ADMINISTRATION

Bruce Power

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Mr. R. Lojk
Acting Director, Bruce Regulatory Program Division
Canadian Nuclear Safety Commission
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CNSC CCSN
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Dear Mr. Lojk:

Information Bulletin 12-30: Invitation to Comment on Draft Omnibus Amendments to Regulatory Documents Addressing Lessons Learned from the Fukushima Daiichi Event

The purpose of this letter is to respond to the request for comments on the above topic as discussed in CNSC Information Bulletin 12-30, issued on July 20, 2012. This letter presents Bruce Power comments on these proposed changes, and similar letters will be sent by the other NPP licensees. Bruce Power has not provided comments on RD-308.

In response to the findings of the Fukushima Task Recommendations (Reference 1) and the corresponding Staff Action Plan (Reference 2), a number of changes are proposed by the CNSC to regulatory documents:

1. S-294, Probabilistic Safety Assessment (PSA) for Nuclear Power Plants
2. S-296 (and G-296), Developing Environmental Protection Policies, Programs and Procedures at Class I Nuclear Facilities and Uranium Mines and Mills
3. G-306, Severe Accident Management Programs for Nuclear Reactors
4. RD-308, Deterministic Safety Analysis for Small Reactor Facilities
5. RD-310, Safety Analysis for Nuclear Power Plants

Bruce Power has not provided comments on RD-308 as it is not applicable to the Bruce site facilities. Our general comments on the remaining four documents are as follows:

1) Our understanding is that an "omnibus" process is being used to implement regulatory document changes that are essential to address issues arising from the Fukushima event. However, we note that:

    a. Some of the proposed changes do not seem to be directly associated with the Fukushima event.
    b. Although the proposed changes have merit, we believe that some would benefit from the normal process associated with regulatory document revision.

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c. Furthermore, some of the proposed changes (with the potential to increase/modify scope or requirements) are of great concern to us because of specific licence conditions around compliance with S-294 (and FAI 2.1.1 & 2.1.2), and the FAI (2.2.1) on RD-310 compliance.
d. Some proposed changes are quite detailed and may be better suited for inclusion in a regulatory guide.

2) Given the issues raised in Item 1 (above), Bruce Power suggests that the CNSC defer some of the proposed changes to a later date and that these be managed via the normal process with detailed consultation.

3) Bruce Power notes that the term "cliff edge effect" is adopted in proposed changes to both RD-310 and S-294. While Bruce Power recognizes that this term has come into wider use post-Fukushima, the term is seen as unnecessarily provocative and not fully descriptive of the concerns and phenomena of interest. Bruce Power suggests that further discussion on this matter would be helpful, with a view to adopting a more descriptive term (e.g. "boundary effect").

4) Bruce Power recommends that references to design capabilities or design basis be clarified and limited to the extent practicable to preserve the distinction between design basis (established in the station design documentation), and beyond design basis initiatives, such as those presented in the Fukushima task force report. For example, Bruce Power notes that many of the "rationale" section comments contain reference to "design capabilities" which do not seem appropriate. As a specific example, Section 6.1 of G-306 refers to "detailed assessments", "design capabilities" and "beyond design basis" and although detailed assessments might be appropriate for design basis it is not normally the standard for beyond design basis assessments.

5) Further to the above, Bruce Power is providing technical comments on the proposed changes, as provided in the attached table. The following general comments are offered for consideration:

   a. It would be helpful to provide reference to the appropriate FAI number in the Rationale column.
   b. The "Introduction/preamble" outlining the basis for the proposed changes for each document also refers to concerns and/or issues which are not related to Fukushima and which in some cases, present significant changes to the existing documents. Bruce Power assumes that this text will not be part of the formal revision to the documents.
   c. On the revised preface which appears in each document, Bruce Power suggests that the reference to Fukushima (second paragraph of the preface) would be better located in the revision summary for each document.
   d. There are no comments on S-296. Comments on G-296 are provided.
   e. As mentioned above, RD-308 was not reviewed by Bruce Power.

Bruce Power has reviewed the "Omnibus package" of proposed regulatory documents, posted for consultation. Our comments are summarized above and detailed in the attached table.

If you require further information or have any questions regarding this submission, please contact Mr. Phil Hunt, Division Manager, Reactor Safety Engineering, at (519) 361-2673, extension 12188.

Yours truly,

Frank Saunders
Vice President Nuclear Oversight and Regulatory Affairs
Bruce Power

cc: CNSC Bruce Site Office (Letter only)

Attach.

References:

1. CNSC Report, "CNSC Fukushima Task Force Report", INFO-0824, October 2011.

2. CNSC Report, "CNSC Staff Action Plan on the CNSC Fukushima Task Force Recommendations", INFO-0828, Draft, December 2011.

Attachment

Bruce Power's Detailed Comments on Proposed Regulatory Document Changes

Table A. S-294 Proposed Amendments and Rationale

S-294 Section #	Current Text	Proposed Changes	Rationale	Industry Comments
1.	**Purpose** The purpose of this Regulatory Standard, when incorporated into a licence to construct or operate a nuclear power plant (NPP) or other legally enforceable instrument, is to assure that the licensee conducts a "probabilistic safety assessment (PSA)" in accordance with defined requirements.	**Purpose** The purpose of this **regulatory document,** when incorporated into a licence to construct or operate a nuclear power plant (NPP) or other legally enforceable instrument, is to assure that the licensee conducts a "probabilistic safety assessment (PSA)" in accordance with defined requirements.	The terminology has changed from regulatory standard to regulatory document.	No Comments.
2.0	**Scope** This Regulatory Standard sets out the requirements for the PSA that a licensee who constructs or operates a NPP shall conduct, when required by the applicable licence or other legally enforceable instrument.	**Scope** This **regulatory document** sets out the requirements for the PSA that a licensee who constructs or operates a NPP shall conduct, when required by the applicable licence or other legally enforceable instrument.	The terminology has changed from regulatory standard to regulatory document.	No Comments
4.0	**Background** The following International Atomic Energy Agency (IAEA) Safety Series documents provide general guidance for conducting quality PSAs: 1. IAEA Safety Series No. 50-P-4, *Procedures for Conducting Probabilistic Safety Assessments of Nuclear Power Plants (Level 1); and* 2. IAEA Safety Series No. 50-P-8, *Procedures for Conducting Probabilistic Safety Assessments of Nuclear Power Plants (Level 2), Accident Progression, Containment Analysis and Estimation of Accident Source Terms.*	**Background** The following International Atomic Energy Agency (IAEA) safety **standards** documents **or updated versions**, provide general guidance for conducting quality PSAs: **1. IAEA safety standard SSG-3, *Development and Application of Level 1 Probabilistic Safety Assessment for Nuclear Power Plants,* and** **2. IAEA safety standard SSG-4, *Development and Application of Level 2 Probabilistic Safety Assessment for Nuclear Power Plants***	The references in the original S-294 are outdated and superseded by new IAEA safety series. There is also a need to specify IAEA and international standards for the determination of the quality of the PSA. The updating of IAEA references will partly address the following related to the FTF recommendations: The PSA methodology and computer codes are required to be accepted by CNSC, and two IAEA procedures are mentioned for background. A purpose is provided for the acceptance, and the means by which it may be achieved.	This is not a Fukushima related change. The impact of this proposal requires further evaluation, particularly in light of the S-294 work and projects in progress to meet PROL requirements. This level of detail may be better suited to a regulatory guide, particularly since these documents are IAEA guides, not standards. It is recommended that this proposed change be deferred to a future revision of the document, where the normal CNSC regulatory document revision process can be used.
5.0	**PSA Requirements** The licensee shall carry out the following activities:	The licensee shall carry out the following activities:		
5.1	Perform **a facility specific Level 2** PSA for each NPP in question.	Perform a **Level 1** and Level 2 PSA for each NPP. **Radioactive sources other than the reactor core, such as the irradiated fuel bay, shall be considered. Multi-unit impacts, if applicable, shall be included.** **The PSA shall include:** **1. a systematic analysis, to give confidence that the design will comply with the general safety**	To explicitly specify: • Level 1 and Level 2 • scope of initiating events to be considered • radioactive sources to be considered • multi-unit effect This will address the following related to the	The scope of changes presented in section 5.1 is extensive and some are not Fukushima related changes. The impact of this proposal requires further evaluation, particularly in light of the S-294 work and projects in progress to meet PROL requirements. Several of the proposed changes are quite detailed and may be better suited to a regulatory guide.

S-294 Section #	Current Text	Proposed Changes	Rationale	Industry Comments
		objectives 2. demonstration that a balanced design has been achieved 3. confidence that small deviations in plant parameters that could give rise to severely abnormal plant behaviour ("cliff-edge effects") will be prevented; 4. assessments of the probabilities of occurrence for severe core damage states, and assessments of the risks of major radioactive releases to the environment. 5. site-specific assessments of the probabilities of occurrence, and the consequences of external hazards 6. identification of plant vulnerabilities and systems for which design improvements or modifications to operational procedures could reduce the probabilities of severe accidents, or mitigate their consequences 7. assessment of the adequacy of emergency procedures 8. assessment of insights into the severe accident management program	FTF recommendations: A Level 1 and 2 PSA is required to cover irradiated fuel bay events and multi-unit considerations, as well as plant-wide internal fires, internal floods, seismic events and other external events. The purpose of the PSA is taken from IAEA SSG-3, and lists in a very clear manner the purpose for conducting a PSA, which will address the following related to the FTF recommendations: It is now expressly stated that the PSA methodology is required to identify dominant contributors to risk, plant vulnerabilities and provide insights into the management of severe accidents. It is expected that the PSA methodology will verify that the safety goals in design (RD-337) are met, and this is now stated.	Therefore, Bruce Power suggests that only the first two statements be used with point 6, and revised as follows: "Perform a **Level 1** and Level 2 PSA for each NPP. **Radioactive sources including the reactor core and the irradiated fuel bay shall be considered. Multi-unit impacts, if applicable, shall be included.** **The PSA shall include identification of plant vulnerabilities and systems for which design improvements or modifications to operational procedures could reduce the probabilities of severe accidents, or mitigate their consequences.**" It is recommended that the other proposed changes be deferred to a future revision of the document, where the normal CNSC regulatory document revision process can be used. -- Bruce Power's technical comments on the proposed changes are as follows: The document needs to provide clarity on the "the radioactive sources that **shall be considered**" per the wording in the second paragraph. Bruce Power anticipates that the G-294 Guide (that will accompany the S-294 document) will provide further clarification with regard to radioactive sources (other than the reactor core) that need to be included in the Level 1 and Level 2 PSA. Bruce Power does not believe that other on-site facilities such as the Used Fuel Storage Facilities at all plants require detailed PRA studies because the existing Safety Report assessments consider external hazards and are sufficient to characterize public risk arising from operation of these facilities. The document needs to provide clarity that alternative methods should be allowed regarding the requirement to include the IFB in the Level 1 PRA scope i.e. IFB events should be considered to the extent necessary to demonstrate that the safety impact to the plant is acceptable. It should be possible to leverage work already ongoing as part of Fukushima action items to demonstrate acceptable risk. In general terms for nuclear facilities, safety objectives include preventing accidents with harmful consequences resulting from a loss of control over the reactor core or other sources of radiation, and to mitigate the consequences of any accidents that do occur. Full detailed event tree/fault tree modeling may or may not be required depending on the likelihood, radioactive source levels and displacement mechanisms.

S-294 Section #	Current Text	Proposed Changes	Rationale	Industry Comments
				Item 1: The term "**general safety objective**" requires clarification. Although the utilities strive to meet the guidance in SSG-3 and SSG-4, caution should be exercised that prescribed safety goals do not inadvertently become a regulatory requirement for existing facilities as this would contradict INSAG-10 guidance, which states "quantitative probabilistic targets are generally not viewed as regulatory requirements. They are intended as a guide for checking and evaluating the design, but not as the only criteria for evaluating a plant. Item 2: The term "**a balanced design**" requires clarification. An overall NPP design objective is to ensure that no single component dominates overall risk and this is consistent with relative importance measures required by Section 5.10 of S-294. However, further effort to define the criteria for "balanced design" is required. Item 3: Please see our general comment on the use of the term "cliff edge effects". The requirements around "Cliff-edge effects" will result in further work and potentially some methodology development. Some effort (with the CNSC) to better characterize the scope of work to address the "cliff-edge effects" will be required. It is worthwhile noting that sensitivity analysis is already part of the PRA scope, and it is not clear what additional work this requirement will entail, and what additional value this incremental work will add. Item 4: The terms "severe core damage states" and "major radioactive releases" require clarification. We note that from a nuclear safety risk communication perspective, the probabilities of occurrence (or final risk estimates) are not the only metrics of interest and should be placed in the context of our comments to item 1. Item 5: Similar comment to Item 4. Place less emphasis on "probabilities". Suggest wording "**5. site specific assessment of credible external hazards**" Item 7 requires further clarification. The PRA already takes human reliability into account, and this assessment is partly based on emergency operating procedures. Item 8 Clarification regarding the purpose of this item is required. G-306 (section 6.1) currently requires the use of the PSA in SAMG development and the Industry SAMG implementation already draws from PRA results.

S-294 Section #	Current Text	Proposed Changes	Rationale	Industry Comments
5.2	Establish and apply a formal quality assurance process for conducting a PSA, such as the Canadian Standards Association (CSA) Standard N286.2, *Design Quality Assurance for Nuclear Power Plants*;	Establish and apply a formal **management system or quality assurance program** for conducting a PSA, such as the Canadian Standards Association (CSA) **Standard N286-05, *Management system requirements for Nuclear Power Plants*. The computer codes used for the PSA models shall comply with** CSA **N286.7-99, *Quality Assurance of Analytical, Scientific and Design Computer Programs for Nuclear Power Plants.***	CSA N286.2 is withdrawn. CSA standard N286-05 supersedes N286.0 as well as the associated sub-tiers N286.1 through N286.6. It is also important to add the CSA standard N286.7-99 regarding the QA program for the computer codes, in order to ensure the codes used in developing PSAs comply with the CSA standard. The original S-294 does not explicitly call for compliance with N286.7. This will help address the following related to the FTF recommendations: A requirement for advance CNSC consultation and/or acceptance of the expected uses of the PSA is provided, since this will influence the methodology and codes.	This is not a Fukushima related change. The impact of this proposal requires further evaluation, particularly in light of the S-294 work and projects in progress to meet PROL requirements Bruce Power agrees with revising the reference from CSA N-286.2 to N-286-05", and suggests the following: "Establish and apply a formal **management system or quality assurance program** for conducting a PSA, such as the Canadian Standards Association (CSA) **Standard N286-05, *Management system requirements for Nuclear Power Plants.*"** It is recommended that the other proposed changes (i.e. reference to CSA N-286.7) be deferred to a future revision of the document, where the normal CNSC regulatory document revision process can be used.
5.3	**Ensure that** the PSA models reflect the plant as built and operated, as closely as reasonably achievable within the limitations of PSA technology and consistent with risk impact;	The PSA models reflect the plant as built and operated **(including multi-unit impacts),** as closely as reasonably achievable within the limitations of PSA technology, and consistent with the risk impact;	To clarify that multi-unit effects have to be considered.	No comments.
5.4	Update the PSA models every three years or sooner if major changes occur in the facility;	Update the PSA models every **five** years or sooner if major changes occur in the facility.	To align the PSA update with the safety analysis report update in S-99/RD-99.1 and with licence renewal.	No comments.

S-294 Section #	Current Text	Proposed Changes	Rationale	Industry Comments
5.5	Ensure that the PSA models are developed using assumptions and data that are realistic and practical;	Ensure that the PSA models are developed using assumptions and data that are realistic and practical. **Supporting deterministic safety analysis shall be provided.**	To provide the supporting analysis for the specification of the success criteria, assumption etc.	This is not a Fukushima related change. The impact of this proposal requires further evaluation, particularly in light of the S-294 work and projects in progress to meet PROL requirements. Therefore, Bruce Power suggests that this clause remain unchanged in this revision and that the proposed change(s) be deferred to a future revision of the document, where the normal CNSC regulatory document revision process can be used. -- Bruce Power's technical comments on the proposed changes are as follows: It is unclear what scope of deterministic analysis is being referred to by **Supporting deterministic safety analysis shall be provided**. The wording is sufficiently vague that it could be interpreted to mean that all event sequences in a PSA must have supporting deterministic analysis, which is not feasible given the internal events PSA can include thousands of sequences. Therefore, suggest the wording be modified to state **"Supporting deterministic safety analyses or engineering assessments shall be provided as required."**
5.6	**Ensure that** the level of detail of the PSA is consistent with the **NPP** testing and configuration management programs;	The level of detail of the PSA is consistent with the **facility** testing, **maintenance** and configuration management programs, **and with the intended uses of the PSA.**	To specify that the level of details of the PSA should also be consistent with the intended use of the PSA. This will help address in part the following related to the FTF recommendations: A requirement for advance CNSC consultation and/or acceptance of the expected uses of the PSA is provided, since this will influence the methodology and codes.	No comments.

S-294 Section #	Current Text	Proposed Changes	Rationale	Industry Comments
5.7	Seek CNSC acceptance of the methodology and computer codes to be used for the PSA;	Seek CNSC acceptance of the methodology and computer codes to be used for the PSA, **prior to using them for the purpose of this document**. **• The methodology shall state the intended PSA applications.** **• The methodology shall be suitable for the intended PSA applications.** **• The computer codes used for PSA and for the supporting deterministic safety analyses shall be developed, validated, and used in accordance with a quality assurance program that meets the requirements of CSA N286.7-99.**	This will help address the following related to the FTF recommendations: The PSA methodology and computer codes are required to be accepted by CNSC, and two IAEA procedures are mentioned for background. A purpose for the acceptance, and the means by which it may be achieved, are provided. A requirement for advance CNSC consultation and/or acceptance of the expected uses of the PSA is provided, since this will influence the methodology and codes. The purpose of these changes is to clarify the separation between the computer codes for developing the PSA models and the codes used for deterministic safety analyses to draw the success criteria.	This is not a Fukushima related change. The impact of this proposal requires further evaluation, particularly in light of the S-294 work and projects in progress to meet PROL requirements. Therefore, Bruce Power suggests that this clause remain unchanged in this revision and that the proposed change(s) be deferred to a future revision of the document, where the normal CNSC regulatory document revision process can be used. -- Our technical comments on the proposed changes are as follows: The underlying purpose and rationale of the proposed changes is not clear to us and we foresee that the revised clause may impose impediments to the usefulness of the PSA. For example: • Are there a minimum set of uses to meet regulatory requirements? • Are new uses of the PSA limited? • Are there "links" to other standards, e.g. the ASME PRA standard?). The inclusion of the last bullet appears unnecessary: Per the PROL computer codes must be in compliance with CSA standard N286.7-99 and the CNSC may audit licensees against this requirement. Bruce Power recommends that the requirement for CNSC acceptance of software be deleted. Section 5.7 requires CNSC acceptance of methodology and computer codes. The extent of these requirements is not clear and requires clarification. For example: • Do the methodologies have to be updated and resubmitted for acceptance at the routine 5-year PSA updates? • Do the computer codes have to be resubmitted for acceptance at the routine 5-year PSA updates? • If one utility has gained acceptance for a computer code, do other utilities also have to gain acceptance? • What is the range of computer codes that require CNSC acceptance? For example, does it include only PSA specific codes and exclude design codes and safety analysis codes? • The reference to CSA N286.7-99 is not required. See our comment on section 5.2

S-294 Section #	Current Text	Proposed Changes	Rationale	Industry Comments
5.8	Include both internal and external events[1] in the PSA; [1] For external events, the licensee may, with the agreement of "persons authorized" by the Commission, choose an alternative analysis method to conduct the assessment. In such cases, the external event may be excluded from the PSA.	**Include all potential site-specific initiating events and potential hazards, namely: (a) internal initiating events caused by random component failures and human error; (b) internal hazards (e.g., internal fires and floods, turbine missiles) and (c) external hazards, both natural (e.g., earthquakes, high winds, external floods) and human-induced, but non-malevolent (e.g., airplane crashes, accidents at nearby industrial facilities).** **Also, include potential combinations of external hazards. Examples include seismic, floods, or fire.** **The screening criteria of hazards shall be acceptable to the CNSC.** The licensee may, with the agreement of "persons authorized" by the Commission Tribunal, choose an alternative analysis method to conduct the assessment **of external events (internal hazards and external hazards).**	The requirement is made clearer. This will address the following related to the FTF recommendations: A Level 1 and 2 PSA is required to cover irradiated fuel bay events and multi-unit considerations, as well as plant wide internal fires, internal floods, seismic events and other external events.	The changes proposed here are not all directly related to Fukushima. The impact of these changes require further evaluation, particularly in light of the S-294 work and projects in progress to meet PROL requirements Several of the proposed changes are quite detailed and may be better suited to a regulatory guide. Therefore, Bruce Power suggests the following: " **Include all potential site-specific initiating events and potential hazards, namely: (a) internal initiating events and internal hazards and (b) external hazards, both natural and human-induced, but non-malevolent** **Also, include credible combinations of external hazards when they have a common origin or other dependency. Examples include seismic-induced floods or seismic-induced fire.** **The screening criteria of hazards shall be acceptable to the CNSC.**"
5.9	Include both at power and shutdown states in the PSA; and	**Include all operational states of the NPP (full power, low power, and shutdown).**	This clause has been reworded to be more inclusive and high-level, in order to address potential new build designs.	This is not a Fukushima related change. The impact of this proposal requires further evaluation, particularly in light of the S-294 work and projects in progress to meet PROL requirements. Therefore, Bruce Power suggests that this clause remain unchanged in this revision and that the proposed change(s) be deferred to a future revision of the document, where the normal CNSC regulatory document revision process can be used.
5.10	Include sensitivity analysis, uncertainty analysis and importance measures in the PSA.	No change	This requirement should remain unchanged (high-level), while the means by which these analyses are to be performed will be specified in GD-294, since the treatment of uncertainty and sensitivity may differ for the Level 1 PSA, Level 2 PSA, and seismic PSA.	No comment.

S-294 Section #	Current Text	Proposed Changes	Rationale	Industry Comments
5.11		The PSA results may be repeated and reaffirmed.	To ensure PSA quality.	This is not a Fukushima related change. The impact of this proposal requires further evaluation, particularly in light of the S-294 work and projects in progress to meet PROL requirements. Therefore, Bruce Power suggests that the proposed change be deferred to a future revision of the document, where the normal CNSC regulatory document revision process can be used. -- Our technical comments on the proposed changes are as follows: The underlying purpose and rationale of the proposed changes is not clear to us. Ensuring analysis "repeatability" is part of the QA process and PSA quality is already addressed via Section 5.2. It is not clear who will repeat and reaffirm the PSA results or how this will be achieved.
5.12		**Documentation** **The licensee shall provide comprehensive and detailed documentation of the PSA, including assumptions, methodology, simplifications and results. It should include significant contributors and vulnerabilities, which would support the regulatory review and assessment of the PSA.**	This will help address the following related to the FTF recommendations: It is now expressly stated that the PSA methodology is required to identify dominant contributors to risk, plant vulnerabilities and provide insights into the management of severe accidents.	This is not a Fukushima related change. The impact of this proposal requires further evaluation, particularly in light of the S-294 work and projects in progress to meet PROL requirements. Therefore, Bruce Power suggests that the proposed change be deferred to a future revision of the document, where the normal CNSC regulatory document revision process can be used. It is worthwhile noting that the proposed wording for section 5.1 will address the FTF recommendation. The following is the proposed wording for Section 5.1: "Perform a **Level 1** and Level 2 PSA for each NPP. **Radioactive sources including the reactor core and the irradiated fuel bay shall be considered. Multi-unit impacts, if applicable, shall be included.** **The PSA shall include identification of plant vulnerabilities and systems for which design improvements or modifications to operational procedures could reduce the probabilities of severe accidents, or mitigate their consequences."** The requirements for comprehensive and detailed documentation is already required in section 5.2 as part of quality program requirements and as part of the CSA standards.

Table B2. G-296 Proposed Amendments and Rationale

G-296 Section #	Current Text	Proposed Changes	Rationale	Industry Comments
5.3.3	**Other Considerations** As a further consideration, the EMS should address environmental emergency preparedness and response in terms of 1. the proposed measures to prevent or mitigate the effects of accidental releases of nuclear substances and hazardous substances on the environment; and 2. the health and safety of persons.[27][28]	**Other Considerations** As a further consideration, the EMS should address environmental emergency preparedness and response in terms of: 1. the proposed measures to prevent or mitigate the effects of accidental releases of nuclear substances and hazardous substances on the environment **2. the proposed measures to ensure the availability and accessibility of environmental monitoring instrumentation during emergency situations** **3. the inclusion of environmental monitoring instrumentation and equipment layouts in emergency plans** **2.4**. the health and safety of persons [27][28]	The guidance provided in ISO-14001, as quoted in S-296 on environmental monitoring for "*emergency situations and potential accidents*", is minimal. This indicates the need to provide some "lessons learned" guidance in section 5.3.3 of G-296 (accompanying S-296), related to the task force's recommendations. Specifically, this addresses the following related to the FTF recommendations: Establish and reinforce criteria and guidelines for environmental monitoring in emergency situations. Review the provisions of and enhance environmental monitoring instrumentation to ensure it is adequately robust against severe situations. Review the environmental monitoring layouts of equipment provisions for adequacy against severe situations. The CNSC is applying international guidance for environmental monitoring for emergency situations, and will continue to do so in the near-term. The need to establish future Canadian criteria and guidance will nevertheless be taken into consideration, pending further developments internationally in response to the Fukushima event. It is planned that relevant information will be incorporated in other emergency-specific procedural guidance being prepared by the CNSC, and not just exclusively in the context of environmental management systems guidance.	Some clarification around the type (fixed or portable) of instrumentation to meet these requirements will be helpful. Domestic NPPs use a variety of fixed and portable instruments as well as survey teams to achieve the results required and believes that the current approach is well optimized. Given this, Bruce Power suggests combining the proposed items 2 and 3 as follows: "2. The provisions for environmental monitoring instrumentation and contingency protocols to ensure these are adequately robust against severe situations."

Table C. G-306 Proposed Amendments and Rationale

G-306 Section #	Current Text	Proposed Changes	Rationale	Industry Comments
6.1	**Risk Assessment** The results of probabilistic risk assessment should assist the licensee to: 1. Verify that SAM would be effective for the severe accident sequences with the highest probability of occurrence, including natural and human-induced external hazards;	**Risk Assessment** The results of probabilistic risk assessment should assist the licensee to: 1. Verify that SAM would be effective for **representative** severe accident sequences, **including multi-unit events, events triggered by** natural and human-induced external hazards, **and extended station blackout accidents**;	Amends the text to address the following related to the FTF recommendations: To ensure that SAM is effective for multi-unit events and events triggered by external events. Considers events affecting multiple reactors on the site, events at spent fuel bays, as well as events triggered by extreme external hazards. Detailed assessments of the severe accident management procedural guidance and design capabilities include beyond-design-basis and severe accidents are a high priority. To demonstrate that revised emergency plans in regard to multi-unit accidents and severe external events, minimum complements, and emergency response organizations are capable and effective. It is currently demonstrated that emergency response organizations are capable of responding to single unit, beyond design basis events	Bruce Power agrees with the changes presented here, but has the following comments: Clarification on what "**extended station blackout**" means would be helpful. We recommend re-phrasing this to "events involving an Extended Loss of All AC Power". As noted in Bruce Power's comments on section 10 (below), it is believed that issues related to minimum staff complement are covered by other regulatory documents, and need not be discussed here (in the Rationale section).
7.2	**Evaluation of Systems and Equipment** **If** systems and equipment are expected to perform in a way or under conditions that were not considered in their original design, **then** the licensee should conduct an assessment of their potential availability, effectiveness, and limitations for use in support of a SAM program. Existing systems may warrant design enhancement if the assessment reveals that the potential consequences of severe accidents are such that the existing systems may not provide the desired preventive and mitigating capabilities.	**Evaluation of Systems and Equipment** **Plant design capabilities for severe accident management – such as containment venting, hydrogen mitigation, and coolant make-up provisions – should be identified.** **For all** systems and equipment **which** are expected to perform in certain manners or conditions that were not considered in their original design, the licensee should conduct an assessment of their potential availability, effectiveness, and limitations for use in support of a SAM program. Existing systems may warrant design enhancement, if the assessment reveals that the potential consequences of severe accidents are such that the existing systems may not provide the desired preventive and mitigating capabilities. **Essential plant monitoring features and instrumentation for diagnosis of plant state should be identified, and verified to function reliably and provide meaningful data under severe accident conditions.**	Amends the text to address the following related to the FTF recommendations: To identify and evaluate the effectiveness and survivability of equipment needed to mitigate challenges on containment integrity and minimize consequences of a severe accident. To cover the installation of passive autocatalytic recombiners. To demonstrate key instrumentation is fully qualified for design-basis accidents, survivability and beyond-design-basis accident conditions as it is for DBA. To demonstrate that the minimum Class I/II equipment that is needed to mitigate beyond-design-basis accidents involving loss of all AC power is systematically identified. To ensure plant design capabilities for severe accident management, such as containment venting, hydrogen mitigation, coolant make-up provisions, instrumentation,	Bruce Power agrees with the changes presented here, but have one comment: It is recommended to rephrase the last paragraph to stipulate that "**reasonable assurance that … will function**" rather than "**verified to function.**" e.g.: "**Essential plant monitoring features and instrumentation for diagnosis of plant state should be identified; reasonable assurance that these instruments and features will function reliably and provide meaningful data under severe accident conditions should be demonstrated.**"

G-306 Section #	Current Text	Proposed Changes	Rationale	Industry Comments
			and the control areas are evaluated and documented. Such design capabilities would allow minimization of the consequences of a severe accident, should one occur. Demonstrates that requirements for design of systems credited in management of BDBAs are adequate, particularly for severe accident harsh environments (e.g., battery life, availability of portable instruments, connections to portable pumps for heat sinks, capability to re-energize instrumentation supplies). Demonstrated compliance to requirements for complementary design features that could be called upon to protect the containment, such as filtered containment venting.	
7.3	**Assessment of Material Resources** The licensee should perform an assessment to determine the availability of coolant, energy, and other material resources that may be required for the effective completion of SAM actions.	**Assessment of Material Resources** The licensee should perform an assessment to determine the availability of coolant, energy, and other material resources that may be required for the effective completion of SAM actions. **For procurement of external resources (equipment, power, water and staff), the licensee should assess the adequacy of arrangements with other organizations, to ensure availability, timing and access to these resources during accidents, with consideration of potential challenges posed by common cause/external events. These arrangements should be formalized and documented.**	Amends the text to address the following related to the FTF recommendations: To require demonstrating adequacy of arrangements for procurement of external resources (equipment, power, water and staff) in terms of timing, access, availability. To demonstrate that licensees' emergency response organizations have access to a regional warehouse that could make available offsite equipment and resources that may be needed in case of a severe accident. Availability of emergency equipment could allow terminating a severe accident early enough to prevent any radioactive releases to the environment. To demonstrate that arrangements and agreements for external support formalized and documented in the applicable emergency plans and procedures.	No comment.
9.2	**Personnel Training** The licensee should provide operating staff and emergency groups with training commensurate with their respective roles in accident management, enabling them to: 1. Understand their roles and responsibilities within the SAM program; 2. Learn about severe accident phenomena and processes; 3. Become familiar with the activities to be carried out; 4. Enhance their ability to perform in	**Personnel Training** The licensee should provide operating staff and emergency groups with training commensurate with their respective roles in accident management, enabling them to: 1. understand their roles and responsibilities within the SAM program 2. learn about severe accident phenomena and processes 3. become familiar with the activities to be carried out 4. enhance their ability to perform in stressful	Amends the text to address the following related to the FTF recommendations: To ensure that SAM is effective for multi-unit events and events triggered by external events. Considers events affecting multiple reactors on the site, events at spent fuel bays, as well as events triggered by extreme external hazards. Detailed assessments of the severe accident management procedural guidance and design capabilities include beyond design basis, and severe accidents are a high priority.	Bruce Power agrees with the changes presented here, but has two comments: - As noted in the comments on section 10 (below), it is believed that issues related to minimum staff complement are covered by other regulatory documents, and need not be discussed here (in the Rationale section). - Regarding the use of simulators, Bruce Power agrees that the full scope simulator provides a valuable training environment for operations staff around overall design basis accident progression. However, Bruce Power does not foresee that the development of specific, detailed SA scenarios on the full

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	stressful conditions; and 5. Verify the effectiveness and improve the clarity of SAM procedures and guidelines. Training programs should address the roles to be performed by the different groups, and include drills and exercises to enable assessment of the interactions between the various groups involved in SAM. To the extent practicable, the licensee should use simulator training, because it provides a realistic and interactive environment and is an efficient method for enhancing human response in complex situations.	conditions 5. verify the effectiveness and improve the clarity of SAM procedures and guidelines Training programs should address the roles to be performed by different groups, and include drills and exercises to enable assessment of the interactions between the various groups involved in SAM. **The licensee should develop a set of drills to cover multi-unit events and events triggered by external events.** To the extent practicable, the licensee should use simulator training, because it provides a realistic and interactive environment and is an efficient method for enhancing human response in complex situations.	To ensure plant design capabilities for severe accident management, such as containment venting, hydrogen mitigation, coolant make-up provisions, instrumentation, and the control areas are evaluated and documented. Such design capabilities would allow minimization of the consequences of a severe accident, should one occur. Ensures that requirements for design of systems credited in management of BDBAs are adequate, particularly for severe accident harsh environments (e.g., battery life, availability of portable instruments, connections to portable pumps for heat sinks, capability to re-energize instrumentation supplies). To demonstrate that revised emergency plans in regard to multi-unit accidents and severe external events, minimum complements, and emergency response organizations are capable and effective. It is currently demonstrated that emergency response organizations are capable of responding to single-unit beyond design basis events. To demonstrate that the performance of the emergency response organization under severe event and/or multi-unit accident conditions has not been challenged by designing and conducting exercises that are based on such conditions.	scope simulator will be warranted due to the uncertainties in the SA scenarios and a concern regarding negative training.
10.0	**Validation and review** The licensee should validate a SAM program, upon its establishment, to confirm its effectiveness, usability, technical accuracy, and scope. This validation should include modeling of selected accident scenarios with and without consideration of accident management actions, as well as drills and exercises. The licensee should also perform periodic reviews of a SAM program, provisions, guidelines, and procedures to reflect changes in plant design, operational modes, or organizational responsibilities. The reviews should address new information that has been derived from drills, exercises, training programs, safety analyses, experimental research or other sources.	**Validation and review** The licensee should validate a SAM program upon its establishment, to confirm its effectiveness, usability, technical accuracy and scope. This validation should include modeling of selected accident scenarios with and without consideration of accident management actions, as well as drills and exercises. **A validation assessment should be undertaken, to confirm that operator actions are possible, accounting for variables such as ease of access, possible radiation fields, presence of debris, fires or flooding, and staff complement.** The licensee should also perform periodic reviews of a SAM program, provisions, guidelines and procedures, to reflect changes in plant design, operational modes, or organizational responsibilities. The reviews should address new information that has	Amends the text to address the following related to the FTF recommendations: To ensure that SAM is effective for multi-unit events and events triggered by external events. Considers events affecting multiple reactors on the site, events at spent fuel bays, as well as events triggered by extreme external hazards. Detailed assessments of the severe accident management procedural guidance and design capabilities include beyond design basis, and severe accidents are a high priority. To demonstrate that revised emergency plans in regard to multi-unit accidents and severe external events, minimum complements, and emergency response organizations are capable and effective. It is	Bruce Power agrees with the intent of the proposed change, but suggest alternate wording, such as the following: *"An assessment methodology should be employed to demonstrate with a high level of confidence that the means (such as intervention of emergency response crews or mitigating equipment)is available and can be deployed to permit the necessary operator actions to take place in the range of localized working environments that could exist."* It is recommended to remove the reference to "**staff complement.**" Staffing issues are addressed in other Regulatory documents.

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		been derived from drills, exercises, training programs, safety analyses, experimental research or other sources.	currently demonstrated that emergency response organizations are capable of responding to single-unit beyond design basis events. To demonstrate that the performance of the emergency response organization under *severe event and/or multi-unit accident* conditions has not been challenged by designing and conducting exercises that are based on such conditions.	
Glossary	**Glossary**	**Glossary** **alternate AC power** **An alternating current power source that is available to, and located at (or nearby) a reactor facility, and is characterized by the following:** **1. is connectable to but not normally connected to the offsite or onsite standby and emergency AC power systems** **2. has minimum potential for common mode failure with offsite power to the onsite standby and emergency AC power sources** **3. is available in a timely manner after the onset of station blackout** **4. has sufficient capacity and reliability for operating all the systems required for coping with station blackout, and for the duration of time required to bring and maintain the plant in a safe shutdown state.** **station blackout (SBO)** **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.** **Note: See also definition for alternate AC power in this document.**	New or modified definitions are provided.	Bruce Power offers the following comments on the proposed changes: Suggestion that the term **"Station Blackout"** not be used in the revision because of the potential confusion that can (and will arise). Suggest instead that the term **"Extended Loss of All AC Power"** (ELAP) be used, or something similar

Table E. RD-310 Proposed Amendments and Rationale

RD-310 Section #	Current Text	Proposed Changes	Rationale	Industry Comments / Feedback
5.2.1 (Pg 39 of Omnibus Tables)	**Identifying Events** The licensee shall use a systematic process to identify events, event sequences, and event combinations ("events" hereafter in this document) that can potentially challenge the safety or control functions of the NPP. This process shall be based on regulatory requirements and guidance, past licensing precedents, operational experience, engineering judgment, results of deterministic and probabilistic assessments, and any other systematic reviews of the design. The identification of events shall account for all operating modes, and the list of identified events shall be reviewed for completeness during the design and analysis process and modified as necessary. ...	**Identifying Events** The licensee shall use a systematic process to identify events, event sequences, and event combinations ("events" hereafter in this document) that can potentially challenge the safety or control functions of the NPP. **The licensee shall also identify events that may potentially lead to fission product releases, including those related to irradiated fuel pools and fuel handling systems.** This process shall be based on regulatory requirements and guidance, past licensing precedents, operational experience, engineering judgment, results of deterministic and probabilistic assessments, and any other systematic reviews of the design. The identification of events shall account for all operating modes, **including low power operation and shutdown modes. Common-cause events affecting multiple reactor units on a site shall be considered. The** list of identified events shall be reviewed for completeness during the design and analysis process and modified as necessary. ...	Changes are made to: 1) clarify that any events potentially leading to fission product releases, even occurring outside the reactor, should be identified in order to be considered for safety analysis 2) Extend the scope of analysis to include considerations of events that can potentially affect multiple reactors in a multiple unit station.	Bruce Power offers the following comments: First proposed change under Clause 5.2.1: - Bruce Power has no comments on this proposed change regarding irradiated fuel pools and fuel handling systems. It is suggested that the term irradiated fuel bays be used rather than irradiated fuel pools. Second proposed change under Clause 5.2.: The Industry has no comments on this proposed change. Current Nuclear Safety Analyses do consider a wide variety of NPP operating modes. However, some clarification on interpretation of "low power operation and shutdown modes" and the intended application to RD-310 compliant analyses would be helpful.
5.2.2 (Pg 40 of Omnibus Tables)	**5.2.2 Scope of Events** The list of events identified for the safety analysis shall include all credible: 1. Component and system failures or malfunctions; 2. Operator errors; and 3. Common-cause internally and externally initiated events.	**5.2.2 Scope of Events** The list of events identified for the safety analysis shall include all credible: 1. component and system failures or malfunctions 2. operator errors 3. common-cause internally and externally initiated events**, including those affecting multiple reactor units on a site**	Ensures that the identification of common-cause events takes into consideration events that can potentially affect multiple reactors at a site.	No comments.
5.3.3 (Pg 40 of Omnibus Tables)	**Acceptance Criteria** **5.3.3 Beyond Design Basis Accidents** Analysis for BDBAs shall be performed as part of the safety assessment to demonstrate that: 1. The nuclear power plant as designed can meet the established safety goals; and 2. The accident management program and design provisions, put in place to handle the accident management needs, are effective.	**Acceptance Criteria** **5.3.3 Beyond Design Basis Accidents** Analysis for BDBAs shall be performed as part of the safety assessment to demonstrate that: 1. The nuclear power plant, as designed, can meet the established safety goals. 2. The accident management program and design provisions, put in place to handle the accident management needs, are effective, **taking into account the long-term availability of cooling water, material and power supplies.**	Ensures considerations of long term make-up water and power supplies in the demonstration of meeting safety analysis acceptance criteria.	Bruce Power suggests that the phrase "long term availability" be replaced simply with "availability" (long-term is not well defined).
5.4.2 (Pg 41 of Omnibus Tables)	**Analysis Method** The analysis method shall include the following elements: .... 6. Conducting calculations, including sensitivity cases, to predict the event transient, starting from the initial steady	**Analysis Method** The analysis method shall include the following elements: ... ... 6. Conducting calculations, including performing sensitivity **analysis**	Ensures that (1) an event is continuously analysed up to the cold, depressurized state, and (2) cliff-edge margins are identified. The changes are at high-level, in line with RD-310, which provides only high-level requirements. Further guidance on long-term	Bruce Power's technical comments on the proposed changes are as follows: - Please see the general comment on the use of the term "cliff edge effects". - Cliff-edge effects should only be sought as

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	state up to the pre-defined end-state;	**and identifying, where necessary, margins to cliff-edge effects.** **7. An event should be analyzed** from its initial steady state up to the pre-defined **stable state in the long-term;** ...	analysis can be found in accompanying document GD-310, as follows: ***5.4.2.6 Conducting calculations*** *The duration of the transients considered in the analysis should be sufficient to determine the event consequences. Therefore, the calculations for plant transients are extended beyond the point where the NPP has been brought to shutdown and stable core cooling, as established by some identified means (i.e., to the point where a long-term, stable state has been reached and is expected to remain as long as required). The analysis should take into account the capacity and limitations of long-term make-up water and electrical power supplies.*	part of sensitivity analysis for key modeling and operational parameters within reasonable uncertainty bands. Further clarification is required on interpretation of margins to cliff-edge effects. - The impact of this proposal requires further evaluation, particularly in light of the RD-310 work and projects in progress to meet PROL requirements
5.4.4 (Pg 41 of Omnibus Tables)	**Analysis Assumptions** Assumptions made to simplify the analysis, as well as assumptions concerning the operating mode of the nuclear power plant, the availability and performance of the systems, and operator actions, shall be identified and justified. The analysis of AOO and DBA shall: 1. Apply the single-failure criterion to all safety systems and their support systems; 2. Account for consequential failures that may occur as a result of the initiating event; 3. Credit actions of systems only when the systems are qualified for the accident conditions, or when their actions could have a detrimental effect on the consequences of the analyzed accident; 4. Account for the possibility of the equipment being taken out of service for maintenance; and 5. Credit operator actions only when there are a) unambiguous indications of the need for such actions, b) adequate procedures and sufficient time to perform the required actions, and c) environmental conditions that do not prohibit such actions.	**Analysis Assumptions** Assumptions made to simplify the analysis, as well as assumptions concerning the operating mode of the nuclear power plant, the availability and performance of the systems, and operator actions, shall be identified and justified. The analysis of AOO and DBA shall: 1. apply the single-failure criterion to all safety systems and their support systems 2. account for consequential failures that may occur as a result of the initiating event 3. credit actions of systems only when the systems are qualified for the accident conditions, or when their actions could have a detrimental effect on the consequences of the analyzed accident 4. account for the possibility of the equipment being taken out of service for maintenance **5. account for the possibility of the equipment being rendered inoperable during a prolonged period required to maintain the plant in a stable, cold and depressurized state, following an accident** **6.** credit operator actions only when there are a) unambiguous indications of the need for such actions b) adequate procedures and sufficient time to perform the required actions c) environmental conditions that do not prohibit such actions	Emphasizes that safety analysis should account for the potential unavailability of equipment that may be needed to maintain long-term stable cooling of the reactor, following an accident.	The proposed change is not directly related to Fukushima. The impact of this proposal requires further evaluation, particularly in light of the work and projects in progress to meet RD-310 requirements. Therefore, Bruce Power suggests that the proposed revision be deferred to a future revision of the document, where the normal CNSC regulatory document revision process can be used. --- Bruce Power's technical comments on the proposed changes (Item 5) are as follows: - The proposed addition seems to be redundant under the discussion on "AOO and DBA analysis". There also appears to be redundancy from the perspective of equipment EQ and seismic qualifications. It is unclear as to why this would be under AOO and DBA. It appears to be BDBA. - The proposed additions in Clauses 5.3.3 (Beyond Design Basis Accidents) and 5.4.2 (Analysis Method) already provide the added context for long-term, stable plant state. - Clarification is required for "random or consequential equipment failures" aspect of this new clause. PRA already covers random equipment failures during mission time. Analysis to include random failures could become intractable if this new clause requires that no credit be taken for qualified equipment

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				in SA. - Including random failures within scope of deterministic safety analysis would make deterministic SA intractable if this new clause requires that no credit be taken for qualified equipment.
Glossary (Pg 43 of Omnibus Tables)	**Glossary**	Glossary **cliff-edge effect** **A large increase in the severity of consequences caused by a small change of conditions. Note: Cliff-edges can be caused by changes in the characteristics of the environment, the event or changes in the plant response.**	New or modified definitions are provided.	Please see the general comment on the use of the term "cliff edge effects".