FORM-14159 R000*

Periodic Safety Review - Final Document Review Traveler

Bruce Power™

Bruce Power Document #:	Revision:	Information Classification	Usage Classification
NK29-SFR-09701-00010	R000	Internal Use Only	Information
Bruce Power Document Title: Safety Factor 10 - Organization and Administration			
Bruce Power Contract/Purchase Order: 00193829	Bruce Power Project #: 39075		
Supplier's Name: CANDESCO	Supplier Document #: K-421231-00210	Revision: R00	
Supplier Document Title: Safety Factor 10 - Organization and Administration			

Accepted for use at Bruce Power by:	**Signature:**	**Date**
Name: Frank Saunders Title: Vice President, Nuclear Oversight & Regulatory Affairs		29 SEP 2016

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*Associated with BP-PROC-01024, Periodic Safety Reviews

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Sheet # 2 of 2

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Reviewed By:

Name	Title	Department	Signature	Date
Susan Brissette (RegC AR 28563006.03)	Department Manager	Management Systems	electronic acceptance	15Sep2016

Recommended for Use By:

Name	Title	Department	Signature	Date
Susan Brissette (RegC AR 28563006)	Department Manager	Management Systems	S Brissette	

Periodic Safety Review - Final Document Review Traveler

Sheet # _____ of _____

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candesco
Division of Kinectrics Inc.

NK29-SFR-09701-00010

Title: Safety Factor 10 - Organization and Administration

File: K-421231-00210-R00

A Report Submitted to Bruce Power

September 20, 2016

Issue R00D0	**Reason for Issue:** For harmonization				
	Author: P. West Y. Dadashi	Verifier:	Reviewer:	Approver:	Date: May 8, 2016
Issue R00D1	**Reason for Issue:** For internal review				
	Author: P. West Y. Dadashi	Verifier:	Reviewer: L. Watt J. Sobolewski G. Archinoff	Approver:	Date: May 11, 2016
Issue R00D2	**Reason for Issue:** For Bruce Power review				
	Author: P. West Y. Dadashi	Verifier: G. Buckley	Reviewer: L. Watt J. Sobolewski G. Archinoff	Approver:	Date: June 24, 2016
Issue R00D3	**Reason for Issue:** Addresses Bruce Power review comments and internal verification comments.				
	Author: P. West Y. Dadashi	Verifier: G. Buckley	Reviewer: L. Watt G. Archinoff	Approver:	Date: August 24, 2016

candesco Division of Kinectrics Inc.	Rev Date: September 20, 2016	Status: Issued
	Subject: Safety Factor 10 - Organization and Administration	File: K-421231-00210-R00

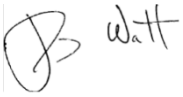
Issue R00	**Reason for Issue:** For use				
	Author: P. West  Y. Dadashi 	Verifier: G. Buckley 	Reviewer: L. Watt  G. Archinoff 	Approver: L. Watt 	Date: Sept 20, 2016
Document Classification: Report			Security Classification: Client Proprietary		

Table of Contents

List of Tables

Acronyms and Abbreviations

AFI	Area for Improvement
ALARA	As Low As Reasonably Achievable
ANO	Authorized Nuclear Operator
AR	Action Request
BP	Bruce Power
BPMS	Bruce Power Management System
CANDU	CANada Deuterium Uranium
CAT-ID	Catalog Identification Numbers
CFAM	Corporate Functional Area Manager
CM	Configuration Management
CMLF	Central Maintenance and Laundry Facility
CNS	Convention on Nuclear Safety
CNSC	Canadian Nuclear Safety Commission
CSA	Canadian Standards Association
DCR	Document Change Request
EA	Environmental Assessment
EE	Engineering Evaluation
EMS	Environmental Management System
EBP	Engineering Business Program
ESD	Engineering Support Division
FASA	Focus Area Self-Assessment
GOSP	Governance, Oversight, Support, Perform model
HU	Human Performance
IAEA	International Atomic Energy Agency
INPO	Institute of Nuclear Power Operations
ISO	International Organization for Standardization
ISR	Integrated Safety Review
ITP	Inspection and Test Plan

LCH	Licence Conditions Handbook
LTEP	Long Term Energy Plan
MCR	Major Component Replacement
MSM	Management System Manual
NEI	Nuclear Energy Institute
NIEP	Nuclear Industry Evaluation Program
NORA	Nuclear Oversight and Regulatory Affairs
NPI	Nuclear Performance Index
NPP	Nuclear Power Plant
NSA	Nuclear Safety Assessment
NSAPI	Nuclear Safety Analysis and Program Integration
NSASD	Nuclear Safety Analysis and Support Department
NSCA	Nuclear Safety and Control Act
NSCMP	Nuclear Safety Culture Monitoring Panel
ODM	Operational Decision Making
OEF	Operational Experience Feedback
OFI	Opportunities for Improvement
OPEX	Operating Experience
OMS	Outage Maintenance Services
OSART	Operational Safety Review Team
PB QA	Pressure Boundary Quality Assurance
PE	Procurement Engineering
PEL	Program Element
PO&C	Performance Objectives and Criteria
PROL	Power Reactor Operating Licence
PSR	Periodic Safety Review
PWU	Power Workers Union
QA	Quality Assurance
RP	Radiation Protection
SAT	Systematic Approach to Training
SBR	Safety Basis Report

SCA	Safety and Control Area
SCR	Station Condition Record
SFAM	Station Functional Area Manager
SFR	Safety Factor Report
SL	Surveillance Limits
SLT	Senior Leadership Team
SME	Subject Matter Expert
SOE	Safe Operating Envelope
SOFA	State of the Functional Area
SOL	Safe Operating Limit
SPHC	Station Plant Health Committee
SR	Surveillance Requirements
SSCs	Structures, Systems and Components
TCC	Temporary Configuration Change
TPO&C	Training Performance Objectives and Criteria
TQD	Training and Qualification Descriptions
VMB	Visual Management Board
WANO	World Association of Nuclear Operators
WM	Work Management

1. Objective and Description

Bruce Power (BP), as an essential part of its operating strategy, is planning to continue operation of Bruce B as part of its contribution to the Long Term Energy Plan (LTEP) (http://www.energy.gov.on.ca/en/ltep/). Bruce Power has developed integrated plant life management plans in support of operation to 247,000 Equivalent Full Power Hours in accordance with the Bruce Power Reactor Operating Licence (PROL) [1] and Licence Conditions Handbook (LCH) [2]. A more intensive Asset Management program is under development, which includes a Major Component Replacement (MCR) approach to replacing pressure tubes, feeders and steam generators, so that the units are maintained in a fit for service state over their lifetime. However, due to the unusually long outage and de-fuelled state during pressure tube replacement, there is an opportunity to conduct other work, and some component replacements that could not be done reasonably in a regular maintenance outage will be scheduled concurrently with MCR. In accordance with Licence Condition 15.2 of the PROL [1], Bruce Power is required to inform the Canadian Nuclear Safety Commission (CNSC) of any plan to refurbish a reactor or replace a major component at the nuclear facilities, and Bruce Power shall:

(i) Prepare and conduct a periodic safety review;

(ii) Implement and maintain a return-to-service plan; and

(iii) Provide periodic updates on progress and proposed changes.

The fifteen reports prepared as part of the Periodic Safety Review (PSR), including this Safety Factor Report (SFR), are intended to satisfy Licence Condition 15.2 (i) as a comprehensive evaluation of the design, condition and operation of the nuclear power plant (NPP). In accordance with Regulatory Document REGDOC-2.3.3 [3], a PSR is an effective way to obtain an overall view of actual plant safety and the quality of safety documentation and determine reasonable and practicable improvements to ensure safety until the next PSR.

Bruce Power has well-established PSR requirements and processes for the conduct of a PSR for the purpose of life-cycle management, which are documented in the procedure Periodic Safety Reviews [4]. This procedure, in combination with the Bruce B Periodic Safety Review Basis Document [5], governs the conduct of the PSR and facilitates its regulatory review to ensure that Bruce Power and the CNSC have the same expectations for scope, methodology and outcome of the PSR.

This PSR supersedes the Bruce B portion of the interim PSR that was conducted in support of the ongoing operation of the Bruce A and Bruce B units until 2019 [6]. Per REGDOC-2.3.3 [3], subsequent PSRs will focus on changes in requirements, facility conditions, operating experience and new information rather than repeating activities of previous reviews.

1.1. Objective

The overall objectives of the Bruce B PSR are to conduct a review of Bruce B against modern codes and standards and international safety expectations, and to provide input to a practicable set of improvements to be conducted during the MCR in Units 5 to 8, and during asset management activities to support ongoing operation of all four units, as well as U0B, that will enhance safety to support long term operation. It will cover a 10-year period, since there is an expectation that a PSR will be performed on approximately a 10-year cycle, given that all units are expected to be operated well into the future.

The specific objective of the review of this Safety Factor is to determine whether the organization and administration are adequate for the safe operation of the nuclear power plant.

1.2. Description

The review is conducted in accordance with the Bruce B PSR Basis Document [5], which states that the review tasks are as follows:

1. The review of the organization and management system will include a review of the following elements or programs against national and international standards:
    a. Policy statements of the operating organization;
    b. The documentation of the management system;
    c. The adequacy of arrangements for managing and retaining responsibility for activities or processes important to safety that have been outsourced (for example, maintenance and engineering services and safety analysis);
    d. The roles and responsibilities of individuals managing, performing and assessing work; and
    e. The processes and supporting information that explain how work is to be specified, prepared, reviewed, performed, recorded, assessed and improved.
2. In addition, the review of the organization and management system will verify the following:
    a. There are adequate processes in place for managing organizational change;
    b. There is a human resource management process in place that ensures the availability of adequate, qualified human resources, including succession planning;
    c. There is adequate control of documents, products and records and this information is readily retrievable;
    d. There is adequate control of purchasing of equipment and services where this affects plant safety;
    e. There are adequate processes in place to check the quality of suppliers' management systems that are intended to ensure that equipment and services supplied to the nuclear power plant are fit for purpose and provided in an effective and efficient manner;
    f. There are adequate communication policies in place;
    g. There are adequate facilities for training and training programs are well

structured;

h. There are formal arrangements in place for employing suitably qualified internal and external technical, maintenance or other specialized staff;
i. There are adequate processes in place for feedback of operating experience to the staff, including experience relating to organizational and management failures;
j. There are suitable arrangements in place for maintaining the configuration of the nuclear power plant and operations are carried out in accordance with the safety analysis of the plant; and
k. There are programs in place for ensuring continuous improvement, including self-assessment and independent assessment.

3. The review of the safety culture will include the following:

a. A review of the safety policy to verify that it states that safety takes precedence over production and to confirm that this policy is effectively implemented;
b. A review of procedures to ensure that nuclear and radiation safety are properly controlled and that appropriate measures are applied consistently and conscientiously by all staff;
c. An assessment of the extent to which a questioning attitude exists and conservative decision making is undertaken in the organization;
d. Verification that there is a strong drive to ensure that all events that may be instructive are reported and investigated to discover root causes and that timely feedback is provided to appropriate staff on findings and remedial actions;
e. Verification that unsafe acts and conditions are identified and challenged in a constructive manner wherever and whenever they are encountered by plant employees and external staff (contractors);
f. Verification that the organization has a learning culture and that it strives continuously for improvements and new ideas, and benchmarks against and searches out best practices and new technologies;
g. Verification that there is an established and effective process for communication of safety issues;
h. Verification that there is a process in place for prioritization of safety issues, with realistic objectives and timescales, that ensures that these issues receive proper resources;
i. Verification that there is a method in place for achieving and maintaining clarity of the organizational structure and managing changes in accountability for matters affecting safety; and
j. Verification that there is adequate training in safety culture, particularly for managers.

As required by the PSR Basis Document, preparation of this Safety Factor Report included an assessment of the review tasks to determine if modifications were appropriate. Any changes to the review tasks described in this section are documented and justified in Section 5.

2. Methodology of Review

As discussed in the Bruce B PSR Basis Document [5], the methodology for a PSR should include making use of safety reviews that have already been performed for other reasons. Accordingly, the Bruce B PSR makes use of previous reviews that were conducted for the following purposes:

- Return to service of Bruce Units 3 and 4 (circa 2001) [7];
- Life extension of Bruce Units 1 and 2 (circa 2006) [8] [9] [10];
- Proposed refurbishments of Bruce Units 3 and 4 (circa 2008) [11] [12] [13] [14] [15];
- Safety Basis Report (SBR) and PSR for Bruce Units 1 to 8 (2013) [6]; and
- Bruce A Integrated Safety Review (ISR) to enhance safety and support long term operation (2015) [16] [17].

These reviews covered many, if not all, of the same Safety Factors that are reviewed in the current PSR. A full chronology of Bruce Power safety reviews up to 2013 is provided in Appendix F of [18].

The Bruce B PSR Safety Factor review process comprises the following steps:

1. Interpret and confirm review tasks: As a first step in the Safety Factor review, the Safety Factor Report author(s) confirm the review tasks identified in the PSR Basis Document [5] and repeated in Section 1.2 to ensure a common understanding of the intent and scope of each task. In some cases, this may lead to elaboration of the review tasks to ensure that the focus is precise and specific. Any changes to the review tasks are identified in Section 5 of the Safety Factor Report (SFR) and a rationale provided.
2. Confirm the codes and standards to be considered for assessment: The Safety Factor Report author(s) validates the list of codes and standards presented in the PSR Basis Document against the defined review tasks to ensure that the assessment of each standard will yield sufficient information to complete the review tasks. Additional codes and standards are added if deemed necessary. If no standard can be found that covers the review task, the assessor may have to identify criteria on which the assessment of the review task will be based. The final list of codes and standards considered for this Safety Factor is provided in Section 3.
3. Determine the type and scope of assessment to be performed: This step involves the assessor confirming that the assessment type identified in Appendix C of the Bruce B PSR Basis Document [5] for each of the codes, standards and guidance documents selected for this factor is appropriate based on the guidance provided. The PSR Basis Document provides an initial assignment for the assessment type, selecting one of the following review types:
    - Programmatic Clause-by-Clause Assessments;
    - Plant Clause-by-Clause Assessments;

- High-Level Programmatic Assessments;
- High-Level Plant Assessments;
- Code-to-Code Assessments; or
- Confirm Validity of Previous Assessment.

The final assessment types are identified in Section 3, along with the rationale for any changes relative to the assignment types listed in the PSR Basis Document.

4. Perform gap assessment against codes and standards: This step comprises the actual assessment of the Bruce Power programs and the Bruce B plant against the identified codes and standards. In general, this involves determining from available design or programmatic documentation whether the plant or program meet the provisions of the specific clause of the standard or of some other criterion, such as a summary of related clauses. Each individual deviation from the provisions of codes and standards is referred to as a Safety Factor "micro-gap". The assessments, performed in Appendix A and Appendix B, include the assessor's arguments conveying reasons why the clause is considered to be met or not met, while citing appropriate references that support this contention.
5. Assess alignment with the provisions of the review tasks: The results of the assessment against codes and standards are interpreted in the context of the review tasks of the Safety Factor. To this end, each assessment, whether clause-by-clause, high-level or code-to-code, is assigned to one or more of the review tasks (Section 5). Assessment against the provision of the review task involves formulating a summary assessment of the degree to which the plant or program meets the objective and provisions of the particular review task. This assessment may involve consolidation and interpretation of the various compliance assessments to arrive at a single compliance indicator for the objective of the review task as a whole. The results of this step are documented in Section 5 of each SFR.
6. Perform program assessments: The most pertinent self-assessments, audits and regulatory evaluations are assessed, and performance indicators relevant to the Safety Factor identified. The former illustrates that Bruce Power has a comprehensive process of reviewing compliance with Bruce Power processes, identifying gaps, committing to corrective actions, and following up to confirm completion and effectiveness of these actions. The latter demonstrates that there is a metric by which Bruce Power assesses the effectiveness of the programs relevant to the Safety Factor in Section 7. Taken as a whole, these demonstrate that the processes associated with this Safety Factor are implemented effectively (individual findings notwithstanding). Thus, program effectiveness, if not demonstrated explicitly in the review task assessments in Step 5, can be inferred if Step 5 shows that Bruce Power processes meet the Safety Factor requirements and if this step shows there are ongoing processes to ensure compliance with Bruce Power processes.
7. Identification of findings: This step involves the consolidation of the findings of the assessment against codes and standards and the results of executing the review tasks into a number of definitive statements regarding positive and negative findings of the assessment of the Safety Factor. Positive findings or strengths are only identified if there is clear evidence that the Bruce B plant or programs exceed compliance with the provision of

codes and standards or review task objectives. Each individual negative finding or deviation is designated as a Safety Factor micro-gap for tracking purposes. Identical or similar micro-gaps are consolidated into comprehensive statements that describe the deviation known as Safety Factor macro-gaps, which are listed in Section 7 of the Safety Factor Reports, as applicable.

3. Applicable Codes and Standards

This section lists the applicable regulatory requirements, codes and standards considered in the review of this Safety Factor. Table C-1 of the Bruce B PSR Basis Document [5], identifies the codes, standards and guides that are relevant to this PSR. Modern revisions of some codes and standards listed in Table C-1 of the PSR Basis Document [5] have been identified in the licence renewal application and supplementary submissions for the current PROL [19] [20] [21]. Codes, standards and guides issued after the freeze date of December 31, 2015 were not considered in the review [5].

3.1. Acts and Regulations

The *Nuclear Safety and Control Act* (NSCA) [22] establishes the Canadian Nuclear Safety Commission and its authority to regulate nuclear activities in Canada. Bruce Power has a process to ensure compliance with the NSCA [22] and its Regulations. Therefore, the NSCA and Regulations were not considered further in this review.

3.2. Power Reactor Operating Licence

The list of codes and standards related to organization and administration that are referenced in the PROL [1] and LCH [2], and noted in Table C-1 of the Bruce B, PSR Basis Document [5], are identified in Table 1. The edition dates referenced in the third column of the table are the modern versions used for comparison.

The following licence conditions are applicable to Organization and Administration:

- Licence Condition 1.1: Management System Requirements
- Licence Condition 2.2: Minimum shift complement and control room staffing
- Licence Condition 2.3: Training and Certification of Persons
- Licence Condition 3.3: Reporting Requirements for Operating Nuclear Power Plants
- Licence Condition 6.1: Maintenance Programs to ensure fitness for service

Table 1: Codes, Standards, and Regulatory Documents Referenced in Bruce A and B PROL and LCH

Document Number	Document Title	Modern Version Used for PSR Comparison	Type of Review
CNSC REGDOC-2.3.3	Periodic Safety Reviews	[3]	NA
CNSC REGDOC-3.1.1	Reporting Requirements for Operating Nuclear Power Plants	[23]	NA
CNSC RD-204 (2008)	Certification of Persons Working at Nuclear Power Plants	[24]	NA
CNSC RD/GD-210 (2012)	Maintenance Programs for Nuclear Power Plants	[25]	NA
CNSC G-323 (2007)	Ensuring the Presence of Sufficient Qualified Staff at Class I Nuclear Facilities – Minimum Staff Complement	[26]	2SF
CNSC Internal Guide, 2010/08	CNSC Expectations for Licensee Hours of Work Limits - Objectives and Criteria	2010/08	NA
CNSC Internal Guide, N/A 2009/05	Requirements for the Requalification Testing of Certified Shift Personnel at Nuclear Power Plants	2009/05	NA
Examination Guide EG-1 (2005/07)	Requirements and Guidelines for Written and Oral Certification Examinations for Shift Personnel at Nuclear Power Plants	Examination Guide EG-1 (2005/07)	NA
Examination Guide EG-2 (2004/06)	Requirements and Guidelines for Simulator-Based Certification Examinations for Shift Personnel at Nuclear Power Plants	Examination Guide EG-2 (2004/06)	NA

Document Number	Document Title	Modern Version Used for PSR Comparison	Type of Review
CSA N286-05 [27]	Management System Requirements for Nuclear Power Plants	CSA N286-12 [28]	NA

Assessment type:

NA: Not Assessed; **CBC**: Clause-by-Clause; **PCBC**: Partial Clause-by-Clause; **CTC**: Code-to-Code; **HL**: High Level; **2SF**: Assessment performed in another SFR; **CV**: Confirm Validity of Previous Assessments

CNSC REGDOC-2.3.3: This PSR is being conducted in accordance with CNSC REGDOC-2.3.3 per Licence Condition 15.2 (i) [1], and associated compliance verification criteria [2]. Therefore, REGDOC-2.3.3 is not reviewed further in this document.

CNSC REGDOC-3.1.1: CNSC REGDOC-3.1.1 [1], Reporting Requirements for Nuclear Power Plants, which replaced S-99 [29] in May 2014, is listed as condition 3.3 in PROL 18.00/2020 [1] and sets reporting requirements for nuclear power plants. Bruce Power switched over to CNSC REGDOC-3.1.1 at the beginning of 2015[1], as committed in a letter submitted to the CNSC [21]. Line-by-line compliance with this regulatory document is verified on an ongoing basis to ensure compliance with the PROL, and therefore it was not assessed as part of this Safety Factor.

CNSC RD-204: CNSC RD-204 [24] defines requirements regarding certification of persons who work at Canadian Nuclear Power Plants (NPPs) in positions that have a direct impact on nuclear safety. The document specifies the requirements to be met by persons working, or seeking to work, in positions where certification by the Canadian Nuclear Safety Commission is required. It specifies the requirements regarding the programs and processes supporting certification of the workers that NPP licensees must implement to train and examine persons seeking or holding a certification delivered by the CNSC. CNSC RD-204 remains part of the licence and has not been revised, and therefore has not been assessed as a part of this PSR.

CNSC RD/GD-210: RD/GD-210 [25], Maintenance Programs for Nuclear Power Plants, sets out the requirements of the CNSC with regard to maintenance programs for nuclear power plants. It specifies that a maintenance program consists of policies, processes and procedures that provide direction for maintaining Structures, Systems and Components (SSCs) of the plant. RD/GD-210 [25] replaces regulatory standard S-210 (published in 2007). RD/GD-210 will be listed in the PROL and line-by-line compliance with this regulatory document is verified on an ongoing basis to ensure compliance with the PROL. Therefore, assessment of RD/GD-210 is not included in this PSR.

[1] Reporting is performed under S-99 up to the end of 2014, and under CNSC REGDOC-3.1.1 for periods thereafter.

CNSC G-323: Table C-1 of the PSR Basis Document [5] calls for the confirmation of validity of the CNSC guidance document G-323 [26]. CNSC G-323 ensures the presence of sufficient qualified staff at Class I Nuclear Facilities (minimum staff complement) and is addressed in Safety Factor 12.

CNSC Internal Guidance: Table C-1 of the PSR Basis Document [5] identifies CNSC internal Guidance regarding the "CNSC Expectation for Licensee Hours of Work Limits – Objectives and Criteria" and "Requirements for the Requalification Testing of Certified Shift Personnel at Nuclear Power Plants". The PSR Basis Document states that these internal guidance documents will not be assessed as a part of this PSR.

CNSC Examination Guide EG-1: Table C-1 of the PSR Basis Document [5] identifies Examination Guide EG-1, Requirements and Guidelines for Written and Oral Certification Examinations for Shift Personnel at Nuclear Power Plants. The PSR Basis Document states that EG-1 will not be assessed as a part of this PSR.

CNSC Examination Guide EG-2: Table C-1 of the PSR Basis Document [5] identifies Examination Guide EG-1, Requirements and Guidelines for Simulator-Based Certification Examinations for Shift Personnel at Nuclear Power Plants. The PSR Basis Document states that EG-2 will not be assessed as a part of this PSR.

CSA N286-12: CSA N286-05 is noted in the PROL (Licence Condition 1.1 [1]). Per the LCH [2], an implementation strategy for the 2012 version is in progress to be submitted to the CNSC by the end of January 2016. CNSC staff have stated that in their view the CSA N286-12 version of CSA N286 "does not represent a fundamental change to the current Bruce Power Management System" and have acknowledged that "the new requirements in CSA N286-12 are already addressed in Bruce Power's program and procedure documentation" [30].

Bruce Power had agreed to perform a gap analysis and to prepare a detailed transition plan, and to subsequently implement the necessary changes in moving from the CSA N286-05 version of the code to the CSA N286-12 version, during the current licensing period [31]. This timeframe will facilitate the implementation of N286 changes to the management system, and enable the gap analysis results from the large number of new or revised Regulatory Documents or Standards committed in the 2015 operating licence renewal. Bruce Power has also proposed that in the interim, CSA N286-05 be retained in the PROL to enable it to plan the transition to CSA N286-12, and committed to develop the transition plan and communicate the plan to the CNSC by January 30, 2016 [32]. Bruce Power further stated CSA N286-12 does not establish any significant or immediate new safety requirements that would merit a more accelerated implementation. The gap analysis and the resulting transition plan were submitted to the CNSC [33]. Per [33], the major milestones of the transition plan to N286-12 are as follows:

- 22 January 2016: Discuss all the regulatory actions and the transition plan at the Corporate Functional Area Manager (CFAM) meeting
- 31 December 2016: Revision of CFAM Program Document(s) [with LCH notification requirements to the CNSC] to comply with CSA N286-12 requirements completed.
- 31 March 2017: Revision of CFAM Program Document(s) [that do not have LCH notification requirements to the CNSC] to comply with CSA N286-12 requirements completed

- 31 December 2017: Confirmation that that all impacted documents in the program suite comply with the requirements of CSA N286-12
- 15 September 2018: Verification via a Focus Area Self-Assessment (FASA) that previously identified transition Gaps to meeting the requirements of CSA N286-12 have been addressed and effectively implemented
- 14 December 2018: issue notification to the CNSC regarding state of CSA N286-12 readiness, and, implementation date

This Safety Factor therefore has not performed a code-to-code assessment between CSA N286-05 and CSA N286-12 and will not be performing a clause-by-clause assessment of CSA N286-05, since it is in the current licence and there is a transition plan in effect.

3.3. Regulatory Documents

The Regulatory Document in Table 2 was considered for application to review tasks of this Safety Factor.

Table 2: Regulatory Documents

Document Number	Document Title	Reference	Type of Review
CNSC REGDOC-2.2.2 2014/08	Personnel Training	[34]	2SF
Assessment type: **NA**: Not Assessed; **CBC**: Clause-by-Clause; **PCBC**: Partial Clause-by-Clause; **CTC**: Code-to-Code; **HL**: High Level; **2SF**: Assessment performed in another SFR; **CV**: Confirm Validity of Previous Assessments			

CNSC REGDOC-2.2.2: Table C-1 of the PSR Basis document [5] calls for a clause-by-clause assessment of CNSC REGDOC-2.2.2 [34]. CNSC REGDOC-2.2.2 sets out the CNSC's requirements for the development of a training system at nuclear facilities, and provides guidance on how these requirements should be met. The majority of CNSC REGDOC-2.2.2 is applicable to Safety Factor 12, and as such is assessed in that Safety Factor.

3.4. CSA Standards

There were no additional Canadian Standards Association (CSA) standards identified in Table C-1 of the Bruce B, PSR Basis Document [5] considered for application to review tasks of this Safety Factor beyond those identified in the PROL [1] and LCH [2]

3.5. International Standards

As applicable, international guidance considered for application to review tasks of this Safety Factor are included in Table 3.

Table 3: International Standards

Document Number	Document Title	Reference	Type of Review
IAEA SSG-25	Periodic Safety Review For Nuclear Power Plants	[35]	NA
IAEA SSR-2/2 (2011)	Safety of Nuclear Power Plants: Commissioning and Operation Specific Safety Requirements	[36]	2SF
Assessment type: **NA**: Not Assessed; **CBC**: Clause-by-Clause; **PCBC**: Partial Clause-by-Clause; **CTC**: Code-to-Code; **HL**: High Level; **2SF**: Assessment performed in another SFR; **CV**: Confirm Validity of Previous Assessments			

IAEA SSG-25: IAEA SSG-25 [35] addresses the periodic safety review of nuclear power plants. Per the PSR Basis Document [5] this PSR is being conducted in accordance with REGDOC-2.3.3. As stated in REGDOC-2.3.3 [3], this regulatory document is consistent with IAEA SSG-25. The combination of IAEA SSG-25 and REGDOC-2.3.3, define the review tasks.

IAEA SSR-2/2: Table C-1 of the PSR Basis document [5] calls for a clause-by-clause assessment of IAEA SSR-2/2 [36] as part of the review performed for Safety Factor 11, and states that for Safety Factor 10 the review is 2SF, indicating that the review in Safety Factor 11 covers that for Safety Factor 10. The code describes the requirements to ensure the safe operation of nuclear power plants including commissioning. Recent developments in areas such as long term operation, plant ageing, periodic safety review, probabilistic safety analysis and risk informed decision making processes required revisions to this International Atomic Energy Agency (IAEA) Safety Standards Series to correct and/or improve the publication and apply the safety objective and safety principles that are established in the Fundamental Safety Principles. The results of the clause-by-clause assessment of IAEA SSR-2/2 in Safety Factor 11 are applied in the assessment of the review tasks in this Safety Factor Report.

3.6. Other Applicable Codes and Standards

The codes and standards discussed in the previous sub-sections have been determined to be sufficient for the completion of the review tasks of this Safety Factor. Accordingly, additional codes and standards are not considered in this Safety Factor Report.

4. Overview of Applicable Bruce B Station Programs and Processes

Section 4.1 provides an overview of Bruce Power programs, procedures, and practices related to this Safety Factor.

4.1. Key Implementing Documents

CSA N286-05 identifies specific requirements that must be met relating to the Management System of a nuclear power plant, including specific requirements for design, purchasing, commissioning, construction, operation and decommissioning. The key Bruce Power documents related to implementation of the Organization and Administration elements are indicated in Table 4[2].

Table 4: Key Implementing Documents

Level 0	Level 1	Level 2	Level 3
BP-MSM-1: Management System Manual [37] BP-MSM-1 Sheet 0001: MSM – Bruce Power Program Matrix [38] BP-MSM-1 Sheet 0002: MSM - Approved Reference Chart Authorities and Responsibilities [39] BP-MSM-1 Sheet 0003: MSM - List of	BP-OPP-00001 - Operating Policies and Principles - Bruce B [42]		
	BP-PROG-00.02: Environmental Safety Management [43]		
	BP-PROG-00.04: Pressure Boundary Quality Assurance Program [44]		
	BP-PROG-00.07: Human Performance Program [45]	BP-PROC-00794: Monitoring Human Performance [46]	

[2] Table 4 lists the key governance documents used to support the assessments of the review tasks for this Safety Factor Report. A full set of current sub-tier documents is provided within each current PROG document. In the list of references, the revision number for the governance documents is the key, unambiguous identifier; the date shown is an indicator of when the document was last updated, and is taken either from PassPort, the header field, or the “Master Created” date in the footer.

Level 0	Level 1	Level 2	Level 3
Applicable Governing Acts, Regulations, Codes & Standards [40] BP-MSM-1 Sheet 0004: MSM - Program Summaries [41]		BP-PROC-00617: Human Performance Tools for Workers [47]	
		BP-PROC-00795: Human Performance Tools for Knowledge Workers [48]	
	BP-PROG-01.01: Business Plan Management [49]	BP-PROC-00162: Business Risk Management – Business Risk Register [50]	
	BP-PROG-01.02: Bruce Power Management System (BPMS) Management [51]	BP-PROC-00016: Business Assessment Process [52]	
		BP-PROC-00166: General Procedure and Process Requirements [53]	
		BP-PROC-00703: Change Management Guidance [54]	BP-PROC-00001: Organizational Structural Change [55]
			BP-PROC-00788: Manage Process Change [56]
		BP-PROC-00774: Program Requirements [57]	
		B-HBK-08130-00001: GOSP Implementation Handbook [58]	

Level 0	Level 1	Level 2	Level 3
	BP-PROG-01.04: Leadership Talent Management [59]	BP-PROC-00221: Succession Management [60]	
	BP-PROG-01.06: Operating Experience Program [61]	BP-PROC-00062: Processing External and Internal Operating Experience [62]	
		BP-PROC-00137: Focus Area Self-Assessment [63]	
		BP-PROC-00147: Benchmarking and Conference Activities [64]	
		BP-PROC-00892: Nuclear Safety Culture Monitoring [65]	
	BP-PROG-01.07: Corrective Action [66]	BP-PROC-00059: Event Response and Reporting [67]	
		BP-PROC-00019: Action Tracking [68]	
		BP-PROC-00060: Station Condition Record Process [69]	
		BP-PROC-00518: Root Cause Investigations [70]	
		BP-PROC-00519: Apparent Cause Evaluation [71]	

Level 0	Level 1	Level 2	Level 3
		BP-PROC-00965: Visual Management Board [72]	
	BP-PROG-02.01: Worker Staffing [73]	BP-PROC-00355: Hiring Process (Contractors) [74]	
		BP-PROC-00468: Workforce Planning Process [75]	
	BP-PROG-02.02: Worker Learning and Qualification [76]	SEC-SIMM-00001: Simulator Validation [77]	
		SEC-SIMM-00002: Simulator Change Control [78]	
		SEC-CST-00001: General Field Guidelines at Bruce Learning Centre Fire Training Area [79]	
		Certification Training Handbook B-HBK-09510-00005 [80]	
	BP-PROG-02.04: Worker Development and Performance Management [81]		
	BP-PROG-02.06: Worker/Labour Relations [82]		

Level 0	Level 1	Level 2	Level 3
	BP-PROG-02.07: Employee Communications [83]	BP-PROC-00868: Employee Communications Processes, Vehicles and Standards [84]	
	BP-PROG-03.01: Document Management [85]	BP-PROC-00098: Records Management [86]	
		BP-PROC-00068: Controlled Document Life Cycle Management [87]	
	BP-PROG-05.01: Supply Chain [88]	BP-PROC-00041: Contract Management [89]	
		BP-PROC-00854: Quality Oversight [90]	BP-PROC-00753: Supplier Audits [91]
	BP-PROG-06.03: CNSC Interface Management [92]		
	BP-PROG-07.04: Scheduling and Dispatch of Plant[3]	BP-PROC-00013: Generation Communication [93]	
	BP-PROG-08.01: Emergency Management Program [94]		
	BP-PROG-09.02: Stakeholder Interaction [95]		

[3] BP-PROG-07.04 is confidential and has only been listed here for information.

Level 0	Level 1	Level 2	Level 3
	BP-PROG-10.01: Plant Design Basis Management [96]	BP-PROC-00363: Nuclear Safety Assessment [97]	DPT-NSAS-00003: Guidelines for Evaluating and Prioritizing Safety Report Issues [98] DPT-NSAS-00008: Management of External Work for Nuclear Safety Analysis and Support [99] DPT-NSAS-00011: Configuration Management of Safety Analysis Software [100] DPT-NSAS-00012: Preparation and Maintenance of Operational Safety Requirements [101] DPT-NSAS-00015: Planning and Execution of Nuclear Safety Assessments [102] DPT-NSAS-00016: Integrated Aging Management for Safety Assessment [103]
		BP-PROC-00335: Design Management [104]	DPT-PDE-00008: Interface with Design Contractors Performing Design Activities for Bruce Power [105]

Level 0	Level 1	Level 2	Level 3
		BP-PROC-00582: Engineering Fundamentals [106]	
		DIV-ENG-00009: Design Authority [107]	
		DIV-ENG-00004: Engineering Evaluations [108]	
	BP-PROG-10.02: Engineering Change Control [109]	BP-PROC-00539: Design Change Package [110]	
		BP-PROC-00542: Configuration Information Change [111]	
	BP-PROG-10.03: Configuration Management [112]	BP-PROC-00786: Margin Management [113]	
	BP-PROG-11.01: Equipment Reliability [114]	BP-PROC-00782: Equipment Reliability Problem Identification and Resolution [115]	BP-PROC-00559: Station Plant Health Committee [116]
		BP-PROC-00779 Continuing Equipment Reliability Improvement [117]	BP-PROC-00498 Condition Assessment of Generating Units in Support of Life Extension [118]
	BP-PROG-11.02: On-Line Work Management [119]		

Level 0	Level 1	Level 2	Level 3
	BP-PROG-11.03: Outage Work Management [120]		
	BP-PROG-11.04: Plant Maintenance [121]	BP-PROC-00696: Maintenance Organization [122]	BP-PROC-00580: Maintenance Fundamentals [123]
	BP-PROG-12.01: Conduct of Plant Operations [124]	BP-PROC-00561: Operator Fundamentals [125]	
		BP-PROC-00136: Plant Operational Review Committee [126]	
		DIV-OPB-00001: Station Shift Complement – Bruce B [127]	
		GRP-OPS-00038: Bruce A and B Operations Standards and Expectations [128]	
		GRP-OPS-00030: Operational Decision Making [129]	
	BP-PROG-12.05: Radiation Protection Program [130]	BP-RPP-00001: Radiation Protection Policies and Principles [131]	
	BP-PROG-14.02: Contractor Management [132]	BP-PROC-00547: Management of Contractors [133]	

Level 0	Level 1	Level 2	Level 3
	BP-PROG-15.01: Nuclear Oversight Management [134]	BP-PROC-00295: Audit Basis and Approach [135]	

BP-MSM-1, Management System Manual (MSM) [37], defines and documents Bruce Power's Management System.

The Management System Manual [37] contains the company's vision, mission, values, behaviours, policies, key results areas, summary of the Board structure and a statement of commitment from the Chief Executive to the management system. It includes Sheets covering a summary of the complete list of Programs, a listing of Program owners and approvers, as well as functional area (process) groupings, the responsibilities and authorities of all section managers and above positions at Bruce Power and a summary of regulatory, legal and business requirements. The sheets include:

- BP-MSM-1 Sheet 0001 [38], MSM - Bruce Power Program Matrix;
- BP-MSM-1 Sheet 0002 [39], MSM - Approved Reference Chart Authorities and Responsibilities;
- BP-MSM-1 Sheet 0003 [40], MSM - List of Applicable Governing Acts, Regulations, Codes & Standards; and
- BP-MSM-1 Sheet 0004 [41], MSM - Program Summaries.

The BP-MSM-1 provides a high level description of the way the business is managed including the leadership direction defining how it is integrated. Nuclear safety is a primary consideration and the BPMS supports the enhancement and improvement of safety culture and the achievement of high levels of safety as well as business performance, and is designed to ensure the leadership team can consistently deliver expected results and satisfy its stakeholders, such as the regulator, the public, its shareholders and employees. It ensures that Bruce Power meets the stipulations of its operating licences, other applicable codes, standards, legal and business requirements.

By design, the BPMS contributes to the establishment of a nuclear safety culture that assures reactor, environmental, industrial and radiological safety, during normal operations, as well as during extreme events. The BPMS covers six components and applies to the entire business at all locations managed by the organization. The components which form the basis of the structure are:

- Strategic Direction;
- Plan - Policy, Program and Process Controls;
- Do - Process Management;
- Check - Monitoring for Results;

- Act - Continuous Learning; and
- Leadership and Organizational Accountability.

Nuclear Safety at Bruce Power is based on the following four pillars of: reactor safety; industrial safety; radiological safety; and environmental safety. These are referred to and covered in different programs and procedures.

4.1.1. Environment – Environmental Safety Management

BP-PROG-00.02 [43], Environmental Safety Management Program provides the overall framework to manage the environmental aspects of the Station operations, consistent with the Management System Manual, safety, environment, quality, economic and other requirements putting safety as the overriding priority.

The Bruce Power Environmental Safety Management Program is structured to address the Environmental Management System (EMS) requirements of the International Organization for Standardization (ISO) 14001 Standard [136]. The Program defines the requirements and elements of environmental protection and oversees the planning, implementation and control of activities to minimize potential adverse impacts of operations on the natural environment. It conforms to S-296 [137], CSA N286-05 [27] clauses 6.28 and 6.29, as well as ISO 14001. S-296 [137] has been replaced by REGDOC-2.9.1 [138], which is included in the LCH for full compliance by December 31, 2018. Programs, processes, and procedures, at a minimum, assure compliance with regulatory and statutory requirements and facilitate continual improvement in environmental performance, and provide a system-based approach to managing environmental aspects.

4.1.2. BPMS – Bruce Power Management System (BPMS) Management

BP-PROG-01.02 [51], the Bruce Power Management System (BPMS) Management Program coordinates the business framework needed to satisfy corporate governance and licence requirements at a level and to an extent that will ensure commitment to reactor safety, radiological safety, industrial safety and environmental safety. It implements the management system and it controls changes to the interdependent processes, organization and document structures that are essential to managing the business. BP-PROG-01.02 establishes the governance, provides oversight, supports and enables the maintenance of an integrated management system framework for Bruce Power and establishes the framework for the planning, implementation, maintenance, and continual improvement of business processes, activities, and human behaviors which contribute to the achievement of Bruce Power's objectives. This Program supports the implementation of the BPMS in such a way that it is known, understood and followed. The BPMS serves as the overall quality assurance program, which complies with CSA N286, the standard required by the PROL. Nuclear Safety is a primary consideration of the management system including the enhancement and improvement of safety culture and the achievement of high levels of safety as well as business performance.

BP-PROC-00166 [53], General Procedure and Process Requirements specifies the requirements for administrative process and procedure document formatting and presentation. It establishes standards, the methodology and processes necessary to ensure Bruce Power practices reflect a strong commitment to nuclear safety and a consistent approach to procedure quality. Well written procedures that use consistent structures, styles and language help reduce human error and promote consistent results.

BP-PROG-01.06, Operating Experience Program [61] implements processes at Bruce Power to meet the requirements of CSA N285.0 by making improvements via processing internal and external OPEX information, conducting Focus Area Self Assessments, Benchmarking others, and by attending industry conferences and workshops. BP-PROC-00892 [65], Nuclear Safety Culture Monitoring is an implementing procedure of BP-PROG-01.06 and provides the framework for Bruce Power to monitor nuclear safety culture between formal assessment activities, in particular to have mechanisms to identify and correct potential gaps in nuclear safety culture.

This procedure introduces a four step approach based on the Plan, Do, Check, Act concept for monitoring nuclear safety culture using the framework described in Institute of Nuclear Power Operation INPO 12-012: Traits of a Healthy Nuclear Safety Culture and based on the approach described in Nuclear Energy Institute NEI 09-07 R1: Fostering a Strong Nuclear Safety Culture (March 2014) [139]. This approach consists of the following steps:

- PLAN – Schedule and prepare for Nuclear Safety Culture Monitoring Panel (NSCMP) and Senior Leadership Team (SLT) Reflection Session meetings;
- DO – Conduct NSCMP and SLT Reflection Session meetings;
- CHECK – Provide oversight of the nuclear safety culture monitoring process; and
- ACT – Continuously improve nuclear safety culture and nuclear safety culture monitoring practices and process.

Other implementing procedures of BP-PROG-01.02 include: BP-PROC-00703 Change Management Guidance [54], BP-PROC-00774 Program Requirements [57], B-HBK-08013-00001, GOSP Implementation Handbook [58] and BP-PROC-00016, Business Assessment Process [52]. These are discussed further in Section 5.

4.1.3. Human Resources – Leadership Talent Management, Worker Staffing

BP-PROG-01.04 [59], Leadership Talent Management defines the approaches and responsibilities associated with the Talent Management process for managers. The program defines how leadership is defined, how managers are selected for both their leadership and technical skills, and then how managers are on-boarded, managed and developed. It defines how Bruce Power ensures a sufficient number of managers with the right leadership and technical skills are available to deliver the business plan.

BP-PROG-02.01 [73], Worker Staffing describes requirements and responsibilities associated with the Worker Staffing processes and activities of recruitment, orientation, and deployment of

staff that possess the competencies required for maintaining staffing levels consistent with the requisite organization structure, including the requirements of staff departure. It applies to employees including regular, temporary, and contract employees and requires that personnel must be recruited against current organizational competencies (technical and behavioural), which are specified in approved job documents and related selection criteria. The program ensures these activities are conducted in a manner consistent with the established values. The Bruce Power talent management activities result in attracting highly skilled and motivated individuals into the organization.

This program is implemented through a series of procedures for Regular Positions Hiring Process (BP-PROC-00465) [140], Student Hiring (BP-PROC-00319) [141], Contractors Hiring Process (BP-PROC-00355) [74], and Hiring Process for Temporary PWU [Power Workers Union] Assignments (BP-PROC-00601) [142].

Bruce Power's Succession Management Procedure, BP-PROC-00221 [60], ensures there are capable managers to deliver on future business plans by identifying and developing successors to management positions. This procedure is supported by BP-PROC-00468 [75], Workforce Planning Process which ensures that Bruce Power has the right people with the right skills at the right time in the right jobs. The Workforce Planning Process is accountable for delivering a 5-year workforce plan, through the annual business planning process and integrating with the recruiting function to develop hiring plans for all divisions across site.

4.1.4. Performance Improvement – Human Performance Program, Operating Experience Program, Corrective Action

BP-PROG-00.07 [45], Human Performance Program, ensures personnel, particularly line management, are trained to be knowledgeable in Human Performance (HU) processes and the proper use of HU tools so they are role models and reinforce the use of HU tools to their peers and teams, so they search for and eliminate, wherever it is possible to do so, conditions that lead to human error. Where the conditions for human error may not be eliminated and may impact the performance of critical steps, line management ensures staff is trained to take defensive action to detect and to correct against human error, and to ensure known measures are implemented to mitigate event consequences if they occur.

Staff and contractors adhere to leadership and worker behaviours that contribute to excellence in human performance by their adherence to the use of HU tools and identification and reporting to line management of conditions that might lead to human error.

The Performance Improvement Department monitors the status of HU indicators and generates site-wide HU reports, manages HU initiatives and makes HU recommendations based on industry best practices, benchmarking, self-assessments, and operating experience.

BP-PROG-01.06 [61], Operating Experience Program, defines processes to meet the requirements of CSA N286-05 (e.g., Sections 5.6, 5.11 and 5.14), by making improvements via Processing Internal and External Operating Experience information, conducting Focus Area Self-Assessments, Benchmarking others, and by attending industry Conferences and Workshops.

Bruce Power's processes governing Operating Experience are described in its implementing procedure BP-PROC-00062 [143], Processing External and Internal Operating Experience. The Operating Experience program and Corrective Action Program are closely inter-connected.

BP-PROG-01.07 [66], Corrective Action identifies and eliminates or mitigates adverse conditions that could negatively impact nuclear safety (including reactor safety, radiation safety, industrial safety and environmental safety), business loss or corporate reputation. All adverse conditions are to be promptly identified, documented and reported. For significant events and significant conditions adverse to quality, the causes will be determined and corrective action will be taken to correct, and where appropriate, prevent their recurrence. Any corrective actions taken to address identified causes are to be tracked to completion. Effectiveness will be verified for corrective actions taken to prevent recurrence stemming from Root Cause Investigations and where required for corrective actions from investigations which addressed the Apparent/Common Cause. Based on significance, adverse conditions may be trended. Periodic trend analysis is performed to identify adverse trends. Where warranted, corrective actions are put in place to address adverse trends. Periodic assessment of the effectiveness of the program will be done based on the results and recommendations obtained from verifications and audits.

4.1.5. Training – Worker Learning & Qualification

BP-PROG-02.02 [76], Worker Learning and Qualification program enables personnel to competently and safely operate, maintain and improve the performance of the Station.

Learning includes: the training elements that support Worker Qualifications that grant working rights; and training elements that support Professional Development. The Worker Learning and Qualification program sets the standard on how to ensure that personnel are competent at the work that they do.

4.1.6. Records Management – Document Management

BP-PROG-03.01 [85], Document Management (Section 3.1.2) defines a Controlled Document as a document that has a defined revision control process for its entire life cycle and is officially assigned a unique controlled document number by the Document Custodian. Controlled Documents are subject to formal procedural control of their preparation, review, validation, approval, issue and change control. Controlled Documents are reviewed for accuracy and approved by authorized personnel prior to release. Controlled Documents are indexed and distributed using the Controlled Document Module in PassPort. A Record is defined as information in any format that has been authenticated (i.e., initialed, stamped or signed, dated, clearly identified) and is retained to meet business or regulatory requirements, by authorized personnel.

The preparation, issue and change of documents that specify quality requirements or prescribe activities affecting quality are controlled to assure that correct documents are being employed. Such documents, including changes thereto are reviewed for adequacy and approved for release by authorized personnel. Documentation which may cause loss, disadvantage or harm

to Bruce Power or any of its partners, customers, employees, suppliers or other third parties are not disclosed to external parties without the written consent of Bruce Power. Documentation entrusted to Bruce Power is treated with the same rigor as that created and owned by Bruce Power. The implementing procedures consider the impacts of Nuclear Safety as they apply to decision making and risk management of Industrial Safety, Environmental Safety, and Radiological Safety in support of overall Reactor Safety.

4.1.7. Supply Chain – Supply Chain

BP-PROG-05.01 [88], the Supply Chain Program defines the requirements and responsibilities associated with the Supply Chain processes and complies with CSA N286-05 [27]. Elements of the program include: Procurement of Items and Services; Contract Management; Warehouse Operations; and Quality Oversight.

BP-PROC-00041 [89], Contract Management provides clear and consistent direction for Bruce Power staff who are required to work within the acquisition of services process. Activities associated with implementing the requirements of this procedure ensure processes are identified and requirements are understood recognizing that reactor safety, industrial safety, radiation safety and environmental safety are essential to the achievement of the company long term goals. Clauses include the need to arrange for inspection and technical surveillance (including identifying and performing/verifying Inspection and Test Plan (ITP) hold and witness points) of on-site Supplier work, when required by the Technical Specification and/or Contract. If the scope of an on-site Contract involves safety-related or Pressure Boundary work, a Supplier ITP, or equivalent document, shall be prepared and submitted to Bruce Power in accordance with the Supplier's Quality Assurance (QA) program.

BP-PROC-00854, Quality Oversight [90], defines the functional requirements and key responsibilities associated with Quality Services processes. The objective of Quality Services is to provide sufficient oversight of suppliers through receipt inspection of material; performance of source surveillance; validation of supplier QA requirements; review of supplier quality performance and correction of quality assurance related issues according to approved procedures that assure best practice and regulatory requirements are applied, and that only correct and accepted items and services are available for use as per established programs.

4.1.8. Licensing & Regulatory Affairs – CNSC Interface Management

BP-PROG-06.03 [92] CNSC Interface Management defines the overall business need, functional requirements, constituent elements and key responsibilities associated with managing the interface between Bruce Power and the CNSC. This is achieved by establishing and implementing standards and processes that meet the expectations of both parties and facilitate conformance to the NSCA, applicable regulations and other CNSC requirements and expectations.

The program supports the achievement of excellence in nuclear safety as the overriding priority and a healthy nuclear safety culture by assuring that processes and practices are defined and managed to ensure that the requirements arising in the PROL are understood, implemented and

reported on in a controlled manner throughout the management system. The program was recently updated to confirm the need for compliance against CNSC REGDOC-3.1.1 [23] ([92] program clause 4.5 items 3 and 4).

The CNSC regulatory framework consists of a mix of requirements and guidance. Requirements are set out in legislation, regulations, licences and CNSC regulatory documents invoked in licences. Guidance on how applicants and licensees can meet regulatory requirements is provided in CNSC guidance documents. CNSC INFO-documents provide more general information on the regulatory regime and processes for the broader public. CNSC interface management processes are structured to facilitate compliance with CNSC requirements and to conform, where practicable, to CNSC guidance or expectations with the understanding that compliance to a CNSC Regulatory Document is mandatory when the document is referred to in a CNSC licence. Deviations from a licence-referenced regulatory document and transitional arrangements, where necessary, are addressed on a case-by-case basis in accordance with the applicable Licence and/or LCH.

4.1.9. Emergency Protective Services – Emergency Management Program

BP-PROG-08.01 [94], Emergency Management Program ensures that the consequences of unplanned events that have the potential to impact on employee, public and environmental safety and the continuity Bruce Power's business operations are managed. Nuclear safety is the paramount consideration guiding decisions and actions. This programmatic document is discussed in detail in Safety Factor 11.

4.1.10. Stakeholder Engagement – Employee Communications, Stakeholder Interaction

BP-PROG-02.07 [83], Employee Communications defines the key responsibilities, standards, processes and vehicles used in communicating with employees, and when appropriate others working at Bruce Power locations. This supports not only those working in the Employee Communications Department, but also the many functions responsible for ensuring a strong site communications environment, including senior executives, line management, human resources, performance improvement, safety, and business improvement functions. This ensures that processes and vehicles are in place so personnel are: continually engaged in the objectives of the business and how it is performing against business goals; and aware of the contribution that they as individuals and their work groups make to the performance of the business.

Additionally, communication efforts promote and contribute to safety culture awareness on the part of employees with the goal of improving nuclear safety performance and underscoring Bruce Power's values in the areas of environmental safety, industrial safety, radiological safety and reactor safety.

BP-PROG-09.02 [95], Stakeholder Interaction defines the fundamental business need, implementing approaches and key responsibilities associated with managing stakeholder interaction and communication. This program establishes Bruce Power's public outreach approach and ensures information on health, safety and security of persons and the

environment, and issues associated with the company's licensed operations and activities are effectively communicated.

4.1.11. Configuration Management Engineering – Engineering Programs

BP-PROG-00.04 [44], the Pressure Boundary Quality Assurance Program describes the program to control the quality of pressure boundary activities at the facilities. It complies with the applicable rules and quality assurance requirements contained in CSA Standard: a) N285.0 and supporting codes for Class 1, 1C, 2, 2C, 3, 3C, 4 and 6 systems and components, and b) B51 and supporting codes for Class 6 and unclassified registered systems and components.

Pressure boundary activities are performed in accordance with the Codes and Standards required by the PROL. Organizations that support pressure boundary work at Bruce B comply with the requirements established in the approved Pressure Boundary Quality Assurance Program.

BP-PROG-10.01, Plant Design Basis Management [96] ensures the plant design meets safety, reliability, and regulatory requirements including pressure boundary quality assurance requirements described in BP-PROG-00.04, Pressure Boundary Quality Assurance Program. This program sets out requirements for engineering analysis and documentation so the adequacy of the design can be demonstrated.

A key implementing procedure of BP-PROG-10.01 is BP-PROC-000363, Nuclear Safety Assessment [97] which defines the elements, functional requirements, implementing procedures, and key responsibilities associated with the Nuclear Safety Assessment (NSA) Process. The objective of NSA is to ensure that all necessary nuclear safety requirements are defined for the actual or proposed design of the plant throughout the design modification process or in addressing emergent issues (e.g., plant design) that may affect the Design Basis or the Safety Report Basis.

BP-PROG-10.02 [109], Engineering Change Control specifies the manner in which design changes and modifications are defined, planned, implemented, and controlled to ensure design changes and modifications are controlled so the design requirements are met and the station is operated safely consistent with the design basis for the full duration of design life. The program applies a graded approach based on risk. The assessment of risk includes elements of safety (industrial safety, reactor safety, environmental safety, radiation safety) and business needs. This program fosters a strong nuclear safety culture by defining relevant accountabilities and responsibilities, appropriate management and supervisory oversight, support interfaces, and ensuring that decision-making with respect to design changes and modifications is systematic and rigorous.

BP-PROG-10.03 [112], Configuration Management ensures modifications to the plant, operation, maintenance and testing of the physical plant configuration is in accordance with the design requirements as expressed in the facility configuration information and defines the processes to maintain this consistency is maintained throughout the operational life-cycle phase, particularly recognizing changes are being made.

4.1.12. Equipment Reliability – Equipment Reliability

BP-PROG-11.01 [114], Equipment Reliability defines the fundamental engineering operational performance needs, requirements, implementing approaches, and responsibilities of the plant equipment reliability integration process. The objective of plant reliability integration is to develop, implement and revise the approaches required for anticipating, identifying, preventing and resolving performance and condition problems with SSCs on the basis of risk, to support safe, reliable plant operation at optimum cost. This is accomplished by:

- Ensuring the safe operation of risk significant plant SSCs, and
- Maintaining a culture that has intolerance for unanticipated equipment failures and drives continuous improvement based on industry leading practices.

4.1.13. Work Management – On-Line Work Management

BP-PROG-11.02 [119], the On-Line Work Management Program, defines the performance needs, requirements, implementing approaches and responsibilities of On-Line Work. Its objective is to provide timely identification, selection, prioritization, approval, scheduling and coordination to allow execution of work necessary to ensure safety and to maximize the availability and reliability of SSCs. It accounts for the risks associated with conducting work and identifies the impact of work to the station and to work groups; protects the station from unanticipated transients due to the execution of work; and supports nuclear safety and fosters a nuclear safety culture through the incorporation of the following guiding principles and values:

- Provide timely identification, screening, scoping, planning, scheduling, preparation and execution of work necessary to maximize the availability and reliability of station equipment and systems;
- Manage the risk associated with work through the proactive identification of situations or activities that could jeopardize or adversely impact safety margins and enable the development of mitigation strategies;
- Identify the impact of work to the station and work groups, and protect the station from unanticipated transients that result from work; and
- Maximize the efficiency and effectiveness of station staff and material resources while sustaining safe, reliable and competitive plant operation at optimum cost to Bruce Power.

4.1.14. Outage Management – Outage Work Management

BP-PROG-11.03 [120], Outage Work Management Program defines the performance needs, requirements, implementing approaches, and responsibilities of Outage Work Management. It identifies the controls associated with planning, implementation, and control of work performed on a reactor unit when the unit is shut down so maintenance, inspections, and modifications are performed safely and on the basis of value to maintaining safe, reliable and cost effective

operation. This includes selecting and controlling the scope of work, planning, scheduling, coordinating work execution, and completing the outage.

4.1.15. Maintenance – Plant Maintenance

BP-PROG-11.04 [121], Plant Maintenance defines the performance needs, requirements, implementing approaches and responsibilities of the management of the plant maintenance process. It covers the hands on maintenance of plant SSCs based on the approved maintenance strategies, schedules, procedures and practices in a cost effective manner that maximizes the availability and reliability of safety related and production sensitive equipment while maintaining the commitment to Nuclear Safety: Reactor, Radiation, Environmental and Industrial Safety. Predictive and preventive maintenance supports enhanced equipment reliability and improved operational safety performance. Maintenance strategies are continually refined using improved technologies, Operating Experience (OPEX) and plant reliability integration feedback. Work selection, prioritization and response are guided by risk informed decision making.

4.1.16. Operations – Conduct of Plant Operations

BP-PROG-12.01 [124], Conduct of Plant Operations defines the fundamental business need, functional requirements, constituent elements and key responsibilities associated with the conduct of operations at Bruce B. The objective is to safely and reliably operate the station systems within the design basis for which the plants are licensed. Operations conducted in accordance with the standards and expectations defined in this program provide strong support for the four pillars of nuclear safety described in Section 4.1.

The four operational areas implemented by the Conduct of Plant Operations program are:

- Plant Operation - Controls the execution of Operator activities in the plants to start-up, operate and shut down the reactor units, to refuel the reactors on an on-going basis, to perform routine operations in support of maintenance activities, and to perform routine surveillance of systems and to respond to unanticipated events;
- Operations Documentation - Controls the development, review, and approval of all procedures, flowsheets, and other documents used by Operations personnel;
- Operator Staffing - Controls the activities to ensure qualified Operations staff complements are acceptable for the safe operation of the reactor units and for the performance of routine and outage activities; and
- Work Protection - Controls the development and approval of Work Protection related procedures and oversees the execution of Work Protection related activities to ensure an isolated and de-energized condition exists for the execution of work.

4.1.17. Radiological Protection – Radiation Protection Program

BP-PROG-12.05 [130], Radiation Protection (RP) Program defines the requirements and implementing approaches of the Radiation Protection Management Policy as defined in the Management System Manual (BP-MSM-1, Appendix A).

A comprehensive review of the Radiation Protection program is included in Safety Factor 15: Radiation Protection.

4.1.18. PMC – Contractor Management

BP-PROG-14.02 [132], Contractor Management provides guidance to personnel acting as Contract Managers/Officers and Supervisors for accomplishing effective oversight of contractors and supplemental personnel performing work for Bruce Power. The program defines the roles and responsibilities of the Contract Manager/Officer, which includes the following:

- Responsible for the site administration, coordination and overall performance of the contractor while working at the site, including but not limited to: quality, timeliness, safety and error-free performance; and
- Ensures the contractor's personnel are qualified and trained to perform the work assigned including any additional risk based training that may be required for specific tasks.

An implementing procedure of BP-PROG-14.02 is BP-PROC-00547 [133], Management of Contractors, which is discussed further in Section 5.

4.1.19. Nuclear Oversight – Nuclear Oversight Management

BP-PROG-15.01 [134], Nuclear Oversight Management identifies the processes required to independently oversee the functioning of Bruce Power's Management System. This program contributes to the development and growth of Nuclear Safety Culture by communicating the Nuclear Safety message, setting the example for nuclear safety, and demonstrating this commitment through words and actions. The Program serves to meet the embedded PROL requirements for oversight of Pressure Boundaries and Environmental Protection. These are accomplished by the Planning, Scheduling, Conducting, Reporting, and Overall Evaluation of Audits and Assessments.

5. Results of the Review Tasks

The results of the review of this Safety Factor are documented below under headings that correspond to the review tasks listed in Section 1.2 of this document. The review tasks assessed in this section have not changed from those listed in Section 1.2.

5.1. Overview Discussion of the Management System and Past Safety Factor 10 Reviews

The Bruce Power Management System is common to both the Bruce A and B systems.

Bruce Power completed a Performance Review of the Stations as part of a supplemental submission in support of the Licence Renewal, in October 2013 [144]. This report [144] discusses numerous CNSC Safety and Control Areas (SCAs) applicable to this Safety Factor report review tasks, including the complete discussion in Sections:

- 3.1.1 on the SCA 1, on Management Systems, Organization and Change Management;
- 3.1.2 on Safety Culture;
- 3.1.4 on Records Management;
- 3.1.5 on Management of Contractors;
- 3.2.1 on SCA 2, on the Human Performance Program (continuous improvement);
- 3.2.2 on Personnel Training;
- 3.2.3 on Personnel Certification;
- 3.2.4 on Certification and Requalification Tests;
- 3.2.5 on Work Organization and Job Design, including specialized staffing;
- 3.3 on Operating Experience;
- 3.4.5 on Management of Safety Issues;
- 3.5 on SCA 5, on Physical Design which covers Configuration Management;
- 3.6 on SCA 6, on Work Management;
- 3.7 on SCA 7, on Radiation Protection; and
- 3.8 on SCA 8, on Conventional Health and Safety.

Each of these sections provides information on the relevance and management of the SCA, past performance, future plans, challenges (if any) and requests (if any).

Safety performance is an area of continual focus and improvement across the site; Bruce Power strives to achieve world-class performance levels by embracing a philosophy of continuous improvement. The Bruce site achieved 22 million hours without a lost time injury in 2010, reached over 14 million hours without a lost time injury in 2013 ([144] Executive Summary, ([145] page 80) and in 2015 it was reported that no employee had suffered an acute lost-time injury in over 13 million hours and the all injury rate (injuries per 200,000 hours worked) continues to drop each year ([146], [145] page 47).On February 1, 2016 a Bruce Power Employee working on a routine maintenance activity as part of the Unit 8 outage was injured when some gas became ignited resulting in a burn to the worker. Immediate actions have been taken to prevent reoccurrence with other workers carrying-out similar work. The company has notified both the CNSC and Ministry of Labour.

Diligent application of Bruce Power's Radiation Protection Program has been effective at identifying and controlling radiological hazards. During the 2009-2014 licensing period Bruce Power consistently maintained worker radiological exposures below regulatory limits and enhancements to the Radiation Protection Program were implemented and are yielding positive results. The online dose trend line continues to decrease showing workers are receiving less annual dose ([145] page 48). Also, the Regulatory Oversight Report for Canadian Nuclear Power Plants: 2014, issued in September 2015 [147], provides a five year trend (from 2010 to 2014) of the annual collective effective doses to workers at each station and concludes that the Radiation Protection program at Bruce B is satisfactorily implemented. These are discussed further in this section with further details in the Performance Report ([144] Section 3.7).

The CNSC performs an annual review of each Station [147][148]. The review for 2014 showed Bruce B's performance was improved to fully satisfactory, compared to the 2013 rating of satisfactory. The Radiation Safety, Management System, Human Performance Management and Integrated Plant Rating SCAs were satisfactory, while the Conventional Health and Safety rating was fully satisfactory ([147] Section 3.1).

CNSC staff concluded that the management system SCA met performance objectives and all applicable regulatory requirements. Bruce Power's management system complied with the requirements of N286-05, Management system requirements for nuclear power plants ([147] Section 3.1.1.1).

With respect to change management, CNSC staff verified that processes were followed. Minor issues identified by CNSC staff related to the effectiveness of the process of documenting changes for maintenance and operations procedures have been adequately addressed by Bruce Power ([147] Section 3.1.1.1).

With respect to safety culture, in February 2014, Bruce Power finalized and submitted information regarding its 2013 safety culture self-assessment including the method, findings, corrective action plans and implementation. CNSC staff concluded that Bruce Power followed the established processes for self-assessments and will continue to monitor Bruce Power's site-wide initiatives on these improvements. Bruce Power monitors safety culture between periodic assessments (BP-PROC-00892 reference), and undertakes narrower but more frequent periodic assessments of culture and to extend the time between full assessments of safety culture to every three to five years. The frequency of self- assessments established by Bruce Power, currently meets CNSC staff expectations ([147] Section 3.1.1.1).

Under the Human Performance Management SCA, CNSC staff concluded that the human performance management SCA met performance objectives and all applicable regulatory requirements ([147] Section 3.1.1.2).

CNSC staff assessed Bruce Power's human performance program and concluded that Bruce Power is in compliance with regulatory requirements. With respect to personnel training, Bruce Power has a well-documented and robust Systematic Approach to Training (SAT)-based training system. The SAT training system ensures identified training needs are analyzed and appropriate performance based training is designed, developed, implemented, and evaluated. The implementation of this system for the training programs at Bruce Power in 2014 met regulatory requirements ([147] Section 3.1.1.2).

For personnel certification, Bruce Power had sufficient certified personnel for all certified positions in accordance with CNSC regulatory requirements. CNSC staff are satisfied that Bruce Power's program certifies the competency of personnel at Bruce Power to perform their duties safely. With respect to the initial certification examinations and requalification tests programs for certified staff met all regulatory requirements. The design and development of a requalification written test, inspected at Bruce Power in 2014, met applicable requirements. No significant compliance issues were identified at either station. CNSC staff concluded that the personnel certification processes and procedures were adequate at Bruce Power ([147] Section 3.1.1.2).

With respect to the minimum shift complement, Bruce Power has a sufficient number of personnel for all certified positions. CNSC staff concluded that Bruce Power stations are in compliance with the requirements for the minimum shift complement. In 2014, Bruce Power reported instances whereby the minimum shift complement was not met for short periods of time due to unforeseen circumstances. CNSC staff did not identify any significant operations-related issues from these reports as Bruce Power took appropriate actions to ensure that safety was maintained. Relating to hours of work, several significant winter storms occurred in the vicinity of Bruce B during 2014. For each of these storms, Bruce Power maintained minimum shift complement and ensured that staff were accommodated, along with assessing staff fatigue. Bruce Power has incorporated lessons learned into its response to severe weather and continues to strengthen its practices to mitigate the risk of fatigue-related errors ([147] Section 3.1.1.2).

Under the Radiation Protection SCA, CNSC staff concluded that the radiation protection SCA at Bruce B met performance objectives and all applicable regulatory requirements. As a result, Bruce B received a "satisfactory" rating, which is unchanged from the previous year ([147] Section 3.1.1.7).

The RP program performance meets the requirements of the Radiation Protection Regulations. The RP program documents and supporting procedures are maintained in terms of industry best practices. The oversight applied by Bruce Power in implementing and improving the RP program has been effective in protecting workers at Bruce B. Routine compliance verification activities indicate that Bruce B is effective in the area of RP program performance ([147] Section 3.1.1.7).

No significant organizational and administration system-related compliance issues were identified during CNSC inspections ([147] Section 3.1). The CNSC inspections are more described in more detail in Section 7.3.

In addition to the aforementioned reviews, the previous Safety Factor 10 reviews confirmed that Bruce Power is meeting the objectives of this Safety Factor. This has been confirmed via the detailed, confidential and privileged industry reviews conducted by organizations such as World Association of Nuclear Operators (WANO), Institute of Nuclear Power Operations (INPO), and the IAEA (Operational Safety Review Team) reviews. In October of 2015 following WANO reviews, Bruce B received a WANO Good Practice 2015-05, on Nuclear Organization Structure and Traits, which covered the Organizational Effectiveness (OR.1) and Performance Improvement (PI-3) areas. Good practices are shared with utility members worldwide. The results from these reviews are communicated to the CNSC and areas for improvement,

including positive ones, are incorporated into the Bruce Station Condition Records to ensure corrective actions are completed if a negative finding is flagged and positive findings are shared throughout the organization.

These various reviews are discussed in more detail in the next sections as part of the more detailed review tasks for this Safety Factor.

5.2. Safety Factor Review Against National and International Standards

As part of review tasks 1 a. through e., the organization and administrative management system was reviewed against the following national CSA standards and companion documents:

- N286-05 [27], which as discussed in Section 3.2, is being transitioned to the similar document N286-12, Management System Requirements for Nuclear Facilities during this licensing period;
- N286.0.1-14, Commentary on N286-12, Management system requirements for nuclear facilities [149];
- N286.7-99, Quality assurance of analytical, scientific and design computer programs for nuclear power plants [150]; and
- N286.7.1-99, Guideline for the application of N286.7-99 [151].

Sections 4 and 7 of N286-12 are applicable to high energy reactor facilities identifying general and specific requirements for the management system. In this Safety Factor, the review focused on the generic requirements as each of the other Safety Factor reports cover the details of the specific requirements.

Furthermore, guidance from the following international standards was considered in the development of Bruce Power's Management System, BP-MSM-1 [37] and as appropriate this guidance is captured in interfacing programs and implementing procedure documents, and utilized during audits and assessments as discussed further in Section 7:

- WANO GL 2013-01 May 2013, Traits of a Healthy Nuclear Safety Culture, which provides cross-references from WANO principle PL 2013-1 Traits of a Healthy Nuclear Safety Culture, to the previous GL 2006-2 Principles for a Strong Nuclear Safety Culture and the International Atomic Energy Agency safety culture attributes (BP-PROC-00582 [106] and BP-PROG-10.02 [109]).
- WANO Good Practice, GP-ATL-11-006, Work Management Process Description, which contains the elements considered essential to a well-functioning work management process.
- WANO GL 2001-02, Guidelines for the Conduct of Plant Operations at Nuclear Power Plants, which describes key elements that support operation of an operating nuclear power plant. Their implementation contributes to safe, reliable and efficient plant operation.

- WANO GL 2001-04, Guidelines for Plant Status and Configuration Control at Nuclear Power Plants (BP-PROG-12.01 [124]).
- WANO GL 2001-06, Guidelines for the Management of Planned Outages at Nuclear Power Stations, March 2002, which supports the development and implementation of excellent outage programs (BP-PROG-05.01 [88]).
- WANO 2013-1 Performance Objectives and Criteria (PO&Cs) (March 2013) (BP-PROC-00582 [106], BP-PROC-00561 [125], BP-PROG-12.01 [124], BP-PROG-05.01 [88] and BP-PROG-01.02 [51]).
- OHSAS 18001:2007 Occupational Health and Safety Management System - Requirements, which is used by Bruce Power to implement the requirements of CSA Z1000-06 Occupational Health and Safety Management (BP-PROG-01.02 [51]).
- IAEA GS-R-3, The Management System for Facilities and Activities, Safety Requirements (2006), which documents leading international approaches to the implementation of a Management System with a strong focus on Nuclear Safety Culture.
- IAEA Safety Guide No. GS-G-3.1 (2006), Application of Management System for Facilities and Activities (BP-PROG-01.02 [51]).
- IAEA Safety Guide No. GS-G-3.5 (2009), the Management System for Nuclear Installations (BP-PROG-01.02 [51]).
- INPO 11-007, Principles for Strong Governance and Oversight of Nuclear Organizations (Preliminary) (2011), which describes the key attributes of effective governance and oversight needed for a nuclear power organization to exercise control through management models and to pursue high levels of operational nuclear safety and reliability.
- INPO 11-007 REV0 Principles for Strong Governance and Oversight of Nuclear Power Organizations (March 2013) (BP-PROG-01.02 [51]).
- INPO 12-012 REV1 Traits of a Healthy Nuclear Safety Culture (April 2013) and its Addendum 1 (BP-PROC-00582 [106]).
- INPO 12-013 Performance Objectives & Criteria REV0 (December 2012) (BP-PROG-01.02 [51]).
- NEI 09-07 (Revision 0), Fostering a Strong Nuclear Safety Culture (2010), Nuclear Energy Institute (NEI), which describes the industry approach to monitoring, assessing and addressing nuclear safety culture issues, which was later superseded by NEI 09-07 Revision 1 [139], Fostering a Healthy Nuclear Safety Culture (2014) (BP-PROG-01.02 [51]).

Finally, the CNSC is developing CNSC REGDOC-2.1.2, Safety Culture for Nuclear Licensees, which is near release for industry and public consultation. It is to:

- provide a clear definition of safety culture and clarify commonly associated language so stakeholders and the CNSC have a shared understanding of these concepts, and

- highlight general safety culture requirements that apply to all licensees, and include an additional chapter with requirements and guidance to nuclear power plants. Specifically, the document will describe the expected and suggested criteria for licensees to self-assess, establish corrective action plans, and report on safety culture.

When issued, it should contribute to the consistent understanding of safety culture assessment expectations.

As discussed in Section 5.1, at a high level Bruce Power and the CNSC perform, at a minimum, annual reviews of Bruce Power's Organizational and Administration performance. Each year these reviews show Bruce Power programs and process in this area meet the established requirements. These reviews utilize CSA N286, as it is a requirement of the PROL. Therefore, it is useful to identify when the review task is consistent with this standard, since audits are often conducted to illustrate that the requirements are routinely met and have been for years. Under each review task where programs and procedures are identified these are illustrative examples to show that Bruce Power is achieving the standard, but it should be recognized that additional programs and procedures could be identified in addition to those listed. For example, a review of Appendix A from BP-PROG-10.01 [96] shows how engineering procedures map to the N286 requirements.

The aforementioned international standards are treated by Bruce Power as guidance documents, so they are not reviewed in detail in the subsections of Section 5.2. However, they are discussed in Section 5 whenever appropriate, as they aid in the verification that Bruce Power is meeting a particular review task.

In these cases, the PO&Cs applicable to the Safety Factor 10 review tasks are identified in the relevant subsections of 5.2, 5.3 or 5.4, and then a review of the Station Condition Records (SCRs) and PassPort Action Requests (ARs) is performed to determine which may have been identified as areas for improvement (AFIs) since the 2014 WANO review was performed and the 2013 Corporate review was completed. The PassPort ARs are then reviewed to ensure Bruce Power has corrective actions in place to improve or enhance their programs and processes, if they have not already completed them. Previous AFIs may be included if they are pertinent to Bruce B and illustrate areas of improvement from either the Bruce B WANO reviews or earlier Bruce A ones. Further verification insight on the review task is provided by a review of the assessments and audits discussed in Sections 7.1 (e.g., SA-COM-2015-03 described in Section 7.1.3, SA-BPMS-2014-01), 7.2, 7.2.2 and 7.3.

Although in Section 3.2 of this report it is stated that CSA N286-05 [27] and N286-12 [28] will not be assessed as part of this Safety Factor review, they are nevertheless the appropriate benchmarks for the review tasks of this Safety Factor and are therefore referenced in the Review Task Assessments in the subsequent sections.

5.2.1. Policy Statements of Bruce Power

This task reviews the policy statements of the operating organization against CSA N286-05 and N286-12.

In the Bruce Power BP-MSM-1 Management System Manual, BP-MSM-1 [37], policy high level value statements are provided in the body of the document and Policy Statements are included in Appendix A.

CSA N286-05 and N286-12 do not identify a need for policy statements but rather they identify management principles, which are covered in Section 4.1.2 of N286-12[4]. These are captured verbatim in Section 2.2 of the MSM.

The MSM document gives the vision, mission, values and behaviours. It states that Bruce Power values guide every day conduct, that people are the key to Bruce Power's success and values guide their conduct, decision making and relationships, and that living the Bruce Power values means people conduct business ethically, respectfully, safely, and with professionalism. The five high level values identified in this document include (quoted verbatim):

- Safety First: We embrace and practice strong nuclear safety principles recognizing that reactor safety, industrial safety, radiation safety, and environmental safety are essential to the successful achievement of our long-term goals and key to our reputation;
- Professionalism and Personal Integrity: We believe in honouring ourselves, our business, and our personal commitments;
- Respect and Recognition: We recognize that our people are essential to our success and respect their exceptional efforts;
- Passion for Excellence: We demonstrate commitment to continuous improvement to create sustainable performance excellence which benefits all of our stakeholders; and
- Social Responsibility: We recognize business excellence and our financial strength as an opportunity for contributing to the greater good.

In addition to the MSM, Section 4.0 of the BPMS Management Program document, BP-PROG-01.02 [51] is structured to align with the generic requirements of N286-12.

The Bruce Power MSM is consistent with the Canadian standard N286-12 with respect to the adoption of the management principles. Bruce Power meets the requirements of review task 1a. Further verification insight on the review task is provided by a review of the assessments and audits discussed in Section 7.1 (e.g., SA-BPMS-2014-01).

5.2.2. Documentation of Management System

This task requires a review of the documentation of the Management System as per Section 2 of N286-05 and Section 4.7.1 of N286-12. For example, N286-12 Section 4.7.1 requires the Management System to define, document, control, and maintain processes that comprise the management system, as well as objective evidence to demonstrate effective implementation of the management system.

[4] CSA N286-12 and N286-05 are used interchangeably since Bruce Power has agreed to transition to N286-12, and has done so in some programs, although not all.

Bruce Power's Management System is documented and defined in BP-MSM-1, Management System Manual [37] and the programs that implement it. BP-PROG-01.02, Bruce Power Management System (BPMS) Management [51] provides the governing processes to control and maintain the Management System as discussed in Section 4, in particular Section 4.3.3 of the procedure.

The BP-MSM-1 and BP-PROG-01.02 and their lower level procedures have been revised to reflect completion of the Process and Document Enhancement Project in reaction to CNSC reviews and to improve operational accountability through the introduction of the Governance-Oversight-Support-Perform (GOSP) organizational model. B-HBK-08013-00001 GOSP Implementation Handbook [58] provides detailed information on how the management system is to be executed and includes roles and responsibilities for the programs. The GOSP model clarifies the accountability of the central program owner in terms of establishing the program expectations and standards. It clarifies the accountability of the station and line organization performers in terms of executing the agreed upon program to deliver the desired results. Other lower level documents from this program lay out responsibilities in greater detail and consistency amongst programs. They are enforced via BP-PROC-00774, Program Requirements [57] and changes to the Management System are controlled via BP-PROC-00703, Change Management Guidance [54].

There have been multiple improvements in the Management System documentation since the Safety Factor 10 review of Organization and Administration was completed in 2008 [12]. The earlier review was conducted in accordance with the Bruce 3&4 Integrated Safety Review (ISR) Basis Document [11], which was based on the guidelines contained in CNSC RD-360. This CNSC Regulatory Document invoked and augmented the guidance contained in IAEA Safety Guide NS-G-2.10 [152] on the Periodic Safety Review of NPPs. The BP-MSM-1 has undergone significant changes to improve and to address the results of audits, and to accommodate incorporation of new or changing national and international standards. Furthermore, changes to the Management System programs are explicitly captured in the LCH so that many of the program documents are reviewed by the CNSC before they are implemented.

The WANO PO&Cs on Nuclear Organizational Structure and Traits OR.1 and Management Systems OR.3 identify a need to ensure the effectiveness of the Bruce Power Management System. A review of the SCR database shows no adverse conditions applicable to this review task have been identified against these PO&Cs following the 2013 corporate and 2014 WANO reviews. Following WANO reviews in October of 2015, Bruce B received a WANO Good Practice 2015-05, on Nuclear Organization Structure and Traits, which covered the Organizational Effectiveness (OR.1) and Performance Improvement (PI-3) areas. Additionally, a review performed by IAEA's Operational Safety Review Team (OSART) identified a number of good practices with respect to organization and administration. The findings of the review are explained further in Section 7.2.2.1.

This was confirmed by a review of the assessments and audits, and CNSC inspections in Section 7. Significant improvements and enhancements have been made to the Management System documentation through the completion of corrective actions arising from past assessments and audits. In particular, Sections 7.2.1.5 and 7.3.2 discuss in more detail sample audits relevant to this review task. No gaps against this review task were identified.

Bruce Power programs and procedures meet the requirement of the review task. The Bruce Power MSM is consistent with the Canadian standard N286-12 with respect to it being defined, documented, controlled, and maintained through processes that comprise the management system. Objective evidence was provided to demonstrate effective implementation of the management system. Further verification insight on the review task is provided by a review of the assessments and audits discussed in Section 7.1 (e.g., SA-BS-2015-01 described in Section 7.1.2, SA-BS-2015-04, SA-BS-2014-01, SA-COM-2014-01, and SA-ERI-2014-05) and Section 7.3.1 (BRPD-AB-2012-016 and BRPD-2011-AB-08).

5.2.3. Management of and Retaining the Responsibility for Processes Important to Safety That Have Been Outsourced

This task requires a review of the adequacy of arrangements for managing and retaining responsibility for activities or processes important to safety that have been outsourced (for example, some maintenance and engineering services and safety analysis) as per Section 4.8.1 of N286-12 and Section 4 of N286.7 [150] (similarly, clauses such as N286-05 Sections 5.3, 5.8, 5.10, 5.11, A.10 and B.3).

Section 4.8.1 of N286-12 says work shall be identified and planned with the following: a clear description of the work including requirements and verification; worker requirements, including verification worker; supply chain requirements, including lead items; resource assignment, including the worker to perform the verification; critical characteristics of the work to be verified, verification methods, extent, and acceptance criteria established; the sequencing and scheduling of the work, including verification (e.g., inspection and testing requirements); and the acceptance criteria for the finished product. Section 1.4 of N286-12 specifies that top management of the nuclear facility remains accountable to ensure the requirements are met.

As discussed in Section 4.1.18, Bruce Power's program BP-PROG-14.02, Contractor Management [132], provides guidance to personnel acting as Contract Managers/Officers and Supervisors for accomplishing effective oversight of contractors and supplemental personnel performing work for Bruce Power. The program defines the roles and responsibilities of the Contract Manager/Officer. Its lower level procedure, BP-PROC-00547 [133], Management of Contractors is an implementing procedure of BP-PROG-14.02. It ensures that contractors are aware of requirements in a wide range of areas such as Health & Safety, Work Protection, Human Performance, High Risk Evolutions, and Chemical Risks.

BP-PROC-00041 [89], Contract Management provides clear and consistent direction for Bruce Power staff who are required to work within the acquisition of services process. Activities associated with implementing the requirements of this procedure ensure that processes are identified and requirements are understood, recognizing that reactor safety, industrial safety, radiation safety and environment safety are essential to the achievement of the company long term goals. Clauses include the need to arrange for inspection and technical surveillance (including identifying and performing/verifying Inspection and Test Plan (ITP) hold and witness points) of on-site Supplier work, when required by the Technical Specification and/or Contract. If the scope of an on-site Contract involves safety-related or Pressure Boundary work, a Supplier

ITP, or equivalent document, shall be prepared and submitted to Bruce Power in accordance with the Supplier's QA program.

BP-PROG-05.01, Supply Chain [88], aims to ensure activities related to the specification, purchase, receipt, storage, issuance and return of items, equipment and services are adequately planned, implemented and controlled in order to achieve a risk-based, market return-on-investment for the company while supporting Bruce Power Values, plant reliability and nuclear safety. One element of this program is Quality Oversight, which is implemented through BP-PROC-00854, Quality Oversight [90].

BP-PROC-00854, Quality Oversight [90], defines the functional requirements and key responsibilities associated with Quality Services processes. The objective of Quality Service is to provide sufficient oversight of suppliers through receipt inspection of material; performance of source surveillance; validation of supplier QA requirements; review of supplier quality performance and correction of quality assurance related issues according to approved procedures that assure best practice and regulatory requirements are applied, and that only correct and accepted items and services are available for use as per established programs.

DIV-ENG-00009 [107], Design Authority, states the Chief Engineer and Senior Vice President, Engineering, is Bruce Power's overall Design Authority. The document summarizes the processes that have been put in place to execute the role of Design Authority and who in the site organization is accountable for the execution. The execution of this procedure implies that the specific Design Program Authorities and Signing Authorities as delegated by the Chief Engineer and Senior Vice President, Engineering reside within the organization. It goes on to list the delegation in specific areas within the Station, such as Plant Design Engineering and Nuclear Safety Analysis. These delegated authorities are to ensure the quality of the design and nuclear safety assessments and assurance of the management of the design basis. Section 7 of the procedure states that the Chief Engineer and Senior Vice President is accountable for the safe and reliable design of the nuclear facility. It is noted that delegation of authority to an outside organization is not permitted, thereby retaining the design authority within Bruce Power.

DPT-PDE-00008 [105], Interface with Design Contractors Performing Design Activities for Bruce Power provides a structured approach to use whenever external design engineering support is needed. When augmented staff is used, the contract staff is integrated in the respective department and Bruce Power assumes full responsibility and accountability for the work performed. The supervisory and management activities are assumed by Bruce Power and the design activities are performed under the Bruce Power Quality Assurance Program.

BP-PROC-00363 [97], Nuclear Safety Assessment, Section 7.1 states that the Manager of the Nuclear Safety Analysis and Support Department (NSASD) is the code owner for safety analysis software and is accountable for quality, development, verification, validation, documentation, maintenance and configuration management of Nuclear Safety Analysis work, and the data sets used, and codes executed within NSASD. No discussion is explicitly provided on safety assessments produced outside of the department. Its lower level documents DIV-ENG-00013, Planning of Internal Work for Nuclear Safety Analysis [153] and DPT-NSAS-00008, Management of External Work for Nuclear Safety Analysis and Support [99] provide no

guidance on the responsibility for work outside the department. Therefore, gap SF10-1 has been identified in Table 10 to highlight this issue.

DPT-NSAS-00008 [99], Management of External Work for Nuclear Safety Analysis and Support, states in Section 7.3 of that procedure, the Technical Single Point of Contact is responsible for ensuring that the deliverable is acceptable and filed with the Records system.

The WANO PO&Cs on applying the Engineering Fundamentals EN.1, on Technical Authority EN.2 and on a Nuclear Professional NP.1, address this review task, as station personnel pursue off-site resources and expertise to aid efforts in responding to emergent challenges and Corporate personnel ensure they have the funding to continuously improve and sustain high levels of safe, reliable operation and emergency response.

A review of the PassPort action requests (ARs) shows that Bruce Power has a managed system to continuously improve and enhance their programs and procedures to strengthen the means to ensure that this review task meets requirements. This was confirmed by a review of the assessments and audits, and CNSC inspections discussed in Section 7.1 (e.g., SA-COM-2015-09 described in Section 7.1.4, SA-COM-2015-12 which has been discussed in detail in Section 7.1.6, SA-COM-2015-14 described in Section 7.1.7, SA-SC-2014-05, SA-SC-2014-04, and SA-SC-2014-03) and Section 7.2.1 (e.g., AU-2015-00016). Significant improvements and enhancements have been made to the Management System documentation covering outsourced activities through the completion of corrective actions arising from past assessments and audits.

With the exception of the gap identified, Bruce Power programs and procedures meet the requirements of the review task as there are adequate arrangements for managing and retaining responsibility for activities or processes important to safety that have been outsourced.

5.2.4. Roles and Responsibilities

This task requires a review of the roles and responsibilities of individuals managing, performing and assessing work, as per Section 4.8 of N286-12 under work management. Work is planned, so planning needs to capture the role and responsibilities of individuals managing, performing and assessing the work and the work needs to be authorized and performed using approved processes and procedures.

The roles, responsibilities, authority and accountabilities of the Board of Directors and the Executive Team are defined in the Management System Manual [37]. BP-MSM-1 Sheet 0002 [39] provides a list of authorities and responsibilities for all organizational units at Section Manager level and above. The roles and responsibilities of personnel are clearly defined in the responsibilities section of each Bruce Power procedure, including a clearly identified process owner and their associated responsibilities. Additionally, as was discussed previously, BP-PROG-01.02, Bruce Power Management System (BPMS) Management [51] provides the governing processes to control and maintain the Management System, in particular Section 4.3.1 of this procedure discusses roles and responsibilities and Section 4.3.4 discusses the management of work. Lower level documents from this program, such as B-HBK-08130-00001 GOSP Implementation Handbook [58], lay out responsibilities in greater detail and consistency

amongst programs is enforced via BP-PROC-00774 Program Requirements [57] and changes to the Management System are controlled via BP-PROC-00703 Change Management Guidance [54].

Bruce Power satisfies the requirements in the PROL condition 2.2 by providing to the CNSC roles and responsibilities documents for key operating positions. BP-PROG-02.01, Worker Staffing [73] specifies the requirements for hiring of all staff positions, regular and contract, which includes a requirement that Regular employees must be recruited against current organizational competencies that are specified in approved job documents and selection criteria. The program requires that no internal or external job search can be initiated until these documents have been reviewed and approved. In addition, all Bruce Power employees receive Human Performance Fundamentals initial training, which includes a review of individual and organizational roles and responsibilities.

The roles and responsibilities for job tasks form part of the pre-job briefing requirements. As stated in the BP-PROC-00617, Human Performance Tools for Workers [47] “Pre-Job Briefing (PJB) tool is used to engage workers prior to a task so that they clearly understand what to accomplish and what to avoid. Pre-Job Briefings serve to ensure all task participants have the knowledge and information necessary to successfully perform their assigned task roles.”

Bruce Power follows the guidance on how nuclear professionals perform their work through procedures such as Engineering Fundamentals, BP-PROC-00582 [106] or Operator Fundamentals, BP-PROC-00561 [125]. Engineering Fundamentals was discussed in Section 5.2.3. That discussion is equally applicable to this section. Operator Fundamentals [125] sets expectations to ensure Operations activities achieve industry best performance. These fundamentals constitute a set of standards and behaviours for the Bruce Power Operations Division of the nuclear stations. Nuclear professionals use the Operator Fundamentals to apply the essential knowledge, skills, behaviours and practices needed to operate the plant safely and reliably.

Use of Operator Fundamentals, along with the appropriate level of proficiency, increases the probability of success. This procedure provides a discussion of each fundamental and describes the attributes that exemplify excellence. The intent is to provide insight into the teaching and understanding of operator fundamentals.

The Operator Fundamentals are as follows:

- Monitoring: Monitoring plant indications and conditions closely.
- Control: Controlling plant evolutions precisely.
- Conservatism: Operating the plant with a conservative bias.
- Teamwork: Working effectively as a team.
- Knowledge: Having a solid understanding of plant design, engineering principles and sciences.

In order for the Operator Fundamentals to benefit the individual operator, crew and station, these elements must be used during normal, abnormal and transient conditions. In addition to

the above fundamentals, two overarching characteristics are necessary to achieve excellence in Operator Fundamentals:

- Operational proficiency; and
- Operator engagement.

Operations leaders establish and reinforce the content of this procedure, which is based on industry top performance, to continually strive for improvement and intervene to identify any gaps in the process or compliance to the process (Section 4.0, [125]).

This procedure reinforces the importance of Nuclear Safety and reinforces WANO principles, traits and attributes of a healthy nuclear safety culture and the WANO PO&Cs applicable to operators' work including a Nuclear Professional NP.1.

GPS-OPS-00038 [128], Bruce A and B Operations Standard and Expectations establishes the expectations and standards for the Bruce A and B Operations Divisions and facilitates safe, reliable and consistent plant operation. The standards established within the document are used for all operational activities and are applicable for both plant operation and simulator operations. They provide direction to other departments that provide support to the Operations Divisions in operating the plants. The Operations Division is in charge of the plant. During the shift, the Shift Manager is responsible for the safe operation of the plant and has oversight of the conduct of all personnel and all activities in the station.

Operations Management establishes the highest standards for the conduct of work, ensures that all staff are aware of, and comply with the standards at all times. Management uses observations of work activities to monitor compliance and provides appropriate coaching as necessary. Operators know and understand their role in Operator Fundamentals, defined as the essential knowledge, skills, behaviours and practices that operating crews need to apply to operate the plant effectively.

The Operations Division owns the station work schedule and demonstrates leadership for enabling completion of scheduled activities by all departments.

The WANO PO&Cs on applying the Engineering Fundamentals EN.1, on Technical Authority EN.2 and on a Nuclear Professional NP.1 are applicable under this review task. Additionally, those for applying Operator Fundamentals applicable to this task are Operations Fundamentals OP.1 and Conduct of Operations OP.2. A review of the SCR database shows no adverse conditions applicable to this review task have been identified against these PO&Cs following the 2013 corporate and 2014 WANO reviews.

A review of the PassPort ARs shows that Bruce Power has a managed system to continuously improve and enhance their programs and procedures to strengthen the means to ensure that the requirements of this review task are met.

This was confirmed by a review of the assessments and audits, and CNSC inspections discussed in Section 7.1 (e.g., SA-COM-2015-12 which has been discussed in detail in Section 7.1.6, SA-ERI-2015-07, SA-ERI-2014-08, SA-ERI-2014-07, and SA-OCP-2015-17 described in Section 7.1.11), and 7.3.1 (e.g., BDPD-2011-AB-018).

No gaps against this review task were identified.

Bruce Power roles and responsibilities meet the requirements of the review task.

5.2.5. Work Processes and Supporting Information

This task requires a review of the processes and supporting information that explain how work is to be specified, prepared, reviewed, performed, recorded, assessed and improved, as per Section 4.8 of N286-12 [28] and Sections 5.5, 5.8, 5.10 and Annex A.1, A.4 of N286-05 [27].

N286-12 [28], Section 4.8 has three subsections relevant to this review task: Section 4.8.1 Work Planning, Section 4.8.2 Work Control, and Section 4.8.3 Independent Verification of Work.

Section 4.8.1 of N286-12 [28] was discussed in Section 5.2.3 as the work planning is the same whether the work is performed in-house or out-sourced. It states that work shall be identified and planned with the following: a clear description of the work including requirements and verification; worker requirements, including verification worker; supply chain requirements, including lead items; resource assignment, including the worker to perform the verification; critical characteristics of the work to be verified, verification methods, extent, and acceptance criteria established; the sequencing and scheduling of the work, including verification (e.g., inspection and testing requirements); and the acceptance criteria for the finished product.

Section 4.8.2 on Work Control focuses on ensuring that the work is authorized and performed using approved sources of information (i.e., controlled documents, software, tools, processes and practices).

Section 4.8.3 discusses the need for ensuring the independence of verification, so those performing the work do not verify it. In addition, it discusses the extent and timing of the verification in that it is based on the potential impact on the work.

The BPMS is described in the MSM [37] Section 2.2, which addresses and incorporates the following principles, which are consistent with CSA N286-05, Management System Requirements for Nuclear Power Plants [27] and are incorporated in the PROL [1]:

- Work is planned;
- The performance of work is controlled;
- Work is verified to confirm that it is correct;
- Problems are identified and resolved;
- Changes are controlled;
- Records are maintained; and
- Assessments are performed.

Bruce Power performs work based on MSM [37] Section 2.4.4, which defines a single point of accountability that is responsible for executing and achieving outcomes in accordance with planned methods and goals. This includes accountability to develop plans, schedules, scope, detailed implementing procedures and ensuring overall results. The process management procedure (DO in PLAN-DO-CHECK-ACT), identified in Section 4.0 of the MSM [37], defines

how work is done. The system of documents consisting of the MSM [37] including Policy Statements, Programs (Section 4.1.3 - Programs and Section 4.1.4 - Procedures and Processes) and other supplementary documentation (Section 4.1.6.) collectively define the organizational structure, strategic direction, authorities, responsibilities and detail what work that must be done, how it is done and by whom.

Bruce Power prepares standard programs and procedures (Section 4.1 of MSM [37]) that are key to sustainability of performance, and are approved by senior management and implemented by line management with corporate support and oversight. Section 4.1.4 of the MSM states that Bruce Power Procedures and Processes provide a structured set of activities designed to produce an output, define how the work gets done, and require standardization of procedures and processes across Bruce Power.

Section 5.1 of the MSM states that a set of performance indicators is monitored and reported on a regular basis as the means to assess performance and to improve. Section 6.0 of the MSM identifies the requirement to take action to learn and continually improve the performance of the business, including improvements in governance and equipment, and to manage changes arising from these improvements. Section 6.1 of the MSM identifies the importance of process improvements and awareness of changes to the business environment in achieving the desired performance at Bruce Power.

Additionally, as was discussed previously, BP-PROG-01.02, Bruce Power Management System (BPMS) Management [51] provides the governing processes to control and maintain the Management System, in particular Section 4.3.4 discusses the management of work.

Within specific Programs, further requirements and guidance are provided through implementing procedures. For example, as discussed in Section 4, BP-PROG-11.02, On-Line Work Management Program [119] defines the fundamental business need, constituent elements, functional requirements, implementing approaches and key responsibilities to support nuclear safety and foster a nuclear safety culture through the incorporation of the guiding principles including the provision of timely identification, screening, scoping, planning, scheduling, preparation and execution of work necessary to maximize the availability and reliability of station equipment and systems. Similarly, other Programs discussed in Section 4.1.13, BP-PROG-10.01 [96], BP-PROG-11.01 [114], BP-PROG-11.03 [120], BP-PROG-11.04 [121] provide more detailed steps for defining work in their respective areas of Plant Design Basis Management, Equipment Reliability, Outage Work Management and Plant Reliability.

Within in the various Programs, there are implementing procedures that provide direction on Design Verification. For example, in Appendix A of BP-PROG-10.01 [96] numerous procedures cover planning of work, performance of work, work verification as discussed in the body of CSA N286-05 (similar to N286-12), as well as further procedures which point to the annex of CSA N286-05. BP-PROG-11.01 does the same thing in its Appendix D.

As stated in Sections 5.2.3 and 5.2.4, Bruce Power follows the guidance on how nuclear professionals perform their work. Another example is through procedures such as Maintenance Fundamentals, BP-PROC-00580 [123] to ensure that Maintenance activities achieve industry best performance. This procedure reinforces the importance of Nuclear Safety and reinforces WANO principles, traits and attributes of a healthy nuclear safety culture and the WANO PO&Cs

applicable to maintenance such as Maintenance Fundamentals MA.1. This highlights ownership of work and how work is performed. As part of this role, among other responsibilities, examples for Maintenance personnel include:

- prepare in advance for work by performing required walkdowns, reviewing instructions, verifying qualifications, and participating in pre-job briefings;
- perform work only when authorized and only on equipment that is properly aligned for maintenance. Work activities are performed in accordance with controlled procedures; and
- planning and performing rigging, lifting, and material handling activities to high standards ensuring equipment and personnel safety.

The WANO PO&Cs discussed in Sections 5.2.3 and 5.2.4 are relevant in that they cover roles and responsibilities, in particular on Nuclear Professionals NP.1. More specifically, On-Line and Outage Work Management WM.1, Maintenance Fundamentals MA.1, Conduct of Maintenance MA.2, and Operational Risk OF.2 address this review task, as they cover work processes in their respective areas. A review of the SCR database shows that adverse conditions applicable to this review task have been identified against PO&C WM.1. A WANO AFI on work management has been raised to resolve the shortcomings. Issues have been combined and closed into one Work Management (WM) apparent cause evaluation. Due to the repeat findings, Nuclear Oversight has elevated this shortcoming to management.

A review of the assessments and audits, and CNSC inspections discussed in Section 7 was performed to assess effectiveness related to this review task. The FASAs and audits in Section 7.1 identify past Bruce Power reviews (e.g., SA-COM-2014-01, SA-ERI-2014-08, SA-ERI-2014-07, SA-ERI-2014-06, SA-SC-2014-01, and SA-WMSI-2014-03, as well as AU-2015-00010 and AU-2014-00020) relevant to this review task. Section 7.2.1.6 discusses AU-2013-00008, which describes improvements needed in the area of work management for outages in prioritizing and sufficiently preparing important activities to allow full execution of the work. Section 7.3.1 also provides some information with respect to CNSC action items (e.g., BRPD-B-2015-001) raised with respect to this review task.

Bruce Power programs and procedures meet the requirements of the review task on Work Processes, as the issues have been correctly identified and corrective actions have been identified to improve work management.

5.3. Organization and Management System Verification

Review tasks 2 a. through k. address verification of numerous aspects of the organization and management system. These are discussed in the subsections of Section 5.3.

5.3.1. Managing Organizational Change

This review task requires verification that there are adequate processes in place for managing organizational change.

N286-05 Sections 4, 5.2., 5.9 and 5.12 discuss the need to: define the organization; ensure it is understood; control changes; and the documentation of those changes. Similarly, N286-12 covers these aspects, for example in Section 4.1.2.

Under BP-PROG-01.02 [51], the BPMS, changes to the Bruce Power organization at the Section Manager level and higher are controlled by the BP-PROC-00001, Organizational Structure Change Management [55]. On an annual basis, a copy of the baseline organization down to the department manager level is provided to the CNSC in response to PROL Licence Condition 1.1.

The process ensures consideration of the impact of a proposed change on the interrelated processes, organization and document structures. The process objective is to ensure that all proposed changes are properly identified, justified, assessed for impact, planned and approved. The level and extent of review depends on the scope, complexity or potential impact of a change on safety, commercial or corporate reputation performance. This procedure does not cover changes to the Safety Related Plant Systems and how work is done, as these are covered through Programs such as BP-PROG-10.01, Plant Design Basis Management [96], BP-PROG-10.02, Engineering Change Control [109] and BP-PROC-00788, Process Change Management Procedure [56].

The WANO PO&Cs on Nuclear Organizational Structure and Traits OR.1, Manager Fundamentals OR.2, Management Systems OR.3, Corporate Governance CO.2 and Corporate Human Resources CO.6 provide guidance related to this review task. For example, OR.1, OR.3, and CO.2 are specifically referenced in BP-PROG-01.02 ([51] Section 5.6). A review of the SCR databases shows that no adverse conditions applicable to this review task have been identified against these PO&Cs following the 2013 corporate and 2014 WANO reviews.

A review of the PassPort ARs shows that Bruce Power has a managed system to continuously improve and enhance their programs and procedures to strengthen the means to ensure that the requirements of this review task are met. This was confirmed by a review of the assessments in Section 7.1 (e.g., SA-BPMS-2015-05, SA-COM-2015-07 discussed in Section 7.1.5), audits in Section 7.2.1 (e.g., AU-2012-00005 discussed in Section 7.2.1.2, AU-2013-00007 described in Section 7.2.1.5) and NK29-CORR-00531-10673 [154]) discussed in Section 7.3.1. No gaps against this review task were identified.

Bruce Power programs and procedures meet the requirements of this review task, as there are adequate processes in place for managing organizational change.

5.3.2. Human Resource Management Process

This review task requires verification that there is a human resource management process in place that ensures the availability of adequate, qualified human resources, including succession planning.

N286-05 Section 5.3 discusses the need that personnel are competent in the work they perform and Section 5.4 discusses that personnel know what is expected of them. Similarly, N286-12 covers these aspects, for example in Section 4.5.2.

Under BP-PROG-01.02 [51], the BPMS, Section 4.3.1 Resources are Managed, Bruce Power addresses the requirements of this review task through BP-PROG-01.04, Leadership Talent Management [59], BP-PROG-02.01, Worker Staffing [73] and BP-PROG-02.02, Worker Learning and Qualification [76].

These programs were discussed in Section 4, but two of the key processes are BP-PROC-00221 [60], Succession Management, which ensures there are capable managers to deliver on future business plans by identifying and developing successors to management positions, and BP-PROC-00468 [75], Workforce Planning Process, which ensures that Bruce Power has the right people with the right skills at the right time in the right jobs.

The Workforce Plan created annually as part of the business planning process is integrated with the recruiting function to develop hiring plans for all divisions across the site. The annual Workforce Plan provides objective evidence that this review task is met. More specifically, for Certified Operator Staff Planning minimum staff complements and control room staffing are maintained. The key staffing positions and the number of qualified staff are documented quarterly in Section 2 of the Quarterly Operations Reports [155], including whether there are changes to the staffing procedure DIV-OPB-00001 [127]. These are submitted to the CNSC to confirm compliance with LCH Licence Condition 2.2.

A Bruce Power submission summarizes the recruiting status in three key areas: Authorized Nuclear Operators, Shift Managers / Control Room Shift Supervisors and Unit 0 Control Room Operators. It shows that Bruce Power is continuing to project more than the qualified minimum number of operators for the next several years (data up to 2018) ([156] Section 2.2.2).

Furthermore, Bruce Power as part of its performance review of the Stations, reports on its general staffing levels and recruitment success ([144] Section 3.2.5).

The WANO PO&Cs on Corporate Leadership CO.1, Corporate Support and Performance CO.5, and Corporate Human Resources CO.6 provide guidance related to this review task. A review of the SCR databases shows two adverse conditions applicable to this review task as identified in SCRs 28403431 and 28403434 against CO.1 and CO.6 following the 2013 WANO Corporate review. Some changes were made to the GOSP Implementation Handbook, B-HBK-08130-00001 [58] to clarify responsibility and authority of corporate and station (line) organizations in regards to process implementation, as well as expectations around alignment of metrics and excellence plans/gaps to excellence. The management system was revised to ensure commitment to alignment with the GOSP model is clearly stated. These changes also resulted in an update to BP-PROG-01.02 [51].

A review of the PassPort ARs shows that Bruce Power has a managed system to continuously improve and enhance their programs and procedures to strengthen the means to ensure that the requirements of this review task are met. A review of the FASAs discussed in Section 7.1 (e.g., SA-PI-2015-08, SA-TRGD-2014-14, SA-TRGD-2014-13, and SA-TRGD-2014-10), and audits in Section 7.2 (e.g., AU-2013-00011 and AU-2013-00013) shows that there are no significant outstanding corrective actions in this area.

No gaps against this review task were identified.

Bruce Power programs and procedures meet the requirements of this review task, as there are adequate human resource management processes in place to ensure the availability of adequate, qualified human resources, including consideration for succession planning.

5.3.3. Control of Documents, Products and Records

This review task requires verification that there is adequate control of documents, products and records and that this information is readily retrievable.

This review is consistent with the requirements of Sections 5.9 and 5.13 of N286-05 and Section 4.7 of N286-12. Per N286 (both versions), controlled documents and records are to be controlled consistent with their intended use and available to those who need them. Means to uniquely identify them are included.

BP-MSM-1 defines the governing document structure and document hierarchy and BP-PROG-01.02 [51] Section 4.3.3 Information is Managed describes the record management function and responsibilities. As discussed in Section 4.1, BP-PROC-00166 [53] specifies the requirements for administrative process and procedure controlled document formatting and presentation, whereas BP-PROG-03.01, Document Management [85], is the process that Bruce Power uses to control Technical documents, products and records ensuring that the information is readily retrievable from a physical perspective. The program maintains and manages documents and records during their life cycles so their integrity, security, accessibility, disclosure and preservation is ensured, while satisfying applicable legal and regulatory requirements. As part of the Program, implementing procedures ensure that Document Owners in specific areas are identified, so they can ensure the specific requirements for controlled documents, products and records are met and the information is readily retrievable. Retrieve-ability, Secure Storage, Maintenance and Destruction of documents and records are covered in the implementing procedures, as identified in the program, including the need for signed affidavits if records are permanently destroyed or lost and as appropriate the notification of Regulatory authorities.

For example, to ensure plant modifications are managed in accordance with BP-PROG-10.03 [112], Configuration Management and BP-PROG-10.02 [109], Engineering Change Control, it is important to ensure that design changes and modifications are controlled so that the design documentation remains consistent with the as-built and as-operated station and the design basis and design requirements. This may include a non-physical change to the design, which is covered by BP-PROC-00542 [111] Configuration Information Change or a physical change covered by BP-PROC-00539 [110] Design Change Package. Configuration Management is discussed further in Section 5.3.10.

On a daily basis, Bruce Power staff utilize the Document Management system to retrieve documents and records. If documents or records are found to be incorrect, depending on the extent of the adverse condition either an SCR [69] is raised along with a Corrective Action per BP-PROG-01.07 [66] or a Document Change Request (DCR) is raised via BP-PROC-00068 [87] Controlled Document Life Cycle Management. For example, SCR 28425278 identified an incorrect revision between a control document number in PassPort, the official repository of controlled documents, and the searchable tool Livelink, due to a lack of attention to

detail. A review of the DCRs showed many have been logged against a particular document, but have not progressed past the initiation phase. This daily verification shows that Bruce Power has an effective document management system.

This was confirmed by a review of the FASAs in Section 7.1 (e.g., SA-BS-2015-01 described in more detail in Section 7.1.1, SA-BS-2015-04, SA-COM-2014-03, SA-COM-2014-01, SA-ERI-2014-07, and SA-TRGD-2015-09), audits listed in Section 7.2 (e.g., AU-2015-00015 and AU-2015-00010), and CNSC inspections discussed in Section 7.3 (e.g.,BRPD-AB-2014-007 and BRPD-2011-AB-013). FASA SA-BS-2012-01 specifically identifies the shortcoming that DCRs can become stagnant in the system, for example depending on how they are initiated. This occurs as a finding in other FASAs and Audits; for example, AU-2013-00015, where 18 outstanding DCRs were initiated prior to the revision date of a document, but they were not factored into the revision. Also, a review of some of the Action Requests raised as a result of audits and inspections performed on governance documents associated with different safety factors revealed that in many cases, the ARs have been closed with a DCR which has not been properly dispositioned. This is identified as gap SF10-2 in Table 10.

The other issue with some of Bruce Power's governance documents is discrepancies in referencing some of the regulatory documents or standards where superseded documents are still referenced in governance documents. For instance, Regulatory Standard S-296 [137] has been replaced with CNSC REGDOC-2.9.1 [138]. However, the latest version of BP-PROG-00.02 still references S-296. There are also procedural documents that cite CSA N286-05 instead of CSA N286-12.

Additionally, there are issues with out of date references in governance documents (e.g., CNSC documents that have been superseded). Some examples of these issues with various governance documents are identified in this Safety Factor Report, along with Safety Factor Reports 9, 14 and 15. This issue is identified as gap SF10-3 in Table 10.

The identified gaps notwithstanding, Bruce Power programs and procedures meet the requirements of this review task, as there is adequate means to control documents, products and records and this information is readily retrievable. Bruce Power has taken action to improve the resolution of DCRs.

5.3.4. Purchase of Equipment and Services

This review task requires verification that there is adequate control of purchasing of equipment and services where this affects plant safety.

CSA N286-05, including clauses 5, 6.4, Annexes B, C.3, F.1, F.2 and G, cover the supplying of equipment and services. Annex B specifically covers Purchasing Requirements in B.1, Inspection of purchased items and services in B.3, Receiving in B.4, and Storage and Handling in B.5. Similarly, this review is consistent with the requirements of N286-12, such as in Sections 4.1.3, 4.8.1, and in particular Section 7.6.2 on Supply Chain.

Many of the processes and procedures discussed in Section 5.2.3 regarding oversight activities or processes of contractors performing work on safety-related SSCs are equally important for the purchase of equipment and services. Bruce Power's Contractor Management BP-PROG-

14.02 [132] and Supply Chain Programs BP-PROG-05.01 [88], and their implementing procedures are applicable to this review task, as well as the interfacing programs and their detailed procedures. The list includes: BP-PROC-00547 [133], BP-PROC-00041 [89], BP-PROC-00854 [90], DIV-ENG-00009 [107], DPT-PDE-00008 [105], BP-PROC-00363 [97], and DPT-NSAS-00008 [99].

The key program addressing this review task is BP-PROG-05.01, Supply Chain Program [88]. As was described in Section 4.1.7, depending on the importance to safety, consideration of requirements are requested from the functional areas desiring the work and these are to be included in the purchase specification. They include requirements covering: receipt, storage, issuance and return of items, planning, review and verification in the production and supply of the purchased equipment and services. These are implemented, controlled and monitored consistent with the Supplier's Management System, as discussed in the next subsection. Annual assessments of the company's compliance with Supply Chain policies are conducted by Supply Chain Division ([88], Section 4.0). Additionally, from a safety perspective, design related procurement requirements are specified in accordance with procedures associated with BP-PROG-10.01 [96], to ensure compliance with regulatory and licensing requirements, including BP-PROG-00.04 [44] pressure boundary requirements so that purchased items can adequately perform their intended end-use design functions. The Engineering Division, Procurement Engineering (PE) Section provides technical evaluation and approval of safety-related, pressure boundary or nuclear class Catalog ID items and changes to the Catalog ID data ([88] Section 4.0). Furthermore, pressure boundary component inventory considerations are managed to ensure availability of spare parts, safety equipment, consumable items and operating supplies required to operate and maintain the plant and other work programs at optimum cost. Inventory levels and deployment points reflect the trade-off between service levels and costs. Service levels are established that meet internal customer needs, costs and risks of a service failure. Inventory levels are defined by safety stock and cycle stock level ([88] Section 4.1.1).

Measures are established for the inspection of the quality of purchased items or the verification of services. Inspection and verification are planned, documented and performed by the responsible organization to ensure that items and/or services meet the requirements of the purchase order/contract. The extent of inspection and verification is directly proportional to the importance to safety and the complexity of the item or service. Inspection or verification may be performed at the supplier's facilities or upon receipt of the item(s) as determined by the verification plan. The supplier's performance is monitored and inspection and verification activities modified according to performance ([88] Section 4.1.2).

In the event that services are required to safeguard public or personal safety or to prevent damage to plant and equipment, the requirements of the Supply Chain program may be set aside temporarily, subject to Executive approval, and purchasing is subject to a specific procedure. The number of such incidents, if any, is to be reported annually ([88] Section 4.2).

The Supply Chain maintains a constant scrutiny on nuclear safety through a mix of self-assessments and independent oversight to strengthen safety and improve performance ([88] Section 7.1.2).

The WANO PO&Cs on Long Term Equipment Reliability ER.3 and Corporate Support and Performance CO.5 provide guidance relevant to this review task. A review of the SCR database shows no adverse conditions applicable to this review task have been identified against these PO&Cs following the 2013 corporate and 2014 WANO reviews.

A review of the PassPort ARs shows that Bruce Power has a managed system to continuously improve and enhance their programs and procedures to strengthen the means to ensure that the requirements of this review task are met (e.g., BP-PROG-10.01).

This was confirmed by a review of the FASAs discussed in Section 7.1 (e.g., SA-COM-2014-09, SA, SC-2015-01, SA-SC-2014-04, SA-SC-2014-03, and SA-SC-2014-02) and audits listed in Section 7.2 (e.g., AU-2015-00016).

Section 7.2.1.3 provides details associated with audit AU-2012-00016 to assess the implementation and technical compliance of BP-PROC-00244, Procurement Engineering [157]. It found weaknesses with respect to compliance with CAT-ID Evaluation and Pre-Screening processes, but concluded that no safety implications arose. As part of the corrective action process, the shortcomings were recorded and appropriate actions taken to improve performance. Section 7.2.2 discusses an external audit that found an overall satisfaction in the Supply process.

No continuing gaps against this review task were identified.

Bruce Power programs and procedures meet the requirements of this review task as there are adequate controls for purchasing of equipment and services where this affects plant safety and integration between Engineering and the Supply Chain Programs.

5.3.5. Supplier's Management System

This review task requires verification that there are adequate processes in place to check the quality of Suppliers' management systems and that such systems are intended to ensure that equipment and services supplied to the nuclear power plant are fit for purpose and are provided in an effective and efficient manner.

CSA N286-05 clauses 5, 6.4, Annexes B, C.3, F.1, F.2 and G cover the supply of equipment and services. Annex B specifically covers Supplier Evaluation and Qualification in B.2. Similarly, this review is consistent with the requirements of N286-12, such as in Sections 4.1.3, 4.8.1, and in particular Section 7.6.2 (e) on Supply Chain requirements of the management system standard and applicable requirements. Section 1.4 of N286-12 specifies that top management of the nuclear facility remain accountable to ensure that the requirements are met.

BP-PROG-05.01 [88], the Supply Chain Program is implemented through BP-PROC-00854 [90], Quality Oversight, which aims to ensure the quality of purchased parts, materials, and services. In order to check the quality of suppliers' management systems, the Quality Oversight procedure requires that suppliers' quality assurance programs be audited to ensure that they are effectively implemented.

Audits and surveys are used to decide whether a supplier qualifies to be included on the Approved Supplier List and are conducted in accordance with BP-PROC-00753, Supplier Audits

[91], which describes the procedure for assessing a supplier's quality assurance program to determine if it is adequately established, implemented, controlled, and effective in achieving the expected results.

Additionally, Bruce Power's procedure BP-PROC-00041, Contract Management [89], specifies the process for the entire lifecycle of a contract for services, including responsibilities of the Contract Manager after the contract has been awarded. The Contract Manager monitors the QA program of on-site Suppliers and on-site or off-site service Suppliers involved in safety-related or Pressure Boundary work as well as quality and technical performance.

The WANO PO&Cs on Long Term Equipment Reliability ER.3 and Corporate Support and Performance CO.5 provide guidance related to this review task. A review of the SCR database shows that no adverse conditions applicable to this review task have been identified against these PO&Cs following the 2013 corporate and 2014 WANO reviews.

A review of the PassPort ARs shows that Bruce Power has a managed system to continuously improve and enhance their programs and procedures to strengthen the means to ensure that the requirements of this review task are met.

This was confirmed by a review of the assessments discussed in Sections 7.1 (e.g., SA-SC-2014-05, SA-SC-2014-04, SA-SC-2014-03, and SA-SC-2014-02). Section 7.2.2.2 discusses an external audit which found the Supply process satisfactory. Section 7.3.2 discusses a recent review of the overall Management System.

No gaps against this review task were identified.

Bruce Power programs and procedures meet the requirements of this review task as there are adequate processes which check the quality of Suppliers' management systems to ensure that equipment and services supplied to the nuclear power plant are fit for purpose and provided in an effective and efficient manner.

5.3.6. Communication Policies

This review task requires verification that there are adequate communication policies in place.

This is consistent with, and touches on, the requirements of Sections 2, 5.2, 5.4, 5.7, 6.9, 6.12 and 6.13 of N286-05 and Section 4.6 of N286-12.

The scope of this review task comprises employee communications and external stakeholder communications.

Bruce Power addresses the first part of the scope through BP-PROG-02.07, Employee Communications [83]. The program ensures that processes and means are in place so that Bruce Power employees:

- Are continually engaged in the objectives of the business and how it is performing against business goals;
- Are aware of the contribution that they as individuals and their work groups make to the performance of the business; and

- Are aware of the external environment in which the company works and of the company's relationships with external stakeholders.

The program and its implementing and interfacing procedural documents define the key responsibilities, standards, processes and vehicles used in communicating with Bruce Power employees, and in some cases non-employees, working at Bruce Power locations.

Bruce Power achieves and maintains communication excellence by adhering to the following criteria:

- Ongoing direct interaction between team members and senior corporate and plant management in the development of strategic communications for management decisions.
- Increasing alignment of internal communications strategies and programs company wide and between stations.
- Corporate, station and functional communications strategies and plans exist, which support the Company's mission, business objectives and change initiatives and can be monitored for effectiveness.
- Corporate and station executives, managers and leaders at all levels are key players in deploying the communication strategy and are able to use effective communication skills in engaging their employees.
- A culture of encouraging employees to communicate openly and honestly across all levels of the organization, to raise concerns, provide suggestions and ask questions, while also facilitating employee feedback on business and safety performance, initiatives.
- Consistency in all communications within the company, from wherever they originate, including accordance with company branding requirements and best practice standards.

BP-PROC-00868, Employee Communications: Vehicles and Processes [84] provides process details for accessing and using Bruce Power's various communication vehicles (e.g., The Point, Bruce Power TV, Intranet, targeted publications, etc.) together with a description of their purposes and accountabilities. This document defines the requirements for audits and checking of effectiveness.

Additionally, BP-PROG-09.02 [95], Stakeholder Interaction defines the fundamental business need, implementing approaches and key responsibilities associated with managing stakeholder interaction and communication. This program establishes Bruce Power's public outreach approach and ensures information on health, safety and security of persons and the environment, and issues associated with the company's licensed operations and activities are effectively communicated.

On a weekly basis, such communication as the Chief Executive Office weekly safety message and week in review covering the four pillars of safety and performance are issued to all staff, while bi-weekly and monthly, such items as the Employee Communications newsletter the Point is issued and Safety and Business Performance Meetings are held.

A general e-mail is sent listing the communications weekly wrap-up reiterating each of these items. Communications are issued to external stakeholders through Town Hall meetings and press releases.

The WANO PO&Cs on Leadership LF.1, Management Systems OR.3, Corporate Leadership CO.1, Corporate Communications CO.7 and Nuclear Organization and Traits OR.1 provide guidance related to this review task, recognizing that most PO&Cs identify the need to communicate. The key ones are CO.1 and CO.7. A review of the SCR database shows that no adverse conditions applicable to this review task have been identified against these PO&Cs following the 2013 corporate and 2014 WANO reviews. Following WANO reviews in October of 2015, Bruce B received a WANO Good Practice 2015-05, on Nuclear Organization Structure and Traits, which covered the Organizational Effectiveness (OR.1) and Performance Improvement (PI-3) areas.

A review of the PassPort ARs shows that Bruce Power has a managed system to continuously improve and enhance their programs and procedures to strengthen the means to ensure that the requirements of this review task are met. This was confirmed by a review of the assessments discussed in Sections 7.1 (e.g., SA-STK-2015-01 discussed in Section 7.1.16). The 2015 evaluation of Bruce B performed by IAEA's Operational Safety Review Team (OSART) also identified a strength is Bruce Power's ability to implement effective communication and engagement with various stakeholders (Section 7.2.2.1).

No gaps against this review task were identified.

Bruce Power programs and procedures meet the requirements of this review task as there are adequate communication policies in place.

5.3.7. Training Facilities and Programs

This review task requires verification that there are adequate facilities for training and training programs are well structured.

This review task is consistent with aspects of Section 5.3 of N286-05 and similarly Section 4.5.2 (a), (c), (d), (e) and (f) of N286-12.

The requirements established in BP-PROG-02.02, Worker Learning and Qualification Program [76] apply to Bruce Power personnel and training areas, with the exception of Nuclear Security.

BP-PROG-02.02 ensures that personnel are provided with the competencies and qualifications necessary to satisfy the requirements of applicable legislation and other regulatory requirements commensurate with Bruce Power business needs. The Bruce Power training processes follow a Systematic Approach to Training to meet the requirements of B-HBK-09500-00003 [158], Training Performance Objectives and Criteria. This document contains standards for training intended to promote excellence in support of operating the Bruce Power nuclear generating stations.

The procedures and job aids that support implementation of this program:

- Implement the necessary controls to ensure personnel are competent to do the work assigned to them;

- Implement the intent of the Bruce Power Training Performance Objectives and Criteria (TPO&Cs). The Bruce Power TPO&Cs address the intent of both the CNSC and INPO training performance objectives and criteria; and
- Require the training elements that support Worker Qualifications approved for inclusion within the Training and Qualification Descriptions (TQD) be created, managed and conducted in a manner that fully meets the intent of the Bruce Power TPO&Cs. The qualifications within these TQDs are considered key qualifications and include:
    - TQD-00009 for Engineering Support Personnel;
    - TQD-00012, -00013, -00014, and -00015 associated with Certified Operator Training;
    - TQD-00019, -00030, -00031, and -00032 associated with Nuclear Operator Training;
    - TQD-00022 for Control Maintenance personnel;
    - TQD-00023 for Mechanical Maintenance personnel;
    - TQD-00036 for Chemical Technologists and Responsible System Chemists;
    - TQD-00046 for Radiation Protection Technicians; and
    - TQD-00075 for Health Physicists, Authorized/Responsible Health Physicists.

Bruce Power has in place training facilities, including two state of the art full scope main control room simulators used for initial certification training of Bruce Power station staff, examination of staff, and continuing training of certified staff. Other simulators include a fuel handling simulator, classroom simulators and kiosk simulators. The fuel handling simulator is used for training personnel from both Bruce A and B. The classroom simulators are non-interactive displays used for training operators outside of the main control room simulators, while the kiosk simulators are not used for training but are available for the Simulator Support department and select instructors and examiners to develop training and examination simulations, as well as troubleshoot and upgrade the simulators.

In addition to simulators, Bruce Power has dedicated training facilities, both on and off site to provide regular and contract staff the necessary training for their specific roles. These facilities include, but are not limited to the Bruce Learning Center, Bruce Technology Skills Training Centre, and the Kincardine training facility. The list of all of the training facilities is included in the scheduling database and is used to assign the appropriate facility to each course. Included in these facilities are class rooms, maintenance training shops, station component mock ups and rehearsal spaces.

Bruce Power's SEC-SIMM-00001, Simulator Validation [77] establishes the validation procedure for the full scope Canada Deuterium Uranium (CANDU) control room simulator. The validation procedure is used to confirm that the simulator is capable of providing the correct observable control room responses during the training and testing exercises.

Changes to the simulator are performed following change control procedure SEC-SIMM-00002: Simulator Change Control [78]. The procedure provides instructions for the development,

review, verification, approval, installation, commissioning, and closeout of any modification made to a Bruce Power Full Scope Training simulator.

Bruce Power has a Fire Training facility at site. The facility is used to train staff on fire-fighting techniques. Bruce Power provides its staff with general guidelines regarding the use of the facility in SEC-CST-00001, General Field Guidelines at Bruce Learning Centre Fire Training Area [79]. The purpose of the guidelines is to provide instructions covering the day-to-day operation of the Fire Training Field Area to ensure minimal impact on the environment and surrounding buildings from the training exercises. Training includes initial classroom instruction followed by periodic classroom instruction, fire-fighting practice and site fire drills. Training program requirements associated with the Fire training facility are governed by the processes and activities associated with the requirements of BP-PROG-02.02, Worker Learning and Qualification Program [76].

The WANO PO&Cs on Nuclear Professional NP.1, Leadership LF.1 and Training TR.1, recognizing each program area provide guidance related to this review task. A review of the SCR database shows that no adverse conditions applicable to this review task have been identified against these PO&Cs following the 2013 corporate and 2014 WANO reviews.

A review of the PassPort ARs shows that Bruce Power has a managed system to continuously improve and enhance their programs and procedures to strengthen the means to ensure that the requirements of this review task are met. This was confirmed by a review of the assessments discussed in Sections 7.1 (e.g., SA-TRGD-2015-12 discussed in detail in Section 7.1.17, SA-TRGD-2015-19, and SA-TRGD-2014-09) and audits which have been discussed in Section 7.2 (e.g., AU-2013-00015, AU-2013-00015, and AU-2013-00011). Further discussion is provided in Safety Factor 12.

No gaps against this review task were identified.

Bruce Power programs and procedures meet the requirements of this review task as specific facilities for training exist and training programs are well structured.

5.3.8. Employing Suitably Qualified Internal and External Staff

This review task requires verification that there are formal arrangements in place for employing suitably qualified internal and external technical, maintenance or other specialized staff.

This review task is consistent with Sections 5.3 and 6.4, and Annexes B.2, C, and F of N286-05 and similarly Section 4.5.2 (b) and for external staff the specific requirement in Section 7.6.6 (b) of N286-12.

Employing suitably qualified internal staff is done in accordance with BP-PROG-02.01, Worker Staffing [73] as explained in Section 5.2.4 and 5.3.2.

The process of employing external technical, maintenance and other specialist staff is controlled through BP-PROG-02.01, Worker Staffing [73] and BP-PROC-00355, Hiring Process (Contractors) [74]. BP-PROG-02.01 defines requirements for hiring of Regular, Temporary and Contract Employees. This process covers both contracted staff working within a defined scope project under the direct supervision of Bruce Power, as well as those personnel working under

the supervision of an external organization that has been contracted to deliver a service. Contractor access to site and Bruce Power assets is controlled.

Contractors who work on site under Bruce Power supervision are required to attend the same orientation and training as a regular hired employee of Bruce Power. The Contract Manager or delegate is responsible for meeting with the successful bidder and identifying Bruce Power requirements for contractors accessing the Bruce Power site. Discussions include requirements for security, health screening, training needs, code of conduct, Nuclear Employee Worker Designation and Dose Information Requirements.

BP-PROC-00041, Contract Management [89] outlines the process utilized during the selection process for contractors. Specific controls are defined for contractors whose scope of work includes activities relating to nuclear safety or pressure boundary work.

The WANO PO&Cs on Leadership LF.1 and Training TR.1, recognizing each program area, provide guidance related to this review task. A review of the SCR database shows that no adverse conditions applicable to this review task have been identified against these PO&Cs following the 2013 corporate and 2014 WANO reviews.

A review of the PassPort ARs shows that Bruce Power has a managed system to continuously improve and enhance their programs and procedures to strengthen the means to ensure that the requirements of this review task are met. This was confirmed by a review of the assessments discussed in Sections 7.1 (e.g., SA-COM-2014-09, SA-TRDG-2014-14, SA-TRGD-2014-13, SA-TRGD-2014-10, and SA-TRGD-2014-06), and audits listed in Section 7.2 (AU-2015-00010 and AU-2015-00012).

No gaps against this review task were identified.

Bruce Power programs and procedures meet the requirements of this review task.

5.3.9. Feedback of Operating Experience to the Staff

This review task requires verification that there are adequate processes in place for feedback of operating experience to the staff, including experience relating to organizational and management failures.

This review task is consistent with the requirements of Sections 0.2, 5.6, 6.18, and 6.19 Annex A and D of N286-05 and similarly requirements such as Section 4.12 and 7.3.2 of N286-12.

This area is reviewed extensively in Safety Factors 8 and 9.

As described in various IAEA documents, signatories to the international Convention on Nuclear Safety are required to have an OPEX program[5]. Canada is a signatory and the enforcement of

[5] A portion of INSAG-23 [159] states:

> *"4. By signing the international Convention on Nuclear Safety (CNS), each Contracting Party commits to taking the appropriate steps to ensure that:*
>
> *"... incidents significant to safety are reported in a timely manner by the holder of the relevant licence to the regulatory body; [and that] programmes to collect and analyse operating experience are established, the results obtained and the conclusions drawn are acted upon and that existing*

this requirement falls to the CNSC. The CNSC ensures that the requirement is passed to nuclear utilities indirectly through including CSA N286-05 [27] in the licences.

In Bruce Power, the OPEX Program taking direction from CSA N286-05 [27] is BP-PROG-01.06, Operating Experience Program [61]. The workhorse implementing procedure is BP-PROC-00062, Processing External and Internal Operating Experience [62]. This procedure identifies the processes used to accomplish the following two Program goals:

- To use external operating experience information to identify, evaluate and apply lessons learned to improve plant safety, reliability and commercial performance through improvements to processes, procedures, training and system/equipment design; and
- Communicate internal experience from the Bruce Site to others in the Nuclear Industry in order to improve nuclear plant safety, reliability and commercial performance around the world.

The PROC then provides detailed instructions on how to extract and process incoming and outgoing OPEX. Submission of SCRs (BP-PROC-00060 [69]), Action Tracking (BP-PROC-00019 [68]), and Root Cause Investigations (BP-PROC-00518 [70]) and Apparent Cause Investigation (BP-PROC-00519 [71]) are associated processes where the impact of inadequate management activity would occur.

A general observation is that many procedures that have been revised in the past three years have added OPEX as one of the components.

The development of Corrective Action Plans from SCRs requires consideration of OPEX.

BP-PROG-02.02, Worker Learning and Qualification [76], requires training on OPEX based on job function, with suggestions for continuous exposure to OPEX training for all employees.

BP-PROC-00965, Visual Management Board (VMB) [72] is a key communication tool used at Bruce Power. These boards, which display current standardized information, communication and performance metrics, are used as a visual focal point relevant to the area of focus. Bruce Power VMB content includes Current Plant Status Condition, Safety and/or Human Performance Messages and relevant Operational Experience information among other communications. As noted in Section 7.2.2.1, the IAEA OSART identified Bruce Power's VMB as one of the 10 Good Practices.

The WANO PO&Cs on Operating Experience OE.1 and Nuclear Professional NP.1 provide guidance relevant to this review task, recognizing that each program area reviews operating experience. A review of the SCR database shows that no adverse conditions applicable to this

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mechanisms are used to share important experience with international bodies and with other operating organizations and regulatory bodies".

All Contracting Parties have indicated in the review meetings of the CNS that they have such programmes in place. These programmes have been valuable. Nonetheless, events do recur and this gives INSAG reason to believe that the mechanisms for operating experience feedback are not as effective as they could be. INSAG concludes that significant safety benefits could be achieved by enhancing national and international Operating Experience Feedback (OEF) programmes.

review task have been identified against these PO&Cs following the 2013 corporate and 2014 WANO reviews.

A review of the PassPort ARs shows that Bruce Power has a managed system to continuously improve and enhance their programs and procedures to strengthen the means to ensure that the requirements of this review task are met. This was confirmed by a review of the assessments discussed in Sections 7.1 (e.g., SA-PI-2015-01, which has been discussed in Section 7.1.14 and SA-PI-2015-05 described in Section 7.1.15), Audits listed in Section 7.2 (e.g., AU-2015-00010 and AU-2013-00018), and Regulatory inspections discussed in Section 7.3 (e.g., BRPD-2011-R-010). These FASAs and Audits identify past Bruce Power reviews relevant to this review task and lessons learned following the refurbishment of Unit 1 and 2.

No gaps against this review task were identified.

Bruce Power programs and procedures meet the requirements of this review task as adequate processes are in place for feedback of operating experience to the staff, including experience relating to organizational and management failures.

5.3.10. Maintaining the Configuration of the Nuclear Power Plant

This review task requires verification that there are suitable arrangements in place for maintaining the configuration of the nuclear power plant and operations are carried out in accordance with the safety analysis of the plant.

This review task is consistent with Section 6.3 of N286-05, which covers the interface between the plant operating documentation and the Safe Operating Envelope (SOE) and is similarly covered in N286-12, for example in specific requirements in Section 7.5.

The design and the safety analysis establish an envelope of plant configurations and operating limits acceptable for safe operation. The operation of the plant needs to remain within this safe operating envelope by (a) defining the acceptable configurations and operating limits; and (b) incorporating these requirements in plant settings and in operating and maintenance procedures, as appropriate.

BP-PROG-10.03 [112], the Configuration Management (CM) program ensures that modifications to the plant, operation, maintenance and testing of the physical plant configuration are consistent with the design requirements as expressed in the facility configuration information. This consistency is maintained throughout the operational life-cycle phase, including when changes are proposed. BP-PROG-10.02 [109], Engineering Change Control, identifies the steps necessary to ensure reviews are conducted prior to the change so the Plant Design Basis, Operations and Maintenance procedures can remain synchronized with the implementation of the design changes. The CM program is established to ensure that:

- Design requirements for SSCs, tools, software and hardware are defined and documented;
- Changes to design requirements are identified, documented, controlled, evaluated and approved or rejected;

- Approved Design Changes and implementation status are recorded and reported throughout the life of the Plant, which results in the accurate implementation of Design Output information into the physical configuration of the Plant (i.e., the as-built status matches the design documents); and
- Plant configuration documents specifying operations, maintenance, testing, installation, procurement, inspection, and training requirements are updated and maintained consistent with the Plant design.

Under BP-PROG-10.02 [109] Engineering Change Control, design changes and modifications are controlled so the design documentation remains consistent with the as-built and as-operated station and the design basis and design requirements. This includes non-physical changes to the design, which are covered via BP-PROC-00542 [111] Configuration Information Control. Physical changes are covered via BP-PROC-00539 [110] Design Change Package.

The link to Safety Analysis is captured in BP-PROC-00363 [97], Nuclear Safety Assessment, which was discussed in Section 5.2.3. Lower level procedures under BP-PROC-00363, including DPT-NSAS-00011 Configuration Management of Safety Analysis Software [100], DPT-NSAS-00012 Preparation and Maintenance of Operational Safety Requirements [101], DPT-NSAS-00015 Planning and Execution of Nuclear Safety Assessments [102], and DPT-NSAS-00016 [103], Integrated Aging Management for Safety Assessment cover: the updating of the SOE; execution of new analysis ensuring its review by those knowledgeable in the SOE; and the requirement to ensure that the condition of the plant is monitored and inspected so the results can be used to ensure that current safety margins of the aged plant remain adequate.

As part of the SOE program, if the Safety Analysis limits are adjusted, the operating documentation, including items such as the Operating Manuals and Safety System Testing, is adjusted to remain in configuration.

Non-conformances in configuration are identified as per the BP-PROC-00060 [69], the Station Condition Record Process. Trends in SCRs related to configuration can be captured and ongoing implementation of corrective actions is monitored through reviews of audit findings related to configuration management.

Separately, CM oversight and trending is performed per BP-PROC-00470 [159], Configuration Management Program Oversight and Trending, which establishes a mechanism for monitoring, trending and reporting the health of the Bruce Power CM Program.

The WANO PO&Cs on Design and Operating Margin Management CM.1, Operational Configuration Control CM.2, Maintenance Fundamentals MA.1, Design Change Processes CM.3, Nuclear Fuel Management CM.4, Operations Fundamentals OP.1, Operational Risk OF.2 and Corporate Support and Performance CO.5 provide guidance relevant to this review task. A review of the SCR database shows one adverse condition applicable to this review task as identified in SCR 28508028 has been identified against these PO&Cs. This resulted in a number of actions to correct a process gap between the safety analysis and SOE. Given that planned and monitored initiatives are underway, this is not identified as a gap for the purpose of this assessment.

A review of the PassPort ARs shows that Bruce Power has a managed system to continuously improve and enhance their programs and procedures to strengthen the means to ensure that the requirements of this review task are met. This was confirmed by a review of the assessments discussed in Sections 7.1 (e.g., SA-COM-2015-03 discussed in detail in Section 7.1.3 and SA-COM-2015-07 described in Section 7.1.5) and audits listed in Section 7.2 (e.g., AU-2015-00018, AU-2015-00015, and AU-2015-00010).

For example, Section 7.2.1.2 notes the overall Configuration Management Engineering functional area procedures was found to meet the requirements of the Program documents although minor gaps and misalignments were found with respect to Bruce Power Management System requirements.

No gaps against this review task were identified.

Bruce Power programs and procedures meet the requirements of this review task, as there are suitable arrangements in place for maintaining the configuration of the nuclear power plant and operations are performed in accordance with the safety analysis of the plant.

5.3.11. Continuous Improvement Programs

This review task requires verification that there are programs in place for ensuring continuous improvement, including self-assessment and independent assessment.

This requirement is consistent with Section 5.14 of N286-05 [27] and similarly Sections 4.11 and 4.13 of N286-12 [28].

The BP-MSM-1 [37], Management System Manual under Values and Behaviours, Section 1.3.4 Passion for Excellence, states that Bruce Power is to demonstrate commitment to continuous improvement to create sustainable performance excellence which benefits the stakeholders and Section 5.1 of BP-MSM-1 states that Bruce Power has an established set of performance indicators that are monitored and reported on a regular basis.

Substandard performance and conditions are identified and appropriate corrective action initiated using the processes documented in BP-PROG-01.07 [66], Corrective Action and BP-PROC-00060 [69], Station Condition Record Process.

BP-PROG-01.02 [51], the BPMS program Section 4.5.3 discusses the requirement for each CFAM to consider and identify how the processes and practices of the Functional Area ensure continuous improvement.

BP-PROC-00137 [63], the Focus Area Self-Assessment (FASA) is used to achieve continuous improvement by identifying areas needing improvement and initiating corrective actions if weaknesses are identified and communicating and sharing strengths. FASAs are performed by managers and employees in an effort to confirm that their work processes, work activities, human performance and performance results meet the requirements of the Management System and independent audits by the Nuclear Oversight department. The results of the evaluation are then compared against the programs and procedures, regulatory and statutory requirements, management's business goals and expectations, and industry standards of excellence.

Each of the Fundamental procedures in the respective disciplines for example, Engineering, Operations, Maintenance, and Supply include expectations to improve.

Given the pervasiveness of continuous improvement in the industry, there are numerous WANO PO&Cs, including Nuclear Professional NP.1, Long-Term Equipment Reliability ER.3, Performance Monitoring PI.1, Nuclear Safety Culture SC.1, Manager Fundamentals OR.2 Nuclear Organisation Structure and Traits OR.1, Independent Oversight OR.5, Corporate Leadership CO.1 and Corporate Governance CO.2, and Corporate Independent Oversight CO.4 which provide guidance for this review task. A review of the SCR database shows that no adverse conditions applicable to this review task have been identified against these PO&Cs following the 2013 corporate and 2014 WANO reviews. Following WANO reviews in October of 2015, Bruce B received a WANO Good Practice 2015-05, on Nuclear Organization Structure and Traits, which covered the Organizational Effectiveness (OR.1) and Performance Improvement (PI-3) areas.

A review of the PassPort ARs shows that Bruce Power has a managed system to continuously improve and enhance their programs and procedures to strengthen the means to ensure that the requirements of this review task are met. This was confirmed by a review of the assessments discussed in Sections 7.1 (e.g., SA-BPMS-2015-04 and SA-PI-2014-04) and audits listed in Section 7.2 (for instance, external audit performed by IAEA's OSART and described in Section 7.2.2.1). Each functional area is now required to do a confidential annual assessment review of the state of their Corporate Functional Area. Responses to WANO and internal audits are summarized and assessed to show plans are on track to show improvement. Issues or concerns such as repeat findings are elevated to senior management. An assessment (SA-BPMS-2015-04) was conducted on the Peer Group competence and effectiveness to ensure groups were open and assisting each other in their improvement efforts and following the GOSP Implementation Handbook [58].

For example, SA- OCP-2015-17: Quick Hit Self-Assessment – INPO 15-004 Operator Fundamental Review, explained in Section 7.1.11, compared the contents of INPO 15-004 to BP-PROC-00561 [125], Operator Fundamentals, and identify the changes and gaps to be considered for incorporation in the revised document. INPO 15-004 contains additional insight into the topic of Operator Fundamentals and provides amplification of the standards for fundamental operator behaviours as Operator Fundamentals evolve within the industry. This assessment has led to a number of changes to the procedures, which will be considered in the next revision of BP-PROC-00561 (AR #28520969) by June 2017.

A subsequent CNSC Inspection (Section 7.3.3) was conducted to assess compliance with regulatory requirements. The inspection assessed compliance with specific clauses of CSA N286-05 and the Bruce Power processes for self-assessment as defined by BP-PROG-01.06, Operating Experience Program [61] and independent assessments defined by BP-PROG-15.01, Nuclear Oversight Management [134], and related implementing and interfacing documents. CNSC staff had positive observations about the process; however, CNSC staff identified shortcomings in the Bruce Power process for raising SCRs. CNSC staff concluded that, despite the efforts to audit all programs in a three-year period, the performance audits covered only a limited number of the implementing procedures and a risk-based audit methodology was not fully developed. The CNSC staff concluded that the consequence of these weaknesses is that

management does not have complete input information for their effectiveness reviews of the management system. Nonetheless, generally Bruce Power personnel followed the procedures for self-assessments and audits as identified in the program documents BP-PROG-01.06 [61] and BP-PROG-15.01 [134]. Furthermore, subsequently improvements have been completed.

The FASA, SA-OCP-2013-04, reviewed BP-PROG-12.01, Conduct of Plant Operations compliance with N286-05 (Section 7.1.12). It provides evidence that programs are in place to ensure continuous improvement. The FASA noted that BP-PROG-12.01 was below standard for quality and completeness; however, it lists all credited requirements of the standard with a few exceptions identified. To address these quality deficiencies the three year document review DCRs were updated with instructions to correct references and an SCR was raised to have a matrix added to BP-PROG-12.01 to specify which procedures satisfy which requirements.

Section 7.2.1 Internal Audits provides a sampling of recent relevant audits, which confirm that when process weaknesses were observed these conditions were recorded as Opportunities For Improvement to assist in the continuous improvement activities relating to the Management System.

Bruce Power programs and procedures meet the requirements of this review task in that there are programs in place for ensuring continuous improvement, including self-assessment and independent assessment.

5.4. Safety Culture

The review tasks in this subsection involve a review of the safety culture. Safety culture is a requirement of Section 0.3 of N286-05 and Section 4.2 of N286-12.

5.4.1. Review of the Safety Policy

This review task requires review of the safety policy to verify that it states that safety takes precedence over production and to confirm that the policy is effectively implemented. Section 4.2 (a) of N286-12 covers the need for a nuclear safety policy.

Bruce Power addresses the requirements of this review task through a statement of their safety policy in the Bruce Power MSM [37]. Section 1.3.1 of the MSM states the Safety First Value. Appendix A of Bruce Power MSM provides information on Bruce Power's Nuclear Safety Management Policy and states that "Individuals at all levels of the organization consider nuclear plant safety as the overriding priority. Their decisions and actions are based on this priority, and they follow up to verify that nuclear safety concerns receive appropriate attention. The work environment, the attitudes and behaviours of all individuals reflect and foster such a safety culture. Bruce Power shall ensure that reactor safety is the overriding priority in its business decisions and activities, and as the operator of a nuclear power plant accepts that its fundamental reactor safety objective is to protect the public, site personnel and the environment from harm, by establishing and maintaining effective defences against radiological hazards."

Similarly, BP-PROG-01.02 [51], the BPMS program Section 4.1 states: Safety is the Paramount Consideration for Guiding Decisions and Actions. Each CFAM is required to consider and

identify how the processes and practices of the Functional Area over which they have programmatic governance and oversight fosters a healthy nuclear safety culture and ensures that nuclear safety requirements and considerations are given the highest priority within their Functional Area. Furthermore, the following message from the President and Chief Executive Officer is included in BP-MSM-1 stating in Section 1.3.1, that top performance is achieved by fostering a healthy Safety Culture.

Bruce Power embraces and practices strong nuclear safety principles, recognizing that reactor safety, industrial safety, radiation safety, and environmental safety are essential to the successful achievement of our long-term goals and key to its reputation.

BP-MSM-1 states that the Management System addresses and incorporates the following principle, consistent with CSA N286-12 [28] and IAEA GS-R-3: The management system for facilities and activities [161]: Safety is the paramount consideration guiding decisions and actions.

Key Results Areas have also been established in the Bruce Power MSM [37] and support implementation of the Safety First Policy:

- Nuclear Performance Index (NPI): NPI is based on a WANO score out of 100 made up of 10 indicators. The WANO performance indicators have been adopted to provide a quantitative indication of plant performance in the areas of nuclear plant safety and reliability and personnel safety. WANO performance indicators encourage emulation of the best industry performance and motivate the identification and exchange of good practices in nuclear plant operation.
- Safety Performance is a set of metrics that measure the ongoing safety performance of Bruce Power staff. Corporate level Key Performance Indicators include Collective Radiation Exposure (e.g., Outage Whole Body Dose) and Industrial Safety Accident Rate [162].

BP-PROC-00892 [65], Nuclear Safety Culture Monitoring provides the framework for Bruce Power to monitor nuclear safety culture between formal assessment activities, in particular to have mechanisms to identify and correct potential gaps in nuclear safety culture. BP-PROC-00016, Business Assessment Process [52] identifies the process to evaluate the effectiveness of the BPMS and foster continuous improvement. This document includes a process for periodic review of oversight and safety culture findings to contribute to fostering a healthy nuclear safety culture and business excellence.

In 2011, Bruce Power introduced a monitoring process to identify subtle changes in Nuclear Safety Culture between formal assessments. Bruce Power considered this approach a leading practice and implemented Nuclear Safety Culture Monitoring Panels (NSCMPs) at Bruce B as of September 2012. The objective of the NSCMP is to review the material from various managed processes against INPO/WANO Traits of a Healthy Nuclear Safety Culture, which are broadly equivalent to IAEA Safety Culture Characteristics. This review identifies themes for further reflection and action, as well as to foster a common understanding of Safety Culture across the organization.

Bruce Power is using NEI 09-07 Rev 1, Fostering a Healthy Nuclear Safety Culture, as a guide for this process. Bruce Power also conducted Nuclear Safety Culture Assessments during the previous licence period, most recently a comprehensive site wide self-assessment in May-June 2013[6].

The assessment used the INPO/WANO Traits of a Healthy Nuclear Safety Culture Framework and included a survey, interviews and focus groups as part of the methodology. Results from the assessment were considered and action plans developed to address findings. On a regular basis, leaders at Bruce B are provided structured opportunities to review Nuclear Safety Culture operating experience as part of an industry wide WANO requirement. The INPO/WANO Traits of a Healthy Nuclear Safety Culture were rolled out to all staff through special focus segments during Bruce Power's monthly safety video.

Development of methodologies and sharing of good practice to more quickly assess and respond to potential changes in nuclear safety culture will continue to be a focus. There is an opportunity to undertake more narrow but more frequent assessments and to extend the time between full assessments to every three to five years [156].

CNSC staff was aware of the site-wide Nuclear Safety Culture Assessment and Bruce Power submitted information regarding its 2013 safety culture self-assessment, method, findings, corrective action plans and implementation to the CNSC who concluded that Bruce Power followed the established processes for safety culture self-assessment. In its submission, Bruce Power identified areas for continuous improvement. The progression towards using updated industry standards and participating in developing such standards regarding safety culture and continuous improvement was identified by CNSC staff as a strength for Bruce Power ([163] Section 3.1.2). Bruce Power has also added some cultural pattern questions related to Safety Culture to the 2015 Employee Engagement Survey. These new questions provide a means for continuous assessment of Safety Culture between formal periodic assessments.

The WANO PO&Cs on Nuclear Safety Culture SC.1 and Corporate Leadership (CO.1) provide guidance for this review task, as does the information provided in the following subsections of Section 5.4. A review of the SCR database shows that no adverse conditions applicable to this review task have been identified against these PO&Cs following the 2013 corporate and 2014 WANO reviews.

A review of the PassPort ARs shows that Bruce Power has a managed system to continuously improve and enhance their programs and procedures to strengthen the means to ensure that the requirements of this review task are met. This was confirmed by a review of the assessments discussed in Sections 7.1 (e.g., SA-PI-2015-09), audits listed in Section 7.2 (for instance the review performed by IAEA's OSART which has been discussed in Section 7.2.2.1) as well as the listing of CNSC inspections in Section 7.3.1.

Bruce Power programs and procedures meet the requirements of this review task, as the safety policy states that safety takes precedence over production and the policy is effectively implemented.

[6] The next Nuclear Safety Culture Assessment is scheduled in 2016 and will include considerations of security culture in addition to Nuclear Safety Culture.

5.4.2. Control of Nuclear and Radiation Safety

This review task requires a review of procedures to ensure that nuclear and radiation safety are properly controlled and appropriate measures are applied consistently and conscientiously by all staff.

Nuclear Safety is controlled by ensuring defence-in-depth through the use of appropriate barriers to protect workers, the public and environment. These barriers are physical (established through design), procedural (established through the management system) and operational (implemented through the establishment of qualified, trained, personnel who follow conservative decision making). These tend to fall within broad categories of prevention, mitigation and accommodation. At Bruce Power, Organizational responsibilities and change approval authority has been assigned to promote through standard processes and activities a commitment to Nuclear Safety which is subdivided into four pillars (discussed in Section 4.1).

The organization's core values and behaviours reflect a collective commitment by all nuclear professionals to make nuclear safety the overriding priority, as evidenced in the discipline Fundamentals documents [106][123][125].

The Plant Design Basis Management [96] program ensures that the design basis and defence-in-depth barriers remain intact, while the Engineering Change Control [109] program ensures that changes to the design are thoroughly reviewed from a nuclear safety perspective by including each of the four pillars of safety. The potential impact on nuclear safety is assessed, including the impact on operational risk and the probabilistic safety assessment during design changes. Completed design changes are incorporated into the plant probabilistic safety assessments.

Finally, under the Configuration Management [112] program and in particular through the Margin Management procedure, BP-PROC-00786 [113], design and operating margins are assessed to ensure the operator's ability to maintain the plant under safe conditions even following postulated transient, upset and accident conditions.

BP-PROG-12.05 [130], the Radiation Protection program, outlines how this specific pillar of nuclear safety is achieved. Bruce Power has a policy statement on Radiation Protection Management [37], which is achieved by establishing and implementing standards and processes for the conduct of licensed activities. A suite of procedures available through the Radiation Protection Program [130] defines the processes and standards to ensure that the Policy objectives are met.

Workers performing radiological work are responsible for the safe conduct of radiological work in accordance with the instructions they have been provided. They have the authority to stop work or prevent work that could result in a violation of the Radiation Protection Program, radiation protection standards or procedures, unplanned radiation dose or otherwise endanger personnel.

Bruce Power has a process in place for routine recording and evaluation of radiation doses to workers to ensure the Radiation Protection Program effectiveness. These include:

- Dosimetry and Dose Reporting; and

- Quarterly CNSC Performance Indicator Reports (e.g. [164]), which provide Operational reports on the Total Station Whole Body Radiation Dose and identify the number of workers, including those with no dose.

Item 8 in Section 5.2 of REGDOC-3.1.1 specifies reporting requirements for events or likely events where workers may receive a significant dose. Additionally, Section 3.1 of REGDOC-3.1.1 specifies the requirements for quarterly reports on safety performance indicators including detailed specifications for reporting collective radiation exposure (outlined in Section 1 of Appendix B). The Quarterly CNSC Performance Indicator Reports meet the requirements of REGDOC-3.1.1.

Worker dose control continues to comply with the regulatory requirements to measure and record doses received by workers. No worker or member of the public received a radiation dose in excess of the annual regulatory dose limits or action levels established in the Bruce Power RP program. The dose information for Bruce A and B was provided in Section 2.7 and Appendix D of the CNSC Staff Integrated Safety Assessment of Canadian Nuclear Power Plants for 2014 ([147] Section 3.1.1.7).

CNSC staff did not identify any regulatory non-compliances or areas requiring improvement in 2014 in the application of As Low As Reasonably Achievable (ALARA). In 2014, CNSC staff conducted a focused inspection on ALARA planning and control at Bruce Power, and noted an overall improving trend in the area's performance, including extensive work planning and implementation of several ALARA initiatives resulting in dose savings. CNSC staff identified a few areas for improvement during this inspection and Bruce Power is addressing these. CNSC staff found that application of ALARA at Bruce Power meets regulatory requirements ([147] Section 3.1.1.7).

The WANO PO&Cs on Leadership LF.1, Maintenance Fundamentals MA.1, On-Line and Outage Work Management WM.1, Project Management PM.1, Equipment Performance ER.1, Long-Term Equipment Reliability ER.3, Design and Operating Margin Management CM.1, Design Change Processes CM.3, Nuclear Safety Culture SC.1, Management Systems OR.3, Corporate Governance CO.2, Independent Oversight OR.5, Corporate Independent Oversight CO.4, Corporate Support and Performance CO.5, Corporate Communications CO.7, and Nuclear Organizational Structure and Traits OR.1 provide guidance for this review task. A review of the SCR database shows that no adverse conditions applicable to this review task have been identified against these PO&Cs following the 2013 corporate and 2014 WANO reviews.

A review of the PassPort ARs shows that Bruce Power has a managed system to continuously improve and enhance their programs and procedures to strengthen the means to ensure that the requirements of this review task are met. This was confirmed by a review of the assessments discussed in Section 7.1 (e.g., SA-OCP-2013-04 and SA-RPR-2014-01), audits listed in Section 7.2 (e.g., AU-2015-00015, AU-2013-00011 and the review performed by IAEA's OSART which has been explained in Section 7.2.2.1), as well as regulatory inspections discussed in Section 7.3 (e.g., BRPD-AB-2015-007).

Bruce Power has effective radiation protection measures in place to protect workers, the public and the environment. A comprehensive review of Bruce Power's RP Program has been

performed in Safety Factor 15. The Safety Factor 15 report discusses specific improvements to the processes themselves.

Bruce Power programs and procedures meet the requirements of this review task, as procedures are in place and personnel trained to ensure that nuclear and radiation safety are properly controlled and appropriate measures are applied consistently and conscientiously by all staff.

5.4.3. Questioning Attitude and Conservative Decision Making

This review task requires an assessment of the extent to which a questioning attitude exists and conservative decision making is undertaken in the organization.

Section 0.3 of N286-05 covers the need for an Operational safety focus and the need to define and implement practices that contribute to excellence in worker performance. Section 4.1.2 (a) of N286-12 covers the need to ensure that safety is the paramount consideration in guiding decisions and actions, while Section 4.13 (b) requires critically assessing the effectiveness of the management system to achieve planned results, and Section 7.9 instructs operators to operate, monitor and maintain operation within the safe operating envelope. N286 (both versions) requires design verification self-checking, co-worker verification, supervisory verification, confirmatory testing, and independent inspection of work based on the potential impact of the work.

The BP-MSM-1 [37], Section 7.6 requires each direct report to the President and CEO to foster the development and growth of Nuclear Safety Culture by implementing and communicating the Nuclear Safety message, setting the example for nuclear safety and demonstrating this commitment through words and actions. The Executive Vice-President of Human Resources is accountable for providing strategic Human Resource support and for creating a high performance engaged culture within the organization.

Questioning Attitude and Decision Making are two of the traits listed in the program which positively influence the organization's shared assumptions, values, beliefs, and group norms that describe how things are done at Bruce Power; thus contributing to a more healthy nuclear safety culture. The use of these two traits is identified in Bruce Power procedures and training programs. A sample follows:

BP-PROC-00136 [126], the Plant Operational Review Committee holds regularly scheduled and ad hoc meetings to provide a high level review of past events and a review of the outputs of other processes related to reactor safety (e.g., Operational Decision Making meetings, Technical Operability Evaluations). The meetings are also intended to provide forward looking insights and future challenges to reactor safety. Agenda items and reviews may include:

- Plant transients or equipment problems and decisions associated with these events.
- External OPEX events to ensure appropriate compensatory actions have been implemented as necessary.
- Proposed proactive plans for future or anticipated events (such as outage maintenance or adverse system health events).

- Proposed design changes with a nuclear safety risk level of 1 or 2 per BP-PROC-00539, Design Change Package [110]. The design shall typically be presented to PORC at the conceptual design phase.
- Proposed actions resultant from risk evaluations which are outside of the scope of the probabilistic risk assessment.
- Engineering Evaluations (EEs) where the assessment deals with high risk areas outside of design intent and is knowledge based or medium risk areas outside the SOE as determined by the "Risk Assessment Guide and Minimum Review Requirements for Engineering Evaluations" Process chart found in Appendix B of DIV-ENG-00004 [108], Engineering Evaluations.
- New or revised safety analysis that has the potential to impact on plant operations.
- Proposed plant operational or maintenance activities that result in exceeding a probabilistic safety goal as outlined in DIV-ENG-00010, Probabilistic Risk Assessment Process [165].

BP-PROC-00136 [126] states that the Plant Operational Review Committee will consistently support the basis of conservative decision making as outlined in the Bruce Power Management System (e.g., GRP-OPS-00038 [128], Bruce A and B Operations Standards and Expectations). The Plant Operational Review Committee shall serve as a forum for challenging the safety culture of the organization with open and self critical discussion in the spirit of continuous improvement

BP-PROC-00561 [125], Operator Fundamentals identifies conservatism as one of the operator fundamentals and states: Conservatism is a bias for action in the direction of plant safety and includes maintaining a sufficient safety margin, as indicated by parameters. This behaviour avoids challenging the plant and shows a clear desire to protect the reactor core. Similar procedures instill the same knowledge worker fundamentals in General Employee Training and Radiation Protection, Engineering, Maintenance and other nuclear staff [48] [166]. Operators receive training in conservative decision making.

DIV-ENG-00004 [108], Engineering Evaluations describes a process followed by staff in the Engineering Division when responding to degraded equipment or plant conditions; to ensure that adequate risk evaluation is given during the analysis prior to making any such decisions/advice. Such responses that impact on plant equipment need to be carefully considered using appropriate Fundamental Human Performance tools (self-checking, questioning attitude, technical task pre job briefing, validating assumptions and signature). Use of this procedure helps reinforce a culture in which Engineering performs thorough, rigorous evaluations (commensurate with risk) as an input to the Operational Decision Making process and decisions in general.

GRP-OPS-00030 [129], Operational Decision Making and GRP-OPS-00038 [128] Bruce A and B Operations Standards and Expectations provide a structured approach for making operational decisions to support safe, reliable plant operation. The focus of these procedures is on the response to degraded/degrading equipment or plant conditions that are inside Operating Policies and Principles (OP&P) limits and are not clearly defined by procedures and the overall standards for all operational activities, respectively. There may be situations involving

reductions in safety margins that evolve over days or weeks, so these procedures provide guidance and instruction to make conservative decisions and to maintain a questioning attitude.

Self-checking and verification provides opportunities to question the work during the planning stages and as it is being completed. Individuals avoid complacency and continuously challenge existing conditions, assumptions, anomalies and activities in order to identify discrepancies that might result in error or inappropriate action. These steps are part of the typical verification activities required by staff (e.g., BP-PROG-10.01 Appendix A requirement reference N286-05 clause 5.10).

Furthermore, Human Performance Tools for Workers [47] and Human Performance Tools for Knowledge Workers [48] encourage individuals to stop when unsure, and ensure the conservatism in their activities is understood. These are communicated to staff as part of the communication strategy and reinforced continuously by management.

Output from the Nuclear Safety Culture Monitoring process [65] is recorded in forms such as FORM-14015-R000 [167]. The SLT uses the form to document and rate the 10 traits of Nuclear Safety Culture, such as the Questioning Attitude of their team members providing strengths, opportunities for improvement and findings during the most recent period (a minimum of three meetings are held each calendar year). These are then used by the SLT to determine subtle changes in the Safety Culture.

The WANO PO&Cs on Nuclear Professional NP.1, Operations Fundamentals OP.1, Maintenance Fundamentals MA.1, Nuclear Fuel Management CM.4, Radiological Safety RS.1, and Nuclear Organizational Structure and Traits OR.1 provide guidance for this review task. A review of the SCR database shows that no adverse conditions applicable to this review task have been identified against these PO&Cs following the 2013 corporate and 2014 WANO reviews. Following WANO reviews in October of 2015, Bruce B received a WANO Good Practice 2015-05, on Nuclear Organization Structure and Traits, which covered the Organizational Effectiveness (OR.1) and Performance Improvement (PI-3) areas.

A review of the PassPort ARs shows that Bruce Power has a managed system to continuously improve and enhance their programs and procedures to strengthen the means to ensure that the requirements of this review task are met. This was confirmed by a review of the assessments discussed in Section 7.1 (e.g., SA-COM-2015-09, SA-OCP-2015-17, and SA-PI-2015-01) and audits listed in Section 7.2 (e.g., for instance the review performed by IAEA's OSART discussed in Section 7.2.2.1 as well as the 2014 Nuclear Industry Evaluation Program Audit reported in Section 7.2.2.2). Furthermore, the corporate audit of Safety Culture showed a strong questioning attitude and recognition of being conservative in decision making [168] as core values and taking corrective action when issues are brought to management's attention. If a procedure is incorrect, Management allows individuals to place things in a safe condition and stop work until the procedure is formally reviewed and if found to be incorrect, corrected.

In 2015 FASA SA-COM-2015-09 was conducted to determine the degree that the Engineering and project management organizations have a healthy technical conscience follow-up activities are planned to better understand and assess the results achieved. A key strength was Engineering staff were interested in assisting with the identification of technical conscience improvements, including items such as improving the process for making engineering

judgements and reviewing work conducted by outside organizations. These FASAs were completed later in 2015.

Bruce Power programs and procedures meet the requirements of this review task, as a questioning attitude exists and conservative decision making is undertaken in the organization.

5.4.4. Reporting and Investigating Instructive Events

This review task requires verification that there is a strong drive to ensure that instructive events are reported and investigated to discover root causes and that timely feedback is provided to appropriate staff on findings and remedial actions.

This is consistent with Section 5.11, 5.14, Annex B.1 (i) of N286-05 and Section 4.1.2 (h) and (k) of N286-12.

The BP-MSM-1 [37], Appendix A on Policy statements says Bruce Power shall foster a culture of open reporting where personnel proactively report all adverse conditions (significant, minor or potential) without fear of reprisal, maintain a culture that has intolerance for unanticipated equipment failures, and drives continuous improvement based on industry leading practices.

Bruce Power addresses the requirements of this review through a suite of programs and procedures that focus on performance monitoring and corrective actions.

The objective of the Corrective Action program [66] BP-PROG-01.07 is to identify and eliminate or mitigate adverse conditions that have resulted in or could result in loss. The program requires that:

- All adverse conditions are to be promptly identified, documented and reported.
- For significant events and significant conditions adverse to quality, the causes will be determined and corrective action will be taken to correct, and where appropriate, prevent their recurrence.
- Any corrective actions taken to address identified causes are to be tracked to completion.
- Effectiveness will be verified for corrective actions taken to prevent recurrence stemming from Root Cause Investigations and where required for corrective actions from investigations which addressed the Apparent/Common Cause.
- Based on significance, adverse conditions may be trended.
- Periodic trend analysis is performed to identify adverse trends. Where warranted, corrective actions are put in place to address adverse trends.
- Periodic assessment of the effectiveness of the program will be done based on the results and recommendations obtained from verifications and audits.

A graded approach is used to identify and resolve adverse conditions. Different functional areas may have different methods for identifying and resolving adverse conditions that do not address nuclear safety. For example, the Human Resources Customer Response Centre uses a

ticketing system for items such as benefit and pay issues and Information Technology uses a ticketing system for application password resets. SCRs may be input for adverse trends identified from these datasets.

Following the GOSP model, the Performance Improvement CFAM is responsible for Governance, Oversight and Support aspects of the Corrective Action Program. The CFAM is responsible to establish and effectively maintain the program and processes in line with the standards and regulations defined within this document and to strengthen the program through continuous improvement. The Station Functional Area Manager (SFAM) is responsible for the Perform aspect of the GOSP model. The SFAM is the leader and highest level authority for the Corrective Action Program within a station. The SFAM is responsible for ensuring overall results of the Corrective Action Program per Business Plan requirements within a station.

BP-PROC-00059, Event Response and Reporting [67], outlines the process for preliminary response and reporting to internal contacts and external agencies and to ensure compliance with both Bruce Power and Regulatory requirements to identify and document adverse conditions using an SCR.

Bruce Power's line management and safety oversight conduct routine field observation and coaching of staff performance. Focused Area Self-Assessments are conducted throughout Bruce Power's departments by line management to identify governance and performance issues. Significant issues identified are addressed through the corrective action program.

Bruce Power staff can identify issues they encounter through the Station Condition Record process, which are evaluated for significance. Independent Audits are conducted at planned intervals to independently evaluate the status of Bruce Power's programs. Issues from either are addressed through the corrective action program.

External evaluations are conducted by the CNSC, WANO, and various registrars such as the Technical Standards and Safety Authority, British Standards Institution and QMI-SAI Global to identify governance and performance issues. These are corrected through the corrective action program.

BP-PROC-00518, Root Cause Investigation [70] supports the Corrective Action Program by providing a process for Root Cause Investigation and Equipment Root Cause Investigations.

The WANO PO&Cs on Nuclear Organizational Structure and Traits OR.1 and Nuclear Safety Culture SC.1 provide guidance for this review task. A review of the SCR database shows that no adverse conditions applicable to this review task have been identified against these PO&Cs following the 2013 corporate and 2014 WANO reviews. Following WANO reviews in October of 2015, Bruce B received a WANO Good Practice 2015-05, on Nuclear Organization Structure and Traits, which covered the Organizational Effectiveness (OR.1) and Performance Improvement (PI-3) areas. Furthermore, the corporate audit of Safety Culture showed that individuals could openly identify safety issues without concern of retribution [168]. These results were re-confirmed in the 2013 study.

A review of the PassPort ARs shows that Bruce Power has a managed system to continuously improve and enhance their programs and procedures to strengthen the means to ensure that the requirements of this review task are met. This was confirmed by a review of the assessments in Section 7.1 (e.g., SA-ERI-2014-08, SA-ERI-2014-07, SA-OCP-2015-15,

SA-OCP-2015-13, and SA-PI-2015-09) and audits in Section 7.2 (e.g., AU-2013-00007 and AU-2011-00013), as well as regulatory inspections discussed in Section 7.3 (e.g., BRPD-AB-2014-007).

For example, CNSC staff had positive observations about the Self and Independent Assessment Process (FASA) (Section 7.3.3) which helps to verify the effectiveness of the FASA process. Overall, the audit supported the review of the effectiveness of the program and in general, Bruce Power personnel followed the procedures as identified in their programs. However, CNSC staff identified a number of weaknesses in the raising of SCRs.

CNSC staff concluded that the self-assessment process does not always continually assess and improve the effectiveness with which work activities meet the requirements. Specifically, CNSC staff concluded that, despite the efforts to audit all programs in a three-year period, the performance audits covered only a limited number of the implementing procedures of the programs, even though a risk-based audit methodology was not fully developed. The CNSC staff concluded that the consequence of these weaknesses is that management would not have complete input information for their effectiveness management system reviews. Four action notices and four recommendations were raised. Personnel follow the procedures for self-assessments and audits, as identified in the program documents BP-PROG-01.06 and BP-PROG-15.01, but it was acknowledged that some improvements were required. Bruce Power has responded to the action notices and recommendations with formal Action Tracking commitments (managed process) to address the inspection findings.

FASA SA-PI-2014-04 in Section 7.1 examined the state of the Focus Area Self-Assessment to confirm that the oversight enhancements and initiatives to increase awareness of the FASA process and revisions to the procedure have been effective and embedded into the procedures for each program. An Annual Self Evaluation Plan worksheet tracks FASA completion requirements. It concluded, overall that the improvements introduced as a result of SA-PI-2013-06 have been effective. Reviews in 2014 and 2015, SA-PI-2014-04 and SA-PI-2015-09 (which is discussed in Section 7.1.13) show continuing improvement in the use of FASAs to identifying areas for improvement. To improve management oversight and timeliness a graded approach will be introduced to address findings, ensuring the significant ones are addresses first.

Operations training utilizes past incidents to help familiarize Operators with a better understanding on how to resolve problems, and reinforce teamwork and leadership skills [169].

To communicate events to staff to gain the benefit of inputs and learning, Morning Review Meetings review events that happened on the same date in past years to remind individuals and events are reviewed as part of quarterly Continuing Training. Furthermore, significant events are reviewed at monthly safety meetings.

Additionally, BP-PROC-00965, Visual Management Board [72] is a key communication tool used at Bruce Power. These boards, which display current standardized information, communication and performance metrics, are used as a visual focal point relevant to the area of focus. Bruce Power VMB content includes Current Plant Status Condition, Safety and/or Human Performance Messages and relevant Operational Experience information among other communications. As noted in section 7.2.2.1, the IAEA OSART identified Bruce Power's VMB as one of the 10 Good Practices.

Issues potentially impacting safety are promptly identified, fully evaluated and promptly addressed and corrected, commensurate with significance. A safety-conscious work environment is maintained in which personnel feel free to raise safety concerns without fear of retaliation, intimidation, harassment or discrimination. BP-MSM-1 Sheet 00002 under roles, decision making authority and responsibilities, shows that the Nuclear Oversight & Regulatory Affairs organization ensures that adverse conditions, incidents, and acts/practices/behaviours that represent substandard or non-conformance situations with regard to established quality requirements are identified, investigated, analyzed and corrected. These are reviewed as part of the Nuclear Safety Culture Monitoring Panel meetings held at a minimum three times per year [65].

Output from the Nuclear Safety Culture Monitoring process [65] is recorded in forms, such as FORM-14015 R000. The Senior Leadership Team uses the form to document and rate the 10 traits of Nuclear Safety Culture such as the Environment for Raising Concerns and Personal Accountability of their team members providing strengths, opportunities for improvement and findings during the most recent period (a minimum of three meetings are held each calendar year). These are then used by the SLT to determine subtle changes in the Safety Culture.

The corporate audit of Safety Culture showed a strong drive for reporting of unsafe events and investigating to discover the root cause [168]. These results were re-confirmed in the 2013 study. SA-BPMS-2015-06 [170] concluded that the BPMS Functional Area is improving and adequately implements the requirements of standards such as CSA N286-05 Management System Requirements for Nuclear Power Plants with the acknowledgement that there is a current transition to CSA N286-12.

Bruce Power programs and procedures meet the requirements of this review task, as there is a strong drive to ensure that instructive events are reported and investigated to discover root causes and that timely feedback is provided to appropriate staff on findings and remedial actions.

5.4.5. Identification and Challenging of Unsafe Acts and Conditions

This review task requires verification that unsafe acts and conditions are identified and challenged in a constructive manner wherever and whenever they are encountered by plant employees and external staff (contractors).

Bruce Power addresses the requirements of this review task through BP-PROG-01.07, Corrective Action [66] and its supporting procedures. The objective of this program is to identify and eliminate or mitigate adverse conditions that have resulted in or could result in loss.

This program is facilitated by BP-PROC-00060, Station Condition Record Process [69], which is used to document adverse conditions, investigation results and corrective actions related to people, plant, environment and process. The procedure also states, in Section 1.0, that:

“A consistent reporting and evaluation process for identified adverse conditions, including but not limited to non-conformances is required to minimize undesirable impacts on nuclear safety, business loss, and corporate reputation.

This is accomplished by ensuring the following:

- Events, incidents, and error-likely situations are adequately documented;
- Cause(s) are determined;
- Appropriate corrective action(s) are implemented; and
- Lessons learned are identified for communication to internal and external organizations."

In addition to the SCR process, the Corrective Action Program is supported by BP-PROC-00059, Event Response and Reporting [67]. The procedure identifies the following steps for the process of Incident Response and Reporting, which consists of the following major steps:

- Immediate response, which specifies that employees have a duty to stop work immediately if there is a hazard to themselves, other employees or the plant, secure any hazards if qualified to do so, or secure the scene to protect workers;
- Rapid Learning, which requires the management to identify and arrange for rapid learning within an identified period from the incident;
- Internal and external notifications, which describes the process for identifying Bruce Power managers and staff, as well as any external agencies that need to be informed of the incident; and
- Initiation of an investigation to determine the cause of the incident.

Both employees and contractors are trained on these processes as part of the Nuclear General Employee Training they receive when joining Bruce Power. Refresher training is conducted on an annual basis. Employees and contractors are made aware of the Nuclear Safety Management Policy identified in the BP-MSM-1. The policy states that individuals at all levels of the organization consider nuclear plant safety as the overriding priority. Their decisions and actions are based on this priority, and they follow up to verify that nuclear safety concerns receive appropriate attention. The work environment, the attitudes and behaviours of all individuals reflect and foster such a safety culture.

Bruce Power ensures that reactor safety is the overriding priority in its business decisions and activities, and as the operator of a nuclear power plant accepts that its fundamental reactor safety objective is to protect the public, site personnel and the environment from harm, by establishing and maintaining effective defenses against radiological hazards.

Output from the Nuclear Safety Culture Monitoring process [65] is recorded in forms such as FORM-14015 R000. The SLT uses the form to document and rate the 10 traits of Nuclear Safety Culture such as the Decision Making and Problem Identification of their team members providing strengths, opportunities for improvement and findings during the most recent period (a minimum of three meetings are held each calendar year). These are then used by the SLT to determine subtle changes in the Safety Culture.

The WANO PO&Cs on Nuclear Organizational Structure and Traits OR.1 and Nuclear Safety Culture SC.1 provide guidance for this review task. The extent and diversity of the SCR database shows that adverse conditions are being flagged on a daily basis. A review of the database shows that no adverse conditions applicable to this review task, with respect to report-ability and challenging by employees and contractors, have been identified against these

PO&Cs following the 2013 corporate and 2014 WANO reviews. Following WANO reviews in October of 2015, Bruce B received a WANO Good Practice 2015-05, on Nuclear Organization Structure and Traits, which covered the Organizational Effectiveness (OR.1) and Performance Improvement (PI-3) areas.

A review of the PassPort ARs shows that Bruce Power has a managed system to continuously improve and enhance their programs and procedures to strengthen the means to ensure that the requirements of this review task are met. This was confirmed by a review of the assessments in Section 7.1 (e.g., SA-ERI-2014-08, SA-ERI-2014-07, and SA-SA-PI-2015-03), and audits in 7.2 (for instance the review performed by IAEA's OSART which has been discussed in Section 7.2.2.1) as well as regulatory inspections discussed in Section 7.3 (e.g., BRPD-AB-2014-007). Furthermore, the corporate audit of Safety Culture showed that identification and challenging of unsafe acts and conditions was a standard value [168]. These results were re-confirmed in the 2013 study. SA-BPMS-2015-06 [170] concluded that the BPMS Functional Area is improving and adequately implements the requirements of standards such as CSA N286-05 Management System Requirements for Nuclear Power Plants with the acknowledgement that there is a current transition to CSA N286-12.

Bruce Power programs and procedures meet the requirements of this review task, as unsafe acts and conditions are identified and challenged in a constructive manner wherever and whenever they are encountered by plant employees and external staff (contractors).

5.4.6. Learning Culture

This review task requires verification that the organization has a learning culture and it strives continuously for improvements and new ideas, and benchmarks against and searches out best practices and new technologies.

This review is consistent with the requirements of Section 4.13 of CSA N286-12.

Section 2.1 of the BP-MSM-1, Management System Manual [37] lists "Continuous Learning" as one of the components that form the basis of the BPMS, while Section 6.0 provides more in-depth detail. Bruce Power takes action to learn and continually improve the performance of the business, including improvements to governance and equipment and to manage changes arising from such improvements. Continuous learning is facilitated through "Process Improvement" and "Change Management".

Process Improvement and awareness of changes to the business environment are critical to achieving the desired performance within Bruce Power. Process Improvement and the identification of focus areas are driven by senior leaders. Similarly, Change Management involves recognizing that changes to processes, designs, systems, equipment, materials and documents must be continually identified, justified, reviewed by stakeholders, approved, implemented and evaluated for effectiveness.

In Appendix A of the Management System Manual [37], Bruce Power's Policy on Human Performance recognizes that the behaviours of all personnel directly impact safe and reliable station operation, and thus leaders use a risk-based approach to reinforce behaviors that contribute to excellence in human performance and establish the conditions that support

event-free performance. This includes searching for and eliminating the programmatic and organizational causes of human error, establishing defenses that prevent or mitigate consequences of human error, and insisting on uniform adherence to high standards of performance. All individuals are required to take responsibility for their actions, and are to be committed to continuously improving plant safety, reliability and performance.

Similarly, the Policy on Operating Experience directs personnel to identify, evaluate, and apply lessons learned to prevent adverse conditions or to improve performance with respect to plant safety, reliability and cost. This is carried through to each of the various organization units via the roles and decision making authority and responsibilities identified in the BP-MSM-1 Sheet 0002 [39]. Departments within the company are encouraged to promote a work environment characterized by innovation, creativity, teamwork, transparency, integrity, respect and promote a learning environment [37].

BP-PROC-00147 [64], Benchmarking and Conference Activities is an implementing procedure of the OPEX policy and program. It provides support to Bruce Power in identifying and documenting lessons learned from external sources in order to continuously improve performance by making improvements to Processes/Procedures, Training or System/Equipment Design.

Through benchmarking and conference activities, Bruce Power is able to foster the use of diverse information sources to understand performance gaps and implement corrective actions to improve performance. These activities enable Bruce Power to:

- Identify industry strengths and best practices;
- Identify performance and/or programmatic gap(s) between Bruce Power and industry peers;
- Identify adverse conditions and opportunities for improvement; and
- Identify the specific improvement activities and corrective actions that will be utilized to close performance/programmatic gaps.

Bruce Power investigates facilities that have the distinction for operational excellence and uses the results to make improvements to Bruce Power processes.

In 2011, a monitoring process to identify subtle changes in Nuclear Safety Culture between formal assessments was introduced. Bruce Power considered this approach to be a leading practice, and implemented Nuclear Safety Culture Monitoring Panels (NSCMPs) at Bruce B as of September 2012. Output from the Nuclear Safety Culture Monitoring process [65] is recorded in forms such as FORM-14015 R000. The SLT uses the form to document and rate the Continuous Learning of their team members providing strengths, opportunities for improvement and findings during the most recent period (a minimum of three meetings are held each calendar year). These are then used by the SLT to determine subtle changes in the Safety Culture.

Success at Continuous and Performance Improvement are gauged by each organization and by the Nuclear Oversight and Regulatory Affairs (NORA) Division. The Performance Improvement Department facilitates improving safety culture via BP-PROC-00137, Focus Area Self

Assessment [63]. This procedure supports each area in identifying and documenting lessons learned from internal sources in order to continuously improve performance by making improvements to Processes/Procedures, Training, or System/Equipment Design. As was discussed in Section 5.3.11, FASAs provide a tool that focuses on specific areas of a Functional Area's activities, processes or performance to assess the adequacy and effective implementation of their programs and procedures. The results of the assessment are then compared with business needs, the management system, industry standards of excellence and regulatory/statutory or other legal requirements. Similarly, NORA independently reviews each area to provide independent advice on potential improvements.

The WANO PO&Cs on Nuclear Organizational Structure and Traits OR.1 and Nuclear Safety Culture SC.1 provide guidance for this review task. A review of the SCR database shows that no adverse conditions applicable to this review task have been identified against these PO&Cs following the 2013 corporate and 2014 WANO reviews. Following WANO reviews in October of 2015, Bruce B received a WANO Good Practice 2015-05, on Nuclear Organization Structure and Traits, which covered the Organizational Effectiveness (OR.1) and Performance Improvement (PI-3) areas.

A review of the PassPort ARs shows that Bruce Power has a managed system to continuously improve and enhance their programs and procedures to strengthen the means to ensure that the requirements of this review task are met. Opportunities to continuously learn are valued, sought out and implemented. This was confirmed by a review of the assessments in Section 7.1 (e.g., SA-AUD-2015-10, SA-OCP-2015-15, SA-OCP-2015-13 discussed in detail in Section 7.1.9, and SA-PI-2015-01). Furthermore, the corporate audit of Safety Culture showed the organization has a learning culture [168]. These results were re-confirmed in the 2013 study. SA-BPMS-2015-06 [170] concluded that the BPMS Functional Area is improving and adequately implements the requirements of standards such as CSA N286-05 Management System Requirements for Nuclear Power Plants with the acknowledgement that there is a current transition to CSA N286-12.

Bruce Power programs and procedures meet the requirements of this review task, as the organization has a learning culture and it strives continuously for improvements and new ideas, and benchmarks against and searches out best practices and new technologies.

5.4.7. Communication of Safety Issues

This review task requires verification that there is an established and effective process for communication of safety issues.

This review is consistent with the requirements of Section 4.6 of CSA N286-12 and applicable to Section 5.7 of N286-05.

Each morning, manager review meetings discuss safety issues that arose the previous day and those issues not resolved from the previous days. Staff receive regular weekly safety inputs from the Chief Operating Officer and from their Department Managers and monthly safety meetings are held, with attendance recorded as part of the standard staff input to the financial reporting system.

BP-PROC-00965, Visual Management Board [72] is a key communication tool used at Bruce Power. These boards, which display current standardized information, communication and performance metrics, are used as a visual focal point relevant to the area of focus. Bruce Power VMB content includes Current Plant Status Condition, Safety and/or Human Performance Messages and relevant Operational Experience information among other communications. As noted in section 7.2.2.1, the IAEA OSART identified Bruce Power's VMB as one of the 10 Good Practices.

Additionally, the objectives of Bruce Power's Operating Experience Program BP-PROG-01.06, [61] are:

- To use external operating experience information to identify, evaluate and apply lessons learned to improve plant safety, reliability and commercial performance through improvements to processes, procedures, training and system/equipment design; and
- Communicate internal experience from the Bruce Site to others in the Nuclear Industry in order to improve nuclear plant safety, reliability and commercial performance around the world.

One of the main objectives of the OPEX Program is to capture OPEX and transfer the lessons learned to staff by making updates and/or improvements to training material. One of the program's implementing procedures, BP-PROC-00062 [62], Processing External and Internal Operating Experience requires that OPEX be incorporated into procedures, training material, and system/component design to ensure that these valuable lessons are effectively communicated to staff and relevant OPEX is reviewed in Pre-Job Briefings. BP-PROC-00062 requires supervisors to ensure personnel discuss the OPEX relevant to the work performed. This allows supervisors and managers to emphasize key lessons learned that are applicable to the activity.

BP-PROC-00062 [62] Section 4.2 states that Learning from OPEX information and supporting a healthy Nuclear Safety Culture is everyone's responsibility and identifies effective safety communications as one of the traits of a healthy safety culture. Personnel are required to communicate internal lessons learned to the site. Lessons learned can originate from Plant Evolutions, Outages, High Risk Evolutions, or Post-Job Critiques. To further assist personnel in accessing relevant OPEX, Operating Experience information is available on the corporate intranet.

As discussed in Section 4.1, BP-PROG-02.07 [83] on Employee Communications stresses the need to work to promote and contribute to safety culture awareness on the part of employees with the goal of improving nuclear safety performance and underscoring corporate values in the areas of environmental safety, industrial safety, radiological safety and reactor safety ([83] Section 1.0).

The WANO PO&Cs on Nuclear Organizational Structure and Traits OR.1 and Nuclear Safety Culture SC.1 provide guidance for this review task. A review of the SCR database shows that no adverse conditions applicable to this review task have been identified against these PO&Cs following the 2013 corporate and 2014 WANO reviews.

A review of the PassPort ARs shows that Bruce Power has a managed system to continuously improve and enhance their programs and procedures to strengthen the means to ensure that the requirements of this review task are met. This was confirmed by a review of the assessments in Section 7.1 (e.g., SA-STK-2015-01 which has been described in Section 7.1.16 and SA-OCP-2015-11 discussed in Section 7.1.10) and audits discussed in Section 7.2 (for instance IAEA's OSART review explained in Section 7.2.2.1). Furthermore, the corporate audit of Safety Culture showed that communication and safety were clear strengths [168]; these results were re-confirmed in the 2013 study. SA-BPMS-2015-06 [170] concluded that the BPMS Functional Area is improving and adequately implements the requirements of standards such as CSA N286-05 with the acknowledgement that there is a current transition to CSA N286-12.

Bruce Power programs and procedures meets the requirements of this review task, as there is an established and effective process for communication of safety issues.

5.4.8. Prioritization of Safety Issues to Ensure Proper Resourcing

This review task requires verification that there is a process in place for prioritization of safety issues, with realistic objectives and timescales that ensures that these issues receive proper resources. This review is consistent with the requirements of Section 4.1.3 of CSA N286-12.

B-HBK-08130-00001 [58] GOSP Implementation Handbook, Section 4.3.1 on Responsibilities of the CFAM identifies that the CFAM is responsible for the adequacy of the suite of all documentation and processes associated with the Functional Area. Adequacy includes adopting a graded approach where appropriate for business needs and ensuring that the Functional Area meets requirements in a manner that reflects safety as the overriding decision-making priority and fosters a healthy nuclear safety culture.

Bruce Power Procedure, BP-PROC-00162, Business Risk Management – Business Risk Register [50] provides guidance and tools to:

- Identify threats and opportunities which could impact the ability to achieve the business plan objectives and results;
- Reinforce with all managers that the management of risk is one of their primary accountabilities;
- Maintain a comprehensive and up to date register (i.e., Risk Register) of threats and opportunities which could impact the ability to achieve the business plan objectives and results;
- Monitor the effectiveness of risk mitigating and optimizing activities, including ensuring that actions are developed and executed in a timely fashion and that risks are managed to an acceptable level; and
- Facilitate the Executive Team's review of risks and quarterly reporting of the top risks to the Board of Directors.

As part of this procedure, risk owners are required to assess the impact of the risk to the business plan by multiplying the probability of occurrence by its impact (Probability x Impact =

Net Impact). In addition to ranking the risks based on their Net Impact, risk owners should develop action plans that “mitigate the threat to an acceptable level of exposure”.

The Risk Status Rating used in this process includes four levels:

- Green, which indicates that either the risk has been reviewed and accepted and no response plan is required or that the risk response plan is complete;
- White, which indicates that the response plan is defined and approved;
- Yellow, which indicates that the response plan is defined and is being implemented; and
- Red, which indicates that either the threat has materialized or that the response plan is not effective.

Appendix E of this procedure provides guidance for risk identification and includes sources such as asset life cycle management, system and component health assessments and SCRs [50].

Risk logs are maintained to identify threats and opportunities that could impact Bruce Power’s ability to achieve its business plan objectives, results and the Safety Policy.

BP-PROC-00559, Station Plant Health Committee [116] (SPHC) defines how the Bruce A and B SPHC is conducted as an effective management tool enabling the station leadership team to make informed and timely decisions in support of equipment reliability that results in safe and reliable plant operation. As part of this process, the SPHC ensures that the proper prioritization; ownership; organizational alignment; resources; and accountability are in place to resolve station issues affecting system/component performance. The procedure requires the FORM-12881, SPHC Initiative Prioritization Worksheet [171] to be completed. This form provides a framework for ranking of impact of the identified issue to equipment reliability based on an assessment of its impact on the four pillars of Safety as discussed in Section 4.1.

Additionally, DPT-NSAS-00003, Guidelines for Evaluating and Prioritizing Safety Report Issues [98] describes the process and the responsibilities of associated personnel, for the step pertaining to the evaluation and prioritization of Safety Report analysis issues. The Nuclear Safety Analysis and Program Integration (NSAPI) Section of the Nuclear Safety Analysis and Support Department receives Safety Report analysis issues, of varying complexity and safety significance, from a number of sources. The issues are assessed to decide if they could impact the Safety Report analysis sections and whether they require analysis. Any analysis is scheduled and performed, the results documented, and submitted to the CNSC as necessary. The issues received and the steps taken to resolve them must be documented so information on their resolution is readily available for traceability and future reference.

Additionally, BP-PROC-00498, Condition Assessment of Generating Units in Support of Life Extension [118] aims to evaluate the physical condition, functionality of, and remaining service life of SSCs. The assessment leads to two determinations:

- First, whether there are there any SSCs which are not practical to replace that would prevent a life extension project from being undertaken (an example might be vault concrete deterioration.)

- Second, the SSCs recommended for replacement or repair during a contemplated refurbishment outage and those repairs deferred to future outages.

The WANO PO&Cs on Nuclear Organizational Structure and Traits OR.1 and Nuclear Safety Culture SC.1 provide guidance for this review task. A review of the SCR database shows that no adverse conditions applicable to this review task have been identified against these PO&Cs following the 2013 corporate and 2014 WANO reviews.

A review of the PassPort ARs shows that Bruce Power has a managed system to continuously improve and enhance their programs and procedures to strengthen the means to ensure that the requirements of this review task are met. This was confirmed by a review of the assessments in 7.1 (e.g., SA-WMSI-2015-02) and audits discussed in Section 7.2 (e.g., AU-2012-00017), as well as regulatory inspections listed in Section 7.3 (e.g., BRPD-AB-2014-002). For example, subsequent to Bruce Power's renewal application for the current PROL, a CNSC Type II Inspection related to Condition Assessments [172], was conducted to assess improvements to the condition assessment methodology as documented in BP-PROC-00498 [118]. CNSC staff concluded there were no major issues associated with the condition assessment methodology; however, it made recommendations to address procedure issues related to not providing clear guidance on how the identified issues should be ranked. Changes are in progress at the time of writing of this report, while CNSC staff recommendations have been added to PassPort in the interim [172].

Bruce Power programs and procedures meet the requirements of this review task, as there is a process in place for prioritization of safety issues. There are however issues with timeframe for implementing Nuclear Safety Improvements from conceptual design to station implementation which implies lack of adequate prioritization. This issue has been discussed in Safety Factor 8 (gap SF8-4).

5.4.9. Clarity of the Organizational Structure

This review task requires verification that there is a method in place for achieving and maintaining clarity of the organizational structure and managing changes in accountability for matters affecting safety. This review is consistent with the requirements of Section 4.4 of CSA N286-12.

BP-MSM-1, Management System Manual [37] identifies one of the responsibilities of the CEO as leading and fostering a nuclear safety culture and establishing an organization where reporting relationships, positional authority, human resources, financial resources and corporate policy support and emphasize the overriding importance of nuclear safety.

This document also provides information on roles and responsibilities of Direct Reports to the President and CEO, which includes that they are accountable to foster the development and growth of Nuclear Safety Culture by implementing and communicating the Nuclear Safety message, setting the example for nuclear safety and demonstrating this commitment through words and actions.

Section 7.0 of the Management System Manual [37], states that Bruce Power's organizational effectiveness is determined by the design of its organization structure, and the clear

specification of responsibilities, authorities, accountabilities, and interfaces associated with each of the defined management and individual contributor roles/positions.

As such, the Management System Manual serves the objective of ensuring clarity of the organization structure and managing any changes in accountability for matters affecting safety.

Additionally, BP-OPP-00001 – Operating Policies and Principles - Bruce B [42] identify Senior Operations Authority as being specifically accountable for ensuring the ongoing safe operation of the station within the safe operating envelope and licence requirements.

BP-MSM-1 Sheet 0002 [39] provides a list of authorities and responsibilities for all organizational units at Section Manager level and above. BP-PROC-00001, Organizational Structure Change Management [55] defines the process for managing organization structure changes at Bruce Power at Section Manager level and above. The procedure provides the framework, recommended tools, and approach to ensure accurate and effective execution of an organizational change.

In 2013, a WANO Corporate Peer Assessment was conducted. An AFI associated with implementation of the BPMS [51] was raised so that personnel could readily understand the responsibility alignment regarding the use of the GOSP to meet Performance Objectives in the GOSP Implementation Handbook, B-HBK-08130-00001 GOSP [58]. Specifically, PO&Cs CO.1 on Corporate Leadership and CO.2 on Corporate Governance were cited in the WANO assessment. This resulted in the recent update to the GOSP Implementation Handbook.

A review of the SCR database shows that no further adverse conditions applicable to this review task have been identified against these PO&Cs following the 2014 WANO and 2013 corporate reviews.

A review of the PassPort ARs shows that Bruce Power has a managed system to continuously improve and enhance their programs and procedures to strengthen the means to ensure that the requirements of this review task are met. This was confirmed by a review of the assessments in Section 7.1 (e.g., SA-OCP-2015-04 discussed in Section 7.1.8) and audits discussed in Section 7.2 (e.g., AU-2015-00015).

Bruce Power programs and procedures meet the requirements of this review task, as there is a method in place for achieving and maintaining clarity of the organizational structure and managing changes in accountability for matters affecting safety.

5.4.10. Training in Safety Culture

This review task requires verification that there is adequate training in safety culture, particularly for managers. Section 4.2 of CSA N286-12 covers Safety Culture and requires Management to define and implement practices that contribute to excellence in worker performance; however, training on safety culture is not specifically mentioned.

“Safety First” is one of Bruce Power’s “Values” as stated in BP-MSM-1, Management System Manual [37] and is to guide conduct daily. Working Learning and Qualification Management Policy in Appendix A of the MSM states that the Programs under this policy shall provide competent personnel who can safely operate, maintain, and improve performance of the Bruce

Power Stations. The program(s) created to implement this Policy must satisfy the requirements of applicable legislation (e.g., acts and regulations), licences, certifications, and codes and standards commensurate with Bruce Power's business needs and do so in a manner that meets training Guidelines from WANO and INPO. While not stated directly, the implication is that training on Safety Culture is included in these requirements.

One of the implementing procedures of BP-PROG-01.06 [61], BP-PROC-00892 [65], Nuclear Safety Culture Monitoring provides the framework for Bruce Power to monitor nuclear safety culture between formal assessment activities, in particular to have mechanisms to identify and correct potential gaps in nuclear safety culture [NEI 09-07, Rev 1]. The approach is collegial and supports the development of a common understanding of safety culture within senior and middle levels of leadership at the nuclear power stations and describes the traits and attributes of the desired safety culture [IAEA GS-G-3.5, Sections 2.22 (b-d), 2.27, 2.28]. This monitoring and adjustment process facilitates the desired behaviors of a learning organization – one that places nuclear safety as its overriding priority and relentlessly seeks ways to continuously improve itself [CSA N286-12, clause 4.2(d) and WANO PO&C 2013-1, SC.1, Performance Objective].

A review of the Certification Training Handbook B-HBK-09510-00005 [80] confirms that Nuclear Safety and Safety Culture training is provided as part of Operations Training for the Unit 0 Control Room Operators and Authorized Nuclear Operators as part of their second group of training activities.

Furthermore, managers are given specific Safety Culture training as part of module 3 of their Principles of Nuclear Safety training under Program Element (PEL) #13128 via Training Aid TA-13128-00003 [173], Safety Management and Safety Culture. Furthermore, PEL 61556 and PEL 63293 on the Bruce Power Leadership Academy and INPO Shift Manager Professional Development Seminar include the key topic of Safety Culture [174]. As part of standard agenda for BP-PROC-00892, Nuclear Safety Culture Monitoring [65], Appendix D, E and F, managers review root cause investigation reports, significant SCRs, Regulatory Findings, Industry Evaluations, and Site Performance Indicators, among other items.

As part of lesson planning, numerous instructor lesson plan documents refer to the need to discuss safety culture as a reminder to instructors to frequently reinforce and discuss Bruce Power commitments to institute a strong Safety Culture.

The WANO PO&C on Nuclear Organizational Structure and Traits OR.1 and Nuclear Safety Culture SC.1 provide guidance for this review task. A review of the SCR database shows that no adverse conditions applicable to this review task have been identified against this PO&C following the 2013 corporate and 2014 WANO reviews.

A review of the PassPort ARs shows that Bruce Power has a managed system to continuously improve and enhance their programs and procedures to strengthen the means to ensure that the requirements of this review task are met.

Bruce Power programs and procedures meet the requirements of this review task, as there is adequate training in safety culture including for managers.

6. Interfaces with Other Safety Factors

There is some degree of interrelationship among most of the 15 Safety Factors that comprise the Bruce B PSR. The following identifies specific aspects of this Safety Factor that are addressed in, or where more detail is provided in, another Safety Factor Report.

- "Safety Factor 8: Safety Performance" in Section 5.14, assesses the overall safety performance of the Station looking for potential trends and future safety concerns to identify deteriorating safety performance.
- "Safety Factor 9: External OPEX and R&D" in Section 4.2, addresses the effectiveness of implementation of the Operating Experience program, including elements of event investigations and the Corrective Action Program.
- "Safety Factor 11: Procedures" in Appendix B.1, performs a clause-by-clause assessment of IAEA SSR-2/2. The results of this clause-by-clause assessment are applied in the assessment of the review tasks in this report. In Sections 4 and 5.3 of Safety Factor 11, BP-PROG-08.01, Emergency Management is discussed in detail.
- "Safety Factor 12: The Human Factor" Section 5.1, reviews the adequacy of staffing levels for the operating plant. In Section 5.2 of Safety Factor 12, a review of the adequacy of worker qualification and training has been performed, which examines whether deficiencies in the quality of the procedures potentially represent a significant adverse contribution to risk. Safety Factor 12 includes a discussion on RD/GD-210, RD-204, G-323, and CNSC REGDOC-2.2.2.
- "Safety Factor 15: Radiation Protection" in Section 5.0 provides a comprehensive review of the Radiation Protection Program.

7. Program Assessments and Adequacy of Implementation

Section 7 supplements the assessments of the review tasks in Section 5, by providing information on four broad methods used to identify the effectiveness with which programs are implemented, as follows:

- Self-Assessments;
- Internal and External Audits and Reviews;
- Regulatory Evaluations; and
- Performance Indicators.

For the first three methods, the most pertinent self-assessments, audits and regulatory evaluations are assessed. Bruce Power has a comprehensive process of reviewing compliance with Bruce Power processes, identifying gaps, committing to corrective actions, and following up to confirm completion and effectiveness of these actions. While there have been instances of

non-compliance with Bruce Power processes, Bruce Power's commitment to continuous improvement is intended to correct any deficiencies.

For the fourth method, the performance indicators relevant to this Safety Factor are provided. These are intended to demonstrate that there is a metric by which Bruce Power assesses the effectiveness of the programs relevant to this Safety Factor.

Taken as a whole, these methods demonstrate that the processes associated with this Safety Factor are implemented effectively (individual findings notwithstanding). Thus, program effectiveness can be inferred if Bruce Power processes meet the Safety Factor requirements and if there are ongoing processes to ensure compliance with Bruce Power processes. This is the intent of Section 7.

7.1. Self-Assessments

Generally, self-assessments are used by functional areas to assess the adequacy and effective implementation of their programs. The results of each assessment are compared with business needs, the Bruce Power management system, industry standards of excellence and regulatory/statutory or other legal requirements. Where gaps are identified, corrective actions are identified and implemented.

The self-assessments:

- Identify internal strengths and best practices;
- Identify performance and/or programmatic gap(s) as compared to targets, governance standards and "best in class";
- Identify gaps in knowledge/skills of staff;
- Identify the extent of adherence to established processes and whether the desired level quality is being achieved;
- Identify adverse conditions and Opportunities for Improvements (OFI); and
- Identify the specific improvement corrective actions to close the performance/programmatic gap.

Selected recent self-assessments relating to this Safety Factor are listed in Table 5.

Table 5: Focus Area Self-Assessment Reports

FASA	Topic	Applicable to Review Section
SA-AUD-2015-10	Quick Hit Self-Assessment: MCR Lessons Learned and Documentation and Records	5.4.6
SA-BPMS-2015-4-R01	Peer Group Competence and Effectiveness	5.3.11
SA-BPMS-2015-05	Quick Hit Self-Assessment: Pressure Boundary Oversight of Organization Change Management	5.3.1
SA-BPMS-2014-01	Compliance with CSA N286-05	All of 5.2, 5.3, 5.4
SA-BPMS-2013-01	INPO Corporate PO&Cs Gap Analysis	All of 5.2, 5.3, 5.4
SA-BPMS-2012-02	Documentation Review against N286-05 Requirements and Understanding	All of 5.2, 5.3, 5.4
SA-BPMS-2012-01	BPMS Effectiveness Review against N286-05 Requirements and Understanding	All of 5.2, 5.3, 5.4
SA-BS-2015-01	Oversight to Pressure Boundary QA Program Requirements, Section 17, Records Management	5.2.2, 5.3.3
SA-BS-2015-04	Records Management	5.2.2, 5.3.3
SA-BS-2014-01	Oversight to Pressure Boundary QA Program Requirements, Section 6 - Document Control	5.2.2, 5.3.3
SA-BS-2012-01	Review Effectiveness of DCR Process	5.3.3
SA-COM-2015-14	Engineering Contract Practices – Oversight Compliance	5.2.3
SA-COM-2015-12	Review of Work Performed by Outside Organizations	5.2.3 and 5.2.4
SA-COM-2015-09	Technical Conscience	5.2.3 and 5.4.3
SA-COM-2015-07	Project Controls Process	5.3.1, 5.3.3, and 5.3.10

FASA	Topic	Applicable to Review Section
SA-COM-2015-03	Configuration Management Engineering Governance Review	5.3.10
SA-COM-2014-09	Assessment of Contracted Engineering Service Provider Safety Performance	5.3.8 and 5.3.4
SA-COM-2014-03	Design Change Management	5.3.3 and 5.3.10
SA-COM-2014-01	Installation & Commissioning Performance	5.2.2, 5.2.5, 5.3.3, 5.3.10
SA-COM-2011-03	CM Performance Indicators & Configuration Management Index	5.3.10
SA-COM-2011-10	Fidelity of Configuration Information to Plant	5.3.3, 5.3.10
SA-ERI-2015-07	Focus Area Self-Assessment – Engineering Mentoring Benchmarking	5.2.4
SA-ERI-2014-08	Effectiveness of deployment of SmartSignal at BA and BB	5.2.4, 5.2.5, 5.4.4, 5.4.5, 5.4.8
SA-ERI-2014-07	Quality of System Health Reporting	5.2.4, 5.2.5, 5.3.3, 5.4.4, 5.4.5
SA-ERI-2014-06	Heat Exchanger Program	5.2.4, 5.2.5, 5.3.3
SA-ERI-2014-05	ER interface with PB Program	5.2.2, 5.2.4, 5.2.5
SA-ERI-2014-01	Review of Data Needs to Assess SSC Aging	5.2.4, 5.2.5, 5.3.3
SA-HP-2011-01	Screening and Evaluating External OPEX	5.3.9
SA-HRS-2015-02	Quick Hit Self-Assessment: Gap Analysis N286-05 to N286-12; Human Resources	5.3.2
SA-MPA-2010-01	Work Management Execution	5.2.5
SA-NSAS-2010-03	Use of OPEX in Fuel Channels Life Cycle Management & Life Extension of Fuel Channels	5.3.9

FASA	Topic	Applicable to Review Section
SA-OCP-2015-04	Focus Area Self Assessment: Operation's Leadership	5.4.9
SA-OCP-2015-17	INPO 15-004 Operator Fundamental Review	5.2.4, and 5.4.3
SA-OCP-2015-15	Ops Peer Q3 Station Observations	5.4.4 and 5.4.6
SA-OCP-2015-13	Emergency Mitigating Equipment Procedures	5.4.4 and 5.4.6
SA-OCP-2013-04	BP-PROG-12.01 N-286.5 Audit	5.2.2, 5.4.2
SA-PI-2015-SOFA	State of the Functional Area Assessment: Performance Improvement	5.3.11
SA-PI-2015-05	Quick Hit Self-Assessment: OMS Interaction with the SCR and OPEX Processes	5.3.9
SA-PI-2015-08	Review of the NORA Process and its Effectiveness	5.3.2
SA-PI-2015-09	NORA Assessments	5.4, 5.4.4
SA-SA-PI-2015-03	BP-PROC-00059 Rapid Learning	5.4.4 and 5.4.5
SA-PI-2015-01	Effectiveness of OPEX Implementation	5.3.9, 5.4.3, and 5.4.6
SA-PI-2014-04	Effectiveness of FASA Process Improvements, Performance Improvement	5.3.11, 5.4.4, 5.4.6
SA-PI-2014-02	External OPEX Applicability Responses	5.3.9
SA-PI-2013-06	FASA Program Effectiveness	5.4.4
SA-PI-2013-02	OPEX - Utilization of Significant Internal OPEX	5.3.9
SA-PI-2012-02	OPEX Training Materials	5.3.9
SA-RPR-2014-01	EPD Alarm Follow-up at Bruce A and Bruce B	5.2.2, 5.3.9, 5.4.2
SA-RPR-2013-05	Discrete Radioactive Particle Control Evaluation for Bruce A	5.4.2

FASA	Topic	Applicable to Review Section
SA-RPR-2013-04	Locked High Radiation Area Controls	5.3.11, 5.4.2, 5.4.3, 5.4.6,
SA-RPR-2013-03	Review against WANO RP Guidelines	5.4.2
SA-RPR-2013-02	Bruce Power CANDU Radiological Protection Benchmarking Project Assessment	5.3.9, 5.4.2
SA-SC-2015-01	Late Material Additions to Plan – Online Work Management	5.3.4
SA-SC-2014-05	Effectiveness review of Implementation of Supply Chain metrics / dashboard	5.2.3, 5.3.4, 5.3.5
SA-SC-2014-04	Supplier Document Acceptance Request	5.2.3, 5.3.4, 5.3.5
SA-SC-2014-03	Quality Services Governance Review	5.2.3, 5.3.4, 5.3.5
SA-SC-2014-02	Application of Contract Administration Activities	5.2.3, 5.3.4, 5.3.5
SA-SC-2014-01	Implementation Effectiveness of BP-PROC-00353	5.2.3, 5.2.5
SA-SC-2012-06	Procurement/Expediting Of Unplanned/Unscheduled Work	5.2.3, 5.3.4
SA-SC-2012-01	Vendor Audit	5.2.3, 5.3.4, 5.3.5
SA-STK-2015-01	Quick Hit Self-Assessment: Effectiveness of Global Email Communications	5.3.6 and 5.4.7
SA-TRGD-2015-09	Record Retention Process	5.3.3
SA-TRGD-2015-12	Focus Area Self-Assessment – Bruce B ANOIT Initial Certification Simulator Training	5.3.7
SA-TRGD-2015-19	Gap Identification between CNSC Regulatory Document REGDOC-2.2.2 and BP-PROG-02.02	5.3.7
SA-TRGD-2014-14	Pressure Boundary Quality Assurance Program	5.3.2, 5.3.7, 5.3.8
SA-TRGD-2014-13	Qualifications not associated with TQDs	5.3.2, 5.3.7, 5.3.8

FASA	Topic	Applicable to Review Section
SA-TRGD-2014-10	Initial Simulator Examinations	5.3.2, 5.3.7, 5.3.8
SA-TRGD-2014-09	Bruce B ANO/CRSS/SM Continuing Skills Training	5.3.7
SA-TRGD-2014-06	Complement Qualifications (TQD-00088), Qualification Structure Clarity	5.3.2, 5.3.7, 5.3.8
SA-TRGD-2014-03	Compliance with the Engineering Continuing Training Requirements	5.3.2, 5.3.7, 5.3.8
SA-TRGD-2014-01	Operations Training Assessment of SOER 2013 Recommendation 1 (Operator Fundamentals)	5.3.2, 5.3.7, 5.3.8
SA-TRGD-2012-04	Review of Training Programs	5.3.7
SA-WMSI-2015-02	Quick Hit Self-Assessment – Online Work Management	5.4.8, 5.4.8
SA-WMSI-2014-01	Bruce A – Scheduling and Building of WO's and WR's	5.2.5
SA-WMSI-SA-2013-01	Graded Approach to Scheduling	5.2.5
SA-WMSI-2013-03	On-Line Work Management	5.2.5

7.1.1. SA-AUD-2015-10: Quick Hit Self-Assessment – MCR Lessons Learned and Documentation and Records

The focus of this self-assessment was to evaluate compliance with requirements on Lessons Learned and Documentation and Records processes found in MCR6-PGMP-001, Major Component Replacement (MCR) Bruce B Unit 6 Outage Program Management Plan and to identify any gaps based on the assessment findings. No major gaps were identified; however, the following minor shortcomings have been noted which are being tracked through SCR 28524944:

- MCR6-PGMP-001, Major Component Replacement Bruce B Unit 6 Outage Program Management Plan does not address who/what/when related to the requirements to review the effectiveness of actions taken to address lessons learned and therefore it should be revised to include this information; and

- The MCR templates need to be updated to address the requirements found in BP-PROC-00110, Information, Classification, Access and Handling Requirements [175].

7.1.2. SA-BS-2015-01 Oversight to Pressure Boundary QA Program Requirements, Section 17 - Records Management

The objective of this FASA [176] was to review BP-PROG-03.01 [85], Document Management and implementing Records Management procedures to determine if current processes, work activities, and performance results meet BP-PROG-00.04 [44], Pressure Boundary Quality Assurance Program (PB QA), Section 17 – Records Management requirements. The FASA confirmed the current approved Bruce Power Records Management processes and activities meet the PB QA requirements, BP-PROG-00.04, Section 17.

An opportunity for improvement (AR #28503941) was raised to create a new Records related Observation and Coaching Checklist to provide enhanced oversight. This task has been completed.

7.1.3. SA-COM-2015-03: Quick Hit Self-Assessment – Configuration Management Engineering Governance Review

The scope of this self-assessment [177] included all programs and procedures for the Configuration Management Engineering Functional area including BP-PROG-10.01 [96], BP-PROG-10.02 [109], and BP-PROG-10.03 [112]. The objective of the FASA was to review the overall governance structure, compliance with CSA N286-12, and opportunities to minimize the number of procedures in Engineering Support Division. The self-assessment recommended that the interface between safety analysis and design processes be revised to make them clear.

This self-assessment has led to identification of an Adverse Condition (AR #28513934) which recommended that the content of BP-PROC-00358 [178] be added to one of the procedures implementing BP-PROC-00326, Software Management, to ensure compliance with BP-PROC-00166 [53]. Additionally, an opportunity for improvement (AR #28513935) has been raised to combine programs and procedures in the Configuration Management functional area for improved efficiency.

7.1.4. SA-COM-2015-09: Focus Area Self-Assessment – Technical Conscience

The objective of this FASA was to determine the degree to which the Engineering and project management organizations have a healthy technical conscience. The documents used to guide this self-assessment include the Utilities Service Alliance Guide to Assessing Technical Conscience, the INPO Principles for an effective Technical Conscience, and the INPO industry Event Report on Integrated Risk Management – Healthy Technical Conscience. In order to evaluate technical conscience effectiveness, the self-assessment was comprised of four parts:

- Technical conscience survey;

- Review of a selection of Bruce A Health Reports;
- Review of engineering initial and continuing training material; and
- Review of internal assessments of technical conscience.

The self-assessment identified two adverse conditions; the first adverse condition (SCR 28477896) requires follow-up assessments in a number of areas including the following FASAs:

- Use of Engineering Judgement;
- Optimum Decision Making; and
- Review of work performed by outside organizations, which has been addressed by SA-COM-2015-12, discussed in detail in Section 7.1.6.

The second adverse condition (SCR 28477897) identified weaknesses in the completion of Health Reports following a review of a selection of Bruce A Health Reports and recommended that one health report per month be selected (rotating between Bruce A, Bruce B, and Corporate Health Reports) for review at the Engineering Management Review Board.

7.1.5. SA-COM-2015-07: Quick Hit Self-Assessment – Project Controls Process

The scope of this FASA in the functional area of Configuration Management was to evaluate the existing project control process, as described in BP-PROC-00840, Engineering Project Controls Procedure [179]. This procedure is used by Engineering Support Division (ESD) to provide a structured approach to managing the engineering portion of projects from initiation to completion phases of design engineering.

Through a review of procedure alteration requests and SCRs, it is evidenced that there is a genuine intent to follow the procedure. There are, however gaps observed and recommendations are made for improvements in the procedure (SCR 28524942 and 28524980) so that it contains more content from industry best practices and the prescriptive nature of the procedure is minimized so that it can be more readable, easier to navigate, and more effective during implementation.

7.1.6. SA-COM-2015-12: Quick Hit Self-Assessment – Review of Work Performed by Outside Organizations

The objectives of this FASA were to determine:

- If clear standards exist for the review of work performed by external organizations (including roles, responsibilities, and expectations of the reviewer/acceptor);
- If thorough reviews are being performed of work performed by outside organizations; and

- If engineering leaders reinforce the responsibility to ensure personnel perform thorough critical reviews of work performed by outside organizations.

As part of this self-assessment, a review of Configuration Management governance documents owned by Station Engineering, Engineering Support and Reactor Safety was completed and results indicate that some standards exist for review of work performed by external organizations, but in many cases there is no risk-based graded approach to the required extent of review. A survey was also conducted to evaluate the thoroughness of reviews performed and to review expectations set by leaders that assign tasks for individuals to review work performed by outside organizations. Generally, the reviews performed exceed requirements in procedures but there are some inconsistencies.

A number of Workshops were also held to review challenges with respect to contactor oversight at Bruce Power with the objective of identifying and documenting issues and proposing corrective actions to resolve the shortcomings.

The results of this assessment indicate that BP procedural guidance is inconsistent for review of contractor qualifications and applied inconsistently by those accepting vendor documents. Additionally, guidance for standards for acceptance of vendor products is inconsistent and not well cross referenced in Bruce Power governance.

To address these shortcomings, SCR 28533235 has been raised to revise a number of BP governance documents (e.g., DPT-PDE-00008 [105] and DPT-NSAS-00008 [99]).

7.1.7. SA-COM-2015-14: Engineering Contract Practices – Oversight Compliance

The objective of this self-assessment was to ensure that Engineering Support Division (ESD) and Engineering Business Programs (EBP) Programs comply with Supply Chain contract oversight requirements established in BP-PROC-00941 [180], BP-PROC-00947 [181], BP-PROC-00948 [182], and BP-PROC-00949 [183].

ESD and EBP procedures (DPT-PDE-00008, Interface with Design Contractors Performing Design Activities for Bruce Power [105] and DPT-PDE-00046, Management of Drawdown Contracts for Plans Design Engineering [184]) were reviewed to determine the extent to which they comply with the governance requirements.

The results of the self-assessment found that the ESD and EBP procedures are not properly aligned with recent Supply Chain revisions to contract management vendor oversight requirements (SCR 28529880) and as such recommended that both procedural documents be revised to ensure that they conform to the Supply Chain contract oversight requirements.

7.1.8. SA-OCP-2015-04: Focus Area Self-Assessment – Operation's Leadership

A gap analysis of the Bruce A Operational Leadership was performed against the behaviours identified in INPO 10-004, Principles for a Strong Operational Focus. The assessment identified

a strength in that Station Management has established a culture where personnel effectively communicate on equipment issues and degraded conditions that adversely affect plant operation.

However, a number of gaps were also identified which are being addressed through proposed corrective actions (SCR 28507211). The gaps identified include horizontal alignment amongst the Shift Managers regarding standards and prioritization, the oversight role of the Shift Manager in the Work Management process, resolution of Operator Challenges through prioritization in the work week planning process, and trigger points to enter the Operational Decision Making (ODM) Process.

7.1.9. SA-OCP-2015-13: Quick Hit Self-Assessment – Operations Peer Q3 Station Observation

This assessment reports on the results of a series of walkdowns and observations which were performed with the objective of breaking down the “silo’s between the two plants” and sharing lessons learnt. The assessment provides information on the results of the walkdowns and observations and provides recommendations to ensure performance is at the highest standard.

7.1.10. SA-OCP-2015-11: Quick Hit Self-Assessment – Operations Cultural Assessment

The objective of this FASA was to review Operations organization cultural aspects and behaviours that may be contributing to events and identify key corrective actions that will result in improved and sustainable performance improvement. A multi-phase process using some of the guidance provided in the INPO Organization Effectiveness Evaluation and Assistance Field Guide was adopted for this review.

The results of the assessment led to identification of opportunities for improvement (SCR 28506215) in five key areas including communications, operator fundamentals, operator training and proficiency, leadership, and risk assessment.

7.1.11. SA- OCP-2015-17: Quick Hit Self-Assessment – INPO 15-004 Operator Fundamental Review

The objective of this FASA [185] was to compare the contents of INPO 15-004 to BP-PROC-00561 [125], Operator Fundamentals, and identify the changes and gaps to be considered for incorporation in the revised document. INPO 15-004 contains additional insight into the topic of Operator Fundamentals and provides amplification of the standards for fundamental operator behaviours as Operator Fundamentals evolve within the industry.

This assessment has led to a number of changes to the procedures, which have been incorporated in the December 2015 revision of BP-PROC-00561 (AR #28520969).

7.1.12. SA-OCP-2013-04: BP-PROG-12.01 N-286-05 Assessment

The objective of this FASA [186] was to confirm that BP-PROG-12.01 [124] Conduct of Plant Operations and associated implementing procedures, correctly reference the requirements of CSA N286-05 [27] credited by BP-PROG-01.02 [51], Bruce Power Management System Management.

It was found that BP-PROG-12.01 is largely aligned with BP-PROG-01.02 Appendix B, Bruce Power Program Alignment to N286-05 [27]. However, there were four requirements that BP-PROG-01.02 Appendix B credits BP-PROG-12.01 with that were not listed in the document. Additionally, many implementing procedures did not reference any of the requirements of the standard, some reference requirements were not credited in BP-PROG-12.01, while some should have been referencing additional requirements. Numerous procedures take authority from GRP-OPS-00038 [128] instead of BP-PROG-12.01. Overall, BP-PROG-12.01 lists all credited requirements of the standard, except as noted above, and therefore was found to be below standard for quality and completeness.

The three year document review DCRs were updated with instructions to correct references and an SCR was raised to have a matrix added to BP-PROG-12.01 to specify which procedures satisfy which requirements. This negates the requirement to specify this in the implementing procedures. BP-PROG-12.01 [124] was revised to remove the shortcomings from this FASA and AU-2013-00014 as documented in its revision summary.

Appendix B of BP-PROG-01.02, BPMS Management System has been removed and the onus is on the respective CFAMs to ensure that their programs comply with the appropriate clauses of CSA Standard N286. As part of the preparation for compliance with N286-12, programs are reviewed to ensure consistency with the CSA Standard.

7.1.13. SA-PI-2015-09: Quick Hit Self-Assessment – NORA Assessments

This self-assessment [187] was conducted to evaluate NORA effectiveness within the Bruce B station. In NORA assessments and their findings, the corrective actions taken by the affected departments to mitigate future reoccurrences were found to be effective.

One adverse condition (AR #28403437) was identified with regards to management oversight and timely completion of mitigating actions. The action requires that a graded approach be developed and formalized for assessment products that allows assessments to monitor and follow up on important issues they identify to ensure timely and effective resolution of issues and to ensure that issues receive adequate management visibility.

Additionally, an opportunity for improvement (AR #28517473) was identified to revise BP-PROC-00706 [188], Nuclear Oversight Issues Elevation and Escalation, to include procedural requirements to initiate an SCR when an elevation is submitted.

7.1.14. SA-PI-2015-01: Quick Hit Self-Assessment – Effectiveness of OPEX Implementation

As part of the Performance Improvement 2015 Annual Self-Assessment plan, this Quick Hit FASA [189] was completed to evaluate the effectiveness of the OPEX process in 2014. There was a significant change in process in 2014 by which OPEX applicability reviews were initiated, tracked and documented. BP-PROC-00062 [143], Processing External and Internal Operating Experience, was updated to make initiation of an SCR and action assignments for all OPEX items mandatory. This provides an auditable trail of the review of the OPEX item. The process to use SCRs and Action Tracking assignment to track OPEX applicability reviews has been accepted across most workgroups. With the implementation of this process change, the OPEX screening rate has demonstrated an appreciable increase in completion and the action rate has remained steady. Tracking via AR completion notes provides an auditable and clear record of the applicability review.

An adverse condition (AR #28498702) and two opportunities for improvement (AR #28495119 and #28498820, which are complete) were initiated to address the findings of this FASA.

7.1.15. SA-PI-2015-05: Quick Hit Self-Assessment – Outage Maintenance Services Interaction with the SCR and OPEX Processes

The objective of this FASA was to ensure the Outage Maintenance Services (OMS) interactions with the SCR and OPEX processes are consistent with both Bruce A and B and that the OMS organizational structure and processes are effective and efficiently operated. The findings of this report are captured in three opportunities for improvement (SCRs 28482129, 28482109, and 28482126).

This assessment identified that the OPEX review process is backlogged in supplying information to the OMS departments. There was evidence that OPEX feedback was too general and was not seen as adding value due to the large number of non-relevant subjects or non-specific material. There were suggestions that an OMS Subject Matter Expert (SME) should review the OPEX packages and only pass the OPEX to the effected Departments. The OMS Performance Improvement manager became the SME and the backlog was removed over a three-week period.

Also, a review of commonality in SCR and HU issues and the value of combining data into a single report was performed which showed that the Bruce B Quarterly Performance Assessment Report appeared to simplify the information while showing the links between cause and effect. Therefore, it has been recommended that a quarterly performance assessment report to include Human Performance, Corrective Action Plan (CAP) Performance and improvement activities based on Bruce B format be prepared.

7.1.16. SA-STK-2015-01: Quick Hit Self-Assessment – Effectiveness of Global Email Communications

The objective if this Quick Hit Focus Area Self-Assessment was to evaluate the effectiveness of Global emails as a communications vehicle to staff for delivering business communications and general information to all employees on the Bruce Site.

As part of this assessment, a review of BP-PROC-00868 [84] was performed to ensure that Global email communications were being used as per the procedure. The assessment found that the Global emails sent during the review period (1 Jan 2014 to 31 July 2015) are aligned with the objective of BP-PROC-00868 which states (in Section 4.1.1) that the purpose of Global emails is to deliver “day-to-day key information updates relevant to all employees”. However, there is an opportunity for improvement for Employee Communications personnel to adopt a questioning attitude toward Global email submissions to ensure each message aligns to this purpose (SCR 28514422).

7.1.17. SA-TRGD-2015-12: Focus Area Self-Assessment – Bruce B ANOIT Initial Certification Simulator Training

The objective of this FASA was to assess the Bruce B Authorized Nuclear Operator (ANO) Initial Simulator Training Program to verify compliance with TQD-00012, Bruce A and Bruce B Authorized Nuclear Operator Initial Training and BP-PROC-00577, Certification Training – Conduct of Initial Certification Training.

The FASA concluded that the overall design and conduct of the MCR Skills Module phase of the Bruce B ANO Initial Training Program meets the standards outlined in TQD-00012 and BP-PROC-00577; however, these documents lack guidance and detail on development, content and conduct of this module. No adverse conditions were identified, but some opportunities for improvement (SCR 28514133) were raised:

- An effective template currently exists for developing Simulator Skills Lesson Plans; however, it lacks procedural guidance which has resulted in inconsistencies between authors when developing lesson plans. Therefore, it is recommended that Certification Training Officers develop and issue a handbook to assist Course Managers and Instructors in developing Simulator Skills Lesson Plans;
- There are inconsistencies in the duration between classes of the MCR Skills Module and as such it has been recommended that Certification Training Officers conduct a review of the MCR Skills Module to establish a current baseline, providing a planning snapshot of both content and duration for Course Managers and Instructors;
- FASA SA-TRGD-2014-1, Operations Training Assessment of SOER 2013-1, Operator Fundamentals Weaknesses identified a weakness in Instructor and Operations Staff knowledge of Operator Fundamentals. PEL 69425, Operator Fundamentals for Instructors was developed and delivered to mitigate this deficiency, although new Instructors to Certification Training have not had an opportunity to receive this training. Therefore it is recommended that Operations Training Department prepare and deliver a

Decision Paper to the Q4 Training Curriculum Review Committee for consideration in adding PEL 69425, Operator Fundamentals for Instructors as part of the Certification Instructor; and

- Additional materials were discovered during this FASA that reflect a potential requirement to review course content for the Classroom portion of the Skills module. Therefore, it is recommended that Certification Training Officers conduct a content review of the MCR Skills Classroom Module.

7.2. Internal and External Audits and Reviews

The objective of the audit process as stated in BP-PROG-15.01 [134] is threefold:

- To assess the Management System and to determine if it is adequately established, implemented, and controlled;
- To confirm the effectiveness of the Management System in achieving the expected results and that risks are identified and managed; and
- To identify substandard conditions and enhancement opportunities.

The objective is achieved by providing a prescribed method for evaluating established requirements against plant documentation, field conditions and work practices. The process describes the activities associated with audit planning, conducting, reporting, and closing-out. The results of the independent assessments are documented and reported to the level of management having sufficient breadth of responsibility for resolving any identified problems (as stated in Section 5.14.2 of [27]).

Audits are planned and scheduled annually and tracked to ensure that they are performed regularly [135]. Requirements and the frequency of audits for specific areas is given in documents such as CSA N286, the PROL based on CSA N285, N288.4, N288.5, N288.7, N293, and CNSC S-296, with the frequency generally ranging from annually to every 3 calendar years.

7.2.1. Internal Audits

Table 6 identifies key audits related to this Safety Factor selected from a list of audits completed after 2008.

Table 6: Corporate Risk Oversight and Audit Division Audits

Audit	Topic	Applicable to Review Section
AU-2015-00018	Temporary Configuration Change Management	5.3.10
AU-2015-2016	OSD&D Process	5.2.3, 5.3.4

Audit	Topic	Applicable to Review Section
AU-2015-00015	Safe Operating Envelope	5.3.3, 5.3.10, 5.4.2, and 5.4.9
AU-2015-00012	Project Risk Management	5.3.8
AU-2015-00010	Technical Operability Evaluation	5.2.5, 5.3.3, 5.3.8, 5.3.9, 5.3.10
AU-2014-00020	Task Planning	5.2.5
AU-2013-00018	Fluid Leak Management Program	5.3.9
AU-2013-00015	PassPort Equipment Data Management	5.3.3, 5.3.7, 5.3.10
AU-2013-00013	Training	5.3.2, 5.3.7, 5.3.8
AU-2013-00011	Dosimetry Program - Health Physics Lab	5.2.2, 5.3.2, 5.3.3, 5.3.7, 5.3.8, 5.4.2
AU-2013-00008	Outage Management	5.2.2, 5.2.5
AU-2013-00007	Bruce Power Management System	5.2.2, 5.4.4
AU-2012-00017	Supply Chain	5.2.3, 5.2.4, 5.3.4, 5.3.5, 5.4.4, 5.4.8
AU-2012-00016	Procurement Engineering	5.2.2, 5.3.4
AU-2012-00015	Critical Drawing Management	5.2.2, 5.2.5, 5.3.10
AU-2012-00011	Records Management	5.2.2, 5.3.3
AU-2012-00010	Dosimetry Program - Health Physics Lab	5.2.2, 5.3.2, 5.3.3, 5.3.7, 5.3.8, 5.4.2
AU-2012-00005	Configuration Management Engineering	5.2.2, 5.3.10
AU-2011-00013	Radiation Protection and Alpha Radiation Recovery Plan	5.2.2, 5.3.3, 5.4.2, 5.4.4
AU-2011-00012	Dosimetry Program - Health Physics Lab	5.2.2, 5.3.2, 5.3.3, 5.3.7,

Audit	Topic	Applicable to Review Section
		5.3.8, 5.4.2
AU-2011-00010	Performance Improvement	5.2.2, 5.3.9
AU-2010-00031	N286.5 Implementation	All of 5.2, 5.3, 5.4
AU-2010-00030	Radioactive Shipments	5.4.2
AU-2010-00024	Root Cause Investigation Audit	5.3.9, 5.4.4
AU-2010-00023	Records Retention Authorization	5.3.3
AU-2010-00016	Re-Certification Training	5.2.2, 5.3.2, 5.3.3, 5.3.7, 5.3.8
AU-2010-00006	Dosimetry Program	5.2.2, 5.2.3, 5.3.2, 5.3.3, 5.3.4, 5.3.7, 5.3.8, 5.4.2
AU-2009-00026	Service Water OPEX	5.3.9, 5.4.4
AU-2009-00013	Radiation Protection Practices	5.3.7, 5.4.2, 5.4.4

The sampling of audits reviewed provides evidence that the audit process is effective and audits, when conducted, go into sufficient detail to evaluate the process to determine whether it is implemented and complies with requirements. All audit reports reviewed contained records of the audit plans, briefings, and clear audit scopes. Reports contain detailed references to samples reviewed and adverse conditions observed during the assessment. Where process weaknesses were observed, these conditions were recorded as opportunities for improvement and appropriately flagged in the SCR system to assist in the continuous improvement activities relating to the Management System.

7.2.1.1. AU-2011-00010, Performance Improvement

The objective of this internal audit [190] was to assess the elements of the following programs in the Performance Improvement Department:

- BP-PROG-00.07 [45], Human Performance Program;
- BP-PROG-01.06 [61], Operating Experience Program; and
- BP-PROG-01.07 [66], Corrective Action.

The audit concluded that overall the programs within Performance Improvement are well documented and thorough. The assessment identified a number of minor shortcomings and misalignments which were documented in four adverse conditions (AR #28265025, 28265027, 28265199, and 28265200) and one opportunity for improvement (AR #28265202). It has been confirmed that all these actions have been completed.

7.2.1.2. AU-2012-00005, Configuration Management Engineering

Independent assessments of Programs are generally conducted every 3 years. This audit was conducted in June 2012 [191]. There were two objectives of this audit:

- Assess the elements of the following programs in the Configuration Management Engineering functional area for completeness and implementation:
  - BP-PROG-10.01 [96], Plant Design Basis Management;
  - BP-PROG-10.02 [109], Engineering Change Control; and
  - BP-PROG-10.03 [112], Configuration Management.
- Assess if requirements of the previous versions of Design Change Package procedures BP-PROC-00539 [110] and BP-PROC-00433 [192] align.

Overall the implementing procedures for the Configuration Management Engineering functional area were found to meet the requirements of the Program documents. Minor gaps and misalignments were found with respect to Bruce Power Management System requirements:

- Implementing procedures for the Configuration Management Engineering functional area programs contain non-adherences to the previous versions of BP-PROC-00166 [53], Procedure and Process Requirements.
- Configuration Management Engineering functional area program documents contain non-adherences to BP-PROC-00774 [57], Program Requirements.
- There were some gaps between the previous versions of Design Change Package Procedures BP-PROC-00539 and BP-PROC-00433. Definitions of terms are not consistent between the procedures and BP-PROC-00433 did not refer to the processes for Software Modifications, Field Change Notices and Temporary Modifications, such as BP-PROC-00539.

The audit identified three adverse conditions related to Configuration Management Engineering that were subsequently addressed through revisions of the documents.

7.2.1.3. AU-2012-00016, Procurement Engineering

The objective of this audit [193] was to assess the implementation of and technical compliance with BP-PROC-00244 [157], Procurement Engineering. The audit was completed in January 2013. Specifically, the audit assessed the implementing procedures associated with the

Catalog Identification Numbers (CAT-ID) Evaluation and Pre-Screening processes, and evaluated the extent to which the associated procedures are maintained.

The audit found the Procurement Engineering processes associated with CAT-ID Evaluation and Pre-Screening processes were not readily complied with, and procedures associated with the Procurement Engineering processes were not managed in accordance with the prescribed requirements.

Regarding the CAT-ID Evaluation and Pre-Screening process compliance:

- The documentation of reviews and changes associated with safety related and augmented quality CAT-IDs were not occurring as prescribed. This resulted in the set of procurement and acceptance requirements (Tech Specs, QA, Equipment Qualification, bill of materials, drawings, manuals) that were not always complete or correct. Although no examples were found during the audit where the intended end-use design function was actually jeopardized, this is a risk when compliance with the associated processes is lacking. There were no distinguishable non-conformances specific to the Unit 1 & 2 Restart sampled CAT-IDs, and as such, the identified adverse conditions were applicable to the efforts of both Restart's and Bruce Power's Procurement Engineering organizations.
- A Self-Assessment was performed by the Procurement Engineering organization in the fall of 2011, which identified a lack of clear, consistent, and unambiguous procedural direction. The requirements were structured so the worker had to navigate within and between different documents to complete a task. The Self-Assessment found general technical compliance with the processes (i.e., no jeopardized end-uses). The corrective actions associated with the Self-Assessment remained open and had been extended six times at the time of the audit.

Procurement Engineering process procedures were not managed in accordance with the prescribed requirements. DCRs and Action Tracking assignments were not completed when documents were revised. Documents were not verified by the identified owners, nor approved by the Corporate Functional Area Manager. Subsequent to this audit and others with similar finding, the Nuclear Oversight group was re-organized to provide greater oversight of the completion of actions and DCR completion has been raised as an opportunity for improvement (Section 5.3.3).

An industry peer assessment identified areas of strength for Bills of Material, and Key Performance Indicators associated with Procurement Engineering deliverables and also confirmed properly specified procurement requirements for rad waste pipe where operating experience had indicated incorrect technical specification application. Improvements were made based on the two adverse conditions, one opportunity for improvement and one area of strength was also identified as a result of the audit.

7.2.1.4. AU-2012-00011, Records Management

The objective of this Audit [194] was to determine if program document BP-PROG-03.01 [85], Document Management, was complete and fully implemented. The results of the audit showed

that for the most part, the documents were complete and the vast majority of requirements were implemented. BP-PROG-03.01 contained some non-conformances in the areas of process identification, revision controls, definitions, descriptions, references, and various administrative requirements. Corrective actions were raised in response to the shortcomings to improve the program document and the implementing documents. These were managed through Bruce Power's corrective action process.

7.2.1.5. AU-2013-00007, Bruce Power Management System

The objective of this audit [195] was to evaluate the completeness and implementation of BP-PROG-01.02 [51], BPMS Management. It was conducted in June 2013. The audit reviewed and evaluated the suite of documents associated with BP-PROG-01.02. The evaluation included the program document, all the procedures and documents that were part of the Program document hierarchy and related regulatory documents.

The audit found that BP-PROG-01.02 did not completely implement the BPMS. It found that many procedures were not aligned, and found previously identified improvements were not completely implemented (all sources, including CNSC Inspections).

The audit generated three SCRs to address the shortcomings.

NK29-CORR-00531-12069 [196] shows the audit findings have been addressed. The following revisions were included in the R008 issue of BP-PROG-01.02:

- AR initiated to Addressed Actions Arising from Bruce Power Audit AU-2013-00007, BPMS Management Audit, June 2013 to align the document with requirements of BP-PROC-00774 and BP-PROC-00068 (note requirements of BP-PROC-00166 do not apply to this document);
- Major revision to include Nuclear Safety aspects;
- Deleted reference to Appendix B Matrix; replaced Appendix B with Document Hierarchy, previously Appendix A. Appendix A is now Process Map. CSA N286-05 compliance matrix is defined as a periodic oversight activity to ensure that the clauses of CSA N286-05 are promulgated through the BPMS;
- DCR revised to better reflect CSA N286-05 Generic Clauses 5.1 to 5.14 and show how, through the Plan-Do-Check-Act cycle, they are met by the various Functional Areas that make up the BPMS; and
- Incorporated changes based on discussion with CNSC, addressing comments contained in [197].

This audit identified weaknesses in implementing the numerous changes that are underway in modifying the BPMS. These changes are being continuously improved through audits and FASAs and in response to CNSC Inspections. The CNSC inspections identified in Section 7.3.2 provide further evidence of the continued improvements underway in implementing the BPMS and BP-PROG-01.02 [51] was updated factoring in the improvements from this audit as referenced in its revision summary.

This resulted in the recent update of the BP-MSM-1 series [37][38][39][40][41], BP-PROG-01.02 [51] and some of its implementing procedures in 2014. BP-PROG-01.02 has also been updated in 2015 to include some additional changes as a result of identified DCRs and to include specific clauses from N286-05.

7.2.1.6. AU-2013-00008, Outage Management

The Bruce Power Management System requires independent assessment of each Program at least once every 3 years. This audit [198] evaluated the Outage Work Management program for conformance and consistency with:

- BP-MSM-1 Management System Manual [37];
- BP-PROC-00068 Controlled Document Life Cycle Management [87];
- BP-PROC-00138 Regulatory Requirements;
- BP-PROC-00166 General Procedure and Process Requirements [53]; and
- BP-PROC-00774 Program Requirements [57].

There were two objectives for this audit. One was to determine if the documents associated with the Outage Work Management functional area were complete and fully documented. This was performed by assessing the Outage Work Management program document (BP-PROG-11.03 R006 (Draft In-progress)) to determine how well all the program requirements were implemented through its document hierarchy. The other objective was to evaluate compliance with and implementation of BP-PROC-00342 SHT001 R005 Planned Outage Preparation Milestones. The audit was completed in November 2013.

The audit found that the Outage Work Management Program generally met the requirements of Bruce Power's Management System, although non-compliances were noted. The following program related issues were identified:

- BP-PROG-11.03 [120], Outage Work Management Program and changes associated with the program were not fully compliant with BP-PROC-00774 R002. The areas not fully compliant were adequacy of documenting and implementing ownership, document hierarchy changes, process mapping, stakeholder reviews, periodic reviews, annual regulatory reviews and records.
- Implementing procedures for the Outage Management Program were not fully compliant with BP-PROC-00166 R023, BP-PROC-00068 R019, and BP-PROC-00138 R002. This resulted in process instructions not meeting all the standardized format requirements, the suite of associated documents and records not always being appropriately identified and aligned, and appropriate reviews not always being conducted to ensure the information remains current.
- Other non-compliances related to BPMS program and procedure requirements for draft documents were captured as opportunities for improvement.

Additionally, the audit found non-compliances with Planned Outage Milestone Requirements in the following areas:

- Bruce Power personnel do not always comply with BP-PROC-00342 SHT001 R005. Procedural non-compliances were found in the areas of Recovery Plans and other Outage Preparation Milestone Requirements. In addition, the Scope Review Panel was not functioning as described in BP-PROC-00342 SHT0002 R007, Scope Review Panel. These non-compliances may result in inadequate preparation for planned outages and lower than expected performance in managing outages. Contributing to this was the lack of control when procedural requirements were altered without following BP-PROC-00811, Procedure Alterations.
- Procedural requirements described in BP-PROC-00342 SHT0001 R005, Planned Outage - Preparation Milestones were not adequate or clearly defined in the areas of Milestone Requirements, Milestone Deadline Alignments and Documentation (Milestone Management Meetings). In addition, multiple conflicting instructions existed which describe the Scope Review Panel process.

Corrective actions associated with an adverse condition (SCR/AR 28167363) identified during a previous surveillance audit (AU-2009-00035, Validation of Outage Milestones) were found incomplete and ineffective. Assignments were not completed as per the original intent and were closed to Management type ARs contrary to BP-PROC-00060 [69], Station Condition Record Process. The surveillance audit found that Outage Preparation Milestones reported as 'satisfied' were not always valid. The audit found similar procedural non-compliances and inadequacies in the areas of implementing milestone colour coding status and milestone deadline alignments respectively.

Two FASAs were also found not conducted in accordance with the requirements of BP-PROC-00137, Focus Area Self- Assessment.

Overall, this audit identified six adverse conditions and two opportunities for improvement. Corrective actions are in place to update the BP-PROG-11.03.

7.2.1.7. AU-2015-00018: Temporary Configuration Change Management

The objective of this audit [199] was to evaluate the completeness of, and compliance to, BP-PROC-00638 [200], Temporary Configuration Change Management Process. The scope of the audit included objectives described in Section 4.7, Temporary Configuration management, of BP-PROG-10.03 [112], Configuration Management, and the requirements implemented in BP-PROC-00638.

The audit found that the Temporary Configuration Change Management process is incomplete but generally effective in meeting the objectives and purpose of BP-PROC-00638. There are, however, weaknesses in the process and non-compliances to the procedure which have resulted in some undocumented configuration management issues and discrepancies between station documentation and field equipment.

BP-PROC-00638 does not adequately specify the applicable Temporary Configuration Change (TCC) records requirements to ensure documentary evidence exists to demonstrate that TCCs meet specified requirements for tracking temporary plant configuration changes from the design basis. The procedure was also found to have inaccuracies, missing and out-of-date instructions.

A number of SCRs were raised to address the findings of this audit (AR #28506621, #28506629, #28506636, #28506641, and #28506643). A review of the status of these SCRs shows that they are all open with a due date of July 2017.

7.2.1.8. AU-2015-00010 – Technical Operability Evaluation

The objective of this Audit was to evaluate the completeness of, and compliance to BP-PROC-00014 [201], Technical Operability Evaluation. The scope of this Audit included a compliance review of Technical Operability Evaluations against the requirements stated in BP-PROC-00014, as well as a review of this procedure against the requirements of BP-PROC-00335-R006, Design Management, and BP-PROG-10.01-R008, Plant Design Basis Management.

The overall conclusion of the audit is that although some deficiencies were identified, the procedure was generally complied with, and although it was in alignment with its Governing Document, it was found to be not fully complete. Some deficiencies in procedure interfaces, records, and requirements were identified, as well as deficiencies in training and staff compliance with some aspects of the procedure which has resulted in gaps between the expectations stated in the procedures stated in the procedure and the technical operability evaluations that are produced. As a result four Adverse Conditions (SCRs 28494162, 28494169, 28494175, and 28494177) have been identified with some of their assignments scheduled to be completed by 2017.

7.2.1.9. AU-2015-00015 – Safe Operating Envelope

This audit evaluated whether the requirements of CSA Standard, N290.15-10, Requirements for the Safe Operating Envelope (SOE) of Nuclear Power Plants, have been adequately established within BP-PROG-10.01-R009 Plant Design Basis Management, its sub-tier documents, and its interfaces.

Reactor Safety Engineering has led a project to implement the requirements of CSA Standard, N290.15-10, Requirements for the Safe Operating Envelope of Nuclear Power Plants within Bruce Power's Operations. The implementation activities have not been fully effective at ensuring the N290.15-10 requirements are embedded within Bruce Power's governance. Incomplete governance includes missing documentation on how the requirements of the standard are met.

The terms Safe Operating Envelope and Safe Operating Limit (SOL) have not been consistently defined or consistent alternatives have not been effectively documented within Bruce Power governance creating confusion regarding N290.15-10 compliance. Bruce Power's use of Surveillance Requirements (SR), Surveillance Limits (SL) and SOL has not been consistent.

In addition, there are Bruce Power programs and procedures that address compliance to N290.15-10 but are not identified as such as required by Bruce Power requirements. Some of these deficiencies have been identified and are being addressed through DCRs and others were not identified.

Reactor Safety Engineering has made extensive use of OPEX, Benchmarking and Self-Assessment activities to assist in the development and implementation of Bruce Power SOE governance. However, the self-assessment and benchmarking activities were not completed in full compliance to Bruce Power requirements to ensure that activities are fully effective and documented.

Three Adverse Conditions were identified (SCRs 28519618, 28524710, and 28524714) which are due to be completed in 2017.

7.2.2. External Audits and Reviews

7.2.2.1. IAEA Operational Safety Review Team Evaluation (2015)

The 2015 evaluation of Bruce B performed by IAEA's Operational Safety Review Team (OSART) identified 10 Good Practices and five recommendations to address the gaps between Bruce Power practices and IAEA guidelines. The following "Good Practices" are relevant to the review tasks considered by this safety factor:

- Use of Visual Management Boards (VMBs) to communicate safety messages and align the organization on daily priorities (relevant to review tasks described in Section 5.4 – Safety Culture); and
- Implementing effective communication and engagement with various stakeholders in surrounding communities, such as the CEO Town Hall event (relevant to review tasks 5.3.6 and 5.4.7).

The following recommendations are relevant to the review tasks considered as part of this Safety Factor:

- Identifying and reporting deficiencies in the field (relevant to review tasks 5.3.11 and 5.4.5);
- Implementing Human Performance techniques to the highest level by maintenance staff (relevant to review task 5.3.11); and
- Protecting onsite personnel in emergency situations, for instance by providing continuous radiation monitoring in assembly areas (relevant to review task 5.4.2).

7.2.2.2. Nuclear Industry Evaluation Program Audit (2014)

Bruce Power had an independent nuclear industry evaluation of the nuclear oversight program [202], and the NORA improvement initiative, where NORA continuously reviews the

effectiveness of their Oversight against the WANO Performance Objectives and Criteria to learn the lessons from WANO 1 Stations around the world [203] [204].

The 2014 Nuclear Industry Evaluation Program (NIEP) evaluation of Bruce Power found that their Programs were effective in meeting the Nuclear Oversight Audit and Supply Chain Quality Services requirements. This assessment concluded that all of the six areas audited were effective. Within those six areas, 75 factors were Satisfactory, although nine areas that were Satisfactory contained Recommendations, three were Deficient and one was defined as a Strength. The deficiencies were in ensuring that the reports were filed on time, to review the Nuclear Procurement reports on Suppliers, and the frequency of meetings of the Plant Operations Review Committee. No concerns were raised with respect to quality assurance and the Management System Manual, BP-MSM-1 [37] and Bruce Power Management System (BPMS) Manual Management Program BP-PROG-01.02 [51].

The strength was that the audit organization has a well-developed Auditor Training program designs training based on a Systematic Approach to Training. Job Task Analysis is documented for knowledge and skill elements. The training program is documented and aligned to develop proficient auditors upon completion of qualifications. Auditors are professional and meet expectations of managers for performance as qualified auditors. This is important from an Organization and Administration Safety Factor perspective, as the Auditors are qualified to assist other groups in improving their performance.

7.3. Regulatory Evaluations and Reviews

After a licence is issued, the CNSC stringently evaluates compliance by the licensee on a regular basis. In addition to having a team of onsite inspectors, CNSC staff with specific technical expertise regularly visit plants to verify that licensees are meeting the regulatory requirements and licence conditions. Compliance activities include inspections and other oversight functions that verify a licensee's activities are properly conducted, including planned Type I inspections (detailed audits), Type II inspections (routine inspections), assessments of information submitted by the licensee to demonstrate compliance, and other unplanned inspections in response to special circumstances or events.

Type I inspections are systematic, planned and documented processes to determine whether a licensee program, process or practice complies with regulatory requirements. Type II inspections are planned and documented activities to verify the results of licensee processes and not the processes themselves. They are typically routine inspections of specified equipment, facility material systems or of discrete records, products or outputs from licensee processes.

The CNSC carefully reviews any items of non-compliance and follows up to ensure all items are quickly corrected.

The CNSC regularly performs Compliance Inspections of wide aspects of the Bruce Power Programs to ensure continuing compliance with CNSC Regulations, Standards and Guidance documents, as well as the internationally recognized Codes and Standards Bruce Power has adopted in their management system. Also, the CNSC conducts quarterly Field Inspections.

Both these review processes are done to ensure continued and improved compliance with the Management System and Safety Culture. The Compliance Inspections are discussed first and then the Field Inspections.

7.3.1. Regulatory Compliance Inspections

Over the last five years, Compliance Inspections relevant to Safety Factor 10 have included single and multiple audits of: Organizational Change Management; Human Resources; Control Documents and Records Management, Communications; the Management System Manual including the documentation and policies; Supply, Work Management including roles and responsibilities; Training and Qualifications; feedback on Operating Experience; Configuration Management; Continuous Improvement; Safety Culture; Nuclear and Radiation Safety procedures; Reportability; and Prioritization of safety issues.

A review of these inspections shows compliance with the majority of the requirements, and continuing improvement.

Examples of the Compliance Inspections relevant to Organization and Administration including Safety Culture are shown in Table 7.

Table 7: Regulatory Evaluations and Reviews

NK29-CORR-00531	Bruce B Compliance Inspection Report	Issues	Summary Comments
12414 12489	Action Item 2015-14-6226: Outage Maintenance Planning and Scheduling (Compliance with RD/GD 210) Response to CNSC Type II Inspection Compliance Report # BRPD-B-2015-001	Programmatic weakness resulting from changing business priorities in outages scheduling and scoping, having multiple outages scheduled at the same time and a lack of resources to focus on both outage and online work at the same time with changing priorities. These issues in turn have caused Bruce Power to be in continuous recovery mode for several milestones throughout the planning process.	Corrective actions taken to address the identified issues with a target completion date of June 2017.
-08782 -09276 -09927 -10673 -10772 -10973 -11031 -11529 -11644 -12069 -12145	Action Item 1307-3968: Response to Compliance Inspection Report BRPD-AB-2012-016 – Management System Review and BP-PROC-00016, Business Assessment Process	State of Functional Area Assessment process incomplete.	Corrective actions taken to resolve concerns. MSM-1 and BP-PROG-01.02 subsequently revised, as well as BP-PROC-00016. Actions have been closed as actions are complete.
-11304 -11785	Action Item 2014-07-5109: BPRD-AB-2014-004 – Assessment (Self and	Frequency, depth and width of audits; pressure boundary	Need to Implement a risk-based audit methodology so Graded

NK29-CORR-00531	Bruce B Compliance Inspection Report	Issues	Summary Comments
-11904 -12095	Independent)	checklists; summary report on audits; tracking actions to completion	approach for Audits of the Management System added BP-PROC-00955.
-11890 -11978 - 12392 - 12553 - 12769 - 12777 - 12953	Action Item 2014-07-5294: BRPD-AB-2014-007 – Problem Identification and Resolution – Corrective Action	Train staff performing trend analysis; improve common cause analysis reports; improve quarterly performance assessment reporting; perform more causal trend analysis. Bruce Power responded to the four Action Notices and eight Recommendations raised by the CNSC inspection team. CNSC staff were satisfied with the corrective actions that have been taken with Action Notices ANO 1 and AN03; these Action Notices are now considered closed. However, Action Notices AN02 and AN04 still remain open. CNSC staff notes that Bruce Power will provide an annual update on the progress of the corrective action plan and provide a request for closure of Action Item 2015-07-6849 by the end of 2017.	Problems Identified and Corrective actions assigned and tracked to completion.
-09869 -10217 -10331 -10332 -11521 -11544 -11836 -11846	Action Item 1107-2924 - BPRD-2011-AB-011 - Radiation Protection Alpha Monitoring and Control; Action Item 1307-4696 - BRPD-AB-2013-018 – Radiation Control - Worker Dose Control;	A process establishing requirements for alpha monitoring is required; hazard posting frequency; personal air samplers; deficiencies with whole body monitor calibration data labels; procedure verification	Worker dose activities in compliance with regulatory requirements but improvements have been suggested.

NK29-CORR-00531	Bruce B Compliance Inspection Report	Issues	Summary Comments
-08929 -09005 -09166 -09256 -09308 -10217 -10304 -10317 - -10626 -10627 -10628 -10687 -11825 -11861 -12044 -12092	Action Item 100712: BRPD-2010-AB-002 Radiation Protection Compliance Inspection Report; Action Item 110706 – BRPD-2010-AB-007 - Radiation Protection Program; Action Item 1107-2924 - BRPD-2011-AB-011 – Radiation Protection Alpha Monitoring and Control; Action Item 1207-3516 – BRPD-AB-2012-009 – Radiological Hazard Control; Action Item 2949 CNSC review of Bruce Power's effectiveness review, of the implementation of BP-RPP-00022, R009 Contamination Control Action Item 2014-07-5397 – BRPD-AB-2014-010	Update Restart Radiation Safety Plan and Procedures to become consistent with Station procedures; perform FASA on contractor and employee onboarding; improve clearances of waste materials; posting and communication of hazards; air purifying respirators; Radiation Exposure Permits; Housekeeping; monitoring at zonal boundaries; CCA requirement compliance; alpha monitoring; lunch room surveillance; dosimetry; waste removal; radiation instrument management; qualification; Contamination Control	Bruce Power was in the process of revising their documentation to ensure top down compliance of the lower tier documents; corrective action plan defined the change timeline. Occupational ALARA Planning and Control meet regulatory requirements with areas and opportunities for improvement
-11891 -11929 -12024	S-99 Reporting	Improve preliminary report timeliness; improved detailed reports	Meeting S-99 reporting requirements
-11668 -11783 -11921	Action Item 2014-07-4687 - BRPD-AB-2014-002 - Condition Assessment Inspection	Improvement of BP-PROC-00498 to use a consistent list of systems important to safety and implementation of a risk-informed decision making process for opportunities for improvement	Satisfactorily implemented
-10830	Action Item 1207-3075: Inspection Report BRPD-2011-AB-018 CFAM Organization Responsibilities	Gaps wrt Supply Chain and Configuration Management	Corrective actions subsequently completed
-08964 -09690 -09706	Document Control MSD- BSGAB-2009-T16492 and Records Management Inspection Report and Document Control of Program Document - BRPD-2011-AB-013	No formal actions, but a recommendation wrt when BP-PROG documents are issued to CNSC past the original stated date.	Improvements made to process. BP-PROG documents which need to be submitted to the CNSC are identified in the LCH.
-10952	Includes discussion of Safety Culture and Improvement & Management Review, Personnel Training	Plans in place should improve human performance. No non-compliances identified and three recommendations for further improvement e.g., focus on higher priority issues and greater participation of Human Factors specialists.	Significant gains in the area of human performance over the past several years

Table 8 assists the reader in determining the relationship between the compliance inspections impact and the review tasks discussed in Section 5.

Table 8: Relationship Between CNSC Compliance Inspections and Review Tasks

CNSC Compliance Inspection	Topic	Applicable to Review Section
BRPD-B-2015-001	Action Item 2015-14-6226: Outage Maintenance Planning and Scheduling (Compliance with RD/GD 210)	5.2.5
BRPD-AB-2015-007	Action Item 2015-07-7037: Radiation Hazard Control at Bruce Power	5.4.2
BRPD-2010-AB-002 BRPD-2010-AB-007 BRPD-2011-AB-011 BRPD-AB-2012-009 BRPD-AB-2014-010	Action Item 100712: Radiation Protection Compliance Inspection Report; Action Item 110706: Radiation Protection Program; Action Item 1107-2924: Radiation Protection Alpha Monitoring and Control; Action Item 1207-3516: Radiological Hazard Control; Action Item 2949 CNSC review of Bruce Power's effectiveness review, of the implementation of BP-RPP-00022, R009 Contamination Control Action Item 2014-07-5397.	5.4.2
BRPD-AB-2014-007	Action Item 2014-07-5294: Problem Identification and Resolution – Corrective Action	5.4.4, 5.4.5
BPRD-AB-2014-004	Action Item 2014-07-5109: Assessment (Self and Independent)	5.3.11
BRPD-AB-2014-002	Action Item 2014-07-4687: Condition Assessment Inspection	5.4.8
BPRD-2011-AB-011 BRPD-AB-2013-018	Action Item 1107-2924: Radiation Protection Alpha Monitoring and Control; Action Item 1307-4696: Radiation Control - Worker Dose Control;	5.4.2

CNSC Compliance Inspection	Topic	Applicable to Review Section
BRPD-AB-2012-016	Management System Related Inspections by CNSC	5.2.2
BRPD-2011-R-010	Completion Inspection - OPEX Program; Action Item 110719: Bruce A Units 1 and 2 Return to Service	5.3.9
BRPD-2011-AB-018	Action Item 1207-3075: Inspection Report CFAM Organization Responsibilities	5.2.2, 5.2.4
BRPD-2011-AB-013	Document Control MSD- BSGAB-2009-T16492 and Records Management Inspection Report and Document Control of Program Document	5.2.2, 5.3.3

7.3.2. Management System Related Inspections by CNSC

From Table 7, there are six correspondence letters related to the Bruce Power Management System Inspection conducted since November of 2012 or related to updates to the Management System. These are: NK29-CORR-00531-10673, -10772, -10973, -11031, -11529, and -11644.

The details of the inspection are identified in Bruce A & B CNSC Type II Compliance Inspection Report BRPD-AB-2012-016 Management System Review at Bruce Power [154], which identified three action notices under Action Item 1307-3968.

The purpose of the inspection was to verify the compliance of the Bruce Power assessment process against CSA N286-05 clause 4 “Management assessment of effectiveness”. Also, the inspection included verifying the assessments are performed with sufficient frequency to confirm the management system’s continuing effectiveness to assess adherence to requirements, and to evaluate the need for changes to the management system including its scope and principles.

A Bruce Power evaluation of the overall effectiveness of the Management System per requirements of CSA N286-05 was piloted in 2010 (for year ended 2009) and took into consideration the introduction of the GOSP model and was performed in parallel with other reviews. Bruce Power Management reviews are also required by other standards/specifications that licensees comply with, such as ISO 14001 (Clause 4.4), “Environmental Management Systems - Requirements with guidance and use” and OHSAS 18001 (Clause 4.6), “Occupational Health and Safety Management Systems”.

CNSC staff concluded that the report structures addressed the full range of activities identified in clause 4 of CSA N286-05 [27], but several weaknesses were also observed with the quality and inputs to some of the reports, and the documentation and resolution of problems.

To address the weaknesses, Bruce Power developed and implemented corrective actions so that the State of the Functional Area (SOFA) reports comply with BP-PROC-00098 [86] requirements and committed to providing copies of any procedures that were revised. Bruce Power noted during the 2012 SOFA review that a number of processes and tool changes were made to improve the quality of Excellence Binders and to strengthen the tie to business planning and augmenting the verification process. Bruce Power also noted that a Continuous Improvement event is part of the Performance Improvement Self-Evaluation plan.

CNSC staff requested that Bruce Power take the necessary measures to ensure that both the documented and implemented Business Assessment process consistently makes a determination of the effectiveness of each program element and the adherence to Functional Area program requirements, based on data from all relevant sources and comprehensive metrics. Bruce Power advised that it had already revised BP-PROC-00166 [53] to include requirements around verification and oversight activities associated with implementing processes. It is expected that the revised procedure will result in better defined verification activities and results for the processes supporting the Programs in each Functional Area.

The Bruce Power oversight model includes Self-Evaluation, management review meetings, Audits, and Assessments to help the CFAM determine the effectiveness of each program suite, and a selection of key metrics are defined and monitored by the CFAM to monitor effectiveness and efficiency. The SOFA process does not use metrics to solely evaluate the effectiveness of the Functional Area and Bruce Power does not require it to report on individual metrics for each programmatic element. To alleviate concerns that the aggregation of scores on the scorecard may lead to an incorrect assessment, the 2011 scorecard was modified to reflect a balanced approach that separates the CFAM's self-evaluation of effectiveness, metric health, results and trends and independent assessment, so that better insights into the Functional Area are achieved.

Additionally, CNSC staff requested that Bruce Power establish and implement administrative or procedural measures to further ensure compliance with the requirements of BP-PROG-01.07 [66] related to documentation and reporting of identified problems, and establishing of corrective actions resulting from the Business/Management Assessment process. Bruce Power revised BP-PROC-00016 [52] to specify when CFAMs are required to use the corrective action or other processes to formally document identified gaps.

The planned due date for the completion of a continuous improvement event on the SOFA process was November 30, 2013, with the submission of the results of the continuous improvement event on the SOFA process by January 30, 2014. The completion date of the revision to BP-PROC-00016 from the identified improvements was identified as February 28, 2014 and formal submission by April 28, 2014. Bruce Power advised an interim update is planned to be made to the procedure, in advance of the Continuous Improvement event, which will go some way to addressing process deficiencies.

Bruce Power subsequently decided that the existing process of ongoing consideration of improvements was a more effective method to gain insights into improving the perceived usefulness, efficiency and integration of the process, rather than performing a single continuous improvement event. BP-PROC-00016 [52] was completed and a request to close AI 1307-3968 was made in August 2014, in time for initial preparations for the next SOFA Assessment and the

periodic full Business Assessment Report, which occurred in 2015. The action was closed by the CNSC on December 1, 2014.

BP-PROG-01.02 [51] was revised to better communicate the SOFA process and link to the N286 requirements.

7.3.3. Self and Independent Assessment Process Inspections by CNSC

From Table 7, there were two correspondence letters related to the Bruce Power Self and Independent Assessment Process as follows: NK29-CORR-00531-12095 is a CNSC Type II Compliance Inspection Report including Action Item 2014-07-5109; and NK29-CORR-00531-11904 is the Bruce Power request to close the AI.

The inspection was conducted to assess compliance with regulatory requirements. The assessment inspection measured the compliance with specific clauses of CSA N286-05 and the Bruce Power processes for self-assessment as defined by BP-PROG-01.06, Operating Experience Program [61] and independent assessments defined by BP-PROG-15.01, Nuclear Oversight Management [134], and related implementing and interfacing documents.

CNSC staff had positive observations about the process and in general, Bruce Power personnel followed the procedures as identified in their programs; however, CNSC staff identified a number of weaknesses with Bruce Power raising SCRs for some issues identified during the inspection to correct these issues.

CNSC staff concluded that the self-assessment process does not always continually assess and improve the effectiveness with which work activities meet the requirements. Specifically, CNSC staff concluded that, despite the efforts to audit all programs in a three-year period, the performance audits covered only a limited number of the implementing procedures of the programs even though a risk-based audit methodology was not fully developed. The CNSC staff concluded that the consequence of these weaknesses is that management would not have complete input information for their management system effectiveness reviews. Four action notices and four recommendations were raised.

In general, Bruce Power personnel followed the procedures for self-assessments and audits as identified in the program documents BP-PROG-01.06 and BP-PROG-15.01. Improvements to BP-PROG-15.01 are in progress and BP-PROG-01.06 was revised in January 2016. Bruce Power has responded to the four action notices and four recommendations with formal Action Tracking commitments (managed process) to address the inspection findings and subsequently formally requested closure of the AI.

Overall, the process was positive, in that there was a collaborative exchange of information and ideas were provided to improve the Self and Independent Assessment Process.

7.3.4. Regulatory Quarterly Field Inspections

In addition to the Type I and II CNSC Inspection, thirteen Quarterly Field Inspection Reports were completed by CNSC staff from the last quarter of 2011 through 2015. These are shown in Table 9, and cover the field surveillance inspections conducted to address each of the CNSC

Safety and Control Areas. The SCAs closely align with the IAEA SSG-25 Safety Factors. The SCA that most closely maps to Safety Factor 10 is SCA 1 on Management Systems, although some overlap exists with SCA 2 on Human Performance Management, SCA 6 on Fitness for Service, SCA 7 on Radiation Protection, SCA 9 on Environmental Protection and SCA 11 on Waste Management.

The CNSC staff Compliance and Verification activities did not find evidence of unsafe operation that would result in undue risk to health and safety of persons, the environment, or that would compromise respecting Canada's international obligations. Major issues result in an Action Item being opened so that the issue resolution can be tracked. Minor issues are usually corrected immediately by Station staff or acceptable responses for the issues are provided. Major issues were reviewed to see if they impacted the Management System – Organization and Administration, but as expected no gaps were identified, as the CNSC would have requested quick remedial action.

Table 9: CNSC Quarterly Field Inspections Reports

NK29-CORR-00531	Bruce A And B Quarterly Field Inspection Report	# of field inspections Bruce B	Minor Issues	Major Issues / comments
-08135	BRPD-2009-AB	37	Information Purposes	None
-09894	BRPD-2011-AB-019	13	Seismic restraining; Radiation protection, Maintenance backlogs	None
-10496	BRPD-AB-2012-014	15	16 positive findings; 7 areas with minor findings; key area: Maintenance backlogs;	None
-10656	BRPD-AB-2012-017	15	13 positive findings; Issues found in 9 areas; fire blanket use for combustible material; scaffolding, work requests for Control Room Panels	2 recommendations / enforcement actions;
-10945	BRPD-AB-2013-005	15	18 positive findings; 5 areas minor issues; Key - Elective Maintenance Work Request high backlogs; 3 action notices and 2 recommendations on elective maintenance	None
-11118	BRPD-AB-2013-010 - ACTION ITEM 1307-4270	13	16 positive findings; 6 areas of minor issues; 3 areas needing improvement; Operator Surveillance, (Elective) Deficient Maintenance Work Requests; Scaffold inspections; 1 action notice and recommendation	2 Enforcement Actions
-11414	BRPD-AB-2013-015	15	18 positive findings; 4 areas of minor issues; 3 areas needing improvement; Operator Surveillance, (Elective) Deficient Maintenance Work Requests; Whole body counters; 1 action notice and recommendation	None

NK29-CORR-00531	Bruce A And B Quarterly Field Inspection Report	# of field inspections Bruce B	Minor Issues	Major Issues / comments
-11598	BRPD-AB-2014-001	16	21 positive findings; 2 areas of minor issues; 2 areas needing improvement; Operator Surveillance, (Elective) Deficient Maintenance Work Requests; Whole body counters; 1 recommendation	Improve tagging recommended
-11755	BRPD-AB-2014-003	15	17 positive/ compliant findings; 6 areas of minor issues; 2 areas needing improvement: Operator Surveillance, (Elective) Deficient Maintenance Work Requests;	None
-11932 -11987	BRPD-AB-2014-008	12	17 compliant findings; 5 areas of minor issues; 4 areas needing improvement: Deficient Maintenance Work Requests, Housekeeping, combustible material management and scaffolding inspection; 1 action notice	Reviewing the process for inspecting scaffolds.
-12088	BRPD-AB-2014-011	14	18 compliant findings; 5 areas of minor issues; 4 areas needing improvement: Deficient Maintenance Work Requests, and scaffolding inspection.	None
12283	BRPD-AB-2014-020	16	17 compliant findings, 9 minor non-compliances, 2 areas of improvement to align with industry best practices	Action Item 1307-4113 to address deficient maintenance backlog issue
12565	BRPD-AB-2015-003	15	25 compliant findings, 5 minor non-compliances, and one are of improvement	None

7.4. Performance Indicators

Performance indicators are defined as data that are sensitive to and/or signals changes in the performance of systems, components, or programs.

The Human Performance Event Free Day (or Human Performance Clock) Reset Indicator is used to depict clock resets as a result of an event at the Station, Department or Section level. The clock is reset as a result of an event attributable to human error or organizational weakness that results in the reset criteria being met for reactor safety, radiological safety, industrial safety or environmental safety.

As discussed in Section 5.1, the CNSC performs an annual review of each Station. The report for 2014, Regulatory Oversight Report for Canadian Nuclear Power Plants: 2014, issued in September 2015 [147], summarizes the 2014 ratings for Canada's NPPs in each of the 14 CNSC Safety and Control Areas (SCA), including management system and human performance management.

CNSC staff rated Bruce B as "satisfactory" in the management system SCA, and concluded that the management system SCA met performance objectives and all applicable regulatory requirements, and that Bruce Power is maintaining compliance with N286-05. CNSC staff verified that the licensee continued to maintain and improve an effective management system at Bruce B.

The human performance management SCA covers personnel training, personnel certification, and work organization and job design. For 2014, the Bruce B rating for the human performance management SCA was also "satisfactory".

Overall, the review for 2014 showed that Bruce B's performance was fully satisfactory, improved from the 2013 rating of satisfactory.

8. Summary and Conclusions

The overall objectives of the Bruce B PSR are to conduct a review of Bruce B against modern codes and standards and international safety expectations, and to provide input to a practicable set of improvements to be conducted during the MCR in Units 5 to 8, as well as U0B, and during asset management activities to support ongoing operation of all four units, that will enhance safety to support long term operation. The specific objective of the review of this Safety Factor is to determine whether the organization and administration are adequate for the safe operation of the nuclear power plant. This specific objective has been met by the completion of the review tasks specific to organization and administration.

Strengths identified during this review are:

- The existence of a comprehensive suite of programs and procedures that ensure the organization and administration will be controlled and well-documented in the future. Additionally, Bruce Power demonstrates a strong commitment to continuous improvement by conducting regular self-assessments of their processes.
- The commitments to improvements that are systematically being undertaken based on the strong direction and guidance from the Nuclear Oversight and Regulatory Affairs organization, both in their audit and assessment reviews and their push to comply with more recent Regulatory Documents, Guidance Documents and Standards. The organization was re-organized to improve their focus on both Audits and Assessments and has committed to the CNSC to introduce a risk-informed process to their audits and assessments process to ensure risk significant areas are reviewed more frequently.
- Bruce Power's organization shares Safety Performance OPEX, Compliance Reporting and Corrective Action processes, as commonly-maintained programs with Bruce A, so observations and lessons learned at Bruce A can be used at Bruce B. Additionally, there is an opportunity to share knowledge from Bruce A by transferring managers to Bruce B and vice-versa. Thus, strengths at each station and means to see how the other Station prevents and mitigates less desirable situations are shared to increase the corporate knowledge and experience.

Table 10 summarizes the key issues arising from the Integrated Safety Review of Safety Factor 10.

Table 10: Key Issues

Issue Number	Gap Description	Sources
SF10-1	BP-PROC-00363 [97], Nuclear Safety Assessment, and its implementing documents do not provide guidance on the responsibility of staff for Safety Assessment work performed outside of the NSAS Department.	Section 5.2.3
SF10-2	Ineffective implementation of BP-PROC-00060 [69]. DCRs can become stagnant in the system, for example, depending on how they are initiated which leads to documents being revised without incorporating the identified changes.	Section 5.3.3
SF10-3	A number of governance documents contain out of date references (e.g., superseded CNSC documents).	Section 5.3.3

The overall conclusion is that, with the exceptions noted in Table 10, Bruce Power's programs meet the requirements of the Safety Factor related to Organization and Administration.

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Appendix A – High-Level Assessments Against Relevant Codes and Standards

No codes or standards relevant to Safety Factor 10 were subjected to high-level assessment. This Appendix is retained only for consistency with the Appendix numbering scheme in all other Safety Factor Reports.

Appendix B – Clause-By-Clause Assessments Against Relevant Codes and Standards

No codes or standards relevant to Safety Factor 10 were subjected to a clause-by-clause assessment. This Appendix is retained only for consistency with the Appendix numbering scheme in all other Safety Factor Reports.