12.2**	Isotopes are not special as described in the 3rd paragraph.	If this section is retained, remove the descriptor "special". Change the title if Section 10 title is changed.	Clarification	
71.	**12.4**	The 2nd bullet of the final paragraph which reads, *"Practices that favourably affect nuclear criticality safety"* does not sound correct. The phrase "favourably affect" could be misinterpreted.	If this section is retained, remove the term "favourably affect." Other words that might be less confusing are *reinforce, support* or *coincide with*.	**MAJOR**	"Favourably affect" could be misinterpreted as industry wanting to have an out-of-core criticality instead of trying to avoid criticality.
72.	**12.8**	This section is overly prescriptive.	Delete Section 12.8.	**MAJOR**	Regulatory documents should only set requirements and not be prescriptive as to how licensees conduct their business.
73.	**13**	This section presents training requirements which are already (or could be) in place under other programs.	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).	**MAJOR**	This has the potential to create additional program and reporting requirements with no corresponding benefit to safety.
74.	**13**	This section was 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.	This section should be presented as guidance.	**MAJOR**	To avoid potential issues related to compliance with REGDOC-2.4.3, this section should be clearly presented as guidance (per the earlier ***RD-327/GD-327*** documents).

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75.	**13.6.6**	In this first paragraph, the term "facility management" is used, though the rest of the document uses the term "management."	Change to *"Management's nuclear criticality safety policy…"*	Clarification	
76.	**14**	This section was 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.	This section should be presented as guidance.	**MAJOR**	To avoid potential issues related to compliance with REGDOC-2.4.3, this section should be clearly presented as guidance (per the earlier ***RD-327/GD-327*** documents).
77.	**15**	This section was 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.	This section should be presented as guidance.	**MAJOR**	To avoid potential issues related to compliance with REGDOC-2.4.3, this section should be clearly presented as guidance (per the earlier ***RD-327/GD-327*** documents).
78.	**16**	This Section presents emergency response requirements which are already (or could be) in place under other programs.	Change section to clarify that the essential elements of criticality emergency response may be incorporated into existing programs where appropriate.	**MAJOR**	This has the potential to develop additional program and reporting requirements with no significant benefit.
79.	**16**	This section was 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.	This section should be presented as guidance.	**MAJOR**	To avoid potential issues related to compliance with REGDOC-2.4.3, this section should be clearly presented as guidance (per the earlier ***RD-327/GD-327*** documents).
80.	**16.2**	Licensees do not support the removal of the final line, which reads, *"This section does not apply to off-site accidents, or to off-site emergency planning and response."*	Retain the sentence from ***GD-327***.	Clarification	
81.	**16.4.1**	Under the Note, a description of a representative nuclear criticality accident is needed for off-site dose mitigation and not emergency response planning.	Move the Note to Section 2.3.2.2 #3.	**MAJOR**	This representative accident discussed here is used for off-site 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.
82.	**16.7.1**	The final paragraph is self-obvious and offers no added value to licensees.	Delete the paragraph.	Clarification	

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83.	**Glossary**	There are important differences in definitions in this REGDOC with ***REGDOC-3.6, Glossary of CNSC Terminology***. These include: 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***.	Correct this draft REGDOC as per the items noted in the industry issue.	Clarification	

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84.	**Appendix B.4**	The text in Appendix B.4 is not consistent with the original requirement given in Appendix B.3. **Issue 1:** The original definition of $\|\Delta kp\|$ 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". **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 $k_c < 1.00$ *Example:* $k_c = 0.9900$ $\|\Delta k_c\| = 0.0001$ $k_p = 0.9400$ $\|\Delta k_p\| = 0.0003$ 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 σ (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)	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: $k_p + 3\sigma \leq k_c - 0.05$	**MAJOR**	The alternative approach for compliance with the USL does not meet the original requirement given in the ANS standard.
85.	**Appendices C through G**	These appendices were presented as guidance in ***GD-327***, and are not regulatory in nature. Furthermore, they provide guidance and contain detailed technical information from other sources that is subject to change.	Appendices C through G should be presented as guidance.	**MAJOR**	To avoid potential issues related to compliance with REGDOC-2.4.3, these appendices should be clearly presented as guidance (per the earlier ***RD-327/GD-327*** documents).
86.	**Appendix E**	Under E.4 Moderator conditions, there is a need to add *"possibility of intrusion of small amount of heavy water into the light water in the irradiated fuel storage bay."*	Add text for completeness on issue relevant to heavy water reactors.	Clarification.	