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To: Consultation

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Subject: OPG comments on RD-337 version 2, Design of New Nuclear Power Plants

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The purpose of this email is to provide a written submission of OPG comments for the public consultation on draft RD-337 version 2, Design of New Nuclear Power Plants.

Please find attached below a Table listing OPG comments on RD-337:

If you have any questions or comments regarding OPG's submission, please contact Mr. Don Williams, Senior Manager, Design Review, Darlington New Nuclear Project, at (905) 839-1151, ext. 5673.

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## OPG Comments on RD-337 version 2, Design of New Nuclear Power Plants

Comment #	RD Document Section/ Excerpt of Section	OPG Issue	OPG Suggested Change
1	Table of Contents	Editorial: Titles of Sections 7.6.1.1 to 7.6.1.3 are missing from the table of contents.	Add titles for Sections 7.6.1.1 to 7.6.1.3 to the Table of Contents.
2	2. Scope  <b>SSR 2/1, Safety Requirements: Safety of Nuclear Power Plants: Design</b>	The correct title of SSR2/1 is " <b>Specific</b> Safety Requirements: Safety of Nuclear Power Plants: Design"	Suggest correcting the title of the document.
3	4.2.3 "4. beyond design basis accidents (BDBAs), including <b>design extension conditions (DECs) - DECs include some severe accident conditions</b> "	Design Extension Conditions OPG and in other areas CNSC (and other jurisdictions) use the term Beyond Design Basis.	How is this determined? Need some guidance.  The preferred option would be to continue using the term Beyond Design Basis Accidents. However, if the term DEC is continued to be used, additional clarification is needed.  See comment 11.
4	Section 4.3.3 <b>"5. requirements for surveillance, maintenance, testing and inspection of the plant to ensure that SSCs function as intended in the design, to comply with the requirement for optimization by keeping radiation exposures as low as reasonably achievable</b>	The OLCs should be based on consistency with the safety analysis, not ALARA. Suggest deleting " <b>, to comply with the requirement for optimization by keeping radiation exposures as low as reasonably achievable (ALARA)</b> ".  It is understood that ALARA must be included when developing the operator activities for performing surveillance, maintenance, testing and inspection of the plant.	Suggest changing the text to:  <b>"5. requirements for surveillance, maintenance, testing and inspection of the plant to ensure that SSCs function as intended in the design"</b>

	(ALARA)”		
5	5 “4. a safety management program that recognizes the importance of a healthy safety culture	Suggest replacing “a safety management program” with “a management system” for consistency with section 5 text.	Suggest changing the text to:  “4. a management system that recognizes the importance of a healthy safety culture”
6	5.3 The computer software used for design and analysis calculations shall be qualified in accordance with applicable standards.	By using the term “qualified in accordance with applicable standards” some confusion may be introduced, because the nuclear industry is more familiar with the use of verified and validated software, as defined in CSA N286.7.  For clarification it is suggested that the definition of “qualified software” from CSA N286.7.1-09 be included in GD-337 to provide clarification and guidance on the intent of “shall be qualified in accordance with applicable standards”, namely:  “Qualified software — software that is considered qualified under CSA N286.7. Qualified software (a) is shown to be capable of addressing intended problems; (b) is adequately specified, which includes (i) documentation of requirements, design, characteristics, and limitations of use; and (ii) identification of all required tool components and their required attributes; (c) possesses attributes that have been demonstrated to satisfy all requirements;	No change to the text.

		and includes configuration management and change control.”	
7	6.2 <b>4. shielding against radiation</b>	Context needs to be added. It is unclear what the requirements would be.	Suggest that part 4 be re-written as follows: “4.shielding against radiation for worker access”
8	7.1 “SSCs important to safety <b>shall</b> include:  2. complementary design features”	Portable equipment – such as emergency mitigating equipment, and pumps should not necessarily constitute systems important to safety.  More clarification is required on positioning portable equipment under systems important to safety in complementary design features for new nuclear power plants. Note, that portable equipment is not considered under systems important to safety for existing nuclear power plants. This additional clarification should be included in GD-337.	No change to the text. More information needed in GD-337.
9	7.2 7.3 7.4	The DEC was introduced as a new concept to cover the BDBAs range for which the design needs to provide mitigation capabilities.  It is not clear what the relation of DEC is with the BDBAs and severe accidents as a subset of the BDBAs.  The Notes on page 15 (Section 7.3.4) clarifies that DEC is a sub-set of BDBA.  However, the document layout presents the Severe Accidents in section 7.3.4.1 as a	The preferred option would be to continue using the term Beyond Design Basis Accidents.  However, if the term DEC is continued to be used, additional clarification is needed.  How is design extension different than design basis for a new plant? Clarification is required.

		subsection of 7.3.4 Design Extension Conditions. This seems to indicate that DEC's include the severe accidents without providing a cut off point or threshold for what range of severe accidents are included in the DEC.	
10	<b>7.3.4 Design extension conditions</b>	Definition for design extension conditions is unclear. No guidance has been given for cut-off conditions (either probabilistic or judgement based).	A more comprehensive definition of DEC is required that provides a clear distinction between DBAs, DEC's and BDBAs See comment 11.
11	<b>7.3.4</b> "The design shall be such that plant states that could lead to significant radioactive releases are practically eliminated; if not, only protective measures that are of limited scope in terms of area and time shall be necessary for protection of the public"	The use of the term "practically eliminated" requires further clarification. This clarification is not provided in GD-337. The text should be revised to put it into context with respect to meeting the safety goals.  The use of the phrase "only protective measures that are of limited scope in terms of area and time shall be necessary for protection of the public" requires further clarification. Is this phrase intended to make reference to the use of sheltering, evacuation and relocation? If so, it is suggested that the text be changed to be consistent with the idea of "implementation of offsite emergency measures".	Suggest changing the text to:  "The design shall be such that plant states that could lead to significant radioactive releases are minimized such that the safety goals are met; if not, only protective measures that are capable of contributing to the reduction of radioactivity releases to allow sufficient time for the implementation of off-site emergency procedures shall be necessary."
12	7.3.4.1 "Containment <b>shall</b> also <b>prevent</b> uncontrolled releases of radioactivity after this period."	Indicating that containment shall prevent uncontrolled releases – but for some low probability severe accidents, (some including impairments of containment), this may not be possible.	Suggest changing the text to:  "Containment <b>shall</b> also <b>prevent</b> uncontrolled releases of radioactivity after this period to the extent practicable".
13	7.4.2 "Applicable natural external	Considering the effects of climate change during the design stage introduces too much	Suggest changing the text to:

	hazards <b>shall</b> include such events as earthquakes, droughts, floods, high winds, tornadoes, tsunami, and extreme meteorological conditions, <b>and shall consider the effects of climate change.</b> "	uncertainty for the purposes of defining the design basis. The principle of maintaining appropriate design margin and considering the risks in the probabilistic safety assessments is more appropriate. Suggest deleting ", <b>and shall consider the effects of climate change</b> ". The requirements in section 9.5 of RD-337 and in S-294 capture the considerations for changes in the frequencies of occurrence of extreme meteorological conditions, and hence, address consideration for the effects of climate change.	"Applicable natural external hazards <b>shall</b> include such events as earthquakes, droughts, floods, high winds, tornadoes, tsunami, and extreme meteorological conditions."
14	7.13.1 "A beyond design basis earthquake shall be considered a DEC. SSCs credited to function during and after a beyond design basis earthquake shall be demonstrated to be capable of performing their intended function under the expected conditions. Such demonstration shall provide high confidence of low probability of failure under beyond design basis earthquake conditions for these SSCs."	The statement "A beyond design basis earthquake shall be considered a DEC." appears to be redundant. By using the term "beyond design basis earthquake", the definition of "design extension conditions is already satisfied. If necessary, additional clarification can be included in GD-337 to explain that beyond design basis earthquakes are considered to be design extension conditions.	Suggest changing the text to:  "SSCs credited to function during and after a beyond design basis earthquake shall be demonstrated to be capable of performing their intended function under the expected conditions. Such demonstration shall provide high confidence of low probability of failure under beyond design basis earthquake conditions for these SSCs."
15	7.13.1 Seismic fragility levels <b>shall be</b> evaluated for SSCs important to safety by analysis or, where possible, by testing.	Suggest adding to this clause that this should only apply to SSCs "that are credited to withstand a design basis earthquake (DBE)"	Suggest changing the text to:  "Seismic fragility levels shall be evaluated for SSCs important to safety that are credited to withstand a design basis earthquake by analysis

			or, where possible, by testing.”
16	<p>8.4</p> <p><b>Means shall be provided to ensure that there is a capability to shut down the reactor in DECs, and that the shutdown condition can be maintained even for the most limiting conditions of the reactor core, including severe degradation of the reactor core.</b></p>	<p>Does this include core melt? What does a “shutdown condition” mean in the context of a severe degradation of the reactor core? Does this relate to adequate cooling of a severely degraded core?</p> <p>Maintaining the reactor sub-critical is the intent of this section.</p>	<p>Suggest changing the text to:</p> <p>“Means shall be provided to ensure that there is a capability to shut down the reactor in DECs, and maintaining the reactor subcritical even for the most limiting conditions of the reactor core, including severe degradation of the reactor core.”</p>
17	<p><b>8.6.12</b></p> <p>The design authority <b>shall demonstrate that</b> complementary design features <b>have been incorporated</b> that will:</p> <p>4. <b>preclude unfiltered and uncontrolled release from containment</b></p>	<p>Preclusion of unfiltered or uncontrolled releases from containment may not be possible, particularly for low probability events</p>	<p>Suggest changing the text to:</p> <p>“4. minimize to the extent practical unfiltered and uncontrolled release from containment”.</p>
18	<p>8.9.1</p> <p>"The design of the emergency power system shall take into account common-cause failures involving loss of normal power supply and standby power supply (if</p>	<p>The second sentence of this statement contradicts the statement in section 8.9:</p> <p>“The requirements of both the standby and emergency power systems may be met by a single system.”</p>	<p>Suggest changing the text to:</p> <p>"The design of the emergency power system shall take into account common-cause failures involving loss of normal power supply and standby power supply (if applicable). The emergency power system shall be electrically</p>

	applicable). The emergency power system shall be electrically independent, physically separate and diverse from normal and standby power systems."	The emergency power system would not be electrically independent, physically separate and diverse from the standby power system, if a single system is used.	independent, physically separate and diverse from normal and standby power systems supply (if applicable)."
19	8.9.2 "This is accomplished by the use of an onsite or offsite portable or transportable power sources, or a combination of these."	Alternate AC power supply (e.g. Emergency Mitigating Equipment – portable or transportable) – but could be fixed in some designs.	Suggest changing the text to:  "This is accomplished by the use of onsite portable, transportable or fixed power sources or offsite portable or transportable power sources, or a combination of these."
20	8.10.4 "3. following indication of the necessity for operator action inside the <b>control rooms</b> MCR, there is at least <b>30 minutes</b> available before the operator action is required  4. following indication of the necessity for operator action outside the <b>control rooms</b> MCR, there is a minimum of <b>1 hour</b> available before the operator action is required"	The basis and justification for changing from an Industry standard of 15 minutes for operator action in the control room and 30 minutes for operator action outside of the control needs to be provided. This change does not appear to be consistent with IAEA guidance.	Suggest changing the text to:  "3. following indication of the necessity for operator action inside the <b>control rooms</b> MCR, there is at least <b>15 minutes</b> available before the operator action is required  4. following indication of the necessity for operator action outside the <b>control rooms</b> MCR, there is a minimum of <b>30 minutes</b> available before the operator action is required"
21	8.12.2	Requires provisions to deal with no shielding in the IFBs. By providing provisions to maintain water in the bays, a utility can effectively preclude the requirement for events with absence of pool water shielding.	Add provision for pool water addition to prevent event progression to situation where fuel is uncovered in bay.



22	<p>9.2  <b>“8. demonstrate that the design incorporates sufficient safety margins to cliff-edge effects”</b></p>	<p>The term “Cliff Edge Effects” should not be used.</p> <p>The impact of this proposed wording requires further evaluation, particularly in light of the work and projects in progress to meet RD-310 requirements.</p> <p>The proposed wording is sufficient to capture the issues related to sensitivity analyses and overall safety margins.</p>	<p>Suggest the following wording.  “8. Demonstrate that the design incorporates sufficient safety margins.”</p>
23	<p>9.4  “1. confirm that OLCs comply with the assumptions and intent of the design for normal operation of the plant”</p>	<p>Safety analysis results are also often used to derive (as opposed to just confirm) the OLCs for the purpose of compliance. OLCs are derived based on limiting accident scenarios whereby safety objectives can still be demonstrated. The statement in question seems to lack clarity with respect to the safety significance of OLCs under accident conditions and can be misconstrued OLCs are applicable strictly to “normal” operation.</p> <p>Suggest the following rewording for consistency with RD-310:  “1. derive and confirm OLCs that are consistent with the design and safety requirements for the plant”</p>	<p>Suggest changing the text to:  “1. derive and confirm OLCs that are consistent with the design and safety requirements for the plant”</p>
24	<p><b>10.2</b>  Technological options for the design of cooling water systems shall consider a <del>closed-eye</del> <b>the best available technology and</b></p>	<p>The introduction of the term "best available technology and techniques economically achievable" goes beyond the current Canadian environmental protection regulations. This is introducing new requirements that may not be consistent with</p>	<p>Suggest changing the text to:  <b>“Technological options for the design of cooling water systems shall minimize impacts on the environment to the extent practicable, taking social and economic</b></p>

	<b>techniques economically achievable (BATEA)</b> in order to minimize adverse environmental impact. <del>on aquatic biota.</del>	the current Canadian Environmental Protection Act.  Delete "the best available technology and techniques economically achievable (BATEA)".	<b>factors into consideration.”</b>
25	<b>General</b>	Version 1 had a reference section. So does GD-337 version 2. Why not include them here as not everyone will refer to GD-337 v2?	Suggest not removing the reference section.
26	Glossary <b>station blackout</b> <b>A complete loss of alternating current (AC) power from offsite and onsite main generator, standby and emergency power sources. Note that it does not include failure of uninterruptible AC power supplies (UPS) and DC power supplies. It also does not include failure of alternate AC power.</b>	Suggest identifying this is also “extended loss of AC power event” – consistent with use of term in industry.	Suggest changing the text to:  “ <b>station blackout (aka extended loss of AC power event)</b> <b>A complete loss of alternating current (AC) power from offsite and onsite main generator, standby and emergency power sources. Note that it does not include failure of uninterruptible AC power supplies (UPS) and DC power supplies. It also does not include failure of alternate AC power.”</b>