Attachment 1

Resume of Joseph F. Bourassa

JOSEPH F. BOURASSA

Contact Information
Cell Phone – (860) 490-7055

SUMMARY

Mr. Bourassa has over 34 years of experience in the many aspects of nuclear facility construction, operation, assessment and decommissioning with concentrations in Senior Management, Project Management, Technical Assessments, Radiological and Environmental Site Closure, Groundwater, Remediation, Radiation Protection Management, Spent Fuel Transfer and Fuel Storage Management, Quality Assurance/Quality Control, Contract Management and Oversight, Transition Management, Licensing, Environmental Compliance, Chemistry, Radioactive Waste Management, Outage Planning/Execution and Corrective Action Program Management. Professional experiences also included some international work as an Expert with the International Atomic Energy Agency (IAEA) for the Chernobyl Nuclear Power Plant decommissioning and International Standards development in the Training and Quality Assurance functional areas.

EXPERIENCE

President NDJ Solutions **2007-Present**

Technical Consultant *– Various Oversight Committees, Assessments, Management and Technical Support Services*

Mr. Bourassa has been performing consulting services for approximately twenty (20) different companies in a variety of oversight, assessment, management, quality and technical services. Some of the specific areas of services have included participation on Oversight Committees, Senior Management consultation, Project Management, Radiological and Environmental Site Closure, Groundwater, Site Remediation, Radiation Protection, Spent Nuclear Fuel Management and Fuel Transfer/Independent Spent Fuel Storage Installation (ISFSI) Operations, Quality Assurance/Quality Control, Contract Management and Oversight, Transition Management, Licensing, Construction Quality Assurance Oversight, Environmental Compliance, Radioactive Waste Management, Outage Management, Supplier Oversight, Independent Assessment and Corrective Action Program Implementation / Management. He has been and continues to be a member of oversight committees. Currently, Mr. Bourassa is the part-time Radiation Protection Manager and Quality Assurance Manager for each of the 3 Yankees Dry Fuel Storage Facilities and the Quality Assurance Manager for the Vermont Yankee Decommissioning Project. He is also currently providing transition, technical and some management support services for the following nuclear facilities: Fort Calhoun, SONGS, Zion Station, Pilgrim, Indian Point and LaCrosse Boiling Water Reactor. He was previously the Director of Nuclear Safety and Regulatory Affairs for Connecticut Yankee during decommissioning of the facility and the Director of Site Closure responsible for the completion of all radiological and environmental site closure activities at the Yankee Nuclear Power Station.

Yankee Atomic Electric Company **2006-2007**

Senior Site Manager *- Director of Site Closure and Project Support/Environmental Compliance Officer*

Mr. Bourassa was responsible for the management of all site activities, including the completion of the technical and production schedule for remediation, final status survey and site closure activities at the Yankee Rowe Nuclear Power Plant. The primary functional areas of responsibility included Radiological and Environmental Site Closure, ISFSI Operations, Groundwater, Massachusetts Contingency Plan (MCP) implementation, decommissioning projects, Remediation, Radiation Protection, Radiological Effluent/Environmental Programs, Licensing, Final Status Survey, Chemistry, Program Transition and Simplification, Causal Evaluations, Quality Assurance and Environmental.

Connecticut Yankee Atomic Power Company **1999-2005**

Senior Management and Technical Positions - Director of Nuclear Safety and Regulatory Affairs, Environmental Compliance Officer, Nuclear Safety Manager, Environmental Closure Manager, Integrated Site Closure Manager, Transition Manager, Safety Oversight Manager, Radiation Protection Manager (RPM) and Construction Oversight Manager

Mr. Bourassa was responsible for and or involved with most aspects of decommissioning of the Connecticut Yankee Haddam Neck Plant from the time of permanent shutdown through Part 50 License Reduction. Functional responsibilities included various Senior Management positions, Project Management, Radiological and Environmental Site Closure, RCRA Corrective Action Program Management, Groundwater, Radiation Protection Management, Spent Fuel Transfer and Management, Quality Assurance, Contract Management and Oversight, Transition Management, Licensing, Environmental Management, Causal Evaluations, Program/Procedure Development, Program Transition and Simplification efforts, Chemistry, Radiological Effluent/Environmental Programs and Corrective Action Program Management.

Yankee Atomic Electric Company/Duke Engineering & Services **1997-1999**

Technical Positions - Connecticut Yankee Decommissioning Quality Assurance Manager, Yankee Atomic Electric Company Quality Services Manager, Connecticut Yankee Quality Assessment Supervisor and Corrective Action Program Lead

Mr. Bourassa was responsible managing the development and implementation of the Connecticut Yankee Haddam Neck Plant (HNP) and Yankee Atomic Electric Company (YAEC) Quality Assurance (QA) And Corrective Action Programs in preparation for and during decommissioning. Trained and qualified individuals prior to them implementing quality related activities. Managed plant and external QA audits, surveillances and surveys and was responsible for the Quality Control Program. Served as a participating member of the YAEC and Connecticut Yankee HNP Site Oversight Committees.

Yankee Atomic Electric Company **1989-1996**

Technical Positions - Senior Quality Assurance Engineer, ISO 14000 Project Manager, Quality Assurance Supervisor and Audit Team Leader

Mr. Bourassa supervised and implemented QA Audit Programs for several nuclear plants. He developed and implemented the Yankee Atomic Electric Company (YAEC) Environmental, Health and Safety Audit Program. He also, developed Yankee's ISO 14000 Environmental services and managed the overall project and managed in-plant and external QA audits, assessments, surveillances and surveys. He also developed Technical Support Accredited Training Program and an ISO 14000 Lead Auditor Training Course.

Vermont Yankee Nuclear Power Corporation **1985-1989**

Technical Positions - Senior Radiation Protection Technician, Senior Chemistry Technician and Junior Technician

Mr. Bourassa was monitored plant chemistry to maintain the highest possible water quality, concentrating in pure water and radiochemistry. He implemented the Chemistry Department's QC and QA Programs and Vermont Yankee's Radiological and Non Radiological Environmental Monitoring Programs. He performed Radiation Protection activities in support of plant operations and outages and calibrated and controlled instrumentation and radioactive material. He monitored plant radiological conditions and wrote, reviewed, validated and maintained Radiation Protection procedures. Mr. Bourassa managed Contract Radiation Protection personnel. He implemented the Process Control Program and Radwaste Shipping activities.

EDUCATION/TRAINING

BS, Chemistry and Geology, Keene State College, 1985
Project Management, 2005 and 2010
Root Cause Analysis Training, 2004 and 1990
Contract Management, 2003 and 2010
10CFR50.59 Training, 1997, 1999 and 2001 (Current Qualifications)
10CFR72.48 Training, 2001(Current Qualifications)
Management Training Course, 1999
ISO 9000 and 14001 Course, 1994 and 1996
Occupational Safety and Health Administration (OSHA) Voluntary Protection Course, 1994
Radioactive Material Shipping Regulatory Awareness Training, 1989 and 1997
Lead Auditor Certification Training, 1994 and 1989 (Current Qualifications)
INPO Accredited Chemistry and Radiation Protection Training Program, 1986-1989
Various other Environmental, Safety, Radiation Protection and Chemistry Courses, 1985-Present

PROFESSIONAL AFFILIATIONS/CERTIFICATIONS

International Atomic Energy Agency (IAEA) Expert to Chernobyl NPP (2006)
International Atomic Energy Agency (IAEA) Expert for Decommissioning QA (2002)
QA Lead Auditor Certification (Current)
Pacific Gas and Electric (PG&E) Oversight Committee Member for HBPP (Previous)
Station Review Committee (SRC) at Zion Station (Previous)

Nuclear Safety Assessment Board (NSAB) at Connecticut Yankee (Previous)
Independent Review and Audit Committee (IRAC) at Yankee (Previous)
National Registry of Radiation Protection Technologists (NRRPT) (Previous)
Environmental Auditors Registration Association (EARA) (Previous)
Registration Accreditation Board (RAB) Member (Previous)
Environmental Assessment Association (Previous)
ASQC Quality Auditor Certification (Previous)
EARA Environmental Auditor Certification (Previous)
Registration Accreditation Board (RAB) Quality Systems Lead Auditor (Previous)

Attachment 2

Nuclear Development, LLC
Nuclear Quality Assurance Plan

ENCLOSURE 1

Summary of Changes to the TVA Nuclear Quality Assurance Plan (NQAP),
TVA-NQA-PLN89-A, Revision 37 to create ND-NQA-PLN89-A, Revision 0

Change No.	Description of Change	Reason for Change	Basis for Conclusion that the Change is Not a Reduction in Commitment
1	Revised TVA to NA	Making this NQA Plan applicable to Nuclear Development (ND)	Change in ownership of the Bellefonte 1 & 2 Nuclear Power Plants
2	Deleted reference to TVA nuclear power plants (Watts Bar –WBN; Sequoyah – SQN and Browns Ferry – BLN)	Making this NQA Plan applicable to Nuclear Development (ND)	Change in ownership of the Bellefonte 1 & 2 Nuclear Power Plants. This NQAP is only applicable to ND's BLN 1&2, which are the only Nuclear Power Plants owned by ND.
3	Deleted reference to the Clinch River Nuclear Project throughout and deleted - 3.3.7 Early Site Permits - Appendix K: Clinch River Nuclear Early Site Permit Project - Appendix L: Clinch River Nuclear Organization - Appendix M: Clinch River Commitments and Clarifications for the ESP QA Program	Making this NQA Plan applicable to Nuclear Development (ND)	Change in ownership of the Bellefonte 1 & 2 Nuclear Power Plants. This involved a reactor site that is not part of the ND construction permit application for BLN 1&2.
4	Moved content of 4.1.4 to 4.1.1 D and stated "See 4.1.1 D" for 4.1.4 to preserve the numbering sequence.	Making this NQA Plan applicable to Nuclear Development (ND)	Change in ownership of the Bellefonte 1 & 2 Nuclear Power Plants. Nuclear Support is a Vice President *(executive level) for ND

ENCLOSURE 1

Change No.	Description of Change	Reason for Change	Basis for Conclusion that the Change is Not a Reduction in Commitment
5	Moved content of 4.1.6 to 4.1.1 E and stated “See 4.1.1 E” for 4.1.6 to preserve the numbering sequence.	Making this NQA Plan applicable to Nuclear Development (ND)	Change in ownership of the Bellefonte 1 & 2 Nuclear Power Plants. Procurement is a Vice President *(executive level) for ND
6	Deleted content of Section 4.1.8 “Clinch River Nuclear” and renumbered 4.1.9 “Nuclear Oversight and Assessment to 4.1.8.and renumbered 4.1.10 to 4.1.9	Making this NQA Plan applicable to ND’s BLN 1 & 2 only.	Change in ownership of the Bellefonte 1 & 2 Nuclear Power Plants. This involved a reactor site that is not part of the ND construction permit application for BLN 1&2.
7	Added a new 4.1.10 “ Bellefonte Completion Project Independent Oversight”	Making this NQA Plan applicable to ND’s BLN 1 & 2 only.	Change in ownership of the Bellefonte 1 & 2 Nuclear Power Plants, and provides an independent oversight group for the BLN Project Completion.
8	Deleted paragraph 4.1.10.C. 4 since it only pertained to Clinch River Nuclear	Making this NQA Plan applicable to ND’s BLN 1 & 2 only.	Change in ownership of the Bellefonte 1 & 2 Nuclear Power Plants. This involved a reactor site that is not part of the ND construction permit application for BLN 1&2
9	Deleted content of 4.1.10.E.8 and stated “Not Used” to preserve the numbering of the document.	ND does not have non-nuclear organizations	Change in ownership of the Bellefonte 1 & 2 Nuclear Power Plants. ND does not have non-nuclear organizations.
10	Deleted paragraph in 5.0: TVA non-nuclear organizations providing services within the scope of the NQAP through an Intergroup Agreement shall develop QA programs that comply with nuclear requirements. These QA programs shall be assessed and/or audited by QA.	ND does not have non-nuclear organizations	Change in ownership of the Bellefonte 1 & 2 Nuclear Power Plants. ND does not have non-nuclear organizations.

ENCLOSURE 1

Change No.	Description of Change	Reason for Change	Basis for Conclusion that the Change is Not a Reduction in Commitment
11	Deleted paragraph 7.3 C since ND is not involved with Small modular Reactors (SMRs) nor Clinch River Nuclear	Making this NQA Plan applicable to ND's BLN 1 & 2 only.	Change in ownership of the Bellefonte 1 & 2 Nuclear Power Plants. This involved a reactor site that is not part of the ND construction permit application for BLN 1&2
12	Revised 9.1.3 E as "Not Used" since ND is not involved with Small modular Reactors (SMRs) nor Clinch River Nuclear	Making this NQA Plan applicable to ND's BLN 1 & 2 only.	Change in ownership of the Bellefonte 1 & 2 Nuclear Power Plants. This involved a reactor site that is not part of the ND construction permit application for BLN 1&2
13	Deleted 9.5.3 E as since ND is not involved with Small modular Reactors (SMRs) nor Clinch River Nuclear	Making this NQA Plan applicable to ND's BLN 1 & 2 only.	Change in ownership of the Bellefonte 1 & 2 Nuclear Power Plants. This involved a reactor site that is not part of the ND construction permit application for BLN 1&2
14	Deleted reference to ISFSI and 10CFR72,	ND is will not be creating an ISFSI at this time. This will be added in the future if needed.	Change in ownership of the Bellefonte 1 & 2 Nuclear Power Plants. AN ISFSI is not needed at BLN 1&2 at this time.
15	Section 14.5, deleted reference to NRC Certification of Compliance for Holtec International HI-STORM 100 Cast System Docket No. 72-1014 and HI-STORM FW System Docket No. 72-1022	ND will not be using these HOLTEC International systems at this time at BLN 1&2	Change in ownership of the Bellefonte 1 & 2 Nuclear Power Plants. These were needed by for other nuclear power plants owned by TVA. They were not needed at BLN 1&2 at this time.
16	Appendix B, Table 2, paragraph F was revised to be applicable to BLN in lieu of WBN and Paragraph G (SQN) and Paragraph H (BFN) were deleted. WBN compliance was chosen since WBN Unit 2 is the most recently licensed PWR.	Making this NQA Plan applicable to ND's BLN 1 & 2 only.	Change in ownership of the Bellefonte 1 & 2 Nuclear Power Plants. A listing was not provided for BLN 1&2 in TVA's NQAP. We chose the most recently licensed PWR in TVA's fleet and in the USA (WBN Unit 2)

ENCLOSURE 1

Change No.	Description of Change	Reason for Change	Basis for Conclusion that the Change is Not a Reduction in Commitment
17	Appendix C, - deleted paragraph 5.0 "Classification of Dry Storage Systems"	ND will not be using Dry Storage Systems at this time at BLN 1&2	Change in ownership of the Bellefonte 1 & 2 Nuclear Power Plants. These systems were needed for other nuclear power plants owned by TVA. They were not needed at BLN 1&2 at time.
18	Appendix G – Revised to include the organizational structure of ND for the BLN project as well as background information regarding the planned 5 phases for completing BLN	Making this NQA Plan applicable to Nuclear Development (ND)	Change in ownership of the Bellefonte 1 & 2 Nuclear Power Plants and resulting organizational changes while maintaining the same level of commitment to Quality Assurance.

ENCLOSURE 2

ND Nuclear Quality Assurance Plan

ND-NQA-PLN89-A, Revision 0

ND Quality Assurance Program	**Nuclear Quality Assurance Plan (NQAP) (Quality Assurance Program Description)**	**ND-NQA-PLN89-A** **Rev. 0** **Page 1 of 132**
		Quality Related ☑ Yes ☐ No
		Effective Date 09-1-2019

Approved by: Joseph Bourassa — Quality Assurance General Manager

8/27/2019 — Date

REVISION LOG

Revision or Change Number	Effective Date	Affected Page Numbers	Description of Revision/Change
0	Refer to Appendix A	All	Initial Issue

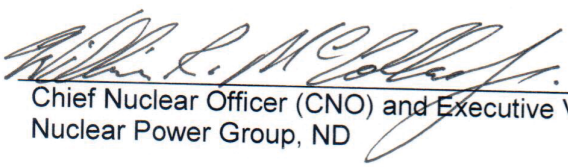
CNO Nuclear Quality Assurance Policy Statement

It is the policy of ND that activities affecting quality be accomplished in accordance with the ND Nuclear Quality Assurance Plan (NQAP) and ND procedures to ensure safe and reliable nuclear operations. As chief nuclear officer, I am responsible for ensuring that nuclear safety is the overriding priority, and that ND's safety and quality-related activities are carried out in accordance with applicable regulatory and ND nuclear procedural requirements. QA personnel have a direct reporting relationship to me and act as my representatives to strengthen nuclear safety and compel improved performance through audits, assessments, and inspections.

The QA organization is responsible for verifying implementation of quality-related activities at corporate and nuclear plant sites. QA personnel have the authority to initiate stop work, if required, to restrict further processing, delivery, or installation of a non-conforming item or unsatisfactory condition until completion of corrective action or satisfactory dispositioning. QA personnel are sufficiently independent from considerations of cost or scheduling to ensure objectivity in performing QA activities. QA personnel have direct access to appropriate levels of management. They also have independence and organizational freedom to be able to effectively assure conformance to QA program requirements.

Line management is responsible for compliance with the NQAP and ND procedures. Line management ensures quality is emphasized in planning, implementing, verifying, and documenting work. Line management is also responsible for pursuing Continuous Improvement through self-assessment practices and prudent application of the Corrective Action Program which may require a level of analysis beyond the minimum required by procedures. Insights from Independent Oversight are expected to be used by line management to improve Nuclear Safety and in the pursuit of Continuous Improvement. Line management is expected to support ND and the industry QA program audits and assessments with subject matter experts and to provide support of the QA rotational development program.

ND Nuclear professionals are responsible for complying with ND procedures as written. Nuclear professionals are expected to value the insights and perspectives of independent oversight and provide timely and effective responses to identified issues. Differing professional opinions are to be encouraged, discussed, and resolved in a timely manner. ND Nuclear professionals shall ensure a healthy nuclear safety culture by emphasizing safety over competing goals to ensure protection of people and the environment.



Chief Nuclear Officer (CNO) and Executive Vice President, Nuclear Power Group, ND

August 27, 2019
Date

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1.0 PURPOSE

This document defines and describes the nuclear quality assurance (QA) requirements for Nuclear Development (ND) and establishes responsibilities for their implementation. The principal objective of the Nuclear Quality Assurance Plan (NQAP) is to provide confidence that activities affecting quality during design, construction, early site permits, operation, and maintenance are accomplished in a manner to achieve compliance with pre- established quality objectives and acceptance criteria.

2.0 APPLICABILITY

The NQAP applies to: (1) ND Nuclear personnel and organizations performing activities that could affect quality-related structures, systems, and components at ND's Bellefonte 1 & 2 nuclear plants and (2) contractor activities that could affect quality-related structures, systems, and components, unless ND has approved alternate administrative controls for those activities.

3.0 GENERAL

It is the policy of the Nuclear Development (ND) that activities which affect quality be accomplished in a planned and systematic manner to achieve compliance with pre-established quality objectives and acceptance criteria. Accordingly, ND has established and will maintain a quality assurance program.

The QA program is founded on the principle that the line organization has the primary responsibility for quality and safety. Quality assurance objectives are not to be subordinated to achieving cost or schedule objectives. Line management will be held accountable for compliance with the quality assurance program and quality requirements. Self-assessment practices are used to ensure the desired levels of quality and safety are achieved and maintained.

Management policies and requirements for the ND Quality Assurance Program are established by the Chief Nuclear Officer (CNO) and Executive Vice President. These management policies and requirements provide the controls that must be applied to the activities performed by and for the agency to ensure implementation of ND commitments. Conflicts involving interpretation of quality assurance requirements of ND’s NQAP are resolved by the Chief Nuclear Officer (CNO) and Executive Vice President.

Activities may be performed by a contractor using their quality assurance program provided that the contractor’s quality assurance program is approved by ND and appropriate interfaces are established. Where ND has delegated responsibility for implementation of parts of the NQAP to contractors, ND line management retains responsibility for adequacy of contractor implementation of quality requirements.

This NQAP is formatted in such a manner as to provide users with a functionally usable document from which Nuclear Procedure System (NPS) documents are developed to implement the requirements stated herein.

The source requirement documents for QA activities are listed in Appendix B. Not only are the source requirement documents listed (e.g., ANSI Standards and Regulatory Guides) but they also specify the particular sections of these source documents that must be addressed (e.g., ANSI N18.7, Section 5.2.12). Providing specific sections of the source requirement documents facilitates use by individuals responsible for the development of applicable procedures and instructions.

However, it must be stressed that the entire set of source requirement documents referenced in each section must be reviewed and understood to capture the program requirements of each source requirement document in QA Program procedures and instructions.

The following subsections identify the management and regulatory requirements applicable to the NQAP. An overview of the program and a description of the functions of the various organizations performing activities within the scope of the program are provided.

3.1 General Management Requirements

The management policies and requirements for the QA Program are established by the Chief Nuclear Officer (CNO) and Executive Vice President. These management policies and requirements provide the administrative controls that shall be applied to activities performed by and for ND to ensure activities are performed in a manner consistent with QA objectives and to provide adequate record of accomplishment of commitments.

3.2 General Regulatory Requirements

The NQAP shall address the conditions of licenses and permits and encompass the applicable regulatory requirements contained in Appendix B of this program description.

3.3 NQAP Overview

The quality assurance program includes the CNO Nuclear Quality Assurance Policy Statement, this NQAP, the ASME Section III Quality Assurance Manual (ASME III QAM) (when active), and other quality-related NPS documents. The NQAP provides direction and implements requirements derived from regulatory requirements, national codes and standards, and other ND commitments. General regulatory guidance and national standards that ND is obligated to implement in the NQAP are listed in Appendix B, "Regulatory Guide Conformance Status."

3.3.1 Implementation

A. The requirements established by this program description and the ASME III QAM (when active) are implemented by ND Nuclear documents sponsored by various organizations. To ensure the NQAP is fully integrated and implemented, procedures and instructions address additional implementing level details contained in requirement documents on which the NQAP is based.

B. The terms "procedure" and/or "instruction," when used within this program description, also includes written standards and documents of a similar nature.

3.3.2 Authority and Organizational Freedom of Those Performing QA Verification

Personnel with responsibility for performing QA verification functions shall have sufficient authority and organizational freedom to:

C. Identify quality problems.

D. Initiate, recommend, and provide corrective actions through a comprehensive corrective action program.

E. Verify the implementation of corrective actions.

F. Initiate stop work, if required, to restrict further processing, delivery, or installation of a non-conforming item or unsatisfactory condition until completion of corrective action or satisfactory dispositioning.

The individuals and organizations responsible for performing QA verifications and assessments of the NQAP shall be formally designated and sufficiently independent from considerations of cost or scheduling to ensure objectivity in performing assessments. They shall be afforded direct access to appropriate management levels.

QA verification of conformance to established quality assurance program requirements is accomplished by those who have neither the direct responsibility nor the authority for performing the quality-related work activities being verified.

3.3.3 Assessment of Effectiveness

The QA General Manager shall assess the overall effectiveness of the NQAP for ND's Corporate and Bellefonte (BLN) site. Results shall be reported to the Chief Nuclear Officer (CNO) and Executive Vice President, and affected vice presidents. These assessments include ND Nuclear and non-nuclear organizations and contractors. QA verifies the effectiveness of NSSS suppliers through audits and annual review of their performance.

The QA General Manager shall arrange for a biennial assessment of the ND Nuclear Quality Assurance program by an organization external to the QA organization. The QA General Manager shall arrange for the assessment of the performance of the BLN QA program by an independent organization at a frequency that meets regulatory requirements.

3.3.4 Achievement of Quality in Performance

Management personnel shall ensure, through organizational structure, self-evaluation, and assigned functional responsibilities, that the attainment of program objectives is accomplished by those who have been assigned the work.

Achievement of quality in the performance of quality-related activities is the responsibility of each individual involved in ND's nuclear power program.

3.3.5 Interpretation of Quality Assurance Program Requirements

The QA General Manager shall provide interpretation of NQAP requirements for ND organizations. Differences involving interpretation or implementation of the NQAP shall be immediately identified and reported to QA for resolution. If satisfactory resolution is not readily attainable, then the difference shall be escalated to the appropriate executive nuclear manager and ultimately the CNO and Executive Vice President, if necessary.

3.3.6 Units with Construction Permits

Refer to Appendix G for BLN 1 & 2 construction permits.

4.0 ORGANIZATION

The organizational structure, functional responsibilities, levels of authority, and lines of internal and external communication for the management, direction, and execution of the NQAP shall be clearly established for all organizational levels. This NQAP describes the general organizational structure and primary responsibilities of the ND Nuclear organization and responsibilities of non-nuclear organizations involved in the NQAP. The Human Resources organization shall prepare organization charts that show overall ND Nuclear organizational structure.

The overall organizational structure is shown in Appendix I. The QA organizations are responsible for establishing upper-tier QA Program requirements and implementation of Quality Assurance functions at corporate and nuclear plant sites. The size of the QA organizations, including the size of respective Site QA staffs, is determined by assessing the resources required to adequately perform functions and workloads assigned to each QA organizational unit.

Bellefonte Nuclear Power Plant’s Final Safety Analysis Report (FSAR) references the ND Organization Topical Report or provides a description of other key organizational positions, including the CNO and Executive Vice President’s organization and plant operating staffs, responsible for administering and implementing the NQAP.

4.1 Functions of Organizations

ND management, while carrying out their functions, are required to fully comply with all aspects of the NQAP applicable to their organization and ensure proper implementation. This subsection identifies (1) functional responsibilities that are generally implemented through procedures and instructions by all ND organizations involved in the program and (2) specific NQAP responsibilities for sponsors of upper-tier corporate program documents.

4.1.1 Executive Nuclear Management

A. The CNO and Executive Vice President has the overall responsibility for the establishment, implementation, and administration of ND's NQAP and the evaluation of its effectiveness. This responsibility is administered through management staff.

B. The Senior Vice President, Nuclear Operations reports directly to the CNO and Executive Vice President and has responsibility for organizations that coordinate and integrate efforts and initiatives into day-to-day ND Nuclear business at BLN 1&2. The BLN Site Vice President and the Nuclear Training General Manager report to this position.

C. The Engineering and Projects Vice President reports directly to the CNO and Executive Vice President and has responsibility for support organizations that coordinate and integrate efforts and initiatives into day-to-day ND Nuclear business. Organizations reporting to this position include Corporate Engineering, Plant Operation Reliability Manager, Inspections Services Manager, Computer Engineering Manager, Project Management, Fuel Supply and Disposal Manager and Nuclear Fuels.

D. The Vice President, Nuclear Support reports to the CNO and Executive Vice President. The Vice President, Nuclear Support reports to the CNO and Executive Vice President. In addition to the responsibilities described in subsection 4.1.2 the Vice President , Nuclear Support is responsible for the management positions responsible for:

1. providing corporate oversight and governance of the planning and execution of plant nuclear outages and outage scheduling,

2. nuclear security, which includes protection of safeguard information, reporting of safeguard events, and development and maintenance of the Site Physical Security/Contingency Plans.

3. technical programs including reliability, safety, emergency preparedness, performance improvement, document control and quality assurance records management

4. providing corporate governance of functional areas (maintenance, operations, radiation protection, chemistry, work control, and procedures) for BLN nuclear plants,

5. developing programs to control procedures and instructions,

6. maintaining the Nuclear Operating Experience Review Program,

7. overseeing the training and performance improvement functions, including development of the ND Nuclear corrective action program, and establishing and maintaining trend analysis procedures for adverse conditions and quality indicators.

E. The Vice President, Procurement reports to the CNO and Executive Vice President.

In addition to the responsibilities described in subsection 4.1.2, the management position responsible for procurement, is responsible for ensuring that the QA requirements established by this program description are either included or referenced (as appropriate) in related Procurement sponsored program areas identified in the body of this Program.

4.1.2 ND Organizations

All ND organizations that work directly under the ND NQAP have the following general functions:

A. Invoke appropriate NQAP requirements on other organizations that provide services for quality-related programs and features.

B. Regularly review the status and adequacy of those parts of the NQAP, which they are executing.

C. Develop, control, and maintain procedures and instructions as appropriate to implement quality-related activities and processes.

D. Ensure appropriate controls for documents and records generated within the organization or received from external sources.

E. Ensure appropriate controls are developed and implemented to maintain housekeeping and cleanness requirements of facilities, systems, and components during the performance of work activities.

F. Identify and resolve adverse conditions and perform related corrective action activities including assessing trends for internally and externally identified problems.

G. Make personnel and resources available during audit performance and ensure that audit responses and corrective actions are completed within established timeframes.

H. Develop certification programs as appropriate and ensure that trained, qualified, and, where required, certified employees are used in the performance of quality-related activities.

I. Initiate stop work within their area of responsibilities when warranted.

J. Ensure personnel performing quality-related activities receive indoctrination and training as necessary to ensure that adequate proficiency is achieved and maintained.

K. Ensure procedures adequately address interfaces of affected organizations.

L. Ensure during preparation and review of procedures and procurement documents that appropriate technical and QA requirements are included.

4.1.3 Nuclear Operations (NO)

A. In addition to the responsibilities described in subsection 4.1.2, the Senior Vice President, Nuclear Operations is responsible for ensuring that the QA requirements established by this program description are either included or referenced (as appropriate) in related NO-sponsored program areas identified in the body of this program description.

B. The BLN Site Vice President is also responsible for:

1. The site compliance with the operating unit license, governmental regulations, and ASME Code requirements.

2. Supplementing programs at licensed units ensuring that the QA requirements of this program description are appropriately established in licensed unit's site procedures.

3. The plant technical review process and PORC.

4. Fire Protection Program.

C. Site Organizations

1. The following site management positions report to the BLN Site Vice President:

a. The management position responsible for plant operations.

b. The management position responsible for site engineering.

c. The management position responsible for Maintenance.

d. The management position responsible for Chemistry.

e. The management position responsible for Radiation Protection.

f. The management position responsible for training.

g. The management position(s) responsible for project management.

h. The management positions responsible for business operations and planning are matrix to this position.

4.1.4 Operations Support

See 4.1.1 D.

4.1.5 Corporate Engineering

A. The management position responsible for corporate engineering reports to the Engineering and Projects Vice President. For issues involving nuclear safety or quality, the management position responsible for corporate engineering has the requisite authority and organizational freedom to report directly to the CNO and Executive Vice President.

B. This management position is responsible for ensuring that the QA requirements established in this program description are either included or referenced (as appropriate) in related engineering-sponsored program areas identified in the body of this program description.

C. In addition to the responsibilities described in subsection 4.1.2, the management position is responsible for:

1. Development of programs to control documents and development of a QA records program.

2. Support of the computer process systems. Computer process systems support coordinates the implementation of the software quality assurance program.

3. Nuclear Cyber Security, which includes the development and maintenance of the Site Cyber Security Plans.

D. Developing and maintaining the ASME III QAM for Bellefonte are the responsibilities of the manager responsible for BLN Project.

E. The engineering organizations are responsible for independent technical reviews. These reviews primarily include:

1. System performance monitoring as required by the Maintenance Rule, 10 CFR 50.65.

2. Technical operability evaluations.

3. Review of technical specification changes that affect the design basis.

4. Review of Final Safety Analysis Report changes that affect the design basis.

5. Self-assessments to ensure maintenance of design basis and adequacy of technical programs.

4.1.6 Procurement

See 4.1.1 E.

4.1.7 Licensing and Performance Improvement

A. The management position responsible for Licensing and Performance Improvement reports to the CNO and Executive Vice President.

B. In addition to the responsibilities described in subsection 4.1.2, the management position for Licensing and Performance Improvement is responsible for:

1. Maintaining an interface between ND and NRC for licensing activities.

2. Directing and managing Nuclear Safety Review Board (NSRB) activities.

C. Nuclear Safety Review Board

1. The NSRB is an offsite committee, which provides senior level oversight of ND's nuclear program with respect to nuclear safety. The NSRB reviews include the activities of the line organizations, as well as other review, audit, and verification organizations. The NSRB also provides senior level management with an assessment of facility operations and recommendations to improve nuclear safety and plant reliability.

2. The Chairperson, NSRB, has an independent reporting relationship to the CNO and Executive Vice President, and other ND Nuclear management on nuclear safety matters. The Chairperson, NSRB, is responsible for advising the CNO and Executive Vice President on the adequacy and implementation of ND's nuclear safety policies and programs and for evaluating these policies and programs for compliance with regulatory requirements governing nuclear safety.

3. The Chairperson NSRB is responsible for complying with the requirements of ANSI N18.7-1976/ANS 3.2. The management position responsible for nuclear licensing is responsible for ensuring that the QA requirements established by the QA program related to NSRB functions are either included or referenced (as appropriate) in related procedures or instructions.

4. The NSRB shall function to provide for independent review as specified in Section 4.1.7C.5.b and oversight of operational phase audits and technical reviews as specified in Sections 12.2E and 4.1.5E.

5. The Chairperson, members, and alternate members of the NSRB shall be appointed in writing by the CNO and Executive Vice President. The CNO and Executive Vice President may delegate the signing of the appointment letter to a subordinate.

Each member shall have an academic degree in engineering or a physical science field, or the equivalent; and shall have a minimum of five years technical experience in one or more of the areas specified in ANSI N18.7-1976/ANS 3.2.

The NSRB shall be composed of at least five members, including the Chairperson. Members of the NSRB may be from ND Nuclear or other organizations external to ND. No more than two alternates shall participate as voting members in NSRB activities at any one time.

a. Functions

The NSRB shall, as a minimum, incorporate the following functions:

(1) Advise the CNO and Executive Vice President on all matters related to nuclear safety;

(2) Recommend to the CNO and Executive Vice President any corrective action to improve nuclear safety and plant operations; and

(3) Notify the CNO and Executive Vice President of any safety significant disagreement between the NSRB and the organization or function being reviewed.

b. NSRB Review Responsibilities

The NSRB shall be responsible for the review of:

(1) The 10 CFR 50.59 Program. 10 CFR 50.59 evaluations will be screened. Review of representative 10 CFR 50.59 evaluations will be performed, selected based on safety significance, for 1) changes to procedures, equipment or systems and 2) tests or experiments completed under the provision of 10 CFR 50.59, to verify that such actions did not require a license amendment;

(2) Proposed changes to procedures, equipment, or systems that require a license amendment as defined in 10 CFR 50.59;

(3) Proposed tests or experiments that require a license amendment as defined in 10 CFR 50.59;

(4) Proposed changes to Technical Specifications or the Operating License relating to nuclear safety prior to implementation, except in those cases where the change is identical to a previously reviewed proposed change;

(5) Violations of codes, regulations, orders, license requirements, and internal procedures or instructions having nuclear safety significance;

(6) Reportable events (10 CFR 50.73);

(7) Plant staff performance;

(8) Recognized indications of unanticipated deficiencies in any aspect of design or operation of structures, system, or components that could affect nuclear safety;

(9) Significant accidental, unplanned, or uncontrolled radioactive releases, including corrective action to prevent recurrence;

(10) Significant operating abnormalities or deviations from normal and expected performance of equipment that affect nuclear safety; and

(11) Implementation of the corrective action program.

c. Minutes of each NSRB meeting and reports of other reviews shall be forwarded to the CNO and Executive Vice President within 30 days following completion of the meeting or review.

4.1.8 Nuclear Oversight and Assessment

The management position responsible for Nuclear Oversight and Assessment reports to the CNO and Executive Vice President and manages the ND Nuclear Quality Assurance organization and the Bellefonte Completion Project Independent Oversight organization.

4.1.9 Quality Assurance (QA)

A. The QA General Manager reports to the General Manager, Nuclear Oversight and Assessment. The QA General Manager has an independent reporting relationship to the CNO and Executive Vice President on quality issues.

The quality organization has direct access to appropriate levels of management and sufficient independence and organizational freedom to be able to effectively assure conformance to quality assurance program requirements.

The QA General Manager administers quality assurance responsibilities through the management positions responsible for corporate QA, site QA and quality services.

The QA General Manager is required to have a bachelor's degree in an engineering or related science, or equivalent related experience. The QA General Manager shall have at least 10 years of experience in a senior managerial capacity with five years' experience in nuclear quality assurance related activities. At least one year of experience shall be nuclear power plant experience in the implementation of the quality assurance program.

The QA General Manager has responsibility for the administration of ND's NQAP requirements for projects being implemented on the BLN units by other organizations. The QA General Manager has responsibility for NQAP implementation for BLN Construction Permit status under guidance of GL-87-15 and RG 1.2 and other organizations.

B. The management position responsible for corporate QA reports directly to the QA General Manager and manages the development and maintenance of ND Nuclear quality assurance programs to ensure compliance with regulations, commitments, and policies, including those Quality Assurance programs that govern activities performed by site Quality Assurance organization personnel. The management position responsible for corporate QA also manages the training program for ND Nuclear QA personnel and the quality audit program.

   The management position responsible for corporate QA is required to have four years of experience in the field of quality assurance, or equivalent number of years of nuclear plant experience in a supervisory position, preferably at an operating nuclear plant or a combination of the two. At least one year of this four years of experience shall be nuclear power plant experience in the implementation of the quality assurance program.

C. The management position responsible for quality services reports directly to the QA General Manager. The management position responsible for quality services:

   1. Manages ND's review and qualification of suppliers to ensure final acceptance of all "safety-related material" for all nuclear plants to comply with applicable specifications and requirements.

   2. Manages the vendor audit program.

   3. Develops and implements the nuclear Quality Control (QC) program which includes the QC inspection program, and the QC training program.

D. The management positions responsible for site QA report directly to the QA General Manager and are responsible for the quality assurance functions and oversight of quality control performance at the site. The management positions responsible for site QA provide oversight of day-to-day plant activities important to safety (for example, the QA organization routinely attends and participates in daily plant work schedule and status meetings to assure they are kept abreast of day-to-day work assignments throughout the plant and that there is adequate QA coverage).

   The management positions responsible for site QA are required to have a bachelor's degree in an engineering or scientific discipline, or equivalent related experience. They shall have at least nine years of experience in plant design, construction, power plant operation, or maintenance, including five years of experience in QA-related activities.

E. ND Nuclear Quality Assurance is responsible for:

1. Developing and administering the NQAP and the QA organization procedures required to ensure that ND activities provide the required degree of safety and reliability.

2. Providing oversight of ND activities by auditing, inspecting, assessing and observing the conduct of activities at corporate and nuclear plant sites to ensure that they provide the required high degree of safety and reliability and are carried out consistent with applicable laws, regulations, regulatory commitments, licenses, and other requirements. The depth and scope of oversight is dependent on the item's or subject's importance to safety and performance history.

3. Stopping work or further processing, delivery, or installation or taking other comparable actions when warranted to control and/or prevent the use of non-conforming materials or continuance of activities adverse to quality at Corporate and nuclear plant sites.

4. Establishing upper-tier QA requirements for QA training and for evaluating the implementation and effectiveness of that training.

5. Developing and implementing the vendor audit and services QA Program which includes auditing, source inspection and surveillance of supplier activities. Developing and maintaining the Acceptable Suppliers List (ASL) of approved vendors.

6. Conducting overview of procured engineering services (offsite) including the review of procurement documents for QA requirements utilizing graded approach criteria, in-depth technical and/or performance based auditing, performing pre- award surveys, and reviewing contractor QA programs.

7. Planning, conducting, and reporting the results of corporate and site audits and following-up identified adverse conditions to ensure appropriate corrective action has been taken.

8. Not Used

9. Developing, reviewing, and maintaining the NQAP.

10. Verifying through assessing or other means that QA requirements are contained in applicable Site QA program procedures, and quality-related activities comply with QA program requirements.

11. Developing and implementing the nuclear QC program which includes the QC inspection program.

12. Reviewing the ASME III QAM - BLN 1 & 2 (when active).

13. Managing development, maintenance, and improvements of site/corporate quality methodologies to evaluate quality programs and technical programs based on observations and trending.

14. Analyzing technical and quality programs from many sources to develop recommendations for senior management action. This includes oversight and independent analysis of trending results. Results are provided to senior management. Advising senior management relative to alternative solutions to technical and quality problems to improve the effectiveness and efficiency of implementation techniques.

15. Advising and interfacing with senior site and corporate management on matters pertaining to the assessment program to aid in the identification and resolution of items that could result in enforcement actions, reduction in power generation, or endangering the health and safety of the general public.

4.1.10 Bellefonte Completion Project Independent Oversight

The management position responsible for Bellefonte Completion Project Independent Oversight reports to the General Manager, Nuclear Oversight and Assessment. This position is responsible for in BLN Project independent oversight of Operator Program Readiness, Construction, Project Controls, Engineering, and Procurement. The management position responsible for Procurement Oversight has an independent reporting relationship to the Vice President, Procurement.

4.1.11 Bellefonte Units 1 & 2

See Appendix G.

4.1.12 Inspection, Testing, Monitoring and Analysis

The management position responsible for inspection, testing, monitoring and analysis reports to the Vice President Engineering and Projects. This is responsible for the Inspection Services Organization (ISO). ISO assists the responsible organization at the sites in the performance of ASME, Section XI, NDE. This organization has a quality responsibility to the management position responsible for nuclear engineering.

4.1.13 Human Resources (Nuclear)

The management position responsible for human resources (nuclear) has the requisite authority and organizational freedom to report directly to the CNO and Executive Vice President for issues related to nuclear personnel. In addition, the management position responsible for human resources (nuclear) maintains a position qualification documentation and validation program.

5.0 NUCLEAR QA PROGRAM

The QA General Manager develops this program description to establish the requirements of the NQAP that encompass the general management and general regulatory requirements in sections 3.1 and 3.2 of this program description. The program requirements apply to design, construction, testing, operation, maintenance, repair, replacement, and modification of BLN 1 & 2 nuclear facilities.

ND Nuclear organizations performing activities within the scope of the NQAP shall implement the program through written procedures and instructions.

5.1 Program Scope

A. The requirements of the NQAP shall apply to activities associated with structures, systems, and components which are safety-related and shall take into account special equipment, environmental conditions, skills, or processes.

B. The requirements shall also apply to ND identified quality-related programs and features which are important to the continued reliable operation of ND's nuclear facilities. Organizations responsible for these programs and features shall determine the extent to which these requirements apply and develop and document applicable NQAP elements and the levels of verification required.

1. Technical requirements related to engineering design are specified by the manager responsible for nuclear engineering. QA shall review or assess these programs and features. The program procedures shall be included in NPS documents.

2. Programs and features for which the NQAP applies are listed below. Appendix C, "Guidelines for Determination of ND-Identified Quality-Related Classifications," was used to develop the list.

   a. Radiological Control.

   b. Emergency Preparedness.

   c. Nuclear Plant Security.

   d. Radioactive Material Shipment.

   e. Special Nuclear Material Management.

   f. Fire Protection.

   g. Radwaste Management Systems, Structures, and Components.

   h. Seismic Category I (L) Items.

   i. Non-safety-related Anticipated Transient Without Scram (ATWS) Equipment.

j. Chemistry.

k. Safety Parameter Display System

l. Nuclear Cyber Security

When using services outside ND Nuclear, responsible organizations for the above programs and features shall specify the extent of applicable QA requirements.

C. To facilitate proper application and implementation of the NQAP, the manager responsible for a nuclear site (delegated to the manager responsible for engineering at the nuclear site) shall develop a Q-List for BLN 1 and 2. The Q-List shall document and classify structures, systems, and components consistent with their importance to safety.

D. Selected requirements of the NQAP shall apply to safety-related activities associated with the license application for new nuclear generation.

5.2 Graded Approach

The NQAP shall provide for the graded application and verification of QA requirements to quality-related items and activities.

A. The following criteria are to be considered when applying NQAP requirements:

1. The impact on safety of an item malfunction or failure.

2. The specification, design, fabrication complexity, or uniqueness of the item, and the environment under which the item must function.

3. The need for special controls and assessments of equipment, processes, and operational activities.

4. The degree to which functional compliance can be demonstrated by an inspection or test.

5. The quality history of the item or activity and its degree of standardization.

6. The intended life span during which the item must perform a quality-related function.

7. Requirements of applicable codes and standards.

B. The following factors are to be considered in the degree of QA verification required to ensure implementation of NQAP requirements:

1. New activities not previously performed or implemented.

2. Trend or previous histories of quality problems.

3. Activities critical to safety or having the most potential to impact safety.

4. Revisions of the procedures which have recently been implemented.

5. Activities that have not been assessed in the recent past or are performed infrequently.

6. Activities that are performed by new personnel, contractors, or technicians.

7. The requirements of applicable codes and standards that are mandated for the item or activity.

5.3 Program Elements

This section identifies or references the NQAP elements delineated through the ASME III QAM for BLN 1 & 2 (when active) during construction completion and implemented through ND Nuclear procedures and instructions. The documents identified in Appendix B contain QA requirements applicable to the NQAP elements. The NQAP shall encompass the following elements:

A. Establishment and use of a comprehensive list of safety-related structures, systems, and components for BLN 1 and 2 identifying the critical plant features that will receive the highest level of QA program application.

B. Use of a graded approach in the application and verification of NQAP requirements. Quality-related items and activities shall be subjected to a level of QA controls and verification commensurate with their importance to nuclear safety.

C. Assignment of responsibilities to appropriate organizations and positions for implementation of the NQAP.

D. Preparation of NPS documents which provide specific guidance in planning, performing, assessing, and controlling activities affecting quality to ensure that quality- related activities are performed in accordance with applicable national codes and standards, regulatory requirements, licensing commitments, and management requirements.

E. Verification of the adequacy of quality-related structures, systems, and components by appropriate inspections, tests, and assessments; and of quality-affecting activities by periodic reviews, audits, and assessments to ensure the adequacy and effectiveness of the NQAP and its implementation.

F. Provisions for adequate indoctrination and training of personnel, and qualification or certification when required, prior to their performing activities which affect quality.

G. Provisions for special controls, processes, test equipment, tools, and skills necessary to attain the required quality.

H. Measures to control cleanness of facilities, material, and equipment; fire prevention; plant access; and equipment protection. Controls shall be applied to the extent necessary to ensure that only proper materials, equipment, processes, and procedures are utilized, and that the quality of items is not degraded through improper practices and techniques.

I. Prompt identification, documentation, evaluation, and correction of adverse conditions.

J. Generation and retention of adequate records to demonstrate compliance with NQAP requirements, applicable national codes and standards, and regulatory requirements.

5.4 Program Documents

The quality assurance program shall be documented by written procedures and instructions. The quality assurance program documents, required by this program description and the ASME III QAM (when active) are contained in the NPS. Requirements for preparation, review, concurrence, and approval of NQAP documents are contained in NPS documents.

A. ASME III QAM for BLN 1 & 2 (when active) during Construction Completion

Associated with this program description is the ASME III QAM. The ASME III QAM is a self-contained manual that prescribes specific QA requirements for the control of items and activities subject to the ASME Code Section III, Division 1. The ASME III QAM satisfies the ASME Section III Code requirement to fully describe both the quality assurance program and the specific responsibilities applied to ND's activities as an "N" certificate holder. The ASME III QAM is filed with the Authorized Inspection Agency in accordance with the requirements of ASME Code, Section III. Changes to the ASME III QAM shall be coordinated with the Authorized Inspection Agency for review and acceptance prior to implementation.

B. Nuclear Quality Assurance Plan

This Nuclear Quality Assurance Plan (Quality Assurance Program Description) contains regulatory and management QA requirements and responsibilities that other NPS documents must address. This program description and implementing documents meet the requirements of 10 CFR 50, Appendix A; 10 CFR 50, Appendix B; applicable ASME Section XI and ASME OM Code requirements for a nuclear QA program. To ensure the nuclear program is fully integrated, additional implementing level details contained in requirements documents shall be included in procedures and instructions sponsored by implementing organizations.

C. Implementing Procedures

The NQAP establishes the quality assurance program requirements. The NQAP places responsibilities on identified sponsors to develop specific

elements of the quality assurance programs addressing specific requirements of source requirement documents. Sponsors of NPS documents are required to identify the document as "quality related" if it contains quality assurance program requirements. Corporate NPS documents identified as quality related receive review and concurrence by QA personnel or others knowledgeable of QA requirements.

5.5 Program Changes

Changes to the NQAP shall be submitted to the NRC in compliance with 10 CFR 50.54 and 10 CFR 50.55. Changes to the NQAP will be distributed to senior managers and department heads for incorporation into their quality procedures.

6.0 CONTROL OF DOCUMENTS AND RECORDS

6.1 Procedures and Instructions

6.1.1 General

A. The QA program requires that quality-related activities shall be prescribed by documented procedures and instructions appropriate to the circumstances. Activities shall be accomplished in accordance with these procedures and instructions.

B. The requirements of this section are applicable to the preparation, review, and approval of procedures and instructions (for example, this program description, NPS documents, ASME III QAM, etc.). Requirements for the preparation, review, and approval of drawings are in Section 7.0 of this program description. Requirements for plant reviews are in Section 9.9 of this program description.

6.1.2 Program Elements

A. Content

Procedures and instructions shall:

1. Describe quality-related activities in adequate detail for the intended user, and include quantitative or qualitative acceptance criteria sufficient for determining that the activities have been satisfactorily accomplished.

2. Describe significant interfaces between personnel and organizations that affect, or are affected by, quality-related activities.

3. Include or reference appropriate technical, QA, regulatory, and licensing requirements, including those in design output documents.

B. Review

Procedures and instructions shall:

1. Receive a documented review for adequacy by a qualified reviewer other than the preparer.

2. Receive the review and concurrence of affected organizations outside the issuing organization prior to approval, unless concurrence has been established in a higher-level document.

3. Receive a review to ensure proper incorporation of QA requirements. These reviews are by QA personnel or others knowledgeable of QA requirements.

C. Approval

Procedures and instructions shall be approved for release by the sponsoring organization prior to use.

D. Procedural Control

Procedures shall be issued for the identification and control of quality-related procedures, instructions, and their changes. The organizations responsible for preparing, reviewing, approving, and issuing procedures, instructions, and changes shall be specified.

E. Review of Operational Phase Procedures

Operational phase site procedures and instructions shall be reviewed to ensure that specific known changes in source documents or changes identified through usage are included as necessary and in a timely manner. The following mechanisms ensure that appropriate procedure reviews are conducted:

1. Plant modification program

2. Resolution of issues identified by QA, NRC, Licensing, and corrective action program

3. Technical specification and FSAR update reviews (including the contractor’s dry cask storage system Certificate of Compliance licensing basis documents).

4. Source document program and process for administering Site procedures

5. Testing program

F. Change Control

6. Changes to procedures and instructions shall be reviewed and approved prior to their implementation by the same organizations that performed the original review and approval, or by another organization assigned by appropriate management or designated in a controlling procedure or instruction.

7. Changes shall be reviewed by organizations having access to pertinent background information upon which to base their approval and having adequate understanding of the requirements and intent of the original document.

8. Minor changes, such as inconsequential editorial corrections that do not affect the outcome, results, functions, processes, responsibilities, and requirements of the performance of procedures or instructions, do not require the same review as the original, but shall be reviewed and approved as defined in controlling documents.

6.1.3 Responsibilities

A. The management position responsible for operations support is responsible for the development of programs to control procedures and instructions. The program elements in Section 6.1.2 and the related source requirements contained within the documents listed in Section 6.1.4 shall be addressed.

B. The QA General Manager shall:

1. Perform reviews or assessments of ND Nuclear NPS documents that implement the NQAP and,

2. Verify through assessing or other means that reviews are conducted by personnel knowledgeable in QA requirements.

C. Deleted.

D. ND organizations that work directly under the ND NQAP are responsible for:

3. Implementing the requirements of the QA program through written procedures and instructions.

4. Ensuring reviews of NPS documents that implement the NQAP are conducted by personnel knowledgeable of QA requirements.

6.1.4 Source Requirement Documents

The applicable source requirement documents and their exceptions are noted in Appendix B of this program description. These establish mandatory controls, which must be addressed in the development of programs for procedures and instructions.

6.2 Document Control

6.2.1 General

A. The QA program requires that for activities affecting quality, measures shall be established to ensure that documents prescribing the activity, including changes, are approved for release by authorized personnel, reviewed for

adequacy, and made available to personnel performing the prescribed activity prior to commencing work.

B. The requirements of this section are applicable to the distribution and control of documents after they have been approved for use.

6.2.2 Program Elements

A. Identification and Distribution

1. The types of documents to be controlled shall be identified. Appendix H lists types of controlled documents and manuals.

2. Master document indexes shall be established and maintained for identifying all controlled documents and their revision status.

3. The distribution of documents shall be controlled and maintained to assist in preventing the use of obsolete or superseded documents.

B. Controlled Use

1. Quality related activities shall be performed in accordance with approved and controlled instructions, procedures, and drawings.

2. Organizations shall ensure through procedures or instructions that those participating in an activity are made aware of and use proper and current documents.

C. Control of Equipment Technical Information

Administrative controls shall provide for control and distribution of equipment technical information (ETI) supplied to ND.

6.2.3 Responsibilities

The management position responsible for nuclear engineering is responsible for the development of programs to control documents. The program elements in Section 6.2.2 of this section and the related source requirements contained within the documents listed in Section 6.2.4 shall be addressed.

6.2.4 Source Requirement Documents

The applicable source requirement documents and their exceptions are noted in Appendix B of this program description. These establish mandatory controls, which must be addressed in the development of programs and procedures for the control of documents.

6.3 QA Records

6.3.1 General

A. The QA program established for the generation, collection, storage, maintenance, and retrieval of QA records requires that records be correctly identified, reviewed, stamped, or otherwise authenticated, retained, and retrievable without undue delay.

B. The storage of quality assurance records in electronic media shall be consistent with the intent of Regulatory Issue Summary (RIS) 2000-18, dated October 23, 2000 and associated Nuclear Information and Records Management Association (NIRMA) Technical Guides (TGs): NIRMA TG 11-1998, NIRMA TG 15-1998, NIRMA TG 16- 1998, and NIRMA TG 21-1998. The guidance of RIS 2000-18 should also be applied to the records keeping and maintenance requirements in other parts of the regulations that accept the storage of records in the form of electronic media.

C. The use of optical disks for electronic records storage and retrieval systems shall comply with the NRC guidance in Generic Letter 88-18.

6.3.2 Program Elements

A. Sufficient records and documentation shall be prepared and maintained to provide evidence of the quality of items or activities affecting quality. QA records shall be legible, complete, and identifiable to the item involved.

B. Design specifications, procurement documents, procedures, and instructions shall specify the QA records to be generated, supplied, and maintained by or for ND. Retention times shall be designated. Indexes shall be established to designate those types of QA records to be maintained.

C. Measures shall be established to maintain control of in process QA documents prior to their completion.

D. Requirements and responsibilities shall be established consistent with applicable codes, standards, and procurement documents for record transmittal, receipt, retention, updating and supplementing of information, and maintenance of the records subsequent to the completion of work and record retrieval.

E. Permanent and temporary QA record storage facilities shall be established to store QA records to prevent infestation, deterioration, or destruction.

F. Measures shall be taken to preclude the entry of unauthorized personnel into QA record storage areas to ensure the integrity of the stored QA records.

G. Records shall be maintained in a manner that will allow access by the Authorized Inspection Agency representative.

6.3.3 Responsibilities

The management position responsible for nuclear engineering is responsible for the development of a QA records program. The program elements in Section 6.3.2 and the related source requirements contained within the documents listed in Section 6.3.4 shall be addressed.

6.3.4 Source Requirement Documents

The applicable source requirement documents and their exceptions are noted in Appendix B of this program description. These establish mandatory controls, which must be addressed in the development of programs and procedures for the control of records.

7.0 DESIGN CONTROL

7.1 General

The QA program requires that measures shall be established and documented to ensure that applicable specified design requirements, such as design bases, regulatory requirements, and codes and standards, are correctly translated into specifications, drawings, procedures, or instructions.

7.2 Program Elements

7.2.1 Basic

A. Specific items, services, and activities subject to design control shall be identified (e.g., reactor physics analysis, stress and thermal analyses, computer code development and use, computer software, compatibility of materials, drawings, specifications, engineering procedures, and instructions).

B. Design activities shall be documented in sufficient detail to permit verifications and audits.

C. Measures shall be established and implemented to ensure that design output documents appropriately identify engineering requirements that apply to plant activities, and to ensure that plant personnel are made aware of engineering requirements that could affect the performance and scope of their responsibilities before those engineering requirements are implemented.

D. Measures shall be established and implemented to provide test requirements in design output documents for the following tests as appropriate:

1. Design qualification.

2. Product acceptance (proof).

3. Pre-operational.

4. Construction.

5. Start-up.

6. Surveillance.

7. Functional.

8. Post-maintenance.

9. Post-modification.

E. Measures shall be established and implemented to provide documented input to other organizations which may request input for their special tests.

F. Acceptance criteria shall be defined for verifications, inspections, and tests in appropriate design output documents.

G. Design output documents shall be utilized, as appropriate, for procurement activities.

H. The Q-List identified in Section 5.1C of this program description shall be developed using appropriate regulations, regulatory guides, and national codes and standards (such as 10 CFR 50, Appendix R; 10CFR50.48(c) Fire Protection, National Fire Protection Association Standard, NFPA 805; Regulatory Guides 1.26 and 1.29; and ASME Boiler and Pressure Vessel Code).

I. Measures shall be established to ensure the environmental qualification (EQ) of safety- related electrical and mechanical equipment is included, as appropriate, within the design basis.

J. Errors and deficiencies in approved design documents, including design methods (such as described in calculations) that could affect quality-related activities are documented and corrected. (Reference Section 10.0 of this program description)

7.2.2 Design Inputs

A. Design assumptions, design inputs, and deviations from approved design inputs shall be identified, reviewed, approved, and documented prior to declaring the structure, system, or component affected by the design operable.

B. Design inputs shall be correctly translated into design outputs.

C. Provisions shall be made to relate the final design to the source of design input.

7.2.3 Design Analysis

A. The performance of design analysis shall be planned and controlled.

B. The suitability of application of materials, parts, equipment, and processes essential to the function of a structure, system, or component shall be reviewed to ensure that functional requirements are met.

7.2.4 Interface Control

Internal and external design responsibilities and interface controls shall be established and defined to facilitate the preparation, review, approval, release, distribution, and revision of documents involving design interfaces. This process ensures that quality-related structures, systems, and components are compatible geometrically, functionally, and with plant processes and environments.

7.2.5 Design Output

A. Engineering requirements on plant activities (e.g., operation, maintenance, installation, modification, surveillance) shall be identified in design output documents.

B. Measures shall be established and documented to control the preparation, review, approval, issuance, and revision of design output documents. These measures shall include criteria and responsibilities to ensure that adequate technical and quality requirements are incorporated prior to issuance.

C. Drawings and specifications shall include, as appropriate, quantitative and qualitative acceptance criteria. These acceptance criteria shall be sufficient for determining that quality-related activities have been satisfactorily accomplished.

D. Drawings and specifications shall receive documented reviews and approvals (and concurrences as required) by responsible organizations prior to use.

E. After approval, drawings shall be controlled in accordance with the requirements of Sections 6.2 and 6.3 of this program description.

F. Revisions shall be reviewed and approved by the same organizations that performed the original review unless another appropriate organization that has access to pertinent background information is designated in the appropriate NPS document or procurement documents.

7.2.6 Design Verification

A. The translation of design inputs into design documents shall be verified and the verification documented.

B. Criteria for determining design verification methods shall be established, identified, implemented, and procedurally controlled. The responsibilities of the

verifier, the areas and features to be verified, and documentation requirements shall be included.

C. Design verification shall be performed by individuals or groups other than those who performed the original design.

D. For nuclear units under a construction permit, design verification shall be complete prior to initial fuel loading.

E. For operating nuclear units, design verification shall be complete prior to reliance upon the component, system, or structure to perform its function. Design outputs which are released prior to verification being completed shall be identified and tracked to ensure the component, system, or structure is not relied upon to perform its function until the verification is complete.

F. When a verification test is used to verify the adequacy of a specific design feature in lieu of other verifying processes, the test shall include suitable qualification testing of a prototype unit under conditions that simulate, to the extent practical, the most adverse design condition. The prototype, component, and feature tests are performed as early as possible and prior to plant installation of the equipment or at least prior to the point where installation of the item would be relied upon to perform its function. In those cases where the most adverse design conditions cannot be achieved in tests, suitable analysis shall be performed to extrapolate test results to design conditions.

7.2.7 Design Changes

A. Design changes, including field changes and modifications, shall be identified. They are subject to design control measures commensurate with or better than those applied to the original design.

B. Design changes shall be reviewed and approved by the organization responsible for the original design unless another appropriate organization that has access to pertinent background information is designated in the appropriate NPS document or procurement documents.

C. Design changes that affect the supply of a quality-related item or service controlled by procurement documents shall not be returned to operation until: (1) the change is reflected in the appropriate change document such as a contract or purchase order change notice, (2) the change document has received the requisite reviews and approvals, and (3) the change document has been submitted to and accepted by the respective supplier.

D. Proposed modifications to quality-related structures, systems, and components shall be reviewed, approved, and controlled in accordance with applicable requirements of the appropriate license and Section 9.9 of this Program. Design modifications shall be at least equivalent to the quality specified in the latest approved design basis.

E. Measures to control plant configuration and ensure that the actual plant configuration is accurately depicted on drawings and other appropriate design output documents and reconciled with the applicable design basis shall be established, documented, and implemented.

F. The design integrity shall be maintained during plant maintenance and modification processes, including temporary changes, and throughout the life of the plant.

7.3 Responsibilities

A. The management position responsible for nuclear engineering is responsible for the development of a design control program. The program elements in Section 7.2 and the related source requirements contained within the documents listed in Section 7.4 shall be addressed. This management position is also responsible for implementation of programs for maintaining design control at licensed units and corporate.

B. The management position responsible for BLN Project is responsible for implementation of programs for maintaining design control at BLN 1 & 2.

7.4 Source Requirement Documents

The applicable source requirement documents and their exceptions are noted in Appendix B of this program description. These establish mandatory controls which must be addressed in the development of programs and procedures for control of the design process.

8.0 PROCUREMENT AND MATERIAL CONTROL

8.1 Procurement Document Control

8.1.1 General

The QA program requires that measures shall be established to ensure that control is applied to documents used to obtain materials, parts, components, spare and replacement parts, and services required to construct, test, modify, maintain, repair, or operate nuclear facilities, commensurate with their importance to safety.

8.1.2 Program Elements

A. Procurement Document Planning

The procurement process, as documented in ND Nuclear procedures, shall identify each activity in the process, who accomplishes the activity, how, and when the activity is performed. The process shall be planned to integrate the following activities as a minimum:

1. Document preparation, review, and change control.
2. Selection of procurement sources.
3. Bid evaluations and award.
4. Purchaser control of supplier performance.
5. Verification activities of purchaser.
6. Control of non-conformances.
7. Corrective actions.
8. Acceptance of item or service.
9. QA records.
10. Audit of procurement program.

B. Procurement Document Content

In the preparation of procurement documents, responsible organizations shall as applicable:

1. Specify or reference applicable design basis technical requirements as defined by Engineering, such as regulatory requirements (including 10 CFR 50.49 and 10 CFR Part 21 as applicable); QA requirements;

material and component identification requirements; drawings; specifications; inspection and test requirements (including acceptance criteria); calibration, handling, storage, packaging, and shipping requirements; and special process instructions. All technical requirements shall be prepared, reviewed, and released under the requirements established by Section 7.0 of this program description.

2. For commercial-grade replacement items intended for safety-related use, Engineering shall determine critical characteristics and specify inspection and acceptance criteria to ensure that items dedicated after receipt are acceptable for use as replacement parts.

3. As appropriate, require that suppliers have a documented QA program that is approved by ND and appropriate interfaces established.

4. As appropriate, require that NQAP requirements be imposed on sub-vendors and subcontractors in sub-tier procurement documents.

5. Identify the documentation to be prepared and/or maintained by the supplier and submitted to ND for review and approval.

6. Identify records to be retained, maintained, and controlled by the vendor or contractor, and those documents and records that the vendors or contractors shall transfer to ND prior to installation or use of an item or service as applicable.

7. Include provisions for right of access to the facilities and records of vendors, contractors, and sub-tier vendors and contractors for source surveillances and audits.

8. Include requirements as defined by Engineering to ensure that suitable spare and replacement materials and components are purchased to the applicable requirements of the NQAP and: (1) specifications and codes equivalent to those specified for the original equipment, or those specifications and codes specified by approved design output; or (2) in cases where the original item or part is found to be commercially "off the shelf" or without specifically identified quality assurance requirements, spare and replacement parts may be similarly procured but, at the very least, equivalent performance is ensured; or (3) in those where the QA requirements of the original item cannot be determined, a documented evaluation establishing the requirements and controls is conducted.

9. Include requirements for reporting non-conformances and for approving corrective actions and non-conformance dispositions.

C. Procurement Document Review and Approval

The review and approval of procurement documents shall include a documented review to ensure that technical, quality assurance, and

administrative requirements are included in procurement documents prior to their use.

D. Procurement Document Change Control

Changes in procurement documents shall be subject to the same degree of control as was utilized in the original documents. Changes such as typographical corrections, quantity, or monetary changes do not require a review.

8.1.3 Responsibilities

A. The management position responsible for procurement is responsible for the development of a procurement document control program. The program elements in Section 8.1.2 and the related source requirements contained within the documents listed in Section 8.1.4 shall be addressed.

B. The management position responsible for procurement is responsible for implementation of programs for maintaining procurement document control.

8.1.4 Source Requirement Documents

The applicable source requirement documents and their exceptions are noted in Appendix B of this program description. These establish mandatory controls, which must be addressed in the development of programs and procedures for control of procurement documents.

8.2 Control of Purchased Material, Equipment, and Services

8.2.1 General

The QA program requires that measures shall be established to assure that purchased material, equipment, and services, whether purchased directly or through contractors, conform to the procurement documents.

8.2.2 Program Elements

A. Evaluation and Selection of Suppliers

1. Evaluations of prospective suppliers shall be conducted and documented to demonstrate that their qualifications and capabilities are adequate to meet procurement document requirements. Supplier evaluations shall include supplier performance assessments as appropriate.

2. Evaluations and selection of procurement sources shall include, as appropriate, the use of historical quality performance data, source surveys or audits, or source qualification programs.

3. A list of approved suppliers shall be maintained.

B. Bid Evaluation and Award

A documented system for reviewing and evaluating bids and correcting bid discrepancies shall be established to ensure suppliers' conformance to procurement document requirements.

C. Effectiveness Assessments

1. The effectiveness of the suppliers' control of quality shall be assessed through periodic audits and/or surveillances utilizing a graded approach consistent with the importance, complexity, and quantity of the items and services procured.

2. The assessments shall consist of, as appropriate, checks, reviews, verifications, examinations, and witnessing of activities related to the fabrication, testing, inspection, and shipment of material, including periodic assessments of suppliers' certificates of conformance.

3. Records, qualifications, and process specifications or procedures shall be documented and verified to be in accordance with contract requirements.

D. Acceptance of Procured Services

Procured services shall be accepted, as appropriate, by:

1. Technical verification of product/data produced.

2. Assessments and/or audit of the activity.

3. Review of objective evidence such as certifications.

E. Acceptance of Procured Items

Procured items shall be accepted by receipt inspection and any combination of the following, as appropriate, based on the item's degree of complexity, uniqueness, and safety classification.

1. Source verification.

2. Pre-installation testing inspection.

3. Supplier certificate of conformance.

4. Post installation testing.

F. Receipt Inspection

1. Receipt inspection shall be performed utilizing graded approach criteria to ensure that material and equipment is properly identified to the purchase document and receiving documentation and meets requirements of

procurement documents. When graded approach criteria are applied to receipt inspection activities, line verification will be required. The applicable QA organization shall independently verify line organization performance to ensure adequacy of line verifications.

2. Deficiencies, such as damage, shall be documented and resolution of the deficiency shall be in accordance with approved documents.

3. Records, such as inspection and test records, shall be available at the Site prior to installation or use of the material or equipment.

G. Maintaining Disposition of Received Items

1. A quality control method for identifying the status of items (e.g., an inventory system, tagging, labeling, and color code) shall be employed that indicates whether items received are acceptable or unacceptable for installation.

2. Items may be installed prior to final disposition of a deficiency. Non-conforming items shall be controlled in accordance with Section 10.2.1.

8.2.3 Responsibilities

A. The management position responsible for procurement is responsible for the development of programs to control purchased material, equipment, and services. The program elements in Section 8.2.2 and the related source requirements contained within the documents listed in Section 8.2.4 shall be addressed.

B. The management position responsible for procurement is responsible for implementation of programs for maintaining control of purchased material, equipment, and services.

C. The QA General Manager is responsible for evaluation and selection of suppliers, acceptance of procured items (as described in Section 9.1.2C), periodic assessments of suppliers utilizing graded approach criteria, and maintenance of an Acceptable Suppliers List (ASL).

8.2.4 Source Requirement Documents

The applicable source requirement documents and their exceptions are noted in Appendix B of this program description. These establish mandatory controls, which must be addressed in the development of programs and procedures for the control of purchased material, equipment, and services.

8.3 Identification and Control of Materials, Parts, and Components

8.3.1 General

The QA program shall ensure that only correct and accepted items are installed and used, and that an item can be related to applicable drawings, specifications, or technical documents at any stage of construction, maintenance, or modification as required.

8.3.2 Program Elements

A. Identification

Identification of quality-related items shall be verified and documented prior to release for fabrication, assembly, shipping, and installation. Identification requirements shall be specified in applicable design and procurement documents. Determination of identification requirements shall be based on the item importance to safety, quality, or potential hazards.

B. Traceability

Traceability of materials, parts, or components to specific manufacturing, installation, maintenance, and/or test records shall be provided as required by codes, standards, or specifications; and shall be accomplished through the recording of heat, batch, lot, part, or serial numbers, or other appropriate identification, either on the item or on records traceable to the item.

8.3.3 Responsibilities

A. The management position responsible for procurement is responsible for the development of the material management program for identification and control of materials, parts, and components. The program elements in Section 8.3.2 and the related source requirements contained within the documents listed in Section 8.3.4 shall be addressed.

B. The management position responsible for procurement is responsible for implementation of programs for maintaining identification and control of materials, parts, and components.

8.3.4 Source Requirement Documents

The applicable source requirement documents and their exceptions are noted in Appendix B of this program description. These establish mandatory controls, which must be addressed in the development of programs and procedures for the identification and control of items.

9.0 CONTROL OF PLANT ACTIVITIES

9.1 Inspection and Line Verification

9.1.1 General

The QA program requires that inspection and line verification procedures and instructions include provisions for inspections and line verifications to ensure quality.

9.1.2 Program Elements

A. Line Verification

1. Line verifications shall be performed and documented to substantiate and ensure that an activity or condition has been implemented and accomplished in conformance with specific requirements.

2. Requirements for line verification identified by design output documents shall be included in implementing documents.

3. Qualification of personnel performing line verifications shall be contained in procedures and instructions developed by the organization performing the line verification and shall be in accordance with Regulatory Guide 1.8 as endorsed in Appendix B of this program description.

B. Inspection Plans and Instructions

Inspections shall be controlled by plans or instructions, which implement requirements, assign responsibilities, and identify acceptance criteria derived from design output documents as appropriate.

1. Inspections to verify conformance to codes, standards, and design output shall be required for each operation. Factors used to determine the extent of inspections to be performed are listed in Section 5.2 of this NQAP.

2. Inspection hold points, witness points, and notification points shall be used as required or needed to verify in-process or final achievement of quality. When graded approach criteria are applied to design/regulatory required inspection activities, line verification will be required. The QA organization shall independently verify line organization performance to ensure adequacy of line verifications.

3. Indirect control by assessment of processing methods, equipment, and personnel shall be specified when direct inspection is impossible or disadvantageous.

4. Instructions for activities such as sampling, assessments, and independent inspections shall be included.

5. Persons responsible for performing sampling, assessments, and independent inspections shall be specified.

C. Inspection Performance

Inspections shall be performed by QA or other qualified individuals approved by QA utilizing graded approach criteria in accordance with controlled plans or instructions which specify attributes to be verified in accordance with requirements and acceptance criteria.

1. Inspections shall be performed by individuals delineated above other than those who performed or directly supervised the activity being inspected.

2. Personnel performing inspections shall be trained, qualified, and certified, as required, within their discipline in accordance with established requirements. The requirements criteria shall be approved by QA.

3. Measuring and test equipment (M&TE) used to perform inspections shall be controlled, calibrated, and maintained as required in Section 9.5 of this program description. The identification of M&TE shall be documented.

4. Work shall not proceed beyond designated hold points prior to release by authorized personnel.

D. Results

Records of inspection results and personnel performing the inspection shall be retained as required in Section 6.3 of this program description.

1. Inspection records shall be identified as such and shall be retrievable.

2. Inspection records shall contain a description of the type of inspection, the date performed, inspection or verification of corrective action results, and identification of the inspector and data recorder as well as the person approving the inspection results including the date of approval.

3. Inspection records and/or data sheets shall include a statement attesting to the acceptability of results and provide for identifying the individual who performed the evaluation.

4. Periodic trending of inspection results shall be performed and reported to appropriate management.

5. Records shall be kept in sufficient detail to permit adequate evaluation of inspection activities.

9.1.3 Responsibilities

A. The management position responsible for inspection, testing, monitoring and analysis, and the QA General Manager are responsible for including the

applicable QA program elements in Section 9.1.2 and the related source requirements found in the documents listed in Section 9.1.4, within the inspection program. The QA General Manager reviews and approves the inspection program to ensure inclusion of QA requirements for their respective site.

B. The management position responsible for inspection, testing, monitoring and analysis, and the Vice President, Nuclear Support are responsible for including the program elements in Section 9.1.2 and the related source requirements contained within the documents listed in Section 9.1.4, as applicable, within the line verification program.

C. The management position responsible for nuclear engineering is responsible for providing qualitative / quantitative criteria in design output documents, which are incorporated in implementing procedures.

D. For BLN 1 & 2, the management position responsible for BLN Project is responsible for providing qualitative / quantitative criteria in design output documents, which are incorporated in implementing procedures.

E. Not Used.

F. The QA General Manager is responsible for establishing and implementing programs for training and certification of personnel performing QC activities.

9.1.4 Source Requirement Documents

The applicable source requirement documents and their exceptions are noted in Appendix B of this program description. These establish mandatory controls, which must be addressed in the development of programs and procedures for inspection.

9.2 Quality Assurance Assessments

9.2.1 General

Assessments by QA are performed as a type of verification to ensure that observed quality- related activities are performed in accordance with requirements and desired results are achieved.

9.2.2 Program Elements

A. Assessment procedures and instructions shall address assessment techniques.

B. Assessment frequencies shall be based on such factors as the status and safety significance of the activity or process, frequency of occurrence, degree and acceptability of previous experience, adverse trends, and testing or operation sequences.

C. The results of assessments shall be documented and reported to appropriate levels of management.

D. Records shall be maintained in sufficient detail to provide adequate documentation of assessed activities.

E. Follow up verifications or additional assessments shall be conducted as necessary to ensure that required corrective action has been taken.

F. Assessments shall be performed in accordance with written procedures and instructions by qualified and appropriately trained personnel not having direct responsibility in the areas being assessed.

9.2.3 Responsibilities

The QA General Manager is responsible for the development and implementation of the QA assessment program.

9.2.4 Source Requirement Documents

None applicable.

9.2.5 Units with Construction Permits

For units with construction permits, refer to Appendix G.

9.3 Control of Special Processes

9.3.1 General

Those processes, as determined by the Engineering organization, which by their nature make a direct inspection either impossible or disadvantageous, are controlled as special processes.

Special processes shall be controlled and accomplished in accordance with approved process control documents by qualified personnel using qualified written procedures.

9.3.2 Program Elements

A. Processes, which are to be controlled, as special processes, shall be documented in design output documents and maintained current. These processes shall include, but not be limited to welding, forming and bending, heat treating, chemical cleaning, protective coatings, and NDE.

B. Measures shall be established, documented, and implemented, as appropriate, using specifications, procedures, and instructions to ensure that special processes are accomplished under controlled conditions and in accordance with applicable codes, standards, specifications, manufacturer instructions, or other special requirements. These measures shall include

requirements for procedures, equipment, personnel, specifications, and control of consumable materials.

C. When a special process is not covered by existing codes or standards, or when an item's quality requirements exceed the requirements of existing codes or standards, any special requirements necessary for controlling, implementing, and documenting the special process shall be defined as appropriate.

D. Procedure, Equipment, and Personnel Qualification and Certification

1. Personnel performing special processes shall be qualified and, when required, certified in accordance with the applicable codes, standards, and any special requirements.

2. Qualification or certification of procedures, equipment, and personnel required by codes, standards, or any special requirements shall be performed.

3. Documentation shall be maintained for these qualifications and certifications. M&TE used in special processes shall be controlled in accordance with Section 9.5 of this program description.

E. Results

Results of examinations associated with special processes shall be documented and evaluated for acceptability. Documentation shall provide for identifying the individual who performed the evaluation.

9.3.3 Responsibilities

A. The management position responsible for nuclear engineering is responsible for development of programs for control of special processes. The program elements in Section 9.3.2 and the related source requirements contained within the documents listed in Section 9.3.4 shall be addressed.

B. The management position responsible for Inspection Services Organization (ISO) is responsible for interpretation of NDE results when not achievable at the site level, and development and implementation of NDE methods and procedures. The management position responsible for ISO is also responsible for the qualification or certification of ISO NDE procedures, equipment, and personnel.

C. Deleted

D. The management position responsible for BLN Project has the responsibility for developing and implementing the NDE Program for ASME Section III work (when active) at BLN 1 & 2. (See also Appendix G.)

E. The QA General Manager reviews and approves the inspection program for control of special processes to ensure inclusion of QA requirements and is also responsible for the development of upper tier QA requirements for the NDE program for licensed units (refer to Section 9.3.2). For construction NDE activities, refer to Appendix G.

F. The management position responsible for nuclear engineering is responsible for coordinating with appropriate organizations and determining which processes are to be controlled as special processes and for developing engineering requirements for NDE.

G. The management position responsible for nuclear engineering is responsible for the qualification or certification of ND Nuclear special process procedures, equipment, and personnel for all areas other than NDE.

9.3.4 Source Requirement Documents

The applicable source requirement documents and their exceptions are noted in Appendix B of this program description. These establish mandatory controls, which must be addressed in the development of programs and procedures for the control of special processes.

9.4 Test Control

9.4.1 General

The QA program requires that controls shall be established to ensure that required testing is identified and performed in accordance with procedures, which incorporate engineering requirements.

9.4.2 Program Elements

A. The following types of tests, as a minimum, shall be included:

1. Design qualification tests.
2. Product acceptance (proof) tests prior to installation.
3. Pre-operational tests.
4. Construction tests.
5. Start-up tests.
6. Surveillance tests.
7. Functional tests.
8. Post maintenance tests.

9. Post modification tests.

10. Special tests.

B. Test Performance

1. Tests shall be accomplished in accordance with written and approved test procedures which include the requirements and acceptance criteria of technical specifications, drawings, specifications, codes, standards, regulatory requirements, and scoping documents as applicable.

2. Tests performed following plant repairs, replacements, maintenance, or modifications shall be conducted in accordance with the original design and testing requirements or approved documented alternatives. Tests shall be sufficient to confirm that the changes produce expected results and do not reduce safety of operations.

3. Test procedures or instructions include the following, as applicable:

   a. Description of test objective.

   b. Instructions for performing the test.

   c. Test prerequisites such as calibrated instrumentation, adequate test equipment and instrumentation including their accuracy requirements, completeness of the item to be tested, suitable and controlled environmental conditions, provisions for data collection and storage, and qualified personnel.

   d. Provisions to assure test prerequisites have been met.

   e. Mandatory inspection hold points.

   f. Acceptance or rejection criteria.

   g. Methods of recording, documenting, and reviewing test data and results.

   h. Provisions for assuring that adverse conditions are corrected, or are evaluated and determined not to adversely impact testing, prior to the initiation of pre-operational testing of the affected item.

C. Test Results

Test results shall be documented in a suitable test results package that contains:

1. The identification of the item to which it applies.

2. The identification of instructions followed in performing the test.

3. Pertinent inspection and test data.

4. Significant dates and times.

5. Signature of inspector or tester.

6. Conditions encountered which were not anticipated, including identification of deviations or adverse conditions, and actions taken to resolve the condition.

D. Results Evaluation

The technical acceptability of the results shall be evaluated by an appropriate authority to ensure that the test requirements have been satisfied.

E. Records of test results shall be retained in accordance with Section 6.3 of this program description.

9.4.3 Responsibilities

A. The management position responsible for nuclear engineering is responsible for the development of test control programs. The program elements in Section 9.4.2 and the related source requirements contained within the documents listed in Section 9.4.4 shall be addressed.

B. The management position responsible for a nuclear site, (delegated to the management position responsible for site engineering) is responsible for reviewing test results and specifying through design output documents the acceptance criteria for tests necessary to demonstrate an item's compliance with design parameters for initial acceptance and major modifications for licensed units.

C. Deleted

D. The management position responsible for a nuclear site, (delegated to the management position responsible for site engineering) is responsible for the development of tests (startup and operations phase) which incorporate engineering requirements and for the conduct of tests, including leak tests (operations phase). He is also responsible for documenting, evaluating, and determining acceptability of test results.

E. The QA General Manager is responsible for oversight of the test control program (i.e., test performance, test results and acceptability of tests).

F. Deleted

9.4.4 Source Requirement Documents

The applicable source requirement documents and their exceptions are noted in Appendix B of this Program. These establish mandatory controls, which must be addressed in the development of programs and procedures for the control of tests.

9.5 Control of M&TE and Installed Safety-Related I&C Devices

9.5.1 General

Measures shall be established to control equipment, which is used to conduct measurements or tests related to determining the functionality or quality of structures, systems, and components within the scope of the QA program.

9.5.2 Program Elements

A. Requirements Common to M&TE and Installed Safety-Related I&C Devices

1. Procedures or instructions for administrative controls shall establish:

   a. Controls for calibration, selection, identification, and utilization of M&TE and installed safety-related I&C devices.

   b. The scope of the various safety-related calibration and control programs.

   c. The types of equipment to be controlled.

2. Calibration procedures and instructions, as a minimum, shall include:

   a. The identity of the item to be calibrated.

   b. Calibration equipment and reference standards to be used.

   c. Checks, tests, measurements, and acceptance tolerances.

   d. Sequence of operations.

   e. Special instructions when necessary.

   f. Recording of performer and applicable procedure or instruction.

   g. Recording of as found and as left data.

3. Intervals shall be established for calibration and adjustments of M&TE and installed safety related I&C devices. These intervals shall be based on required accuracy, purpose, degree of usage, stability characteristics, and other conditions which may affect the measurement or output data.

4. An index, listing, or log shall be procedurally maintained; and shall identify each piece of M&TE and installed safety-related I&C device within the calibration program.

5. Reference standards shall be traceable to nationally recognized standards or physical constants. When national standards do not exist, the basis for calibration shall be documented and approved by designated responsible management.

6. Prior to use, M&TE and installed safety-related I&C devices shall be identifiable and traceable to applicable calibration records.

B. Unique Requirements for M&TE

Controls for M&TE shall include the following requirements. These requirements are in addition to those noted in Section 9.5.2A.

1. M&TE shall be stored, calibrated, and used in environments that will not adversely affect its accuracy.

2. M&TE shall be identified to indicate the date of the last calibration, by whom it was calibrated, and when the next calibration is due.

3. Methods shall be established to identify previous usage of M&TE when found to be out of calibration. These methods shall require that inspections or tests be repeated or a documented evaluation be performed when the integrity of past measurements obtained with the suspect equipment or device cannot be demonstrated.

4. Calibration standards, including test stands that are used as a standard (i.e., multiple M&TE) shall have an accuracy of at least four times the required accuracy of the equipment being calibrated. When this is not possible, standards shall have an accuracy that ensures the equipment being calibrated will be within required tolerances. The basis of acceptance shall be documented and authorized by identified responsible management.

5. M&TE shall be conspicuously labeled, tagged, or otherwise controlled to ensure performance of required calibrations on or before the established due date.

6. M&TE which are consistently found out of calibration shall be identified as non-conforming, removed from service, and repaired or replaced.

C. Unique Requirements for Installed Safety-related I&C Devices

Controls for installed safety-related I&C devices shall include the following requirements. These requirements are in addition to those noted in Section 9.5.2A.

1. The calibration of installed safety-related I&C devices that provide final measurements data or controls shall be against M&TE that have an accuracy equal to or better than the required accuracy of the devices being calibrated.

2. Installed safety-related I&C devices shall be controlled to ensure performance of required periodic calibrations.

3. Environmental qualification controls for 10 CFR 50.49 installed safety-related I&C devices shall be established in applicable design documents. These controls shall be maintained when installed safety-related I&C devices are opened in place or removed for calibration in a laboratory.

4. Installed safety-related I&C devices which are consistently found to be out of calibration shall be identified and repaired or replaced.

D. Unique Requirements for Installed Compliance I&C Devices

Controls for installed compliance I&C devices shall include the following requirements. These requirements are in addition to those noted in Sections 9.5.2A and 9.5.2C.

1. Methods shall be established to identify previous usage of installed compliance I&C devices when found to be out of calibration. These methods shall require that inspections or tests be repeated or a documented evaluation be performed when the integrity of past measurements obtained with the suspect equipment or device cannot be demonstrated.

9.5.3 Responsibilities

A. The management position responsible for a nuclear site is responsible for the development of controls for M&TE and installed safety-related I&C devices. The program elements in Section 9.5.2 and the related source requirements contained within the documents listed in Section 9.5.4 shall be addressed.

B. For BLN 1 & 2, the management position responsible for BLN Project is responsible for the development of controls for M&TE and installed safety related I&C devices. The program elements in Section 9.5.2 and the related source requirements contained within the documents listed in Section 9.5.4 shall be addressed.

C. The management position responsible for a nuclear site, (delegated to the management position responsible for site engineering) is responsible for providing qualitative/quantitative criteria in design output documents for licensed plants.

D. For BLN 1 & 2, the responsibility for providing qualitative / quantitative criteria in design output documents is assigned to the management position responsible for BLN Project.

9.5.4 Source Requirement Documents

The applicable source requirement documents and their exceptions are noted in Appendix B of this program description. These establish mandatory controls which must be addressed in the development of programs and procedures for the control of M&TE and installed safety-related I&C devices.

9.6 Handling, Storage, and Shipping

9.6.1 General

Measures shall be established such that items, including consumables, under the scope of the QA program are handled, stored, and shipped by qualified individuals in a manner to prevent deterioration, contamination, damage, or loss of identification in accordance with approved engineering and procurement documents.

9.6.2 Program Elements

A. Marking

Items and/or their containers shall be adequately marked so that the items may be properly identified, maintained, and preserved during shipping, receiving, and storage. Marking shall also indicate the presence of special environments or the need for special controls.

B. Packaging and Cleaning

1. Packaging shall be adequate to provide protection against effects such as corrosion and contamination, which would lower the quality of items or cause deterioration beyond specified limits.

2. Special coverings, special equipment, and special protective environments shall be provided and maintained, as required, by procurement documents and vendor instructions determined to be applicable by the responsible engineer.

3. Cleaning operations shall be performed, as required, prior to coating, packaging, storing, or installing items.

C. Shipping and Handling

Special protection required for shipping shall be provided and maintained, as specified, by procurement documents or vendor instructions. Specified instructions and precautions for handling shall be followed.

D. Storage

1. Methods of controlling stored items, including shelf life, shall be established to minimize the potential for damage or deterioration during storage.

2. Appropriate facilities shall be provided for storage of items requiring special environmental conditions.

3. Periodic assessments of storage areas and stored items shall be performed and documented to verify compliance with storage requirements.

4. Proper maintenance shall be provided for stored items, where necessary to prevent deterioration.

9.6.3 Responsibilities

A. The management position responsible for procurement is responsible for the development of program controls for handling, storing, and shipping. The program elements in Section 9.6.2 and the related source requirements contained within the documents listed in Section 9.6.4 shall be addressed.

B. The management position responsible for procurement is responsible for implementation of programs for handling, storage, shipping, and issuance of materials.

C. The management position responsible for nuclear engineering is responsible for establishing storage, handling, and shipping requirements and preventive maintenance requirements during storage.

9.6.4 Source Requirement Documents

The applicable source requirement documents and their exceptions are noted in Appendix B of this program description. These establish mandatory controls, which must be addressed in the development of programs and procedures for the control of handling, storage, shipping, cleaning, and preservation of items.

9.7 Inspection, Test, and Operating Status

9.7.1 General

Measures shall be established and documented to ensure that the operating status is current and the acceptability of items is known throughout fabrication, storage, construction, installation, operation, maintenance, and modification.

9.7.2 Program Elements

A. Inspection and Test Status

1. The status of inspections and tests shall be identified either on the items or in documents traceable to the items to ensure that required inspections and tests are performed and to preclude inadvertent bypassing.

2. The status of inspections and tests shall be maintained through the use of indicators such as tags, markings, shop travelers, routing cards, stamps, inspection records, or other suitable means.

3. The authority for application and removal of tags, markings, labels, and stamps shall be specified.

4. Deletions or alterations of required inspections, tests, and other critical operations shall be controlled through appropriate changes to applicable procedures. These changes shall be handled in accordance with Section 6.1.2F of this program description.

B. Operating Status

1. The operating status of items (including temporary alterations) shall be indicated by status indicators such as tags on valves and switches to prevent inadvertent operation.

2. Plant instructions that require items to be removed from service for maintenance, testing, or modification shall require designated personnel permission and the completion of the appropriate clearance (hold order or approved plant procedures) before commencement of the activity.

9.7.3 Responsibilities

A. The management position responsible for a nuclear site is responsible for the development of controls to maintain inspection, test, and operating status. The program elements in Section 9.7.2 and the related source requirements contained within the documents listed in Section 9.7.4 shall be addressed.

B. The management position responsible for a nuclear site, (delegated to the management position responsible for site engineering) is responsible for establishing applicable inspection and test acceptance criteria to ensure the acceptability of items is maintained.

C. Deleted

D. The management position responsible for BLN Project is responsible for the implementation of programs for maintaining inspection, test, and system status for BLN 1 & 2 construction permit activities (when active).

E. The management position responsible for a nuclear site is responsible for the implementation of programs for maintaining inspection, test, and operating status at licensed units.

9.7.4 Source Requirement Documents

The applicable source requirement documents and their exceptions are noted in Appendix B of this program description. These establish mandatory controls, which

must be addressed in the development of programs and procedures for the control of inspection, test, and operating status.

9.8 Control of Maintenance

9.8.1 General

The nuclear maintenance program, including corrective and preventive maintenance, shall ensure that quality-related structures, systems, and components are maintained (including appropriate equipment qualification maintenance) at a level sufficient to perform their intended functions.

9.8.2 Program Elements

A. Preventive Maintenance

A preventive maintenance program prescribing the frequency and type of maintenance activities to be performed shall be established and maintained.

B. Procedures and Instructions

Maintenance shall be carried out in accordance with procedures or instructions to ensure quality at least equivalent to that specified in the approved design basis or approved alternatives. Procedures or instructions shall be written to the level of detail that is normally expected of the user group. Training, experience, and the technical complexity of the work are factors which should be considered in determining the level of detail the procedure or instruction should contain. Guidelines shall be established for the use of these procedures or instructions.

C. Maintenance Preplanning

Maintenance shall be preplanned to include as appropriate:

1. Review of work-initiating documents to ensure quality requirements have been addressed.

2. Evaluation of the use of special processes, equipment, and materials including potential hazards to personnel and equipment and ALARA considerations.

3. The potential for common-mode failures when working on similar multiple or redundant systems and components.

4. Documented approval by designated personnel to release equipment or systems for maintenance.

5. Inspection and testing, as appropriate, to ensure a suitable level of confidence. This includes post maintenance testing commensurate with the maintenance performed to ensure that the equipment is capable of

being returned to service, that the original deficiency (if any exists) has been corrected, and that no new deficiency has been created.

D. Malfunctions

The cause of malfunctions shall be evaluated and documented in accordance with ND's nuclear corrective action program.

E. Trending

The Maintenance Program shall establish the parameters for trending maintenance activities and describe the methods for evaluating and documenting adverse trends.

9.8.3 Responsibilities

A. The management position responsible for a nuclear site is responsible for the development of the nuclear maintenance program. The program elements in Section 9.8.2 and the related source requirements contained within the documents listed in Section 9.8.4 shall be addressed.

B. Deleted

C. The management position responsible for BLN Project is responsible for the implementation of the nuclear maintenance program during construction phase activities for BLN 1 & 2.

D. The management position responsible for a nuclear site is responsible for the implementation of the nuclear maintenance program during operations phase activities.

9.8.4 Source Requirement Documents

The applicable source requirement documents and their exceptions are noted in Appendix B of this program description. These establish mandatory controls, which must be addressed in the development of programs and procedures for the Nuclear Maintenance Program.

9.9 Plant Reviews

9.9.1 General

A. The plant staff organization provides reviews of day-to-day activities to ensure they are conducted in a safe manner. Qualified Reviewers provide for reviews of procedures, procedure changes, and proposed changes to structures, systems, and components that affect nuclear safety in their area of expertise.

B. The Plant Operations Review Committee (PORC) is a multi-disciplined committee responsible for providing an oversight review of documents required

for the safe operation of the plant. The PORC advises the management position responsible for plant operations on matters related to nuclear safety.

9.9.2 Plant Reviews

A. Activities which affect nuclear safety shall be conducted as follows:

1. Proposed changes or modifications to plant nuclear safety-related structures, systems, and components shall be reviewed in accordance with approved written procedures. Such modifications shall be reviewed by an individual/group other than the individual/group which designed the modification, but who may be from the same organization as the individual/group, which designed the modification. Proposed modifications to plant nuclear safety-related structures, systems, and components shall be approved by the manager responsible for plant operations, or designee, prior to implementation.

2. Written procedures shall be established, implemented, and maintained covering the following activities:

   a. The applicable procedures recommended in Regulatory Guide 1.33, Revision 2, Appendix A, February 1978 and in accordance with Appendix B of this program description;

   b. The emergency operating procedures which implement NUREG-0737 and NUREG-0737, Supplement 1, as stated in Generic Letter 82-33;

   c. Security Plan implementation;

   d. Radiological Emergency Plan Implementation;

   e. Offsite Dose Calculation Manual implementation;

   f. Fire Protection Program Implementation;

   g. Radiation Protection Program;

   h. Process Control Program Implementation (radwaste packaging and shipping);

   i. In Plant Radiation Monitoring;

   j. Quality Assurance Program for effluent and environmental monitoring, using the guidance contained in Regulatory Guide 4.15, December 1977, Regulatory Guide 1.21, Revision 1, 1974 and Regulatory Guide 4.1, Revision 1, 1975; and

   k. Not Used.

l. Cyber Security Plan implementation.

3. Procedures required by Section 9.9.2A.2, procedures and programs required by site-specific technical specifications, other procedures which affect plant nuclear safety, and changes (other than editorial or typographical changes) thereto, shall be prepared and reviewed in accordance with approved administrative procedures prior to implementation except as specified in Section 9.9.2A.6.

   Procedures or procedure changes shall be reviewed by a qualified individual knowledgeable in the subject matter other than the preparer. The reviewer may be from the same or different organization. Procedures not reviewed by PORC shall be approved by the responsible management in accordance with established program requirements. Procedures reviewed by PORC shall be approved by the manager responsible for plant operations, or designee.

4. Qualified Reviewers responsible for reviews performed in accordance with Section 9.9.2A.3 shall be designated and qualified. Qualifications of qualified reviewers shall be as specified in written procedures. Such reviews shall include a determination of whether additional cross-disciplinary review is necessary. If deemed necessary, such review shall be performed by review personnel of the appropriate discipline.

5. Procedures and intent changes to these procedures within the scope of 10 CFR 50.59 shall be reviewed to determine whether a license amendment is required.

6. Temporarily approved changes to procedures of Section 9.9.2A.2 shall be made in accordance with ANSI N18.7-1976/ANS 3.2, as modified in Appendix B of this program description. Such changes shall be documented, reviewed, and approved in accordance with Sections 9.9.2A.3 and 9.9.2A.4 within 14 days and in accordance with approved administrative procedures.

B. Plant Operations Review Committee (PORC)

BLN 1 and 2 shall have a PORC which shall function to advise the management position responsible for plant operations in matters related to nuclear safety. This advisory function shall be performed by the PORC acting in a formal meeting periodically and as situations demand. PORC shall be organized, and conduct business as described below. The Chairperson and members shall be appointed in writing by the management position responsible for plant operations. PORC members shall meet the experience requirements of ANSI N18.1-1971 and ANSI/ANS 3.1-1981 as endorsed by Regulatory Guide 1.8, Revision 2, April 1987, “Qualification and Training of Personnel for Nuclear Power Plants,” as outlined in Appendix B of this program description. This applies to the correlated ANSI N18.1-1971 and ANSI/ANS 3.1-1981 Manager or Supervisor position for the represented organization. (Operations

representatives who hold or who have held SRO licenses at the station are considered qualified.)

1. Composition

   The composition of PORC shall be as follows:

   Chairperson: Director, Operations

   Member: operations representative(s)

   Member: maintenance representative(s)

   Member: chemistry control representative(s)

   Member: radiological protection representative(s)

   Member: engineering representative(s)

2. Alternates

   Alternate chairpersons and members shall be appointed in writing by the management position responsible for plant operations.

3. Meeting Frequency

   The PORC shall meet at least once per calendar month and as convened by the PORC Chairperson or designated alternate.

4. Quorum

   The PORC shall consist of the chairperson or designated alternate and three of the five functional area representatives.

5. Reporting

   The PORC reports to the management position responsible for plant operations on its activities and findings. The meeting minutes shall serve as the official correspondence from PORC to the management position responsible for plant operations. PORC recommendations shall be recorded in the minutes and submitted to the management position responsible for plant operations.

6. Functions

   a. Advise the management position responsible for plant operations on matters related to nuclear safety;

b. Recommend to the management position responsible for plant operations approval or disapproval of items considered under Section 9.9.2B.7; and

c. Provide written notification to the management position responsible for a nuclear site and the NSRB of safety-significant disagreements between the PORC and the management position responsible for plant operations within 24 hours. The management position responsible for plant operations shall have responsibility for resolution of such disagreements.

7. Responsibilities

The PORC shall be used to conduct, as a minimum, reviews of the following. The PORC may delegate the performance of reviews, but shall maintain cognizance over and responsibility for them, e.g., subcommittees.

a. New procedures or changes to existing procedures recommended by Regulatory Guide 1.33, Revision 2, Appendix A, February 1978; that require an evaluation in accordance with 10 CFR 50.59.

b. The emergency operating procedures which implement NUREG-0737 and NUREG-0737, Supplement 1, as stated in Generic Letter 82-33;

c. Physical Security Plan;

d. Radiological Emergency Plan;

e. Offsite Dose Calculation Manual;

f. Process Control Program (radwaste packaging and shipping);

g. Additional PORC reviews specifically required by site-specific technical specifications or the plant's licensing basis;

h. Proposed changes to TS; Technical Requirements Manual; their bases; amendments to the Operating License;

i. Selected 10 CFR 50.59 evaluations; and

j. Cyber Security Plan.

9.9.3 Records

The PORC shall maintain written minutes of PORC meetings that, at a minimum, document the results of its activities. Copies shall be provided to the management position responsible for a nuclear site. At a minimum, the PORC minutes shall include results of the activities conducted under the provisions of Section 9.9.

10.0 ADVERSE CONDITIONS

10.1 General

Measures shall be established to ensure that items that do not conform to requirements are controlled to prevent their inadvertent installation or use. Adverse conditions, including non-conforming items or non-hardware problems such as failure to comply with operating license, technical specifications, or procedures, shall be identified, evaluated, corrected, tracked, trended, and when required, reported to appropriate levels of management.

Procedures or instructions implementing the corrective action program shall establish the criteria for documenting and tracking adverse conditions.

10.2 Program Elements

10.2.1 Control of Non-conforming Items

A. Organizations responsible for items determined to be non-conforming during receipt inspection, construction, maintenance, modifications, or operations shall identify (physical identification) and segregate the non-conforming items from acceptable items to prevent further processing, delivery, installation, or inadvertent use. When segregation is not practical, tagging, marking or other means of identification is acceptable.

B. In cases where a non-conforming item is needed for use prior to correcting the non-conformance, a conditional release request document is required. The conditional release request document requires appropriate reviews and approvals. In addition, for equipment to be energized, operated, or pressurized an evaluation and justification is required.

10.2.2 Corrective Action for Adverse Conditions

A. ND Nuclear and onsite non-nuclear service organizations performing quality-related activities at nuclear facilities shall promptly identify and resolve adverse conditions.

B. Minor deficiencies, which may be brought into compliance within an acceptable timeframe, shall be corrected on the spot in accordance with established instructions.

C. Adverse conditions shall be dispositioned by organizations with defined responsibility and authority; and shall be corrected in accordance with documented plans.

D. Disposition actions for non-conforming items may be accept-as-is, repair, rework, scrap, or return to vendor. Dispositions of accept-as-is or repair shall be reviewed and approved by Corporate or Site Engineering. Reworked or repaired, and replaced items shall satisfy the original inspection and test requirements or acceptable alternatives.

E. The cause of significant adverse conditions shall be determined and corrective action taken to preclude recurrence.

F. Significant adverse conditions shall be reported to appropriate levels of management.

G. The satisfactory completion of corrective actions shall be verified and documented by the appropriate organization.

H. Independent verification of corrective action implementation is performed as specified within the corrective action program.

10.2.3 Escalation of Adverse Conditions

Commensurate with their importance to quality or safety, adverse conditions which are not being effectively or timely resolved shall be escalated to appropriate levels of management in a timely manner.

10.2.4 Tracking

Procedures describing the corrective action program shall establish the requirements for those adverse conditions, which shall be tracked.

10.2.5 Quality Trend Analysis

Trend analysis shall be performed on adverse conditions and quality indicators associated with QA verification activities, through the periodic review and evaluation of CR data and other performance monitoring information as part of the corrective action program. Trend results shall be used to advise management of the quality status, identify adverse trends that need increased management attention, and compare quality of performance among organizations. The trend analysis program shall be described in procedures or instructions and shall include the following items as a minimum.

A. Identify the quality indicators associated with QA verification activities to be trended.

B. Specify the process of data handling such as gathering, collecting, sorting, grouping, and coding.

C. Specify the process to be used in analyzing data and trend determination.

D. Describe the actions to be taken when an adverse trend is identified.

E. Describe the type, distribution, and frequency of issue of trend results reporting.

10.2.6 Stop Work

Work shall be stopped under any of the following conditions:

A. Work is proceeding in violation of approved and controlling documents.

B. A condition, which clearly indicates that cessation of an activity, is the only means available to protect the health and safety of the public and/or plant personnel.

C. An activity, which if continued, will require extensive rework or repair for corrective action.

D. An activity, which if continued, may jeopardize nuclear safety.

E. A condition that represents continual failure to comply with technical or administrative controls.

10.3 Responsibilities

A. The management position responsible for operations support is responsible for the development, review and approval of the ND Nuclear corrective action program. The program elements in Section 10.2 and the related source requirements contained within the documents listed in Section 10.4 shall be addressed.

B. Deleted

C. For the BLN project, the management position responsible for BLN Project is responsible for the development, review and approval of the corrective action program. The program elements in Section 10.2 and the related source requirements contained within the documents listed in Section 10.4 shall be addressed.

D. Line managers are responsible to stop any work within their areas of responsibility when a continuation of activities could meet the criteria of Section 10.2.6

E. QA is responsible to issue a formal Stop Work Order, as required, if a line manager fails to act on a stop work condition. Stop Work Orders shall remain in effect until proper evaluation can be made and adequate corrective action can be applied.

F. The management position responsible for operations support is responsible to establish and maintain trend analysis procedures for adverse conditions and the quality indicators generated by QA verification activities such as audits, assessments, inspection, and vendor audits and surveillances. The QA General Manager is responsible for oversight and independent analysis of ND Nuclear CAP trending.

G. Deleted

10.4 Source Requirement Documents

The applicable source requirement documents and their exceptions are noted in Appendix B of this program description. These establish mandatory controls which must be addressed in the development of programs and procedures for the corrective action program.

11.0 INDOCTRINATION, TRAINING, QUALIFICATION, AND CERTIFICATION

11.1 General

Personnel performing quality-related activities shall receive indoctrination and training, as necessary, to ensure that adequate proficiency is achieved and maintained.

11.2 Program Elements

11.2.1 Indoctrination and Training

A. Personnel performing quality-related activities shall receive training related to administrative controls and the purpose, scope, and implementation of the NQAP.

B. For personnel performing quality-related activities, proficiency shall be maintained and demonstrated through activities such as annual performance evaluation, retraining, reexamining, or recertifying.

C. Training of employees performing quality-related activities shall be conducted, as appropriate, when new programs or procedures affect the scope of their work and whenever changes in their duties or responsibilities occur.

D. The scope, method, and objectives of formal training for quality-related activities shall be documented.

E. Records documenting the date, attendance, content, instructor, and duration of training sessions shall be prepared and maintained to demonstrate individual qualification and training program implementation for employees performing quality-related activities.

11.2.2 Qualification and Certification

Qualification and certification programs shall be established and maintained to include the following:

A. Certification of personnel, as needed, to perform inspections, tests, examinations, special processes, or lead audits prior to performance of the activity. Certifications shall delineate the functions personnel are qualified to perform and the criteria used for qualification.

B. Personnel qualification criteria for applicable inspection, test, or examination techniques, audits, special processes, and capabilities necessary to perform the activity safely and in compliance with applicable requirements.

C. A method to assess the performance of certified individuals and the qualifications of employees performing quality-related activities, to determine their initial and continued acceptability for performing their duties and to provide an assessment of the current level of qualification and certification.

D. Development and maintenance of qualification and certification records and documents in accordance with applicable commitments and regulatory requirements.

11.3 Responsibilities

A. The management position responsible for operations support is responsible for the development of the program for indoctrination and training.

B. Other ND Nuclear managers are responsible for delineating training requirements in their applicable areas of responsibility and providing these requirements to the management position responsible for operations support.

C. The management position responsible for human resources (nuclear) is responsible for establishing a position qualification documentation and validation program.

D. Managers are responsible for implementing the indoctrination and training program and, as appropriate, developing a certification program and implementing the certification requirements in their area of responsibility.

E. The program elements in Section 11.2 and the related source requirements contained within the documents listed in Section 11.4 shall be addressed in the development and implementation of indoctrination, training, qualification, and certification activities.

11.4 Source Requirement Documents

The applicable source requirement documents and their exceptions are noted in Appendix B of this program description. These establish mandatory controls which must be addressed in the development of programs and procedures for the indoctrination, training, qualification, and certification program.

12.0 AUDITING

12.1 General

Measures shall be established to implement a comprehensive audit program, which consists of internal audits, including ND Nuclear and other organizations, which support the nuclear program and contractor/supplier audits to determine and assess the adequacy and effectiveness of the QA program.

12.2 Program Elements

A. An audit plan shall be prepared identifying the audits to be performed and their frequencies and schedule.

B. Audits shall include: a determination of the effectiveness of QA program elements; evaluation of work areas, activities, processes, and items; review of documents and records; review of audit results with responsible management; follow up on corrective action taken for deviations identified during the audit; and escalation to appropriate senior management of any safety significant disagreement between the auditing organization and the organization or function being audited.

C. Audits shall be performed in accordance with written procedures or checklists by qualified, certified, and appropriately trained personnel not having direct responsibilities in the areas being audited.

D. Audited organizations shall provide access to facilities, documents, and personnel needed to perform the audits. They shall take necessary action to correct deviations identified by the audit in a timely manner.

E. Internal Audits

1. The scope of an audit shall be determined by considering such factors as work areas, activities, processes, or items and the specific organizations involved.

2. The auditing organizations shall ensure that audit procedures and instructions adequately cover applicable elements of the NQAP.

3. Audits of Design and Construction Phase units and the Fitness for Duty Program are in accordance with the Code of Federal Regulations.

4. Audits of operational phase units shall be performed with oversight by the NSRB. Except as noted in 12.2E.4.f, 12.2E.4.g, 12.2E.4.h, 12.2E.4.m, and 12.2E.4.n below, audit frequencies shall be biennially. These audits shall encompass:

   a. The conformance to provisions contained within the Technical Specifications and applicable license conditions.

   b. The performance, training and qualifications of the plant staff.

   c. The results of actions taken to correct deficiencies occurring in site equipment, structures, systems, components, or method of operation that affect nuclear safety.

   d. The performance of activities required by the Nuclear Quality Assurance Program to meet the criteria of Appendix B, 10 CFR Part 50 and 10 CFR Part 72, Subpart G.

e. Any other activities and documents considered appropriate by the NSRB or the CNO and Executive Vice President.

f. The fire protection programmatic controls including the implementing procedures at least once per 24 months.

g. An independent fire protection and loss prevention program inspection and audit shall be performed at a maximum interval of 24 months utilizing either qualified offsite license personnel or an outside fire protection firm.

h. An inspection and audit of the fire protection and loss prevention program shall be performed by an outside qualified fire consultant at intervals no greater than three years.

i. The Radiological Environmental Monitoring program and the results thereof.

j. The performance of activities required by the NQAP to meet the criteria of Regulatory Guide 4.15, December 1977, Regulatory Guide 1.21, Rev. 1, 1974, and Regulatory Guide 4.1, 1975.

k. The Offsite Dose Calculation Manual and implementing procedures.

l. The Process Control Program and implementing procedures for solidification of wet radioactive wastes.

m. The site Radiological Emergency Plan and implementing procedures in accordance with the Code of Federal Regulations.

n. The site Physical Security/Contingency Plan and implementing procedures in accordance with the Code of Federal Regulations.

o. The site Cyber Security Plan and implementing procedures in accordance with the Code of Federal Regulations.

5. A grace period not to exceed 90 days can be applied to audits with a biennial frequency, with the following exceptions. No grace period is permitted for the audits of Emergency Preparedness, Security, Cyber Security or Access Authorization.

6. Audit reports, including recommendations to the management of the organization being audited, shall be maintained.

F. Contractor/Supplier Audits

1. Audits of selected suppliers shall be conducted to verify implementation and adequacy of specified QA requirements.

2. Contractors/suppliers to be audited shall be selected on the basis of the importance of their products or services to safety, status of contract activity, historical performance of the supplier, and potential QA problems that may be discovered during source surveillance inspection activities or earlier audits.

3. Audit schedules shall be prepared and audits shall be conducted in accordance with the schedules.

4. Audit reports shall be prepared and reviewed by the audit team, approved by management, and transmitted to the supplier and appropriate management within ND.

5. A grace period not to exceed 90 days may be applied to Contractor/Supplier audits that normally are of 36-month frequency.

12.3 Responsibilities

A. The QA General Manager is responsible for the development of the ND Nuclear audit program. The program elements in Section 12.2 and the related source requirements contained within the documents listed in Section 12.4 shall be addressed.

B. Deleted

C. QA is responsible to conduct audits, including audits of selected suppliers, to verify implementation and adequacy of specified QA requirements.

12.4 Source Requirement Documents

The applicable source requirement documents and their exceptions are noted in Appendix B of this Program. These establish mandatory controls, which must be addressed in the development of programs and procedures for the control of audits.

13.0 COMPUTER SOFTWARE AND DATA

13.1 General

The program elements in Section 13.2 of this program description apply to application software meeting the criteria of Appendix E of this Program, whether procured or developed at ND. The controls established shall be commensurate with the importance of the application software to nuclear safety.

13.2 Program Elements

A. Controls shall be established for the development of application software and associated documentation, including requirements specification, design specifications, coding conventions, and user documentation.

B. Controls shall be established for changes to application software and associated software documentation.

C. Software documentation shall be controlled in accordance with Section 6.2 of this program description.

D. Software documentation specified as QA records shall be controlled in accordance with Section 6.3 of this program description.

E. Documentation shall be provided for application software describing the correct usage.

F. A central list of application software, which meets the criteria of Appendix E of this program description, with appropriate levels of classification shall be established and maintained. Involved personnel shall be trained on the intent and purpose of the list.

G. Prior to implementation, application software shall be verified to demonstrate that the system requirements are satisfied in the system design, implemented in the computer code, validated through documented tests, and the test results independently reviewed.

H. Controls shall be established to verify the accuracy and integrity of data input into automated computer databases.

I. For currently active application software developed or purchased prior to October 16, 1986, only the requirements of Section 13.2B, 13.2E, and 13.2F apply. In addition, this application software shall be validated through documented tests and test results independently reviewed.

13.3 Responsibilities

The management position responsible for nuclear engineering is responsible for the development of controls for computer software and data. The program elements in Section 13.2 and the criteria of Appendix E of this program description shall be addressed.

13.4 Source Requirement Documents

The applicable source requirements documents and their exceptions are noted in Appendix B of this program description. These establish mandatory controls, which must be addressed in the development of programs and procedures for the control of computer software and data.

14.0 REFERENCES

14.1 Regulations

10 CFR 20, "Standards for Protection Against Radiation."

10 CFR 21, "Reporting of Defects and Non-compliance."

10 CFR 50, "Domestic Licensing of Production and Utilization Facilities."

10 CFR50.48(c) Fire Protection, National Fire Protection Association Standard, NFPA 805

10 CFR 50.49, "Environmental Qualification of Electrical Equipment Important to Safety for Nuclear Power Plants."

10 CFR 50.54, "Conditions of Licenses."

10 CFR 50.55, "Conditions of Construction Permits."

10 CFR 50.55a, Codes and Standards."

10 CFR 50.55(e), "Conditions of Construction Permits."

10 CFR 50.59, "Changes, Tests, and Experiments."

10 CFR 50, Appendix A, "General Design Criteria for Nuclear Power Plants."

10 CFR 50, Appendix B, "Quality Assurance Requirements for Nuclear Power Plants and Fuel Reprocessing Plants."

10 CFR 50, Appendix R, "Fire Protection Program for Nuclear Power Facilities Operating Prior to January 1, 1979."

10 CFR 50.62, "Requirements for Reduction of Risk from Anticipated Transients without Scram (ATWS) Events for Light-Water-Cooled Nuclear Power Plants."

10 CFR 50.72, "Immediate Notification Requirements for Operating Nuclear Power Reactors."

10 CFR 50.73, "Licensee Event Report System."

10 CFR 50.120, "Training and Qualification of Nuclear Power Plant Personnel."

10 CFR 52, “Licenses, Certifications, And Approvals for Nuclear Power Plants.”

10 CFR 55, "Operators' Licenses."

10 CFR 70, "Domestic Licensing of Special Nuclear Material."

10 CFR 71, Subpart H, "Quality Assurance (Packaging and Transportation of Radioactive Material)."

10CFR 73.54, “Protection of Digital Computer and Communication Systems and Networks”

10 CFR 73.55, “Requirements for Physical Protection of Licensed Activities in Nuclear Power Reactors against Radiological Sabotage."

10 CFR 73.71, "Reporting of Safeguards Events."

10 CFR 74, "Material Control and Accounting of Special Nuclear Material."

10 CFR 75, "Safeguards on Nuclear Material - Implementation of US/IAEA Agreement."

10 CFR 100, "Reactor Site Criteria."

14.2 Regulatory Guidance

Refer to listing in Appendixes B and C of this program description.

14.3 ND Licensing Submittal Documents

Bellefonte Nuclear Plant Technical Specifications, Administrative Controls Section.

14.4 QA Manuals

ASME Section III Quality Assurance Manual (ASME III QAM).

14.5 Other

INPO 84-010, "Vendor Equipment Technical Information Program (VETIP)," March 1984.

NEI 04-02, Revision 2, Guidance for Implementing a Risk-Informed, Performance-Based Fire Protection Program

NRC letter from H. J. Thompson, Jr., dated April 16, 1985, "Quality Assurance Guidance for ATWS Equipment That Is Not Safety Related," Generic Letter 85-06 (A02 850422 044).

NRC letter from D. G. Eisenhut dated April 24, 1986, "Implementation of Fire Protection Requirements," Generic Letter 86-10 (A02 860512 005).

NUREG 0800, Section 9.5.1, Branch Technical Position, CMEB 9.5-1 (formerly BTP ASB 9.5-1), Rev. 2, July 1981, "Fire Protection for Nuclear Power Plants."

Appendix A to Branch Technical Positions APCSB 9.5-1, August 23, 1976.

Safety Evaluation by the Office of Nuclear Reactor Regulation Proposed Change to the Quality Assurance Program Common Safety Review Board conduct of Operations Southern Nuclear Operating Company, Inc. Joseph M. Farley Nuclear Plant, Units 1 and 2, Edwin I. Hatch Nuclear Plant, Units 1 and 2, Vogtle Electric Generating Plant, Units 1 and 2, Docket Nos. 50-348, 50-364, 50-321, 50-366, 50-422, and 50-425 to Appendix B

NEI 14-05, “Guidelines for the Use of Accreditation in lieu of Commercial Grade Surveys for Procurement of Laboratory Calibration and Test Services,” Revision 1

NOTE

The terms and definitions identified in this section are important in order to have a consistent understanding of requirements of the NQAP. Regulatory Guide 1.74, which endorses ANSI N45.2.10, contains terms and definitions applicable to the nuclear industry. This section identifies acceptable alternatives to these definitions with an asterisk (*).

15.0 DEFINITIONS

Adverse Conditions - Deficiencies including non-conforming material, parts, or components; failures; malfunctions; deviations; hardware problems involving noncompliance with licensing commitments, specifications, or drawing requirements; abnormal occurrences; and non-hardware problems such as failure to comply with the operating license, technical specifications, licensing commitments, procedures, instructions, or regulations.

Assessment - An evaluation of the adequacy and effectiveness of quality programs, processes, ongoing tasks or activities, or management controls to identify opportunities for improvement, performance problems, or verify resolution of problems.

***Audit** - A documented activity performed in accordance with written procedures or checklists to verify, by examination and evaluation of objective evidence, that applicable elements of the NQAP have been developed, documented, and effectively implemented in accordance with specified requirements. An audit should not be confused with assessment or inspection for the sole purpose of process control or product acceptance.

Basic Component - Refer to 10 CFR 21 for definition of basic component.

Commercial-Grade Items - Refer to 10 CFR 21 for definition of commercial grade items.

Construction Tests - Those tests which are performed on safety-related and other plant components and systems on nuclear units which may satisfy prerequisites to the preoperational test program. Construction tests include pressure and other

integrity tests; component and piping system cleaning and flushing; and equipment checkout, initial operation, and adjustments.

Corrective Action - The action taken to correct an adverse condition. Corrective action includes interim measures and corrective and preventive actions.

Dedication - Refer to 10 CFR 21 for definition of dedication.

Emergency Preparedness - A program which ensures the preparation and implementation of plans and procedures to provide, in the event of an emergency, protective measures for health and safety of ND personnel and the public.

Environmental Protection - A program that provides controls, mainly in association with Environmental Protection Agency (EPA) requirements, for non-radiological environmental monitoring and compliance activities. These include hazardous and non-radiological waste material (solid, liquid, and gas) which could be released to the environment.

Experience in Nuclear Quality Assurance Related Activities - Participated in one of the following: QA or QC function or involvement in program quality for programs subject to QA/QC audits or inspection.

Features - Refers to either individual structures, systems, and components specifically called out by the scope of this Program (such as seismic Category 1 [L] items) or structures, systems, and components that may be integral to, or associated with, the programs identified in Section 5.1B of this Program.

Finding - A term defined in Quality Assurance audit and assessment procedures equivalent to adverse audit findings specified in ANSI/ASME N45.2.12 - 1977 section 4.5.

Fire Protection - A program that provides controls necessary for the protection of the life and health of ND plant personnel and the public, to limit damage of property, and to minimize loss of generating capacity resulting from fire or explosion.

Functional Test - The manual operation or initiation of a system, subsystem, or component to verify that it functions within design tolerances (e.g., the manual start of a core spray pump to verify that it runs and that it pumps the required volume of water.)

Graded Approach - A methodology of applying a grading criteria based on an item's impact on safety, quality history, and other factors such that determination can be made as to the type and degree of QA program requirements which need to be applied. Refer to Section 5.2.

Greater than Class C waste (GTCC waste) - Low-level radioactive waste that exceeds the concentration limits of radionuclides established for Class C waste in 10 CFR 61.55.

Handling - The act of physically moving items by hand or by mechanical means but not including transport modes.

Hold Point - A designated stopping place during or following a specific activity at which inspection or examination is required before further work can be performed.

Important to - A system, structure, or component condition/function required to store spent nuclear fuel safely; to prevent damage to spent nuclear fuel or high-level waste container during handling and storage, and to provide reasonable assurance that spent nuclear fuel can be received, handled, packaged, stored and retrieved without undue risk to the health and safety of the public.

Independent Offsite Safety Review - Safety reviews performed by the Nuclear Safety Review Board (NSRB) which provide additional assurance that ND licensed nuclear plants are operating without undue risk to the health and safety of plant personnel and the public.

***Inspection** - A phase of quality control performed by certified inspection personnel or other qualified individuals approved by QA that, by means of examination, observation, and/or measurement determines the conformance of materials, supplies, components, parts, appurtenances, systems, processes, or structures to predetermined quality requirements.

Installed Compliance Instrumentation and Control (I&C) Devices - Process instruments which are used to determine or verify compliance with plant technical specification requirements for parameters such as flows, pressures, temperatures, levels, voltages, and currents.

Item - Any level of unit assembly, including structure, system, subsystem, subassembly, component, part, or material.

Line Verification - A routine verification by a qualified individual who is in the work-performing organization who did not perform or directly supervise the activity to be verified.

Measuring and Test Equipment (M&TE) - Equipment or devices used to calibrate, measure, gauge, examine, compare, test, inspect, monitor, or control in order to acquire data to determine compliance with design, specification, licensing, or other established requirements. M&TE includes both laboratory and portable instruments, gauges, tools, fixtures, test or analytical test stands, reference and transfer standards, nondestructive examination equipment, etc., where data obtained will be used to determine acceptability or be the basis for design or engineering evaluations.

Non-safety-Related Anticipated Transient Without Scram (ATWS) - Special features that, as referenced in 10 CFR 50.62, fall into a category of items which could be related to an expected operational transient (such as loss of feedwater, loss of condenser vacuum, or loss of offsite power to the reactor) which is not accompanied by the reactor trip system shutting down the reactor.

Notification Point - A specific pre-established point within a selected activity where work may proceed after contacting and receiving concurrence from the organization responsible for the notification point.

Nuclear Cyber Security - A program which provides controls to protect digital computer and communication systems and networks from cyber attacks in accordance with 10CFR73.54, Protection of Digital Computer and Communication Systems and Networks.

Nuclear Plant Security - A program which provides controls to ensure continued operability of security equipment and the integrity of nuclear plant security. This includes prevention of sabotage, safeguard information and material, plant access, and physical security events.

Operational Phase - That period of time during which the principal activity is associated with normal operation of the plant. This phase of plant life is considered to begin formally with receipt of the operating license onsite and ends with commencement of plant decommissioning. In addition, there are certain pre-operational activities (for example, testing, training, maintenance) proceduralized in accordance with operations NQAP requirements and initiated by the operations staff prior to receipt of the operating license which are considered to be operational phase activities at the time these activities begin.

Post maintenance Tests - Testing performed after completion of maintenance to verify the operational/functional acceptability of components/systems upon completion of maintenance.

Post modification Tests - Tests performed after completion of a plant modification to demonstrate conformance with as-designed requirements and to determine the effect of the modification on the overall system.

Pre-operational Tests - Tests identified in a facility's Safety Analysis Report and performed on any system or plant feature for the purpose of proving its ability to perform its designed function.

Procurement Documents - Contractually binding documents that identify and define the requirements that items or services must meet in order to be considered acceptable by the purchaser.

Programs - Programs which administer and control activities and associated features as identified in Section 5.1B of this Program that require control based on regulatory requirements or ND commitments.

Quality Assurance Records - Those records which furnish documentary evidence of the quality of items and of activities affecting quality. A document is considered to be a QA record when the document has been completed.

Quality Control Inspectors - Personnel whose qualifications are not required to meet those specified in ANSI N18.1 and who are performing inspection, examination and testing activities during the construction or operational phases of

the plant shall be qualified to ANSI N45.2.6-1978 as certified Quality Control Inspectors.

Quality-Related - Quality-related is a term which encompasses quality assurance program requirements that describe activities which affect structures, systems, and components.

These requirements provide reasonable assurance that the facility can be operated without undue risk to the health and safety of the public. In addition to safety-related structures, systems, components, and activities, the term "quality-related" encompasses the broad class of plant features covered (not necessarily explicitly) in the General Design Criteria of 10 CFR 50, Appendix A, that contribute in an important way to the safe operation and protection of the public in all phases and aspects of facility operation (i.e., normal operation and transient control as well as accident mitigation).

Radioactive Material Shipment - A program that provides controls for handling and/or shipping of radioactive material (NRC-licensed packages only).

Radwaste Management Systems, Structures, and Components - Special features containing radioactive materials (i.e., liquids, gases, or solids) that, by design or operating practice, provide a means of processing prior to final disposition.

Reference Standards - Standards (primary, secondary, and working standards where appropriate) used in a calibration program. These standards establish the basic accuracy limits for the calibration program.

Reportable Events - Any of those conditions specified in 10 CFR 50.73.

Safety-Related Structures, Systems, and Components - Those items that are necessary to ensure:

A. The integrity of the reactor coolant pressure boundary.

B. The capability to shut down the reactor and maintain it in a safe condition.

C. The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures comparable to the applicable guideline exposures set forth in 10 CFR 50.34(a)(1) or 10 CFR 100.11, as applicable.

Seismic Category I(L) - Special features that apply to non-safety-related systems, structures, and components which provide structural integrity in preventing damage to a safety-related system, structure, and component in case of a failure and/or damage during a safe shutdown earthquake (SSE).

Significant Adverse Condition - A documented adverse condition that is determined to be a QA programmatic deficiency. Criteria for significance are specified in the corrective action program.

Special Nuclear Material Management - A program which provides for special nuclear material (SNM) control and accountability as required by 10 CFR 70, 74, and 75. This program includes SNM inventories and system reviews, inspections, records management, and DOE/NRC inventory and transfer reports.

Special Tests - A test that is (a) an engineering test including qualification testing for design verification or evaluation of components, structures, or systems, (b) a general test that is not specifically related to plant systems or features, such as the material testing and product testing that is normally performed by a testing lab, or (c) tests or experiments not described in the facilities Safety Analysis Report which may affect the operation of systems described therein (reference 10 CFR 50.59).

Startup Tests - Those tests as identified in the Final Safety Analysis Report that commence after receipt of an operating license allowing fuel loading and testing at ranges through zero power, power escalation, and 100% warranty run. Startup tests prove that the unit has been properly designed and constructed and will meet all licensing requirements and specific contractual criteria. Startup tests are also referred to as Power Ascension Tests.

***Storage** - The act of holding items at the construction or operating Site in an area other than its permanent location in the plant.

Surveillance Tests - Periodic tests to verify that structures, systems, and components continue to function or are in a state of readiness to perform their functions.

Test Record Drawings - A set of as-constructed drawings which depict the configuration of a system as tested.

Test Scoping Documents - Documents which include descriptions of each test to be performed including safety precautions to be followed, specific identification of test objectives, the means of performing the test, prerequisites that must be completed, environmental conditions required for testing, justification for a proposed degree of simulation less than full simulation, and specific acceptance criteria or a description of the means of determining acceptance criteria from functional testing requirements.

Test Deficiency - Any condition during which the equipment or system being tested: (1) fails to operate (e.g., pump will not operate, no control room annunciation), (2) operates in a suspected adverse manner (e.g., motor operates but smokes, questionable vibration), or (3) operates outside limits of documented acceptance criteria (e.g., inadequate flow, slow valve closure time).

Trend Analysis - Evaluation of data that has been compiled or grouped onto charts, diagrams, reports, or other formats such that the prevailing tendency of selected parameters can identify areas that need improving and areas of past successes.

***Verification** - An act of confirming, substantiating, and ensuring that an activity or condition has been implemented and accomplished in conformance with specific requirements. This includes line verifications.

Appendix A
Comparison Matrix of Quality Assurance Program Requirements with those of 10 CFR 50, Appendix B, and Selected ANSI Standards

(Page 1 of 1)

10 CFR 50, Appx B		ANSI N45.2 - 1971		ANSI N18.7 - 1976	
Criterion	NQAP	Section	NQAP	Section	NQAP
I	4.0; 4.1	2.0	5.0	3.1	4.1; 5.0
II	5.0	3.0	4.0; 4.1	3.2	4.0; 4.1
III	7.0	4.0	7.0	3.3	11.0
IV	8.1	5.0	8.1	3.4	4.0; 11.0
V	6.0; 7.0; 9.9	6.0	6.0; 7.0; 9.9	4.0	4.1.7C; 5.3; 6.0
VI	6.0; 7.0; 9.9	7.0	6.0; 7.0; 9.9		4.1.9; 9.9; 12.0
VII	8.2	8.0	8.2	5.1	5.0
VIII	8.3	9.0	8.3	5.2.1	4.0
IX	9.3	10.0	9.3	5.2.2	6.0
X	9.1	11.0	9.1	5.2.3	6.0
XI	9.4	12.0	9.4	5.2.4	6.0
XII	9.5	13.0	9.5	5.2.5	6.0
XIII	9.6	14.0	9.6	5.2.6	6.0; 9.7
XIV	9.7	15.0	9.7	5.2.7	6.0; 9.8
XV	10.0	16.0	10.0	5.2.8	6.0; 9.1; 9.4
XVI	10.0	17.0	10.0	5.2.9	5.1; 6.0
XVII	6.3	18.0	6.3	5.2.10	4.1.2; 6.0
XVIII	12.0	19.0	12.0	5.2.11	6.0; 10.0
				5.2.12	6.0; 6.3
				5.2.13	6.0; 8.0; 9.6
				5.2.14	6.0; 10.0
				5.2.15	6.0
				5.2.16	6.0; 9.5
				5.2.17	6.0; 9.1
				5.2.18	6.0; 9.3
				5.2.19	6.0; 9.4
				5.3	6.0
				5.3.1	6.0
				5.3.2	6.0
				5.3.3	6.0
				5.3.4	6.0
				5.3.5	6.0; 9.8
				5.3.6	6.0; 5.1
				5.3.7	6.0; 9.5
				5.3.8	6.0; 5.1
				5.3.9	6.0; 5.1
				5.3.10	6.0; 9.1; 9.4

Appendix B
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Table 1 (pages 1 through 10) is a matrix of the source requirement documents (e.g., Regulatory Guides and ANSI Standards) which apply to applicable portions of the NQA program description. Table 1 specifies the particular sections of the source documents (e.g., ANSI N18.7, Section 5.2.12) that establish mandatory controls, which must be addressed in the development of the associated implemented programs and procedures.

Table 2 (pages 11 through 29) identifies alternatives to sections of the source requirement documents listed in Table 1.

TABLE 1

SOURCE REQUIREMENT DOCUMENT / NQA PLAN SECTION	Procedures and Instructions 6.1.4	Document Control 6.2.4	QA Records 6.3.4	Design Control 7.4	Procurement Document Control 8.1.4	Control of Purchased Material, Equipment, and Services 8.2.4	Identification and Control of Materials, Parts, and Components 8.3.4	Inspection and Line Verification 9.1.4	Control of Special Processes 9.3.4	Test Control 9.4.4	Control of M&TE and Installed Safety-Related I&C Devices 9.5.4	Handling, Storage and Shipping 9.6.4	Inspection, Test and Operating Status 9.7.4	Control of Maintenance 9.8.4	Adverse Conditions 10.4	Identification, Training Qualification, and Certification 11.4	Auditing 12.4	Computer Software and Data 13.4	Definitions 15.0
Reg. Guide 1.8 R/2 April 1987 ANSI N18.1 - 1971, and ANSI/ANS 3.1 - 1981, “Personnel Selection & Training”								X								X			
Reg. Guide 1.33 R/2 February 1978 ANSI N18.7 - 1976/ANS-3.2 “Administrative Controls and Quality Assurance for the Operational Phase of Nuclear Power Plants”	X Sect. 5	X Sect. 5.2.15	X Sect. 5.2.12	X Sect. 5.2.7.2	X Sect. 5.2.13 5.2.13.1	X Sect. 5.2.13.2	X Sect. 5.2.13.3	X Sect. 5.2.8 5.2.17	X Sect. 5.2.12 5.2.18	X Sect. 5.2.8 5.2.19	X Sect. 5.2.16	X Sect. 5.2.13.4	X Sects. 5.2.6 5.2.8 5.2.14	X Sect. 5.2.7 5.3.5	X Sect. 5.2.11 5.2.14	X Sect. 3.3	X Sect. 4.5		

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TABLE 1

SOURCE REQUIREMENT DOCUMENT / NQA PLAN SECTION	Procedures and Instructions 6.1.4	Document Control 6.2.4	QA Records 6.3.4	Design Control 7.4	Procurement Document Control 8.1.4	Control of Purchased Material, Equipment, and Services 8.2.4	Identification and Control of Materials, Parts, and Components 8.3.4	Inspection and Line Verification 9.1.4	Control of Special Processes 9.3.4	Test Control 9.4.4	Control of M&TE and Installed Safety-Related I&C Devices 9.5.4	Handling, Storage and Shipping 9.6.4	Inspection, Test and Operating Status 9.7.4	Control of Maintenance 9.8.4	Adverse Conditions 10.4	Identification, Training Qualification, and Certification 11.4	Auditing 12.4	Computer Software and Data 13.4	Definitions 15.0
Reg. Guide 1.28 R/3 August 1985 ANSI N45.2 - 1971 "Quality Assurance Program Requirements for Nuclear Power Plants"	X Sect. 6	X Sect. 7	X Sect. 18	X Sect. 4	X Sect. 5	X Sect. 8	X Sect. 9	X Sect. 11	X Sect. 10	X Sect. 12	X Sect. 13	X Sect. 14	X Sect. 15		X Sect. 16 17	X Sect. 2	X Sect. 19		
Reg. Guide 1.37 R/0 March 16, 1973 ANSI N45.2.1 - 1973, "Cleaning of Fluid Systems and Associated Components During Construction Phase of Nuclear Power Plants"	X Sect. 2.1 2.2		X Sect. 9					X	X Sect. 2.5	X	X Sect. 2.5								
Reg. Guide 1.38 R/2 May 1977 ANSI N45.2.2 - 1972 "Packaging, Shipping, Receiving, Storage, and Handling of Items for Nuclear Power Plants (During the Construction Phase)"	X Sect. 2.1 2.2		X Sect. 8			X Sect. 5	X	X Sects. 5.2 7.4		X Sect. 2.3	X Sect. 2.5	X		X Sect. 6	X Sect. 5.5				

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TABLE 1

NQA PLAN SECTION / SOURCE REQUIREMENT DOCUMENT	Procedures and Instructions 6.1.4	Document Control 6.2.4	QA Records 6.3.4	Design Control 7.4	Procurement Document Control 8.1.4	Control of Purchased Material, Equipment, and Services 8.2.4	Identification and Control of Materials, Parts, and Components 8.3.4	Inspection and Line Verification 9.1.4	Control of Special Processes 9.3.4	Test Control 9.4.4	Control of M&TE and Installed Safety-Related I&C Devices 9.5.4	Handling, Storage and Shipping 9.6.4	Inspection, Test and Operating Status 9.7.4	Control of Maintenance 9.8.4	Adverse Conditions 10.4	Identification, Training Qualification, and Certification 11.4	Auditing 12.4	Computer Software and Data 13.4	Definitions 15.0
Reg. Guide 1.39 R/2 September 1977 ANSI N45.2.3 - 1973 “Housekeeping During the Construction Phase of Nuclear Power Plants”	X Sect. 2.1 2.2		X Sect 4					X				X Sect. 3.3							
Reg. Guide 1.30 R/0 August 11, 1972 ANSI N45.2.4 - 1972, “Installation, Inspection, and Testing Requirements for Instrumentation and Electric Equipment During the Construction of Nuclear Power Generating Stations”	X Sect. 2.1 2.3	X Sect. 2.3	X Sect. 8			X Sect. 2.2		X Sect. 2.4 5.1 6.1 7.0		X	X Sect. 2.5	X Sect. 2.2	X		X Sect. 2.6				

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TABLE 1

NQA PLAN SECTION / SOURCE REQUIREMENT DOCUMENT	Procedures and Instructions 6.1.4	Document Control 6.2.4	QA Records 6.3.4	Design Control 7.4	Procurement Document Control 8.1.4	Control of Purchased Material, Equipment, and Services 8.2.4	Identification and Control of Materials, Parts, and Components 8.3.4	Inspection and Line Verification 9.1.4	Control of Special Processes 9.3.4	Test Control 9.4.4	Control of M&TE and Installed Safety-Related I&C Devices 9.5.4	Handling, Storage and Shipping 9.6.4	Inspection, Test and Operating Status 9.7.4	Control of Maintenance 9.8.4	Adverse Conditions 10.4	Identification, Training Qualification, and Certification 11.4	Auditing 12.4	Computer Software and Data 13.4	Definitions 15.0
Reg. Guide 1.94 R/1 April 1976 ANSI N45. 2.5 - 1974 Supplementary Quality "Assurance Requirements for Installation, Inspection, and Testing of Structural Concrete and Structural Steel During the Construction Phase of Nuclear Power Plants"	X Sect. 2.1 2.2	X Sect. 2.2	X Sect. 7				X	X Sect. 2.3 4 5 6		X	X Sect. 2.5	X	X Sects. 3 4 5			X Sect. 2.4			
Reg. Guide 1.58 R/1 September 1980 ANSI/ASME N45.2.6 - 1978 "Qualifications of Inspection, Examination, and Testing Personnel for Nuclear Power Plants"			X Sect. 6					X	X	X						X			

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TABLE 1

SOURCE REQUIREMENT DOCUMENT / NQA PLAN SECTION	Procedures and Instructions 6.1.4	Document Control 6.2.4	QA Records 6.3.4	Design Control 7.4	Procurement Document Control 8.1.4	Control of Purchased Material, Equipment, and Services 8.2.4	Identification and Control of Materials, Parts, and Components 8.3.4	Inspection and Line Verification 9.1.4	Control of Special Processes 9.3.4	Test Control 9.4.4	Control of M&TE and Installed Safety-Related I&C Devices 9.5.4	Handling, Storage and Shipping 9.6.4	Inspection, Test and Operating Status 9.7.4	Control of Maintenance 9.8.4	Adverse Conditions 10.4	Identification, Training Qualification, and Certification 11.4	Auditing 12.4	Computer Software and Data 13.4	Definitions 15.0
Reg. Guide 1.116 R/0-R June 1976 ANSI N45.2.8 – 1975 “Supplementary Quality Assurance Requirements for Installation, Inspection, and Testing of Mechanical Equipment and Systems for the Construction Phase of Nuclear Power Plants”	X Sect. 2.1 2.2	X Sect. 2.2	X Sect. 7				X	X Sect. 2.3 3 4 5		X	X Sect. 2.8	X Sects. 2.5	X Sects. 4.2 5.1	X Sects. 3.1 3.5-H 4.5-B, C		X Sect. 2.7			
Reg. Guide 1.88 R/2 October 1976 ANSI N45.2.9 - 1974 “Requirements for Collection, Storage, and Maintenance of Quality Assurance Records for Nuclear Power Plants”	X		X														X Sect. 5.7		
Reg. Guide 1.74 February 1974 ANSI N45.2.10 - 1973 “Quality Assurance Terms and Definitions”																			X

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TABLE 1

NQA PLAN SECTION / SOURCE REQUIREMENT DOCUMENT	Procedures and Instructions 6.1.4	Document Control 6.2.4	QA Records 6.3.4	Design Control 7.4	Procurement Document Control 8.1.4	Control of Purchased Material, Equipment, and Services 8.2.4	Identification and Control of Materials, Parts, and Components 8.3.4	Inspection and Line Verification 9.1.4	Control of Special Processes 9.3.4	Test Control 9.4.4	Control of M&TE and Installed Safety-Related I&C Devices 9.5.4	Handling, Storage and Shipping 9.6.4	Inspection, Test and Operating Status 9.7.4	Control of Maintenance 9.8.4	Adverse Conditions 10.4	Identification, Training Qualification, and Certification 11.4	Auditing 12.4	Computer Software and Data 13.4	Definitions 15.0
Reg. Guide 1.64 R/2 June 1976 ANSI N45.2.11 - 1974 "Quality Assurance Requirements for the Design of Nuclear Power Plants"	X Sect. 2.2	X Sect. 7	X Sect. 10	X											X Sect. 9		X Sect. 11	X Sect. 6.1	
Reg. Guide 1.144 R/1 September 1980 ANSI N45.2.12 - 1977 "Requirements for Auditing of Quality Assurance Programs for Nuclear Power Plants"			X Sect. 5														X		
Reg. Guide 1.123 R/1 July 1977 ANSI N45.2.13 - 1976 "Quality Requirements for Control of Procurement of Items and Services for Nuclear Power Plants"	X Sect. 2		X Sect. 11		X Sect. 3.0	X		X Sect. 7 10			X Sect. 7.4				X Sects. 8 9	X Sect. 7.5	X		

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TABLE 1

NQA PLAN SECTION / SOURCE REQUIREMENT DOCUMENT	Procedures and Instructions 6.1.4	Document Control 6.2.4	QA Records 6.3.4	Design Control 7.4	Procurement Document Control 8.1.4	Control of Purchased Material, Equipment, and Services 8.2.4	Identification and Control of Materials, Parts, and Components 8.3.4	Inspection and Line Verification 9.1.4	Control of Special Processes 9.3.4	Test Control 9.4.4	Control of M&TE and Installed Safety-Related I&C Devices 9.5.4	Handling, Storage and Shipping 9.6.4	Inspection, Test and Operating Status 9.7.4	Control of Maintenance 9.8.4	Adverse Conditions 10.4	Identification, Training Qualification, and Certification 11.4	Auditing 12.4	Computer Software and Data 13.4	Definitions 15.0
Reg. Guide 1.146 R/0 August 1980 ANSI N45. 2.23 - 1978 "Qualification of Quality Assurance Program Audit Personnel for Nuclear Power Plants"			X Sect. 5													X	X		

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SOURCE REQUIREMENT DOCUMENT / NQA PLAN SECTION	Procedures and Instructions 6.1.4	Document Control 6.2.4	QA Records 6.3.4	Design Control 7.4	Procurement Document Control 8.1.4	Control of Purchased Material, Equipment, and Services 8.2.4	Identification and Control of Materials, Parts, and Components 8.3.4	Inspection and Line Verification 9.1.4	Control of Special Processes 9.3.4	Test Control 9.4.4	Control of M&TE and Installed Safety-Related I&C Devices 9.5.4	Handling, Storage and Shipping 9.6.4	Inspection, Test and Operating Status 9.7.4	Control of Maintenance 9.8.4	Adverse Conditions 10.4	Identification, Training Qualification, and Certification 11.4	Auditing 12.4	Computer Software and Data 13.4	Definitions 15.0
Reg. Guide 1.152 November 1985 ANSI/IEEE - ANS-7-4.3.2 - 1982 "Application Criteria for Programmable Digital Computer Systems in Safety Systems of Nuclear Power Generating Stations"																		X Sects. 6 7	
Reg. Guide 1.189, April 2001 "Fire Protection for Operating Nuclear Power Plants"																	X 1.7.10.1		
10 CFR 21						X								X	X				
10 CFR 50, Appendix B	X Crit. V	X Crit. VI	X Crit. XVII	X Crit. III	X Crit. IV	X Crit. VII	X Crit. VIII	X Crit. X	X Crit. IX	X Crit. XI	X Crit. XII	X Crit. XIII	X Crit. XIV		X Crit. XVI	X Crit. II	X Crit. XVIII		
10 CFR 50.49				X	X									X					
10 CFR 50.55a				X															
10 CFR 50.55e															X				
10 CFR 50.59				X											X				
10 CFR 50.72															X				

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SOURCE REQUIREMENT DOCUMENT / NQA PLAN SECTION	Procedures and Instructions 6.1.4	Document Control 6.2.4	QA Records 6.3.4	Design Control 7.4	Procurement Document Control 8.1.4	Control of Purchased Material, Equipment, and Services 8.2.4	Identification and Control of Materials, Parts, and Components 8.3.4	Inspection and Line Verification 9.1.4	Control of Special Processes 9.3.4	Test Control 9.4.4	Control of M&TE and Installed Safety-Related I&C Devices 9.5.4	Handling, Storage and Shipping 9.6.4	Inspection, Test and Operating Status 9.7.4	Control of Maintenance 9.8.4	Adverse Conditions 10.4	Identification, Training Qualification, and Certification 11.4	Auditing 12.4	Computer Software and Data 13.4	Definitions 15.0
10 CFR 50.73															X				
10 CFR 50.120																X			
10 CFR 73.71															X				
ASME Sect III DIV. 1, Art. NCA 4000 “Quality Assurance”	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X		
ASME Sect. V. “Nondestructive Examination”									X										
ASME Sect. IX “Welding and Brazing Qualifications”									X										
ASME Sect. XI “Rules for In-service Inspection of Nuclear Power Plants”				X				X	X	X			X		X				
AWS “Structural Welding Code D1.1”									X										

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AISC “Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings”									X										

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SOURCE REQUIREMENT DOCUMENT / NQA PLAN SECTION	Procedures and Instructions 6.1.4	Document Control 6.2.4	QA Records 6.3.4	Design Control 7.4	Procurement Document Control 8.1.4	Control of Purchased Material, Equipment, and Services 8.2.4	Identification and Control of Materials, Parts, and Components 8.3.4	Inspection and Line Verification 9.1.4	Control of Special Processes 9.3.4	Test Control 9.4.4	Control of M&TE and Installed Safety-Related I&C Devices 9.5.4	Handling, Storage and Shipping 9.6.4	Inspection, Test and Operating Status 9.7.4	Control of Maintenance 9.8.4	Adverse Conditions 10.4	Identification, Training Qualification, and Certification 11.4	Auditing 12.4	Computer Software and Data 13.4	Definitions 15.0
ASNT SNT-TC-1A-2006 “Personnel Qualification and Certification in Nondestructive Testing”									X										
Plant Technical Specifications (Administrative Controls Section)	X																		
NUTAC Report on Generic Letter 83-28 “Required Actions Based on Generic Implications of Salem ATWS Events,” Section 2.2.2 (letter from L. M. Mills to H. R. Denton dated September 17, 1984)			X										X		X		X		
ANSI/ASNT CP-189-1995 “Standard for Qualification and Certification of Nondestructive Testing Personnel"									X										

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SOURCE REQUIREMENT DOCUMENT / NQA PLAN SECTION	Procedures and Instructions 6.1.4	Document Control 6.2.4	QA Records 6.3.4	Design Control 7.4	Procurement Document Control 8.1.4	Control of Purchased Material, Equipment, and Services 8.2.4	Identification and Control of Materials, Parts, and Components 8.3.4	Inspection and Line Verification 9.1.4	Control of Special Processes 9.3.4	Test Control 9.4.4	Control of M&TE and Installed Safety-Related I&C Devices 9.5.4	Handling, Storage and Shipping 9.6.4	Inspection, Test and Operating Status 9.7.4	Control of Maintenance 9.8.4	Adverse Conditions 10.4	Identification, Training Qualification, and Certification 11.4	Auditing 12.4	Computer Software and Data 13.4	Definitions 15.0
ASME OM Code “Code for Operation and Maintenance of Nuclear Power Plants”				X						X			X		X				
Final Safety Evaluation for Technical Report NEI 14-05 “Guidelines for the Use of Accreditation in lieu of Commercial Grade Surveys for Procurement of Laboratory Calibration and Test Services,” Revision 1																	X		

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NRC Regulatory Guide 1.8 - "Personnel Selection and Training," Revision 2, 4/87, endorses ANSI N18.1-1971 and ANSI/ANS 3.1-1981.

The Nuclear Quality Assurance Plan (NQAP) follows this Guide with the following alternatives:

A. ND will meet the requirements of Regulatory Guide 1.8, Revision 2 (4/87) for all new personnel qualifying on positions identified in regulatory position C.1 after January 1, 1990. Personnel qualified on these positions prior to this date will still meet the requirements of Regulatory Guide 1.8, Revision 1-R (5/77). As specified in regulatory position C.2, all other positions will meet the requirements of ANSI/ANS N18.1-1971.

B. Section 4.3.2 - There may be occasions where ND will utilize a composite crew (multidiscipline) during operations phase activities to efficiently perform a task. As such, a foreman may not have the experience required in one of the disciplines he supervises. In these instances, the foreman will meet the requirements of ANSI N18.1 in at least one of the disciplines, and additional technical support, procedure support, and/or discipline support will be available to the foreman for the task period.

C. In lieu of the training guidelines endorsed by Regulatory Guide 1.8, Revision 2, specified in Regulatory Position Sections C.1.b and C.1.f, ND shall comply with the requirements of 10 CFR 55.31(a) (4) and 10 CFR 55.59 as they apply to training programs based on a Systems Approach to Training (SAT) as defined in 10 CFR 55.4 and using a plant-referenced simulator as required by 10 CFR 55.45.

D. ND uses the methodology for equating education and experience contained in ANSI 3.1-1987 for guidance to evaluate equivalent related experience for a degree.

E. In addition to the training guidelines in subsections 5.3.2, 5.3.3, 5.3.4, and 5.5 of ANSI N18.1- 1971, ND shall comply with the requirements of 10 CFR 50.120 as it applies to training programs based on a systems approach to training.

F. In lieu of the one year of experience in the implementation of the quality assurance program for the management position responsible for site QA (ANSI/ANS 3.1-1981, Section 4.4.5.b), ND requires five years of experience in QA-related activities.

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NRC Regulatory Guide 1.28 - "Quality Assurance Program Requirements (Design and Construction)," Revision 3, 8/85, allows continued implementation of ANSI N45.2-1971 as previously committed.

The NQAP follows this Guide.

NRC Regulatory Guide 1.30 - "Quality Assurance Requirements for the Installation, Inspection, and Testing of Instrumentation and Electric Equipment," 8/72, endorses ANSI N45.2.4-1972.

The NQAP follows this Guide with the following alternatives:

A. ANSI N45.2.4 states that the Appendixes are not a part of the standard; therefore, ND does not consider the Appendixes to be mandatory.

B. Section 2.1, "Planning" - The intent of this section shall be met in different forms depending on magnitude and scope of work.

C. During the operational phase, tests are performed as determined by the site engineering organization, modification, or maintenance engineers, as appropriate, based upon the equipment or system functions that could be impacted by the work performed.

D. ND's alternative to the tagging of in plant process instruments for calibration status (ANSI N45.2.4, Section 6.2.1) is that each item of process control instrumentation is uniquely identified with an instrument number. This number is utilized in an instrument maintenance record so that the current calibration status and data attesting to the status of each item are documented along with the identification of the person performing the calibration. In addition, this record system provides a mechanism for evaluating equipment performance and adjusting calibration frequencies to ensure quality performance.

E. Section 6.2.2 - For modifications, ND interprets this section as not requiring that an entire system be retested after modifications. Testing will be performed on equipment that has or could be impacted by the modification in accordance with applicable design and testing requirements to verify that operability requirements are met and that interfacing components and equipment functions have not been degraded.

F. ND implements the requirements of N45.2.4 Sections 5.1 and 6.1 with a performance-based graded QA verification program consisting of quality control inspection, line verification, and quality assessments.

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NRC Regulatory Guide 1.33 - "Quality Assurance Program Requirements (Operations)," Revision 2, 2/78 endorses ANSI N18.7-1976/ANS 3.2.

The NQAP follows this Guide with the following alternatives:

A. ANSI N18.7-1976 references certain other standards to which ND takes exception. ND's exception and appropriate alternatives to the other standards are listed in this Appendix in the appropriate location.

B. Section 5.2.2 - The guidelines of this section are accepted with the following interpretations:

   1. Temporary changes which clearly do not change the intent of the approved procedure shall as a minimum be approved by two members of the plant management staff, at least one of whom holds a Senior Reactor Operator License on the unit affected or as defined in Section 9.9 of this Program, the FSAR, or appropriate plant procedures.

   2. For facilities holding a construction permit where system(s) and/or components have been released to the operations organization, temporary changes to procedures, as described above, shall as a minimum be approved by two members of the plant management staff, at least one of whom shall be a designated member of the plant operations management staff.

C. Section 5.2.13.1 - The statement that changes made to procurement documents be subject to the same degree of control as was used in the preparation of the original documents is applied consistent with the requirements of ANSI N45.2.11, paragraph 7.2. Minor changes to documents, such as inconsequential editorial corrections or changes to commercial terms and conditions, may not require that the revised document receive the same review and approval as the original documents.

D. Section 5.2.15 - The guidelines of this section are accepted with the following alternatives:

   1. Minor changes to documents are processed as delineated in Section 6.1.2F.3 of this Program.

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3. ND has programmatic controls in place that make a biennial review process unnecessarily duplicative. These programmatic controls ensure procedures are periodically reviewed and maintained current when pertinent source material is revised; the plant design changes; and/or any deficiencies occur. ND has determined that this approach better addresses the purpose of the biennial review process and that, from a technical and practical standpoint, is better suited to ensure the validity of operational phase site procedures and instructions.

E. Section 5.2.17 - The statement that deviations, their cause, and any corrective action completed or planned shall be documented will apply to significant deviations. Other identified deviations will be documented and corrected. This interpretation is consistent with Appendix B to 10 CFR 50, Criterion XVI, "Corrective Action."

F. ND will comply with regulatory position C.4 except that audit frequencies are specified in NQAP Section 12.2E. A grace period not to exceed 90 days will be applied to the biennial frequency for internal audits described in Section 4.5 of ANSI N18.7-1976 which states that audits of safety- related activities are completed “within a period of two years.” This grace period will not be applied to audits of the Radiological Emergency Plans to satisfy the requirements of 10 CFR 50.54 (t) (1), Security to satisfy the requirements of 10 CFR 50.54 (p) (3) and 10 CFR 73.55 (m), Access Authorization to satisfy the requirements of 10 CFR 73.56 (n) (1) and (n) (2).

G. Section 4.3.4.4.c - The independent review body implements this section by reviewing reportable events that are reported to the NRC in accordance with 10 CFR 50.73.

H. When purchasing commercial grade services from domestic and international calibration or testing laboratories accredited to ISO/IEC 17025 that are accredited by an Accreditation Body that is a signatory to the ILAC MRA, the procurement documents are not required to impose a quality assurance program consistent with ANSI N45.2-1971. Alternative requirements described in NRC Final Safety Evaluation for Technical Report NEI 14-05 Revision 1, Agencywide Documents Access and Management System (ADAMS) Accession No. ML14322A535 may be implemented in lieu of imposing a quality assurance program consistent with ANSI N45.2-1971.

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NRC Regulatory Guide 1.37 - "Quality Assurance Requirements for Cleaning of Fluid Systems and Associated Components of Water Cooled Nuclear Power Plants," 3/73, endorses ANSI N45.2.1-1973.

The NQAP follows this Guide with the following alternatives:

A. The phrase "when applicable" used in Regulatory Guide 1.37, paragraph C.2, leaves open to interpretations which specific requirements and recommendations contained in ANSI N45.2.1- 1973 are applicable to and achievable during the construction or operation phase. The interpretation of "when applicable" will be made with appropriate concurrence in a written procedure before its application.

B. The second sentence of paragraph C.3 should be amended to read:

   "The water quality for final flushes of fluid systems and associated components during the operations phase shall be at least equivalent to the quality required for normal operation. This requirement does not apply to dissolved oxygen or nitrogen limits nor does it infer that other additives normally in the system water will be added to the flush water."

C. Temporary ink markings placed by the fabricator as mill marks may remain on components that operate at temperatures greater than 140□F (normal or accident) and have a 40 year integrated radiation dose less than 106 rads.

D. Control of halogen, sulfur, or low-melting metal contents is not required for abrasive tools such as grinding wheels, cutoff wheels, sanding paper, and flapper wheels. Use of abrasive tools on corrosion-resistant alloys shall be followed by cleaning with an approved solvent. Particulate residue shall be removed by vacuum, brush, dry wiping cloth, or air, with special attention to crevices.

E. Temporary tape and markings (ink and paint) may remain on components that operate at temperatures less than 140□F (normal or accident).

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G. Section 2.1, "Planning - For operations phase activities, the required planning is frequently performed on a generic basis for application to many systems and component installations. This results in standard procedures for cleaning, inspection, and testing which meet the requirements of the standard. Individual plans for each item or system are not normally prepared unless the work operations are unique; however, standard procedures are reviewed for applicability in each case. Cleaning procedures are limited in scope to those actions or activities, which are essential to maintain or achieve required quality. This is consistent with Section 5.2.17, paragraph 5, of ANSI N18.7-1976, which provides for examination, measurement, or testing to ensure quality or indirect control by monitoring of processing methods.

H. ND intends to conform to the cleanness requirements of Section 3.1 of ANSI N45.2.1-1973 with the exception of permissible particle sizes for cleanness Classes B and D. In these cases, ND will conform to the requirements of ANSI N45.2.1-1980, Section 3.2.2.1(b), which states, "There shall be no particles larger than 1/32 inches by 1/16 inches long (0.8 mm by 1.6 mm)" for cleanness Class B, and Section 3.2.4.4 which states, "Particles no larger than 1/16 inch by 1/8 inch long (1.6 mm by 3.2 mm) on a 14 mesh (1.4 mm, ASTM E-11, "Specification for Wire Cloth Sieves for Testing Purposes) or finer filter, or the equivalent" for cleanness Class D.

NRC Regulatory Guide 1.38 - "Quality Assurance Requirements for Packaging, Shipping, Receiving, Storage, and Handling of Items for Water Cooled Nuclear Power Plants," Revision 2, 5/77 endorses ANSI N45.2.2-1972.

The NQAP follows this Guide with the following alternatives:

A. Storage requirements at the site are determined by the responsible engineering unit. This determination involves an evaluation of the complexity of the item and its importance to safety. The various types of storage are provided (yard, warehouse, humidity controlled, etc.) but the classification levels of N45.2.2 are not necessarily employed.

B. In accordance with ASME QA Case 78-N45.2.2-01-0, welding electrodes hermetically sealed in metal containers may be stored under conditions described for level C items unless other storage requirements are specified by the manufacturer. Storage conditions for level C items may also apply to bare wire and consumable inserts unless specified otherwise by the manufacturer.

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D. Austenitic stainless steel and nickel alloy items may have markings applied directly to the bare metal surfaces provided the requirements of ND internal procedures, which control the chemical content of the marking materials, are met.

E. Tubing and piping materials shall have end caps or plugs while in storage unless specified otherwise by engineering specification. End caps or plugs are not mandatory on tube or pipe fittings provided the requirements of ND internal procedures to store under cover with protection from the elements are met. These materials are required to be in a visually clean condition and free of visually detectable defects prior to installation.

F. Section 6.4.1 - ND will meet this section through periodic inspection of randomly selected stored items by QC inspection personnel certified to ANSI N45.2.6. The criteria and factors regarding frequency and degree are established in Section 5.2A and 5.2B of this Program.

G. ND takes exception to ANSI N45.2.2, Section 5.2.1. ND's alternative is that shipping damage inspection shall be done before unloading if evidence of possible shipping damage would be lost in unloading, such as when the item is secured to the carrier, covered by tarpaulin, accompanied by a visible impact recorder, or when the contract requires any of the above. Personnel performing preliminary visual observations (prior to unloading) per Section 5.2.1 need not be qualified to ANSI N45.2.6. Item inspections per Section 5.2.2 are performed by personnel qualified to ANSI N45.2.6. The item inspections also ensure that no damage has occurred during shipping.

H. Section 6.4.2(8) - ND will follow either vendor recommendations for preventive maintenance, an engineering evaluation, or engineering requirements documents delineating appropriate maintenance requirements, for items in storage. Engineering evaluations and engineering requirement documents will consider vendor recommendations.

I. Section 6.5 (last sentence) - During a period of installed storage or extended layup after release of an item from permanent storage, vendor recommendations for preventive maintenance, or an engineering evaluation or an engineering requirements document delineating appropriate maintenance requirements will be followed. Engineering evaluations and engineering requirement documents will consider vendor recommendations.

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K. ND's alternative to the requirements of Section 6.6 of ANSI N45.2.2 is that Procurement will maintain written records of pertinent information such as storage location and receipt inspection results and will take necessary action to provide packaging for items not suitably packaged for storage. Written records of personnel access to nuclear stores are kept for entry during times when nuclear stores personnel are not on duty. All other times, the storeroom is locked and admittance is controlled by stores personnel.

L. ND does not utilize specific levels for classification of items (ANSI N45.2.2, Section 2.7); however, the specific requirements identified in the Standard are used as a guide with respect to protecting the equipment.

M. ND does not utilize specific levels for packaging (ANSI N45.2.2, Section 3.2). All purchased items have been properly packaged. Additionally, periodic storage inspections are conducted to ensure protective measures specified in the Standard to prevent damage or deterioration are complied with and are imposed until the item or component is issued for use. Purchased items undergo receiving inspection using the graded approach. This inspection verifies that items have been properly packaged for shipment and will ensure that any special protective measures specified in the Standard to prevent damage, deterioration, or contamination will be imposed until the item or component is issued for use.

N. ND takes exception to the requirement (ANSI N45.2.2, Section 6.2.4) that salt-tablet dispensers in any storage area shall not be permitted. ND Procurement stores salt-tablet dispensers in sealed containers for use outside of the storage area only.

O. Sections 7.3.2 and 7.4.2 - Use of hoisting equipment beyond its rated load is acceptable when specifically approved with technical justification by engineering.

P. Section 5.2.2(1) Physical Properties - QC Inspectors, Engineers, or other technically competent individuals assure that physical properties conform to specified requirements and that chemical and physical test reports meet the requirements.

Q. Section 2.4 - Off-site inspection, examination or testing is audited by personnel who are qualified in accordance with ANSI N45.2.23 rather than ANSI N45.2.6 as stated in the ANSI Standard.

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NRC Regulatory Guide 1.39 - "Housekeeping Requirements for Water-Cooled Nuclear Power Plants," Revision 2, 9/77 endorses ANSI N45.2.3-1973.

The NQAP follows this Guide with the following alternative:

The zone designations of Section 2.1 of N45.2.3 and the requirements associated with each zone are not consistent with the requirements for an operating plant. Instead, ND Nuclear procedures or instructions for housekeeping activities which include the applicable requirements outlined in Section

2.1 of N45.2.3 and which take into account radiation control considerations, security considerations, fire protection considerations, and personnel and equipment safety considerations are developed on a case basis.

NRC Regulatory Guide 1.58 - "Qualification of Nuclear Power Plant Inspection, Examination and Testing Personnel," Revision 1, 9/80 endorses ANSI N45.2.6-1978.

The NQAP follows this Guide with the following alternatives:

A. ND complies with Regulatory Position C.1 of this Regulatory Guide, as follows:

   1. Construction testing personnel are qualified to Regulatory Guide 1.28 (ANSI N45.2).

   2. Operations, maintenance, and modification testing personnel are qualified to Regulatory Guide 1.8 (ANSI N18.1) as endorsed in Appendix B of this program description.

   3. Quality control inspection personnel are qualified to ANSI N45.2.6.

B. Certifications may not correspond to the levels established in N45.2.6. Inspection, examination, and testing personnel may be classified by disciplines (mechanical, civil, electrical, instrumentation, hanger, etc.) and certified by procedure to perform the functions identified in N45.2.6, Tables I, L-I, and L-II.

C. Medical eye examinations for inspection, testing, and examination personnel are made in accordance with ND eye examination requirements.

D. ANSI/ASNT CP-189, 1995 Ed. “Standard for Qualification and Certification of Nondestructive Testing Personnel” will be used to qualify and certify Nondestructive Examination (NDE) personnel. In ASME Section XI applications, CP-189 will be used, as modified by ASME Section

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E. XI. ANSI/ASNT CP-189, 1995 Ed. is acceptable for qualification of personnel performing NDE of primary containment.

F. ND complies with Regulatory Position C.2 as follows: For containment leak rate testing personnel, ND as a minimum will meet the qualification requirements of ANSI N45.2.6 as endorsed by Regulatory Guide 1.58, Revision 1.

NRC Regulatory Guide 1.64 - "Quality Assurance Requirements for the Design of Nuclear Power Plants," Revision 2, 6/76, endorses ANSI N45.2.11-1974.

The Nuclear Quality Assurance Program follows this Guide with the following alternative to Regulatory Position C.2:

A. If in an exceptional circumstance, the engineer's supervisor is the only person technically qualified to perform the review, the design verification review will be conducted by the supervisor, provided that:

1. The other provisions of this Regulatory Guide and ANSI N45.2.11, Section 6.1 are satisfied.

2. The justification is individually documented and approved in advance by the supervisor's management.

3. QA will audit the use of supervisors as design verifiers to guard against abuse.

NRC Regulatory Guide 1.74 - "Quality Assurance Terms and Definitions," 2/74, endorses ANSI N45.2.10-1973.

The NQAP follows this Guide with applicable alternatives noted in Section 15.0 of this Program.

NRC Regulatory Guide 1.88 - "Collection, Storage, and Maintenance of Nuclear Power Plant Quality Assurance Records," Revision 2, 10/76, endorses ANSI N45.2.9-1974.

The NQAP follows this guide with the following alternatives:

A. Section 2.2.1 - ND may also define lifetime QA records to be "life of the nuclear liability policy, plus the subsequent 10 years during which claims may be covered by the policy." This definition is consistent with ANI Information Bulletin 15-01 “Nuclear Liability Insurance Records Retention, and the requirements of our nuclear insurer.

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C. Section 5.4.3 - In order to preclude deterioration, manufacturer's packaging and storage recommendations for special process records will be considered.

D. Section 5.6 - ND will provide two-hour minimum fire-rated protection for QA records and utilize one of the following alternatives as single storage facilities:

1. A fire-resistive vault or file room that meets the applicable requirements of ANSI N45.2.9- 1974 with the following exceptions:

   a. Records will be afforded the protection of a two-hour rated facility.

   b. Records will be stored in fully enclosed cabinets.

   c. Structure, doors, frames, and hardware shall be designed to fully comply with a minimum two-hour rating.

   d. Pipes or penetrations will be allowed for fire protection, lighting, temperature, humidity control, or communications.

   e. Work not directly associated with records storage or retrieval will be prohibited in the facility.

   f. Smoking and eating/drinking will be prohibited throughout the records facility.

2. One-hour fire-rated cabinets if the following conditions are met:

   a. The records are recreatable, OR

   b. Are contained within a facility of fire-resistive construction with adequate smoke detection or fire-suppression systems: OR

   c. Are within a facility with a fuel loading less than 25 pounds/square foot as defined by NFPA 232-1980.

E. QA records may be temporarily stored for 60 days or less in steel file cabinets or drawers if the following conditions are met:

1. The records are recreatable, OR

2. Are contained within a facility of fire-resistive construction with adequate smoke detection or fire-suppression systems: OR

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3. Are within a facility with a fuel loading less than 25 pounds/square foot as defined by NFPA 232-1980.

F. For storage of film and other processed records, humidity and temperature controls shall be provided to maintain a stable environment. Recommendations by the manufacturer will be considered in determining an acceptable range of tolerance.

G. In addition to the records specified in Appendix A to ANSI N45.2.9-1974, the following records and retention times are applicable to **BLN**:

1. Licensee Event Reports required by 10 CFR 50.73 (3 years).

2. Records of changes made to the procedures required by NQAP Section 9.9.2B.7.a for BLN only (3 years).

3. Records of surveillance activities, inspections, and calibrations required by the Technical Specifications and the Fire Protection Program (5 years).

4. Records of sealed source and fission detector leak tests and results (5 years).

5. Records of annual physical inventory of all sealed source material of record (5 years).

6. Records of reactor tests and experiments (lifetime).

7. Records of in-service inspections performed pursuant to the Technical Specifications (lifetime).

8. Records of quality assurance activities required by the NQAP not listed in items 1 through 5 above and which are classified as permanent records by applicable regulations, codes, and standards (lifetime).

9. Records of 50.59 screening reviews and evaluations performed for changes made to equipment pursuant to 10 CFR 50.59 (lifetime). Records of 50.59 screening reviews and evaluations performed for changes made to procedures or tests and experiments pursuant to 10 CFR 50.59 (5 years).

10. Records of the reviews required by NQAP Sections 9.9.2 and 4.1.7C (lifetime).

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11. Records of the service lives of all hydraulic and mechanical snubbers required by Technical Requirement (TR) 3.7.3, "Snubbers," including the date at which the service life commences, and associated installation and maintenance records (lifetime).

12. Records of secondary water sampling and water quality (lifetime).

13. Records of analyses required by the Radiological Environmental Monitoring Program that would permit evaluation of the accuracy of the analysis at a later date (these records should include procedures effective at specified times and QA records showing that these procedures were followed (lifetime).

14. Records of reviews performed for changes made to the Offsite Dose Calculation Manual and the Process Control Program (lifetime).

15. Records of steam generator tube surveillance (lifetime).

NRC Regulatory Guide 1.94 - “Quality Assurance Requirements for Installation, Inspection, and Testing of Structural Concrete and Structural Steel During the Construction Phase of Nuclear Power Plants, “ Revision 1, 4/76, endorses ANSI N45.2.5-1974.

The NQAP follows this Guide with the following alternatives:

A. The qualification requirements for quality control (QC) inspectors are stated in our position on Regulatory Guide 1.58 in this table.

B. Testing frequency and QC acceptance criteria for concrete construction is described in the Safety Analysis Report for BLN 1 and 2.

C. Burning of bolt holes is acceptable when specifically approved by engineering.

D. The installation method for high strength bolting may be either the automatic cutoff impact wrench method, turn-of-nut method, or direct tension indicator method.

E. Torque wrench inspection of completed connections installed by the turn-of-nut method shall not be required but may serve to resolve disagreements concerning the results of inspection of bolt tension.

F. Torque wrench inspection of the load indicator washer type of direct tension indicator shall not be required.

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Regulatory Guide Conformance Status

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G. Bolts shall be considered long enough if the bolt point is flush with or outside the face of the nut.

H. When specified by the design output document, ND's alternative for visual welding acceptance criteria will be NCIG-01, May 7, 1985, Revision 2, "Visual Weld Acceptance Criteria for Structural Welding of Nuclear Power Plants."

I. For modifications or repairs to structures within the scope of N45.2.5-1974, plant management shall refer to the Site Engineering organization for any design analyses.

J. Verification of pre-weld activities, including fit-up, will be verified through a graded QC inspection program, unless 100 percent inspection is specified in design output documents.

K. Much of N45.2.5 applies to construction and pre-operational testing. As a result, many of the listed tests are not appropriate in an operational plant. In lieu of this, ND utilizes the appropriate engineering organizations to establish the need for specific tests or test procedures during the operational phase, and the guidance provided in ANSI N45.2.5-1974 is considered for applicability.

L. ND implements the requirements of N45.2.5 Section 3, 4, and 5 with a performance-based graded QA verification program consisting of quality control inspection, line verification, and quality assessments.

NRC Regulatory Guide 1.116 - "Quality Assurance Requirements for the Installation, Inspection, and Testing of Mechanical Equipment and Systems," 6/76, endorses ANSI N45.2.8-1975.

The NQAP follows this Guide with the following alternatives:

A. QA programmatic/administrative requirements included in the Regulatory Guide shall apply to construction, maintenance, and modification activities. Technical requirements associated with maintenance and modifications shall be the original requirements or better (e.g., code requirements, material properties, design margins, manufacturing processes, and types of inspection requirements).

B. Much of N45.2.8 applies to construction and pre-operational testing. As a result, many of the listed tests are not appropriate in an operational plant. In lieu of this, ND utilizes the appropriate engineering organizations to establish the need for specific tests or test procedures during the operational phase and the guidance provided in ANSI N45.2.8-1975 is considered for applicability.

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C. ND implements the requirements of N45.2.8 Sections 4.4 and 5.1 with a performance based, graded QA verification program consisting of quality control inspection, line verification, and quality assessments.

NRC Regulatory Guide 1.123 - "Quality Assurance Requirements for Control of Procurement of Items and Services for Nuclear Power Plants," Revision 1, 7/77, endorses ANSI N45.2.13-1976.

The NQAP follows this Guide with the following alternative:

A. Section 4.2 - In the special case of "commercial grade items": the supplier may not be evaluated by one of the methods identified; however, the procurement documents shall contain acceptance requirements (special receipt inspection requirements, special tests, or functional tests) specific to the item being procured. The acceptance (dedication) of commercial grade items intended for safety-related applications meets the intent of EPRI NP-5652 as accepted by the NRC.

B. Section 7.5 - Personnel responsible for performing verification activities are qualified in accordance with ANSI N45.2.6 or ANSI N45.2.23 as applicable.

C. Section 3.2.3 - When purchasing commercial grade calibration or testing services from a laboratory holding accreditation by an accrediting body recognized by the International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Arrangement (MRA), commercial grade surveys need not be performed provided each of the following conditions are met:

1. A documented review of the supplier's accreditation is performed and includes a verification of the following:

   a. The calibration or test laboratory holds accreditation by an accrediting body recognized by the ILAC MRA. The accreditation encompasses ISO/IEC-17025:2005, "General Requirements for the Competence of Testing and Calibration Laboratories."

   b. For procurement of calibration services, the published scope of accreditation for the calibration laboratory covers the needed measurement parameters, ranges, and uncertainties.

2. For procurement of testing services, the published scope of accreditation for the test laboratory covers the needed testing services including test methodology and tolerances/uncertainty.

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3. The purchase documents require that:

    a. The service must be provided in accordance with their accredited ISO/IEC-17025:2005 program and scope of accreditation.

    b. As-found calibration data must be reported in the certificate of calibration when calibrated items are found to be out-of-tolerance. (for calibration services only)

    c. The equipment/standards used to perform the calibration must be identified in the certificate of calibration. (for calibration services only)

    d. The customer must be notified of any condition that adversely impacts the laboratory's ability to maintain the scope of accreditation.

    e. Additional technical and quality requirements, as necessary, based upon a review of the procured scope of services, which may include, but are not necessarily limited to, tolerances, accuracies, ranges, and industry standards.

4. It is validated, at receipt inspection, that the laboratory's documentation certifies that:

    a. The contracted calibration or test service has been performed in accordance with their ISO/IEC-17025:2005 program, and has been performed within their scope of accreditation, and

    b. The purchase order's requirements are met.

NRC Regulatory Guide 1.144 - "Auditing of Quality Assurance Programs for Nuclear Power Plants," Revision 1, 9/80, endorses ANSI N45.2.12-1977.

The NQAP follows this Guide with the following alternatives:

A. Paragraph 2.3 - Technical specialists who assist in performing audits in their area of special expertise will perform their audit duties under the supervision of a certified lead auditor.

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C. ND implements the requirements of Regulatory Guide paragraph C.3.a and Sections 3.4 and 3.5 of ANSI N45.2.12 with a performance-based, graded QA audit program. Real time adjustments are made to the audit scope, depth, and frequency based on an item's or subject's importance to safety and performance history. Real-time adjustments allow emphasis to be placed in areas where performance is weak and decrease emphasis where performance is evaluated to be good.

D. Section 4.5.2 - QA will have a certified lead auditor or a manager of the auditor either conduct the required follow up or attest to the acceptability of the follow up conducted by audit personnel.

E. Regulatory Guide 1.144, Section C.3.b(2):

When purchasing commercial grade calibration or testing services from a laboratory holding accreditation by an accrediting body recognized by the International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Arrangement (MRA), commercial grade surveys need not be performed provided each of the following conditions are met:

1. A documented review of the supplier's accreditation is performed and includes a verification of the following:

   a. The calibration or test laboratory holds accreditation by an accrediting body recognized by the ILAC MRA. The accreditation encompasses ISO/IEC-17025:2005, "General Requirements for the Competence of Testing and Calibration Laboratories."

   b. For procurement of calibration services, the published scope of accreditation for the calibration laboratory covers the needed measurement parameters, ranges, and uncertainties.

   c. For procurement of testing services, the published scope of accreditation for the test laboratory covers the needed testing services including test methodology and tolerances/uncertainty.

2. The purchase documents require that:

   a. The service must be provided in accordance with their accredited ISO/IEC-17025:2005 program and scope of accreditation.

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c. As-found calibration data must be reported in the certificate of calibration when calibrated items are found to be out-of-tolerance. (for calibration services only)

d. The equipment/standards used to perform the calibration must be identified in the certificate of calibration. (for calibration services only)

e. The customer must be notified of any condition that adversely impacts the laboratory's ability to maintain the scope of accreditation.

f. Additional technical and quality requirements, as necessary, based upon a review of the procured scope of services, which may include, but are not necessarily limited to, tolerances, accuracies, ranges, and industry standards.

3. It is validated, at receipt inspection, that the laboratory's documentation certifies that:

a. The contracted calibration or test service has been performed in accordance with their ISO/IEC-17025:2005 program, and has been performed within their scope of accreditation, and

b. The purchase order's requirements are met.

NRC Regulatory Guide 1.146 - "Qualification of Quality Assurance Program Audit Personnel for Nuclear Power Plants," 8/80, endorses ANSI N45.2.23-1978.

The NQAP follows this Guide with the following alternative:

A. In addition to the State agencies and technical societies recognized by ANSI N45.2.23, Section 2.3.1.3, ND may grant two points for professional competency to those individuals licensed as either a Reactor Operator (RO) or Senior Reactor Operator (SRO) by the NRC.

B. Replace Section 2.3.4 of ANSI N45.2.23 with the following:

"Prospective Lead Auditors shall demonstrate their ability to effectively implement the audit process and effectively lead an audit team. This process is described in written procedures which provide for evaluation and documentation of the results of this demonstration. A prospective Lead Auditor shall participate in at least one nuclear quality assurance audit within the year preceding the individual's effective date of qualification."

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NRC Regulatory Guide 1.152 - "Criteria for Programmable Digital Computer System Software in Safety-Related Systems of Nuclear Power Plants," November 1985, endorses ANSI/IEEE-ANS-7- 4.3.2-1982.

The NQAP follows this Guide consistent with Section D of the Guide, with the following alternative:

C. “For programmable digital computer system software installed in safety-related protection systems, ND will follow this guide for the verification and validation of program elements specified in Sections 13.2G and 13.2H of the NQAP.”

Appendix C
Comparison Matrix of Quality Assurance Program Requirements with those of 10 CFR 50, Appendix B, and Selected ANSI Standards

(Page 1 of 4)

1.0 INTRODUCTION

The guidelines for classifying components, systems, and activities as quality related depend on the relationship of the terms quality related and safety related as discussed in 2.0 and 3.0 below. The guidelines are contained in Section 4.0 of this Appendix.

2.0 QUALITY-RELATED

A. Quality-related (QR) is a term, which encompasses quality assurance program requirements that describe activities, which affect structures, systems, and components. These requirements provide reasonable assurance that the facility can be operated without undue risk to the health and safety of the public. In addition to safety-related structures, systems, components, and activities, the term "quality- related" encompasses the broad class of plant features covered (not necessarily explicitly) in the General Design Criteria of 10 CFR 50, Appendix A, that contribute in an important way to the safe operation and protection of the public in all phases and aspects of facility operation (i.e., normal operation and transient control as well as accident mitigation).

B. Quality-related is more encompassing than the term safety related. Appendix D shows the scope of the Nuclear Quality Assurance Program. All quality-related items and activities are not necessarily safety-related. Appendix D illustrates the programmatic relationships.

3.0 SAFETY-RELATED

A. Use of the term safety-related (or variations thereof) and the methodology for classifying items and activities as safety-related has been established in the General Design Criteria and Safety Analysis Report for BLN. The term safety-related as used in this appendix, this program description and other Nuclear Quality Assurance Program documents is generic in nature.

B. Items and activities classified as safety-related are subject, without exception, to the requirements of 10 CFR 50, Appendix B. All safety-related items and activities are also quality-related.

Appendix C

Comparison Matrix of Quality Assurance Program Requirements with those of 10 CFR 50, Appendix B, and Selected ANSI Standards

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5.0 GUIDELINES

Some items and activities are classified as quality-related but not safety-related. However, because some items and activities classified as quality-related are considered important to the continued reliable operation of ND's BLN nuclear facilities, ND shall apply the requirements of all or selected parts of the NQAP to such items and activities.

A. Structures, systems, and components shall be classified as quality-related but not safety-related if they fit one or more of the following categories:

1. Contain radioactive material and have not been identified as safety-related.

2. Are required by ANS 3.2/ANSI N18.7-1976, "Administrative Controls and Quality Assurance for the Operational Phase of Nuclear Power Plants," and are not identified as safety-related (e.g., plant security system).

3. Are fire protection features that provide protection for safety-related structures, systems, or components.

4. Are structures, systems, and components that have environmental or operability requirements important to the safe operation of the unit (as specified in the Plant Technical Specifications).

5. Are structures, systems, and components that could impact reliability and operability goals recommended by ND Nuclear management and approved by the CNO and Executive Vice President.

B. Those components or systems designated as Seismic Category I (L) in nuclear plant FSARs shall be classified as quality-related. Seismic Category I (L) is the non-safety-related portion of Seismic Category I. (Refer to Appendix D.)

C. Additional components or systems, not identified in the FSARs as NNS or Seismic Category I (L,) can be designated as quality-related but not safety-related. Such additional components or systems could include the following:

1. Plant security system.

2. Plant radiological controls and radwaste systems.

Appendix C

Comparison Matrix of Quality Assurance Program Requirements with those of 10 CFR 50, Appendix B, and Selected ANSI Standards

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4. Other structures, systems, and components which have special environmental or operability requirements.

5. Structures, systems, or equipment designated by ND Nuclear management as requiring some level of quality control because of their importance to plant reliability or operability.

D. Items to which one or more of the following regulatory documents are applicable should be considered for classification as quality-related.

1. Regulatory Guide 1.143, "Design Guidance for Radioactive Waste Management Systems, Structures, and Components Installed in Light-Water-Cooled Nuclear Power Plants."

2. 10 CFR 71, Subpart H, "Quality Assurance (Packaging and Transportation of Radioactive Material)."

3. Regulatory Guide 1.29, "Seismic Design Classification."

4. 10 CFR 73.55, "Requirements for Physical Protection of Licensed Activities in Nuclear Power Reactors against Radiological Sabotage."

5. 10 CFR 50.62, "Requirements for Reduction of Risk from Anticipated Transients without Scram (ATWS) Events for Light-Water-Cooled Nuclear Power Plants."

6. 10 CFR 50, Appendix R, "Fire Protection Program for Nuclear Power Facilities Operating Prior to January 1, 1979."

7. ANS 3.2/ANSI N18.7-1976, "Administrative Controls and Quality Assurance for the Operational Phase of Nuclear Power Plants."

8. Regulatory Guide 1.33, Revision 2, February 1978, "Quality Assurance Program Requirements (Operation)."

9. NRC letter from H. J. Thompson, Jr., dated April 16, 1985, "Quality Assurance Guidance for ATWS Equipment That is Not Safety Related," Generic Letter 85-06, (A02 850422 044).

10. NRC letter from D. G. Eisenhut dated April 24, 1986, "Implementation of Fire Protection Requirements," Generic Letter 86-10 (A02 860512 005).

Appendix C

Comparison Matrix of Quality Assurance Program Requirements with those of 10 CFR 50, Appendix B, and Selected ANSI Standards

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11. NUREG 0737, "Clarification of TMI Action Plan Requirements."

12. NUREG 0800, Section 9.5.1, Branch Technical Position, CMEB 9.5-1 (formerly BTP ASB 9.5-1), Revision 2, July 1981, "Fire Protection for Nuclear Power Plants."

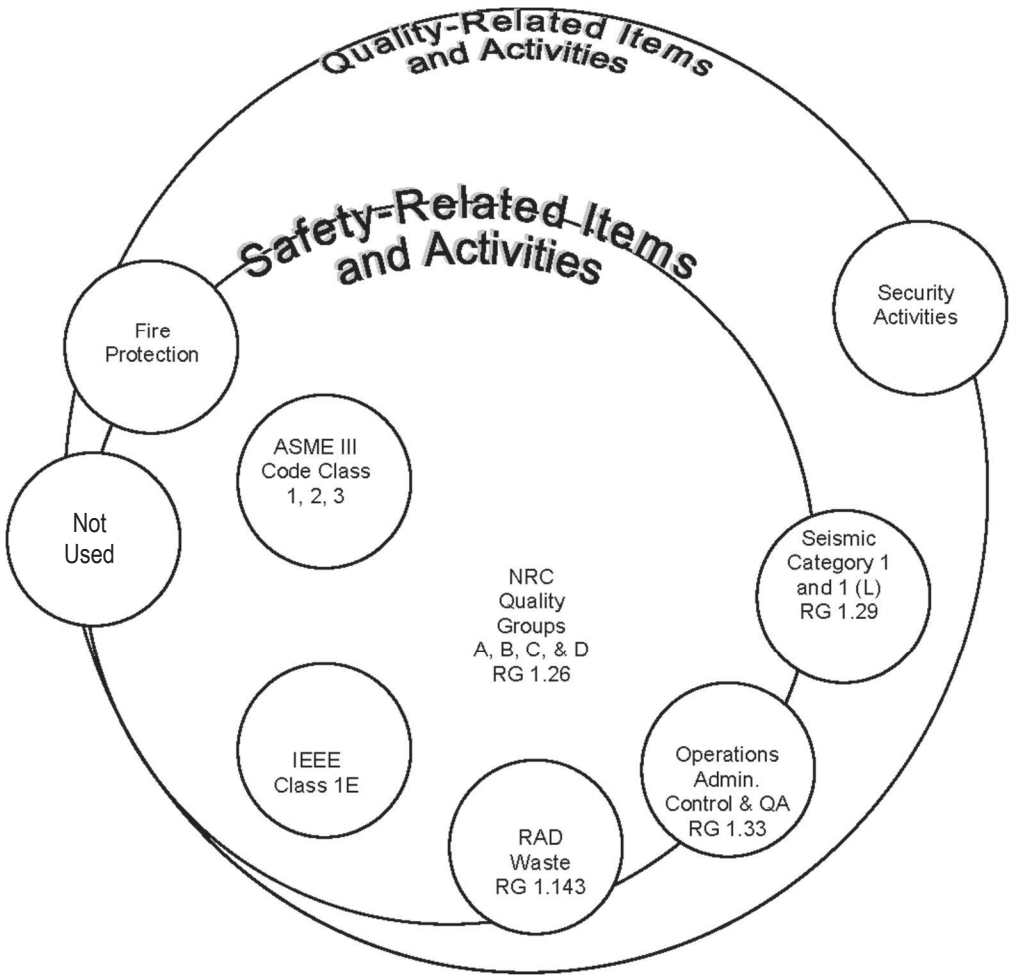
13. Nuclear Plant Fire Protection Functional Responsibilities, Administrative Controls, and Quality Assurance, (the "FRACQA Letter") - GL 77-02”

E. New systems (or items being added as a result of approved modifications) shall be classified on the same basis as the existing components or systems.

F. Classification of components or systems as quality-related but not safety-related shall be performed in accordance with approved corporate or site engineering procedures or at ND Nuclear management direction.

Appendix D
Scope of Nuclear Quality Assurance Program

(Page 1 of 1)



This diagram displays the relationship of safety-related to quality-related items and activities. Examples of these items and activities are shown. It is not intended to show each specific item and activity within the scope of the Nuclear QA Program.

Appendix E
Computer Software

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The requirements of Section 13.0 apply to application software, which performs any of the following:

A. Directly operate safety-related plant equipment.

B. Generates design output for the design of safety-related or quality-related functions, structures, systems, or components.

C. Used by control room personnel, without further verification, to make plant operating decisions affecting:

   1. The integrity of the reactor coolant pressure boundary.

   2. The capability to shut down the reactor and maintain it in a safe condition.

   3. The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures comparable to the applicable guideline exposures set forth in 10 CFR 50.34(a)(1) or 10 CFR 100.11, as applicable.

D. Perform calculations, the results of which are used, without further verification to operate, maintain, inspect, or test safety-related or quality-related structures, systems, and components.

E. Performs engineering calculations, the results of which are used, without further verification to support the design of safety-related and quality-related structures, systems, and components.

F. Generates output used to procure safety- or quality- related items.

G. Maintains, controls, or distributes information to be used without further verification in the procurement, design, operation, and maintenance of safety-related or quality-related structures, systems, and components.

Appendix F
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(Page 1 of 1)

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Appendix G
Quality Assurance Programs for Bellefonte Units 1 and 2

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1.0 GENERAL

This appendix to the Nuclear Development's (ND's) Nuclear Quality Assurance Plan (NQAP) describes the top level policy that assigns major functional responsibilities for activities conducted by or for ND Bellefonte Units 1 and 2 (BLN) while the construction permits for the units remain, first, in a terminated status, and then transition to a deferred status. The NQAP describes the methods and establishes the administrative control requirements that meet applicable 10 CFR 50, Appendix B requirements, NRC Generic Letter 87-15, "Policy Statement on Deferred Plants," and the BLN 1 & 2 construction permits as reinstated in accordance with the terms of the NRC order reinstating the BLN Units 1 & 2 construction permits to TVA, dated March 9, 2009.

Current ND Nuclear programs and procedures that implement the NQAP, as well as the existing ND Nuclear organizational structures, are primarily focused on an operating plant structure. This appendix is developed to take into account the unique requirements and commitments necessary to ensure effective quality assurance program implementation and oversight of BLN 1 & 2.

The execution and accountability for quality assurance for the BLN 1 & 2 units remains with ND, but may be delegated to support contractors for specific tasks and activities. Contracted activities are implemented through a ND approved contractor Nuclear Quality Assurance Manual (NQAM) or may be implemented through direct implementation of the ND QA program through ND procedures. ND's review and approval of a contractor NQAM, and any changes thereto, ensures that regulatory requirements and ND specific commitments of this NQAP are met. ND retains and exercises the overall responsibility for the establishment and execution of an effective QA program for BLN 1 & 2.

Procedures and instructions that implement the requirements of the NQAP are developed prior to commencement of those activities and are reviewed and approved by ND.

ND will also provide NRC with revisions to the NQA Plan as necessary per 10 CFR 50.55 as ND transitions BLN through the five phases discussed in Paragraph 2.0.

Appendix G

Quality Assurance Programs for Bellefonte Units 1 and 2

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3.0 BACKGROUND

The completion of Bellefonte 1 and 2 will be conducted in five (5) phases.

- Phase 1: Verification & Validation

  During this phase, clear decisions regarding regulatory and licensing strategies will be established. Based on original design criteria and necessary regulatory updates, engineering design scoping documents will be developed for each system in order to support detailed design in Phase 2.

- Phase 2: Design & Development

  By prioritizing the engineering and procurement work, ND will have the capability to phase in construction work in a logical manner to expedite project completion.

- Phase 3: Implementation / Construction

  ND will select, manage and support the construction execution services during this crucial phase.

- Phase 4: Evaluation / Commissioning

  ND will select an experienced US Nuclear Operator to work with ND through the start-up and commissioning of Bellefonte Unit 1. The chosen Operator will provide a fully trained organization to accept system turnover through participation in plant testing and startup.

- Phase 5: Operations

  The chosen experienced US Nuclear Operator will operate the completed nuclear plant under the ND NQAP and will provide the governance and oversight for required nuclear regulatory programs to obtain and maintain an ND operator license for BLN.

4.0 SCOPE/APPLICABILITY

This appendix applies to BLN 1& 2 plant activities while ND evaluates, maintains and preserves the units for the reactivation of construction and completion activities. ND will take the actions necessary to maintain and preserve the units in order to maintain the option of plant reactivation in accordance with Generic Letter 87-15, “Policy Statement on Deferred Plants” and the terms of the NRC order reinstating the BLN Units 1 & 2 construction permits, dated March 9, 2009.

Appendix G

Quality Assurance Programs for Bellefonte Units 1 and 2

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5.0 ORGANIZATION

This section describes the highest levels of the ND organizational structure shown in Appendix I including functional responsibilities, levels of authority and interfaces for establishing, executing, and verifying the implementation of quality assurance requirements for BLN 1 & 2. The organizational structure includes offsite and on-site functions including interface responsibilities for multiple organizations performing non-safety-related functions. Implementing documents assign more specific responsibilities and duties, and define the organizational interfaces involved in conducting activities and duties within the scope of this NQAP. Management gives careful consideration to the timing, extent and effects of organizational structure changes.

The QA General Manager is responsible for ensuring that the ND BLN QA organization is sized commensurate with assigned duties and responsibilities. This is accomplished through the use of a dedicated and experienced QA organization performing oversight activities both onsite and offsite.

The following sections describe the reporting relationships, functional responsibilities, and authorities for organizations implementing and supporting the Nuclear Quality Assurance Program as it applies to BLN Units 1 & 2 in a terminated or deferred plant status. The ND Nuclear organization is described herein and in the NQAP.

5.1 President and Chief Executive Officer (CEO)

The CEO is responsible for all aspects of design, construction and operation of ND's nuclear plants. The CEO is also responsible for all technical and administrative support activities provided by ND and contractors. The CEO directs the CNO and Executive Vice President. The CEO also directs the executive responsible for resources and operations support. The CEO reports to the ND Board of Directors with respect to all matters.

Appendix G

Quality Assurance Programs for Bellefonte Units 1 and 2

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5.3 Chief Nuclear Officer (CNO) and Executive Vice President

The Chief Nuclear Officer (CNO) and Executive Vice President reports to the CEO and is responsible for BLN plant licensing, engineering, procurement, construction and testing activities and ultimately the safe, reliable, and efficient operation of BLN. The CNO and Executive Vice President directs Vice Presidents and EH General Manager, Nuclear Oversight and Assessment and ensures the implementation of this NQA Plan for activities at BLN. The CNO and Executive Vice President also directs the planning and development of the ND staff and organization resources and is responsible for establishing and managing the contracts for the BLN completion, engineering, licensing, testing, startup and operation of BLN plants in accordance with the Nuclear Quality Assurance Program.

5.3.1 Senior Vice President, Nuclear Operations

The Senior Vice President, Nuclear Operations reports directly to the CNO and Executive Vice President and has responsibility for organizations that coordinate and integrate efforts and initiatives into day-to-day ND Nuclear business at BLN 1&2. The BLN Site Vice President and the Nuclear Training General Manager report to this position.

5.3.2 Vice President, Engineering and Projects

The Vice President Engineering and Projects reports directly to the CNO and Executive Vice President and has responsibility for support organizations that coordinate and integrate efforts and initiatives into day-to-day ND Nuclear business. Organizations reporting to this position include Corporate Engineering, Plant Operation Reliability Manager, Inspections Services Manager, Computer Engineering Manager, Project Management, Fuel Supply and Disposal Manager and Nuclear Fuels.

5.3.3 Vice President, Nuclear Support

The Vice President, Nuclear Support reports to the CNO and Executive Vice President. In addition to the responsibilities described in subsection 4.1.2 the Vice President, Nuclear Support is responsible for the management positions responsible for:

1. providing corporate oversight and governance of the planning and execution of plant nuclear outages and outage scheduling,

2. Nuclear security, which includes protection of safeguard information, reporting of safeguard events, and development, implementation, and maintenance of the Site Physical Security/Contingency Plans.

3. technical programs including reliability, safety, emergency preparedness, performance improvement, document control and quality assurance records management

4. providing corporate governance of functional areas (maintenance, operations, radiation protection, chemistry, work control, and procedures) for BLN nuclear plants,

5. developing programs to control procedures and instructions,

6. maintaining the Nuclear Operating Experience Review Program,

7. Overseeing the training and performance improvement functions, including development of the ND Nuclear corrective action program, and establishing and maintaining trend analysis procedures for adverse conditions and quality indicators.

5.3.4 Vice President, Procurement

The Vice President, Procurement reports to the CNO and Executive Vice President.

In addition to the responsibilities described in subsection 4.1.2, the management position responsible for procurement, is responsible for ensuring that the QA requirements established by this program description are either included or referenced (as appropriate) in related Procurement sponsored program areas identified in the body of this Program.

5.3.5 General Manager, Nuclear Oversight and Assessment

The General Manager, Nuclear Oversight and Assessment reports to the CNO and Executive Vice President.

The ND Nuclear Oversight and Assessment organization includes:

1. The Quality Assurance organization which is responsible for independently planning and performing activities to verify the effective implementation of the NRC approved NQAP described in this document for BLN 1 and 2 activities including, but not limited to engineering, QA/QC, licensing, document control, corrective action program, and procurement that support plant completion. The QA General Manager has an independent reporting relationship to the CNO and Executive Vice President on quality issues.

Appendix G

Quality Assurance Programs for Bellefonte Units 1 and 2

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3. The Bellefonte Completion Project Independent Oversight organization which is responsible for providing independent oversight of Operator Readiness, Procurement, Construction, Project Controls and Engineering.

5.4 Authority to Stop Work

ND Nuclear QA and Contractor quality assurance and inspection personnel have the authority, and the responsibility, to stop work in progress which is not being done in accordance with approved procedures or where safety or structure, system or component integrity may be jeopardized. This extends to off-site work performed by suppliers furnishing safety-related materials and services to ND.

5.5 Organizational Independence

For the BLN Plant, independence shall be maintained between the organization performing the checking (quality assurance and quality control) functions and the organizations performing the functions. This provision is not applicable to design review/verification.

6.0 PROGRAM

A. During the period that BLN units 1 & 2 remain in terminated or deferred status as described in Generic Letter 87-15, “Policy Statement on Deferred Plants” the Quality Assurance elements described in this appendix and the body of the NQAP will be accomplished through written, reviewed and approved procedures.

B. Site procedures that were not used in the period of deferral before the construction permits were withdrawn were placed in inactive status. As activities necessary to consider the viability of construction completion are required, the applicable procedures will be reactivated, reviewed and reissued prior to the conduct of the activity.

Appendix G

Quality Assurance Programs for Bellefonte Units 1 and 2

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8.0 PLANT EQUIPMENT POLICY

A. An important factor in construction reactivation and completion includes the impact of equipment age on its continued suitability for use. Considerations regarding age degradation due to design life, outdated or obsolete equipment, design improvements, any impact associated with resource recovery activities, and economic feasibility to replace rather than preserve equipment indefinitely under a lay-up program must be taken into account given the age of certain existing equipment. For these reasons, in August 2003 the Tennessee Valley Authority (TVA), the owner of BLN 1&2 at that time, submitted and in May 2004 the NRC approved a change to the NQAP that allowed preventive maintenance to be terminated on selected equipment and to allow that equipment to be entered into the corrective action program as “deferred equipment”. TVA procedure controls prohibited and ND procedure controls will continue to prohibited “deferred equipment” from being used in nuclear safety related applications without further evaluation and having been fully restored or replaced.

B. Structures, systems or components that have been affected in the course of resource recovery activities conducted by TVA prior to ND procurement of BLN 1&2 will likewise be entered in to the corrective action program and prohibited from being returned to service without evaluation and having been restored or replaced.

Appendix H
Types of Controlled Documents and Manuals

(Page 1 of 1)

A. Design Specifications and Drawings

B. Safety Analysis Reports for the 10 CFR 50 Reactor Power Facilities

C. Program Manuals

D. Plant Instructions

E. Radiological Protection Plan

F. Nuclear Engineering Procedures Manual

G. Site Engineering Project Manuals

H. ASME Section III Quality Assurance Manuals

I. Nuclear Procedures System Manuals

J. As-built Documents

K. Computer Programs

L. Non-conformance Reports

M. Nuclear Quality Assurance Plan

N. System Descriptions

O. Topical Report

P. Not Used

Q. Radiological Emergency Plan

R. Fire Protection Reports

S. Part 52 Plants Safety Analysis Reports and QAPD

Appendix I
ND NQAP Organization Chart

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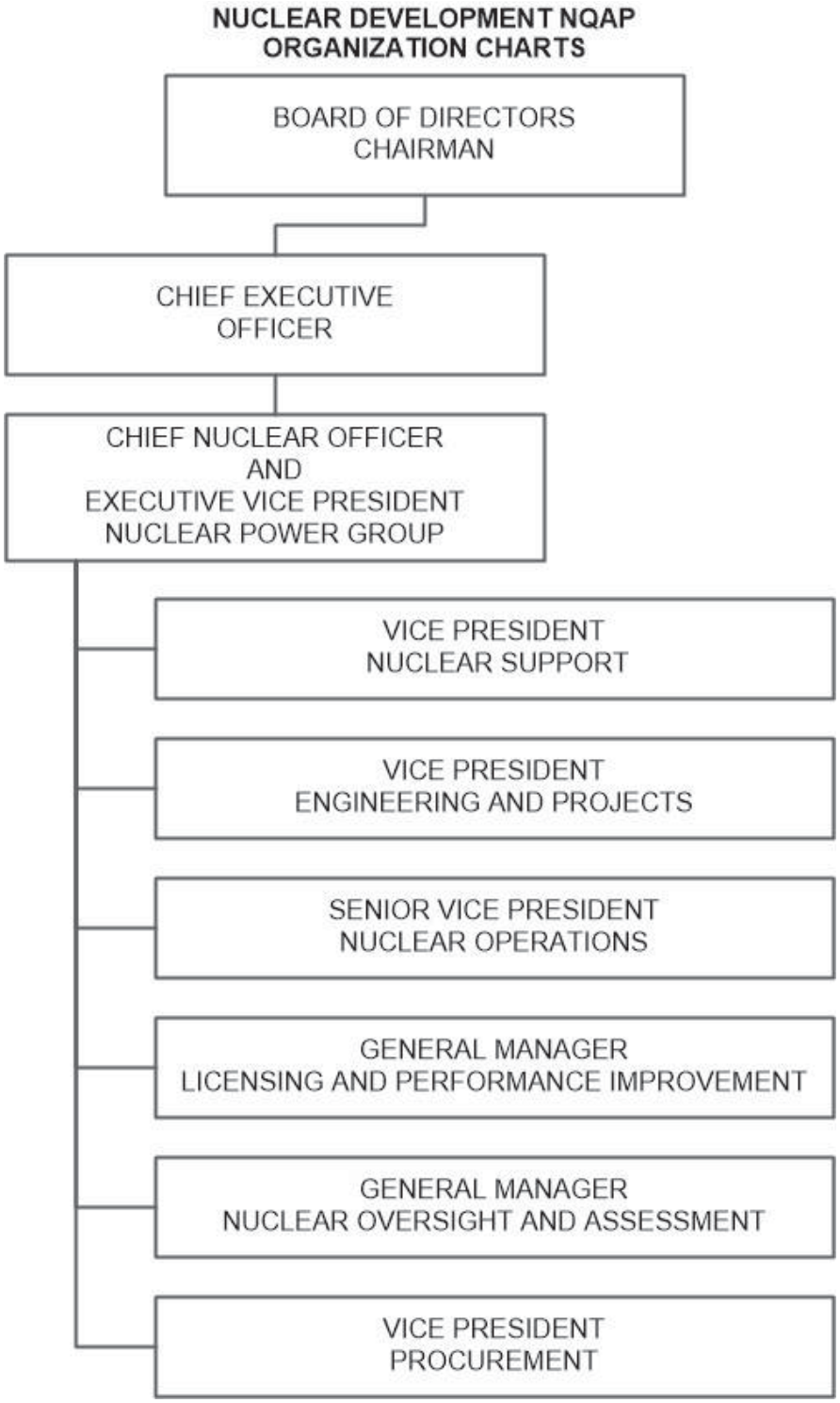
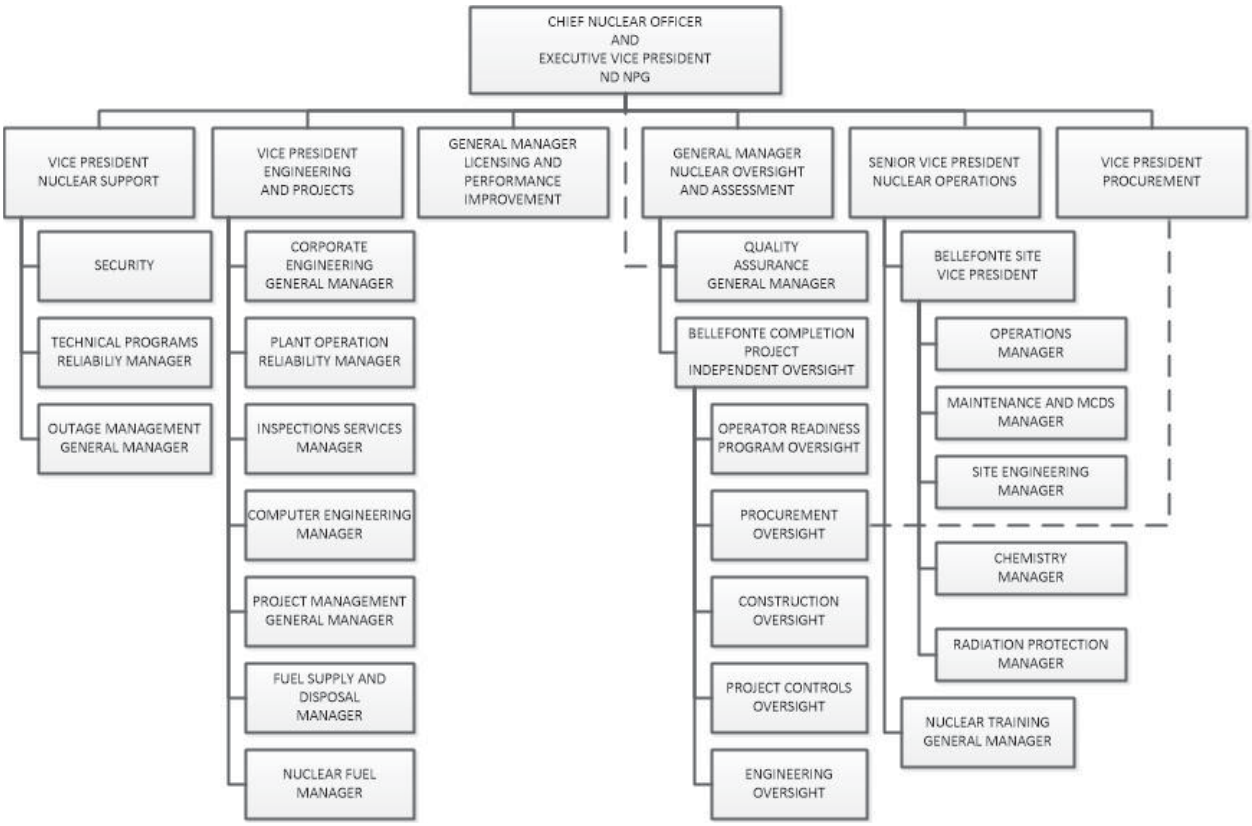


Appendix I

ND NQAP Organization Chart
(Page 2 of 2)



Appendix J
List of Abbreviations

(Page 1 of 2)

The following abbreviations are used in this program description:

AISC - American Institute of Steel Construction

ALARA - As Low as Reasonably Achievable

ANS - American Nuclear Society

ANSI - American National Standards Institute

ASL - Acceptable Suppliers List

ASME - American Society of Mechanical Engineers

ASME III QAM - ASME Section III Quality Assurance Manual

ASNT - American Society for Nondestructive Testing

ATWS - Anticipated Transient Without Scram

AWS - American Welding Society

BLN - Bellefonte Nuclear Plant

CEO - Chief Executive Officer

COO - Chief Operating Officer

CNO – Chief Nuclear Officer

CFR - Code of Federal Regulations

DOE - Department of Energy

EPRI - Electric Power Research Institute

ESPA - Early Site Permit Application

ESP - Early Site Permit

FSAR - Final Safety Analysis Report

I&C - Instrument and Control

Appendix J
List of Abbreviations
(Page 2 of 2)

IEEE - Institute of Electrical and Electronics Engineers

ITS - Important to Safety

M&TE - Measuring and Test Equipment

NDE - Nondestructive Examination

NFPA - National Fire Protection Association

NNS - Non-nuclear Safety

NO - Nuclear Operations

NPS - Nuclear Procedures System

NQAP - Nuclear Quality Assurance Plan

NRC - Nuclear Regulatory Commission

NSRB - Nuclear Safety Review Board

NSSS - Nuclear Steam Supply System

PI - Performance Improvement

PORC - Plant Operations Review Committee

QA - Quality Assurance

QAPD - Quality Assurance Program Description

QC - Quality Control

SNM - Special Nuclear Material

SSAR - Site Safety Analysis Report

SVP - Senior Vice President

TVA - Tennessee Valley Authority

Attachment 4

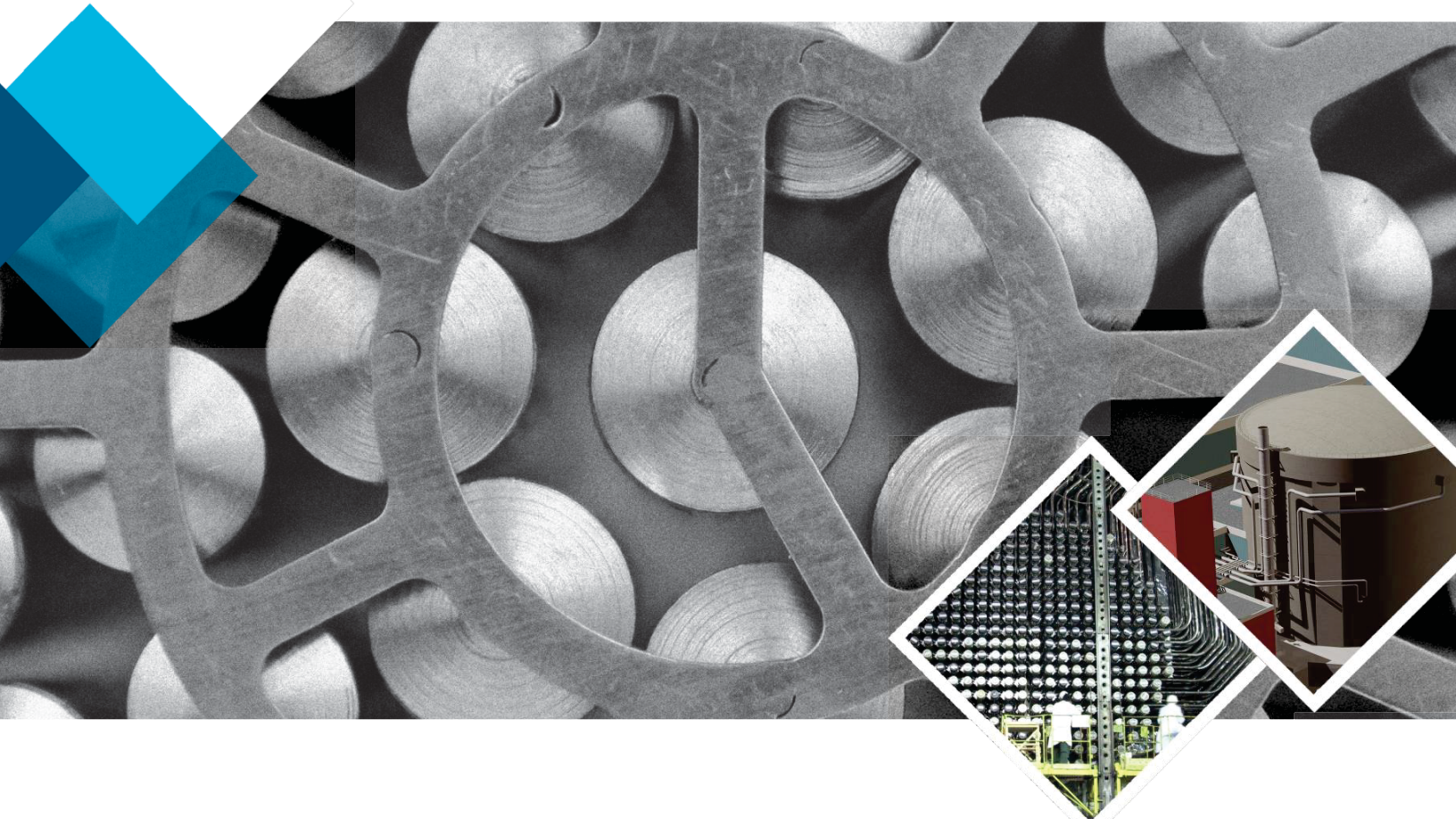
SNC-Lavalin Nuclear (USA) Qualifications

SNC·LAVALIN

Capability in Nuclear Design and EPC Execution of Nuclear Projects

Submitted by: Candu Energy Inc., a member of SNC Lavalin Group

Compiled for the Bellefonte Completion Team



Nuclear

2019 | 06 | 21

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1 Introduction

As part of ongoing support for the Bellefonte Completion Team, SNC-Lavalin Nuclear has been requested to provide a summary of our technical and engineering capability focusing on support for licensing, nuclear plant design, nuclear support plant design, balance of plant design, nuclear civil engineering and EPC execution for completion or new build of nuclear power plants. As requested we have compiled our capabilities in this document and attached example representative and at-scale projects for consideration as Appendix A.

Candu Energy Inc. are a wholly owned subsidiary of SNC-Lavalin Group Inc. and part of the SNC-Lavalin Nuclear Division with global reach and resources.

2 Capabilities and Capacity

SNC-Lavalin's Nuclear Division (ND) comprises the skills and capabilities of the former SNC-Lavalin Nuclear (nuclear process design and delivery), Atkins Nuclear (technical, engineering and decommissioning services) and Candu Energy (reactor vendor, new build, major projects and engineering services) and as a whole we provide full scope lifecycle nuclear solutions, products and services to global owner/operators and utilities. ND provides call-off, 24/7 emergency and emergent engineering services to global nuclear owner/operators & utilities across most reactor technologies. We also provide Engineering, Procurement and Construction (EPC) packages for the total power plant comprising Reactor Island, reactor support infrastructure, Turbine Island, balance of plant (BOP), grid interconnection, nuclear waste treatment and nuclear chemical/process plants.

ND has over 60 years' experience in delivering real world nuclear engineering solutions into nuclear new-build and nuclear power plant (NPP) upgrade/uprate, life extension, refurbishment fuel, fuel handling and waste treatment markets and has successfully designed, constructed and commissioned research reactors in the 10kWt to 135MWt range and prototype/commercial reactors in the 22MWe to 728MWe range.

ND deploys a consistent design development, risk assessment and project execution model that increases confidence in outcomes and reduces impacts on cost and schedule. We are and have delivered technical, engineering and commercial services to a number of thermonuclear fusion projects including JET and ITER, new build of large commercial reactors, delayed completion of large commercial reactors, life extension of large, commercial reactors, advanced (fast and thermal neutron) reactor (AR) design and small modular reactor (SMR) design in non-exclusive commercial arrangements in UK, Europe, Asia and the Americas. We also support AR/SMR developers in grant and loan applications and interact directly with funding agencies as required. We are advising government agencies, potential commercial reactor and AR/SMR hosts/owners/operators and Client side project developers in the resources sectors e.g. power, oil & gas and mining & metallurgy.

ND's team of over 3,000 full-time nuclear employees are part of SNC-Lavalin's ~50,000 staff who provide services to our internal Resources, Infrastructure, Capital and Nuclear sectors. We can package projects across sectors to deliver a full range of technical/engineering services from feasibility studies, pre-conceptual design, preliminary (reference) design to detailed design of any aspect of a nuclear new build/completion project, cost estimation to

support all stages of a project to financial close, supplier qualification, procurement specification, procurement and contract management, materials management, construction management, inspection and testing, training, commissioning and completion for turnover (handover).

We support our EPC activities with our in-house Capital team who develop projects, arrange financing, invest equity, undertake complex financial modelling and manage investments. The Capital team offers comprehensive cradle-to-grave, investment-to-divestment asset management expertise and has assets under management including build-own-operate (BOO), public-private partnership (PPP) and concession-type financed projects. Our Capital team has arranged over $12Bn in project financing over the past decade.

ND is the both the Vendor and Original Equipment Manufacturer (OEM) for the pressurized heavy water (PHWR) CANDU® reactor and as such we possess Tier-1 nuclear engineering capabilities that are applicable to all reactor types. We provide spares and installation services to all water reactor types and manage national nuclear laboratories & national waste treatment programs in Canada, USA and Japan. ND has access to global resources with specialists in PWR, BWR, SMR, generic PHWR, HTGR, graphite moderated reactors, liquid sodium reactors and novel & AR design development and EPC execution. ND is known for its successful engagement in large, high technology, innovative and FOAK engineering projects from nuclear fusion to neutrino observatory construction.

ND have a clearly differentiated track record in large, global nuclear new build in that its last seven (7) international projects were completed to budget and schedule or better and we have delivered three (3) first-of-a-kind (FOAK) major (nuclear new build scale) reactor refurbishments in Canada, two (2) in Korea and Argentina respectively that benefitted from FOAK learning to the advantage of the Client. We are currently delivering ten (10) major reactor refurbishments solely or in partnership and have prospects for four (4) more major reactor refurbishments in early negotiation.

We have suitably qualified and experience staff providing “boots on the ground” in many global nuclear projects including:

a) Hinkley Point C NPP, UK
b) Fukushima Daiichi clean-up, Japan
c) Barakah NPP, UAE
d) ITER, France
e) Canadian Nuclear Laboratories, Canada
f) Portsmouth and Paducah clean-up operations, USA
g) Sellafield legacy spent fuel pool clean-up, UK
h) Hanford, Oak Ridge and Savanah River operations, USA
i) Darlington and Bruce NPP mid-life refurbishments, Canada

We work with many engineering companies and retain them as subcontractors, or in a consortium or as JV partners. We have recently worked with the following engineering companies:

a) AMEC Nuclear
b) Rolls Royce Nuclear
c) BWXT
d) AECOM

e) Ansaldo Nucleare
f) Hitachi-GE
g) Kepco
h) Bechtel
i) Orano (formerly Areva NC)
j) Framatome (formerly AREVA NP)
k) Westinghouse
l) Zachry

The main areas of commercial engagement in nuclear reactor design and EPC execution are as follows:

2.1 Design Engineering Services

ND maintains a nuclear design house capability with nuclear grade design change control processes such that we can provide total service from pre-conceptual design to detailed design with the appropriate cost engineering, planning & scheduling and project development support.

Our qualified and experienced experts provide services to the nuclear industry as follows:

- Nuclear Process & Equipment Engineering including ability to design and analyze high-pressure systems, safety systems, feedwater and auxiliary systems. Analysis of thermal-hydraulic characteristics of process systems. Select, procure and install system components and equipment. Conduct Failure Modes and Effects Assessments (FMEA) on nuclear components/systems. Perform emission analysis and management for radioactive and non-radioactive applications.
- Reactor Component & Mechanical Engineering including design, analysis and installation for all steam piping, feed pipework and supports, design, inspection, fitness for service analysis for reactor core structure, reactivity mechanisms and heat exchangers. Three-dimensional SmartPlant© layout and two-dimensional drafting for piping/equipment. Metallic and non-metallic materials and dissimilar weld expertise. Metallurgical laboratory support and expertise in stress analysis tools such as ANSYS, LS-DYNA, PIPESTRES etc.;
- Civil, Structural and Seismic Engineering including design, modify, repair and rehabilitate buildings, containment and safety related structures. Perform general and special structural analysis, inspection and material testing. Seismic analysis, design, qualification, condition assessments and walk-downs. Special analysis service (FMEA, impact, drop, explosion, blast, assessment from various actions from external hazards). Plant architectural layout modification and upgrade with new safety requirements. Civil structural performance recovery, specialist containment repairs, regulatory justification, leak rate assessment and mitigation (attached at Appendix A001a-c Wolsong 1, 2 and 3&4 New Build, A002 Qinshan New Build and A005 Cernavoda 2 Completion);
- Instrumentation, Control, Electrical & Computer Engineering including analog and digital control system design for nuclear applications. Control system static and dynamic analysis/troubleshooting. Design, specification and procurement of instrumentation, control, electrical and computer hardware, systems and components.

Safety and control computer software design, verification & validation. Human factors engineering assessments and design, analysis and modification of electrical distribution and emergency power systems (attached as Appendix A006 Embalse Refurbishment);

- Safety Engineering including probabilistic seismic hazard analysis (PSHA). Criticality safety analysis, system modeling, design and operating improvements. The application of circuit analysis to verify dominant contributors. Deterministic analysis of severe accidents and trip coverage analysis. Radiation Protection, dose and shielding design;
- We design and execute nuclear process plant projects in and out of NPP sites, we have proprietary waste management technologies and the depth of experience and a lifecycle commitment to Clients that we can deliver design, build, operate (DBO) contracts such as the Darlington Radioactive Waste Management Building (RWPB) a 25 year operational performance based contract. We have specialist knowledge and capability to reliably deliver nuclear waste treatment for both the NPP operations and legacy clean-up markets;
- We have practical experience of nuclear modularization, pioneered the use of open-top construction, use of advanced concretes, nuclear rebar design, design for modularization in both nuclear and conventional power (attached at), storage, transportation and preservation of modules. We design, manufacture and supply modules where necessary. We also have a dedicated nuclear qualified manufacturing shop where we can develop, prototype, produce and service nuclear components. We have a dedicated nuclear import/export licence control team who can ship and repatriate nuclear components globally (attached at nuclear Appendix A002 Qinshan New Build.

2.2 Engineering Support Services

ND maintains a 24/7 response capability both for emergency and emergent issues. We maintain a full lifecycle capability in-house. We take part in international technical committees to keep our services at the forefront of nuclear engineering and materials technology.

Our experts provides services to the nuclear industry as follows:

- Our Metallurgical team handles a variety of items from Class 1 component (alloy 690), zircaloy, to dissimilar welding of carbon and low-alloy steels. They are intensively involved in selection, specification, replacement of materials in a variety of areas;
- Our Metrology team utilizes an in-house lab to calibrate all tooling used in reactor component manipulation including torque and mechanical/electrical measuring devices. The team has laser scanning capabilities that are used during major component replacement and have recently been used to save significant operator dose at the Darlington NGS RFR (attached at A003 Darlington RFR);
- We maintain Level 1 and 2 qualified individuals in Non-Destructive Examination in liquid penetrant (PT/LP), ultrasonic testing (UT), magnetic particle testing (MP), industrial radiography (RT) and eddy current (ET) testing as well having access to level 3 qualified inspectors;

- We regularly perform Steam Generator inspection and cleaning in the field and have engineers and technicians to evaluate the results to support continued operation;
- We carry out radioactive waste storage structure and waste process plant design;
- We carry out seismic margin assessments including fragility analysis of civil structures and equipment;
- We carry out post-Fukushima assessments including seismic capacity calculations and seismic PSA/PRA including evaluation of beyond design basis seismic events;
- We deliver special purpose piping analysis, including high energy line break assessments (HELBA);
- We provide one stop solutions for new/obsolete feedwater control systems;
- We carry out obsolescence consultation and bespoke manufacturing to ensure assured, efficient and reliable parts supply.

2.3 Equipment Reliability Analysis

ND has Equipment Reliability expertise centered in INPO AP-913 Equipment Reliability. We are experienced in investigating component and equipment life, as well as analyzing the impact of potential failures and identifying single-point vulnerabilities for elimination. We have experience specifying, managing and implementing nondestructive and destructive examination and measurement techniques to support life assessment work and new build construction. In addition we maintain a cost engineering group helping with equipment and construction cost estimation based on both our internal records and on industry and client data. ND has completed many projects and services in line with INPO AP-913 reference.

2.4 Plant Life Management (PLiM)

ND is a leader in PLiM for nuclear stations. We customize PLiM programs to meet specific utility needs based on our wealth of knowledge and over six decades of nuclear experience. Our integrated programs help utilities maximize plant life and ensure reliability and predictability; this wealth of operational experience can be leveraged into reactor materials selection, design choices, manufacturing and operational parameters. We supplement utility asset management programs, basing our recommendations on detailed analysis and station feedback. A focused and comprehensive PLiM program supports long term operation, while providing enhanced equipment reliability throughout the life of the station. Our highly qualified engineers and designers have experience carrying out new build projects and modifying existing structures and buildings for plant life extension projects.

2.5 Engineering Programs

ND provides materials, welding, chemistry engineering and metallurgical testing services that support design to specification, design for construction and design for operation all necessary for effective reactor manufacturing, repair and maintenance of high operational performance, including:

- Consultation and support of metallic materials, welding, and chemistry for design, procurement, manufacturing, installation and operation of components, equipment;
- Properties and selection of structural and metallic materials;
- Qualification of welding processes;
- Expertise in code acceptable materials and welding practices;
- Consultation and support in manufacturing processes e.g. coatings, heat treatment, peening, cleaning and forging etc.;
- Materials and component production qualification;
- Wear and corrosion resistant coatings and plating;
- Consultation on degradation mechanisms and corrosion prevention.

2.6 Nuclear License Application, Amendment, Renewal & Strategic Engineering

ND has expertise in directing on behalf of Clients appropriate licensed site applications, renewals and environmental permits in Canada, UK, US, China, Korea, Argentina and European Union (Romania) for water cooled reactors. This includes activities such as making presentations to the US NRC Advanced Committee for Reactor Safety, involvement in EPRI Materials Reliability Program, the BWR Vessel Internals Project and the PWR Owners Group in addition to all licensing support activities related to CANDU reactor. ND supports owners, operators and utilities in maintenance of their licensing regime and attends licensing hearings as expert advisors in many jurisdictions.

ND has broad experience in reviewing existing designs against modern design codes and standards, jurisdictional equivalence expertise and the ability to prepare design option evaluations for design improvements to be undertaken to close any identified gaps, supporting the case that a design is consistent with current regulatory expectations.

ND has fully completed the commercial reactor vendor design review (VDR) process in Canada (attached at Appendix A004 VDR EC6), has previously commenced (but not completed) the generic design approval process (GDA) in the UK for the CANDU reactor and has completed a simplified design review of the MOX-enabled CANDU reactor that being carried out by the UK Office of Nuclear Regulation (ONR). We advise other water reactor vendors on licensing matters in the UK, US, Asian and European regulatory space. We have practical experience that would assist timely and cost effective licensing and permitting of a reactor completion or new build project.

We have worked with jurisdictions with nuclear power expertise and structures and assisted jurisdictions with limited or no prior experience to establish the necessary legal structures to construct, complete and support the operation of a nuclear power plant.

2.7 Field Services

With increasing pressure to complete safe outages in a timely fashion, it is important to have an advanced and reliable Engineering and Field Services provider. ND experts have the

knowledge and project management experiences to execute Field Services such as inspections remediation and assessments that inform the design process. A focused and comprehensive Field Services program means fewer unplanned outages, higher efficiencies and lower costs. Our experience allows us to critically assess opportunities to improve reactor project value. Added benefits include longer reactor life, high reliability and high predictability, which maximize energy production and revenue. We regard the Field Services activity as closure of the feedback loop into our design processes ensuring that we are fully engaged with Client requirements and how we can address operational performance issues through design development.

2.8 Integrated EPC Delivery

ND has a wide design and EPC capability and capacity that is reinforced by the total capability portfolio of SNC-Lavalin Group. As an integrated team beyond nuclear completion and new build we deliver some of the largest and most complex projects from world class aluminum smelters, state of the art carbon capture retrofit, large petrochemical facilities and large chemical process plant.

3 Nuclear Qualifications and Experience

3.1 Qualification

ND employs university graduates and highly experienced experts, develops competence and experience and maintains close links with academia and the nuclear thought leaders. We maintain thought leadership internally though membership of institutions, international committee membership, developmental assignments and utility and Client secondments. We have staff with professional registration in most jurisdictions.

ND has developed and maintains a training program (based on INPO's accredited program) where all engineers must possess the appropriate qualification prior to independently performing work.

We maintain staff experience across all the necessary engineering disciplines to maintain a nuclear new-build capability. We have a knowledge management system and a comprehensive lesson learned database to refresh and enhance our processes.

We maintain two nuclear grade quality management systems to ISO9001 covering the full range of nuclear engineering services, we have an ASME N Stamp for fabrication and installation, TSSA fabrication and installation and are approved vendors to OPG, Bruce Power, CNL, NB Power, TQNPC, KHNP, CNE-Romania, Doosan, Exelon-USA and Dominion-USA.

All SNC-Lavalin staff are required to annually participate in Code of Ethics and Business Conduct training as well as Human Performance training which includes a Dynamic Learning Activity.

3.2 Experience

The main areas of experience in nuclear markets related to AR/SMR advisory service include:

Studies

ND has extensive experience in preparing studies to evaluate project and product options and to select design concepts. The range of experience extends from pre-conceptual studies to bankable nuclear new-build studies and studies supporting investor/lender decisions.

Our nuclear-design and change control process includes this consideration of options from performance, constructability, operability and financeability and is compatible with practice within nuclear utilities but driven from a knowledgeable investor perspective. We can apply our nuclear design processes from the design of components within a reactor through to the provision of complete sub-systems, process plant and reactor/BOP design.

Conceptual, Preliminary and Detailed Design

ND has extensive design experience and uses modern design and design change control processes compliant with nuclear quality standards. Our nuclear-design process recognizes three (3) levels of design: conceptual, preliminary (or reference) and detailed (including standard plant design, the design basis before project specific changes).

We implement design change control within our documented, nuclear quality grade Engineering Design Process. Specific audited procedures exist that cover the following aspects of engineering/design change control workflow as follows:

- Engineering Plan;
- Design Input;
- Conceptual, Preliminary and Detailed Design;
- Design Verification;
- Issue Design Package for Customer;
- Engineering Support to Procurement;
- Release for Fabrication/Construction;
- Design Change Control;
- Design Completion Assurance and Design Closeout;
- Design Authority Function;
- Reporting Problems and Taking Actions through ProAct;
- Lessons Learned;
- Project Scope Change Control;
- Field Change Control;
- Design Change Instruction;
- Deviation Disposition Request (DDR).

We can apply a standalone or collaborative approach to each depending on the needs of the Client. We can apply our design capability to all aspects of nuclear new-build, retrofit/uprate/upgrade, systems or components. We work for the Client and with the Client

and are reactor technology and product independent providing services to a number of reactor developers/host/operators in commercial arrangements.

In carrying out detailed design we establish unique and distinct project responsibilities within our organization to:

- Ensure that we have the right (qualified and experienced) people and procedures in place and fully document the project management and project controls such that we can successfully deliver the work;
- Engage early with Client, subcontractors, suppliers, fabricators and stakeholders (including the regulator) proactively, agree responsibilities and timing of deliverables necessary for the Design Reviews;
- Collaborate with suppliers and fabricators in the development of specifications which meet the harmonized codes, standards and requirements of the specific plant item and overall project.

Where we have areas of high technical risk we will work side by side with the suppliers to oversee the development of their work packages from design through to construction/installation and commissioning. In recent UK Energy projects our wholly owned subsidiary WS Atkins was procuring equipment from lesser known European companies and we took the following package design approach:

- Working with the supply chain to develop the Product Specifications and Performance Standards;
- Independent Design Review of their solutions;
- Additional manufacturing oversight & inspection of what are already accredited suppliers;
- Attendance as SATs/FATs;
- Participation in LOPA, HAZOP etc. assessments.

In addition to the above, a large proportion of our designers and engineers have been recruited from operational and commissioning backgrounds carrying valuable lessons learned into the design process. We work on international green and brownfield nuclear sites and are experienced in the variation in supplier standards in other jurisdictions and our early engagement with local suppliers to qualify them to manufacture/fabricate safety significant components and equipment is an essential part of our business.

We have been appointed as an Engineer-of-Choice (EOC) supplying design to decommissioning services to the largest nuclear utility in the US, we continue to provide EOC services to the UK EDF Energy Hinkley Point C new build, have been awarded a framework contract for nuclear services for the UK Office of Nuclear regulation (ONR) and are prequalified to bid for the design and EPC execution of the URENCO waste treatment plant at Capenhurst, Cheshire.

Calculations

ND can perform many nuclear calculations for safety, licensing and process purposes. We operate industry standard software packages and are familiar with the legitimacy of such

codes in the design process. This includes the full range of calculations necessary to design, license and operate a nuclear reactor (fuel, physics, thermal hydraulics, containment, shielding, dispersion, dose, stress, fitness for service, PRA, fire and flood, FHA, FSSA, seismic, criticality, etc.). Our quality assurance systems are designed to nuclear standards and includes all of the required validation and verification mechanisms required by the nuclear industry.

Specification Changes

ND has extensive experiences on preparing and revising/updating specifications for nuclear components and systems, including ASME Section III Division I items. We maintain a pool of Specialist Professional Engineers qualified to certify specifications as per ASME Appendix XXIII.

Evaluations

ND has extensive experience in evaluating systems, structures and components against existing and new requirements. This includes walkdowns for seismic, fire, flood and high-energy line-break assessments, as well as condition and life assessments. ND has performed capacity assessment, including SQUG qualified seismic walkdown for NPPs. ND also provides owner support for the assessment of special reactor components including rotating equipment, heat exchangers and valves.

Reports

ND has extensive experience in preparing reports for regulatory submission and/or in support of engineering programs. This includes post-outage inspection results, fire protection reports, component-performance reports, stress reports, etc. ND also has experience in specifying, managing and implementing nondestructive and destructive examination and measurement programs to support such reports.

Cyber Security

With the intended staffing reductions postulated with SMR technology cyber security is an important element. ND experience with nuclear Cyber Security include the identification and classification of the cyber security requirements of essential equipment, assessment of the vulnerabilities of cyber essential assets and the preparation of cyber security program plans, policies and procedures in line with International standards such as NIST-SP800-53, or CSA N290.7 or US NRC RG 5.71.

3.3 Engineering Disciplines

The main nuclear engineering disciplines related to reactor completion or new build project assessment and design execution include:

Civil Engineering

The Civils team currently modifies existing structures, delivers conceptual, preliminary & detailed designs for steel, concrete and masonry structures, and performs finite element, seismic and load analysis of civil structures. Additionally, our SQUG certified engineers can conduct seismic screening and walk downs in the station. This team performs the following design and analysis work:

- Site Infrastructure, Site Works & Investigation;
- Foundation Design (Piling);
- Concrete Design (Cast-In-Place, Composite, Advanced, Rebar construction interaction etc.);
- Structural Steel Design, including Buildings Design/Modifications to NBCC, OBC and UBC;
- Design of Safety-Related Structures;
- Floor Response Spectra;
- Seismic Margin Assessment;
- Structural Analysis using StaadPro, SAP2000.

Reactor, Mechanical, Process & Equipment Engineering

This team is currently analyzing thermal hydraulic characteristics and human factors assessments for mechanical systems. In addition to designing, or modifying, existing process, reactor and piping systems, our experts are selecting, procuring and installing equipment and components under a nuclear quality management system.

- System Modification;
- Replacement of class 1 pressure boundary components;
- Turbine Generator and Auxiliaries;
- Main Condensate System;
- Main Feedwater System;
- Steam and Condensate Systems;
- Steam Generator Replacement;
- Circulating Water Systems;
- Building Services Design/Modifications (HVAC);
- Analysis – Piping Stress, Fluid Flow.

Electrical, Computer, Instrumentation & Control Engineering

The Instrumentation, Control & Electrical (ICE) team is providing Clients with safety systems that meet single failure criteria, high availability requirements, and applicable code, standards and regulatory requisites and currently is working on:

- Process Control and Design Development;
- Digital Control Systems Design;
- Reactor Startup Instrumentation;
- Nucleonic instrumentation such as flux detectors, ion and fission chambers, etc.;

- Containment leakage monitoring instrumentation;
- ICE System Modifications;
- Station Instrumentation and Controls;
- Dynamic Engineering Simulation;
- Software Qualification and Categorization;
- Fire Detection;
- Communication (Public Address etc.);
- Design/Specification of Site Instrumentation, Environmental Monitoring Equipment;
- Equipment control and monitoring including vibration, pressure, temperature, etc.;
- Security System Design;
- Human Factors Engineering (HFE);
- Power Systems (Class I, II, III, IV) Design/Analysis;
- Generator Excitation upgrades;
- Main Generator Output improvement;
- Electrical Protection design and upgrades;
- Grounding and Lightning Protection design;
- Switchyard design;
- Load Flow / Short Circuit Analysis / Static Motor Starting / Protection Coordination / Arc Flash Studies (using ETAP);
- Cable / Wiring Database (INTEC, OLW)

Computer and Display Systems

ND supplies computer hardware and software systems for nuclear plant applications. Working with the customer, we improve and maintain existing systems, and complete safety assessments on software in accordance with international codes and standards. We also have specialized Human Factors engineers who plan functional and task analyses, verifications, and integrated safety reviews for a plant's life cycle.

- Computerized Safety Systems - Class 1 Systems (Protective Systems, Safety Actuation Systems);
- Plant Control Computer & Display Systems - Class 2,3 Systems (Safety Related);
- Plant Display Systems.

Tooling and Robotics, Manufacturing and Fabrication, Testing & Spare Parts

ND designs and manufactures a range of robotics and inspection equipment including fueling machines and reactor tools for inspection and monitoring, maintenance, refurbishment and decommissioning of nuclear reactors. We provide standard and custom spare parts for water

reactor Clients and provide full quality system validation as to the source and performance of spares.

Radiation & Health Physics

ND health physicists and radiation protection experts work daily within our facilities and at Client sites. Our specialists visit stations to survey radiation fields, interact with employees & subcontractors and implement on-site radiation protection programs; they can also conduct environmental assessment surveys of nuclear systems. We can provide:

- Estimates for site radiological environment dose and calculations for project accumulated dose;
- Preparation and implementation of radiation protection and ALARA plans to minimize radiation exposure to workers;
- Radiation shielding analysis for reactor refurbishment and decommissioning;
- Environmental qualification and assessment;
- Analysis and assessment of radiation damage to reactor components and equipment;
- Support for shielding design of custom tools for in-vessel inspection and reactor decommissioning;
- Characterization of radiological waste;
- Preparation of waste management plans.

4 EPC Execution

Founded Montreal in 1911 as a respected engineering services provider for the growing power market what was then known as SNC expanded into oil & gas, mining & metallurgy and infrastructure and in the following decades closely supported the growth of the Canadian natural resources sector. In 1991 SNC merged with engineering giant Lavalin to form Canada's largest engineering and construction Company becoming a global supplier of engineering and project management services. Already a player in Canada's nuclear industry SNC-Lavalin acquired the assets of Atomic Energy of Canada Limited to now have full service Tier-1 NPP Vendor capability and is the vendor and OEM of the CANDU® reactor system, globally the third most numerous reactor type. In 2004 and 2017 SNC-Lavalin acquired Kentz UK and WS Atkins respectively to become one of the world's largest professional engineering services and project management firm expanding the breadth and depth of services to our Clients.

SNC-Lavalin operate in power, oil & gas, mining & metallurgy and infrastructure sectors providing discrete and integrated solutions to our Clients. We provide full scope services across these sectors throughout a project's lifecycle and support 24/7 operation of facilities as owners, managing agents, technology vendor, OEM or subcontractor. We offer pre-conceptual consulting, conceptual design, financing, asset management, owners engineer services, engineering, procurement, a range of delivery models e.g. DBOOT or DBOO for (EPC or EPCM) construction, construction wrap, brownfield upgrade & repowering, training, commissioning, operation, maintenance, decommissioning and waste management.

SNC-Lavalin having a wholly owned full service provider of nuclear services in its Nuclear Division has a clearly differentiated track record in nuclear new build in that the last seven (7) international projects were completed to budget and schedule or better and has delivered three (3) first of a kind (FOAK) major reactor refurbishments in Canada and a further two (2) in Korea and Argentina which benefitted from the FOAK learning and these were delivered on-budget and on-schedule. We are currently delivering ten (10) major reactor refurbishments solely or in partnership and have prospects for four (4) more reactor refurbishments in early negotiation. Reactor refurbishment is an activity unique to the CANDU reactor product and is carried out at mid-life (~30-years) to replace major components and is at reactor new build scale from a project perspective.

From the nuclear portfolio the Darlington RFR project stands out as a leading example of phased implementation, appropriate risk sharing with the Client, in partnership, of a nuclear new build scale and certainly at scale as a completion project. This project is being carried out with our 50% JV Partner AECON of Ontario, Canada (Construction Company), is to deliver General Contractor services to the Client who is leading the overall project and consists of Scope 1, Design, test and supply of complex tooling and training program, Scope 2 included the design and build of a Reactor Mock-up building for worker training purposes. Scope 3 included an integrated approach to defining the execution of the construction project and support engineering and Scope 4 involves the Project Management, Engineering and Deconstruction/Reconstruction of four (4) nuclear reactors. The project is attached at Appendix A003 and has been referenced earlier in this document.

On the more conventional power front we have recently delivered one of the world's largest and innovative EPCM projects in the UAE in that we constructed the EMAL Phase 1 & 2 projects in 2013 with the following attributes, Zero Lost Time Accident Frequency Rate, now the world's longest aluminium smelter line, world's highest rated transformer, largest ever Gas Treatment Centre and Anode Baking Oven, captive 1,000MWe power plant, animal capture and relocation program, contaminated soil processing and concrete recycling initiative.

With over 3,000 staff within ND we feel that suitably qualified and experienced staff are the backbone of our nuclear engineering services business and that 10 years on-job experience is a fair measure of that. In ND we have directly employed ND staff with staff with 10 years' experience or more in the following representative disciplines:

- 56 Reactor & Mechanical Engineering
- 22 I&C engineering
- 14 Civil Engineering
- 24 Nuclear Fuel & Physics Team
- 15 Nuclear Procurement and Contract Management
- 12 Nuclear Quality System Practitioners
- 8 Chemistry and Metallurgy
- 8 Electrical Engineering
- 17 Nuclear Process Engineering
- 5 Non-Destructive Testing
- 25 Large Nuclear Project Management Practitioners
- 15 Document Control Practitioners

Within the 50,000 staff employed by SNC-Lavalin Group we have directly employed staff with 10 years' experience or more in the following disciplines:

- 1365 Mechanical, Electrical, I&C and process installation supervisors
- 82 Qualified Inspectors in Welding, Lifting & Handling, ASME and PED

- 82 Contract Management
- 87 Site Coordinators
- 76 Start-up & Testing
- 3823 Design and Drawing office
- 939 Planning
- 407 Works Supervision
- 351 Procurement
- 482 Configuration Control
- 78 Materials Management with a dedicated nuclear import/export control organisation

SNC-Lavalin has a Global Health and Safety Management System (GHSMS) are in line with International Organization for Standardization OHSAS 18001. SNC-Lavalin's Global Health and Safety Management System (GHSMS) includes Critical Risk Control Protocols, Blue Rules and a Hazard Risk Management Process. Driven by our Health and Safety Policy our management system's processes and procedures enables the maintenance of our high standard of safety performance and drives continual improvement and is fully aligned with our Client's expectations.

Our Global Environmental Management System (GEMS) 2017 is our management system and is aligned with International Organization for Standardization ISO 14001-2015.

SNC-Lavalin has quality systems applicable to its various business lines and for nuclear work we would choose from either the Candu Energy (Candu) or SNC-Lavalin Nuclear (SLN) systems that are ISO0991, accredited by UKAS (BSI) or international equivalent (SAI-GLOBAL), are in date and align with the prospective scope of work.

We have information security processes in place and we have recently passed an external vulnerability stress test. We currently are contracted under the UK Nuclear Decommissioning Authorities Terms &Conditions including data security in relation to UK Government requirements. We are fully compliant with Canadian Government security requirements as the commercial agent for Canada's nuclear technologies. Candu Energy Inc. is firewalled from the main SNC-Lavalin business activities in compliance with Canadian security requirements. Our systems are aligned with and are compliant with ISO/IEC 27001 but we have not applied for that certification.

As a full service nuclear reactor vendor operating internationally we subscribe to many codes and standards including BSI, ASME, CSA, ISO, INPO, EPRI and IAEA etc. We are also holders of ASME "N" Stamp for nuclear manufacturing

We have both proprietary and commercial Material Requirement Planning Systems (MRPS) systems in daily use and the proprietary system nuclear standard CMMS has been used on previous nuclear new build projects and is in use on a current new build project for materials control. SNC-Lavalin has at the behest of certain Clients has implemented the full Intergraph SmartPlant Suite including the materials management module (SP-MAT) for many large non-nuclear projects.

We have both proprietary and commercial Electronic Data Management System (EDMS) systems in daily use and the nuclear standard proprietary system TRAK has been used on previous nuclear new build projects and is in use on a current new build project for completions. SNC-Lavalin has at the behest of certain Clients has implemented the full Intergraph SmartPlant© Suite including the "Completions" module for large non-nuclear (mining) projects.

We currently implement and have delivered successful local resource development initiatives (LRDI) that reflect unique and project specific requirements for localisation, local employment, specific group needs and apprenticeships etc. It is our intent that these matters will be fully specified in the development of the individual project's commercial arrangements with subcontractors whereupon SNC-Lavalin will take contractual responsibility for delivery and reporting. The implementation of LRDI and the wider initiatives are demonstrated in at scale projects across the globe from Northern Canada to Madagascar where the unique needs and concerns of the region, locality and workforce e.g. jobs, skills, apprenticeships, youth outreach, college development, remote learning, infrastructure development, roads, bridges etc. are identified and mitigated in a structured programme. We have experience on developing local competences, skills and job training for a whole operating nuclear plant from a green-field condition.

The SNC-Lavalin Group has access to people, processes and tools covering a wide range of engineering services and not just nuclear. SNC-Lavalin has a specific embedded capability in its nuclear Home Office, two certified and audited quality systems directly applicable to nuclear projects and an enviable project execution track record to deliver the following nuclear EPC related activities globally to utilities, owners and operators. We have experience in:

- Preliminary design development across nuclear new-build, nuclear refurbishment, plant upgrade, life extension, nuclear fuel plants, nuclear fuel, nuclear steam plant spares, fuelling machines, automated reactor dismantling, spent fuel dry storage, radioactive waste treatment and radioactive waste storage);
- Design licensing support for large commercial water reactors, small modular reactors, research reactors, plant upgrades, life extension and nuclear ancillary systems in multiple jurisdictions including Canada, China, Romania, Argentina, Korea, USA and UK;
- Detailed design completion for nuclear steam plant, balance of plant and nuclear ancillary systems;
- Procurement specification of the totality of nuclear power plant equipment, components and construction materials;
- Vendor qualification of nuclear pressure boundary and nuclear significant equipment and components;
- Factory and site inspection of nuclear significant equipment and components;
- Project management of nuclear new-build, nuclear steam plant, balance of plant and nuclear ancillary systems;
- Materials management including receipt processing, warehousing, preservation, storage and maintenance;
- Construction preparation for nuclear new build, balance of plant and nuclear ancillary systems;
- Site coordination of integrated activities on brownfield, operational sites and multi-unit sites;
- Works supervision of nuclear steam plant, balance of plant, and nuclear ancillary systems;
- Completion activities comprising plant walk downs, inspection, testing, production of as-built records, operator training, commissioning planning, commissioning coordination, commissioning, rectification, permitting and plant handover as a successful construction/installation needs a strong completion.

The business model to deliver Client satisfaction in both nuclear design and EPC execution is based on a full lifecycle commitment from design, financing, project execution, partial ownership, operation and maintenance services as and when required.

5 Conclusion

SNC-Lavalin's Nuclear Division is a full scope, lifecycle nuclear vendor operating in the global reactor market. We are working across technologies built upon our broad and deep experience in the traditional water reactor technology. We can deliver that experience and knowledge into the reactor completion and new build community as an investor, partner or service provider.

We currently invest in our reactor products, our services products and our nuclear engineering capability. Our Capital group works with project developers and Clients by assisting project development (where there is line of sight to the market), arranging financing and investing equity to support commercialisation. Our Capital group offers comprehensive cradle-to-grave, investment-to-divestment asset management expertise and has assets under management including build-own-operate (BOO), public-private partnership (PPP) and concession-type financed projects. Our Capital team has arranged over $12Bn in project financing over the past decade.

We have access to a global resource of people, processes and tools with a utility focused 24/7 nuclear engineering capability in its nuclear Home Office. We have access to global topic experts, academic institutions, laboratories, validated suppliers and experienced subcontractors. We know what is needed to commercialise reactor technology and then bring a commercial project into successful operations.

ND's team of over 3,000 full time nuclear employees is part of SNC-Lavalin's 50,000 staff who can deliver a full range of technical and engineering services from feasibility studies, pre-conceptual design, site selection, site characterization, preliminary (reference) design to detailed design, cost estimation, financing, site mobilization, supplier qualification, procurement specification, procurement and contract management, materials management, construction management, inspection and testing, training and commissioning.

ND and its predecessor companies have worked with and as EPC project managers to deliver many on-schedule and on-budget nuclear new build projects to the rigorous standards required by global nuclear regulators.

Appendix A Example Projects

A001a	Wolsong 1 New build
A001b	Wolsong 2 New build
A001c	Wolsong 3&4 New build
A002	Qinshan 1&2 New build
A003	Darlington RFR
A004	VDR EC6
A005	Cernavoda 2 Completion
A006	Embalse refurbishment

SNC·LAVALIN

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Ontario Canada, L5K 1B2
Tel: (905) 823-9040
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www.snclavalin.com

Wolsong Unit 1 Nuclear Power Plant New Build

Wolsong, South Korea

Power

SECTOR OF ACTIVITY
Nuclear Power

CLIENT
Atomic Energy of Canada Limited

YEAR OF COMPLETION
1982

TOTAL PROJECT COST
CA $2,000,000,000

SNC-LAVALIN
CA $23,400,000

MANDATE
Engineering, Design, Procurement and Project Management Services related to the Balance of Nuclear Steam Plant (BNSP), BOP, and Site Project Construction and Commissioning Management Services.

DESCRIPTION
The Wolsong 1 NPP New Build Project consists of 1 x 628 MW CANDU reactor unit and is the first of 4 CANDU reactors built at the Wolsong site. Atomic Energy of Canada Limited (AECL), developer of the CANDU technology and overall Contractor, engaged CANATOM Ltd., now SNC-Lavalin Nuclear, to provide engineering and design services for certain portions of the Nuclear Steam Plant (NSP), procurement services, site construction management and quality assurance services. In a joint venture, SNC-Lavalin also performed design engineering services for the Balance of Plant (BOP).

SERVICES PROVIDED
SNC-Lavalin performed Design engineering (conceptual and detailed) for certain portions of the NSP such as the Reactor Building (RB) and Service Building (SB) and civil/structural systems and auxiliary and common service facilities such as:

- Emergency Water Supply Pump House
- Emergency Power Supply Building
- Certain areas of the Administration Building
- SB Auxiliary Steam Systems
- Lighting and Electrical Services Systems
- SB Service Water Systems
- SB Fire Protection Systems
- SB Demineralized Water Distribution
- SB Sewage
- SB Common Chilled Water System
- SB HVAC
- SB Cranes and Hoists Radiation Protection Equipment

SNC-Lavalin also performed Design engineering for the Balance of Plant (BOP):

- Main BOP structures (Turbine building and CW structures)
- Turbine Generator and associated mechanical, electrical and control systems
- Cooling and service water pumps and all distribution outside NSP structures
- Station service power supplies and distribution within the BOP
- Main transformers and switchyard

NSP and BOP engineering and design services included:

- Site Investigations including additional seismic, geological and soil investigations
- Conceptual Design (where required) including preliminary GA drawings for structures and principal equipment, structural framing and loading diagrams, flow sheets and single line diagrams for mechanical and electrical systems, piping and instrumentation, system specifications and data sheets, etc.)
- Detailed Design including Plant layout drawings, construction and installation drawings, BOMs, technical specifications for construction, installation and equipment, instrumented flow diagrams and one line diagrams, logic and control elements and detailed circuitry, cable drawings and lists, and regulatory submissions.

Wolsong Unit 1 Nuclear Power Plant New Build

SNC·LAVALIN

Wolsong, South Korea

Power

Procurement services were provided for non nuclear equipment inside the RB and SB as well as those in the BOP such as Pumps, Standby Class III power generators, Switchyard equipment, etc. Site Project, Construction and Commissioning Management Services were also provided including Planning, Scheduling, Contracts Administration, Resident Engineering, Construction Management, and Commissioning.

Wolsong Unit 2 Nuclear Power Plant New Build

Wolsong, South Korea

Power

SECTOR OF ACTIVITY
Nuclear Power

CLIENT
Atomic Energy of Canada Limited

CLIENT REPRESENTATIVE
Darryl Murcoc
115 Toronto Road
Port Hope, Ontario
L1A 3S4, Canada
613-584-8811 x 46340

YEAR OF COMPLETION
1997

TOTAL PROJECT COST
CA $2,500,000,000

SNC-LAVALIN
CA $140,000,000

KEY PERSONNEL
Peter Wendl
Project Engineer

MANDATE
Supply of Engineering and Design, Project Management, Procurement, Training, Equipment Supply and Owner Support Services

DESCRIPTION
The Wolsong 2 NPP New Build Project consists of 1 x 628 MW CANDU nuclear generating unit and is the second of four CANDU type reactors to be built at the Wolsong site. Atomic Energy of Canada Limited (AECL), developer and owner of the CANDU technology and over all Contractor for the project, engaged CANATOM Inc. and NPM Nuclear Project Managers Canada Inc., (now SNC-Lavalin Nuclear), to provide engineering and design services related to the site improvements, certain building structures and auxiliary systems, in addition to equipment supply, project management services, training services and Owner support services.

SERVICES PROVIDED
SNC-Lavalin performed Engineering and Design related to:

- Site Improvements including Site Access Systems, Site Security, and On Site Transportation facilities
- Buildings and structures such as the Reactor Building, Turbine Building, Cooling and Water Structures, Service Building, Auxiliary Services Structures (e.g. Emergency Water and Power Supply, Secondary Control Area, Oil Storage, Transformer Area, Switchyard and Cable Towers)
- Reactor and Steam Generator Auxiliaries such as Shield Cooling Systems, Spent Fuel Bay Systems, Resin Transfer System, Emergency Water Supply System, Spent Fuel and Storage, Steam System, SG Chemical Control System, etc.)
- Turbine Generator and Auxiliaries such as Turbine and Auxiliary Equipment, Generator and Auxiliary Equipment, Main Condensing System, Feedwater Heating System, Chemical Control System, Sampling System, etc.
- Electrical Power Systems such as Control Centre Systems, Pumphouse Systems, UPS Systems, HPECC and SCA Systems, etc.
- Instrumentation and Control Systems such as Vibration Monitoring and Control, PA System, Telephone System, Clock System, etc.

SNC-Lavalin also procured and supplied equipment for the Nuclear Steam Supply System (NSSS) such as Calandria, Fuel Channel Assemblies, Pressure Tubes, Calandria Tubes and End Shields, End Fittings, Heavy Water Collection System, etc. As part of the equipment supply, SNC-Lavalin performed conceptual and detailed design (where required), procurement engineering, quality assurance, etc.

In addition, SNC-Lavalin performed project management services, procurement support services in Canada for Owner's off shore supply, training services for Owner personnel, and Owner Support Services including project, resident and field engineering services, project management support services, construction management, commissioning support, quality assurance

and other services.

Wolsong Units 3 & 4 Nuclear Power Plant New Build

Wolsong, South Korea

Power

SECTOR OF ACTIVITY
Nuclear Power

CLIENT
Atomic Energy of Canada Ltd

CLIENT REPRESENTATIVE
Pat Tighe
2251 Speakman Drive
Mississauga, Ontario
L5K 1B2, Canada

YEAR OF COMPLETION
1999

TOTAL PROJECT COST
CA $4,000,000,000

SNC-LAVALIN
CA $235,000,000

CAPACITY
1,256 MWe Gross

MANDATE
Procurement and Supply of Nuclear Steam Plant (NSP) equipment, systems and components, procurement agency services for Owner and a major local subcontractor, and Technical Assistance Services. SNC-Lavalin became the Prime Contractor for this project through acquisition.

DESCRIPTION
The Wolsong 3 & 4 NPP New Build Project consists of 2 x 628 MW CANDU nuclear generating units and represents the third and fourth CANDU type reactors to be built at the Wolsong site. Atomic Energy of Canada Limited (AECL), developer and owner of the CANDU technology and over all Contractor for the project, engaged CANATOM NPM Inc., (now SNC-Lavalin Nuclear), to provide procurement services for certain NSP equipment, systems and components, and to provide procurement agency services for the Owner and a major local subcontractor Korea Heavy Industries Corporation (KHIC), and Technical Assistance Services. NOTE SNC-Lavalin value relates to the specific scope carried out by CANATOM but entire project of reactor, primary pressure boundary systems, buildings and structures, secondary pressure boundary and systems and BOP was eventually under SNC-Lavalin responsibility

SERVICES PROVIDED
SNC-Lavalin procured and supplied NSP equipment including:

- Calandria
- Pressure Tubes
- Primary Heat Transport Pump Bowl
- PHT Pump internals and pump assembly
- Fuelling Machine Heads
- Steam Generators
- Pressurizer
- Main Moderator Heat Exchangers
- PHT Header Frame Assembly
- PHT Lower Feeder Piping
- D2O Upgrading Plant

As part of the NSP equipment supply, SNC-Lavalin performed related services such as:

- Component design
- Procurement engineering
- Preparation of tender documents, including Technical Specifications
- Preparation of test criteria and implementation plans
- Field Test and Inspection
- Quality Assurance, Audits and Surveillance

In addition, SNC-Lavalin acted as an agent for the Owner (KEPCO) for the purchase and delivery of certain other equipment required by the plant which was in KEPCO's and KHIC's scope of supply. SNC-Lavalin also provided Technical Assistance services related to receipt, unloading, warehousing, field fabrication, inspection and test, and performance tests.

Qinshan Units 1 & 2 New Build

Qinshan, China

Power

SECTOR OF ACTIVITY
Nuclear Power

CLIENT
Atomic Energy of Canada Ltd

CLIENT REPRESENTATIVE
Ken Petrunik
2251 Speakman Drive
Mississauga, Ontario
L5K 1B2, Canada
(905) 823-9040

YEAR OF COMPLETION
2004

TOTAL PROJECT COST
CA $2,880,000,000

SNC-LAVALIN
CA $764,000,000

CAPACITY
1,400 MWe Gross

MANDATE
Engineering, Design, Procurement and Project Management Services related to the Reactor Island, Balance of Nuclear Steam Plant (BNSP), and Site Project Construction (PM) and Commissioning Management (CM) Services. (NOTE: values refer to this BNSP, PM & CM scope although SNC-Lavalin had wider scope through later acquisition)

DESCRIPTION
The Qinshan 1 & 2 New Build Project consists of 2 x 700 MWe CANDU reactor units. Atomic Energy of Canada Limited (AECL), developer of the CANDU technology and overall Contractor, engaged SNC-Lavalin Nuclear (then operating as CANATOM NPM) to provide design, procurement engineering, site project, construction and commissioning management services related to the BNSP portion of the project. The project started in 1996 and went into commercial operation in 2003, ahead of schedule and within budget. SNC-Lavalin subsequently acquired the commercial reactor division of AECL so was the overall contractor for the reactor, reactor support and BOP

SERVICES PROVIDED
SNC-Lavalin performed Design (conceptual and detailed) of the NSP, BNSP and BOP:

- Reactor primary pressure boundary systems
- Secondary pressure boundary systems
- Reactor Building,
- Service Building,
- ECC High Pressure Accumulator Building,
- D2O Upgrading Area,
- Spent Fuel Bay,
- Emergency Power Supply Room,
- Secondary Control Area,
- Emergency Water Supply Pump House, and
- Gas Storage Structures.

Engineering services included:

- Site Layout and Civil Work,
- Design of Civil Structures including Yard Services,
- Design of Process and Mechanical Systems,
- Design of Electrical, Control and Instrumentation Systems, and
- Procurement Engineering for NSP, BNSP and BOP equipment such as reactor systems, components and equipment, temporary fire protection systems, sewage collection and disposal systems, fresh water supply pipeline, on site transportation facilities, finishes and liners, airlocks, shielding doors, shield cooling systems, cooling and purification system, spent fuel transfer and storage, heavy water supply stem interconnections, service building cable trays, communication systems, HVAC, etc.

Procurement Engineering services included

- Preparation of Engineering Quotation Requests,
- Technical Evaluation of Proposed Bidders' Capabilities,
- Technical Review and Evaluation of Tenders,
- Technical Meetings and Clarifications with selected bidders,
- Approval of Technical Documents during manufacturing, and

Qinshan Units 1 & 2 New Build

Qinshan, China

Power

› Resolution of Technical Issues during manufacture and warranty period.

Site Project, Construction and Commissioning Management Services included

› Planning, scheduling and cost control,
› Contracts administration,
› Resident Engineering,
› Site Construction Works Management, and
› Commissioning Support.

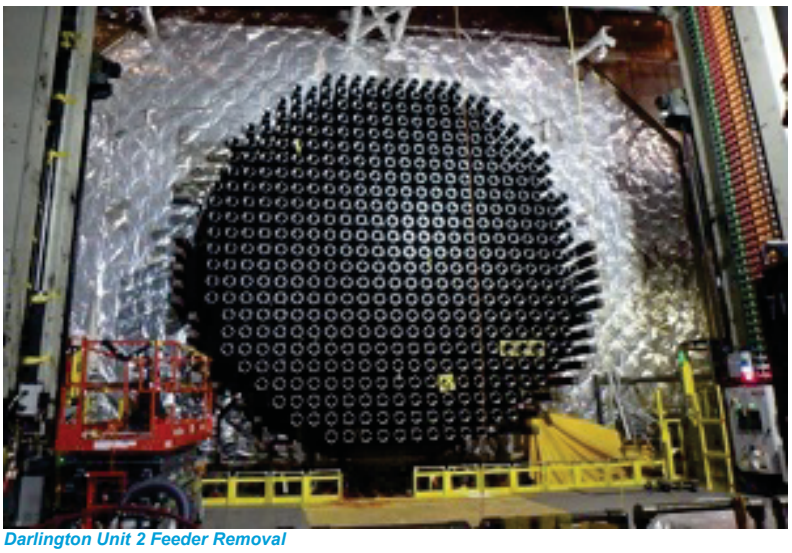
SNC-Lavalin introduced the innovative technique of using open top construction as well as a significant amount of modular design.

Darlington NGS Retube and Feeder Replacement (Darlington RFR)

SNC·LAVALIN

Clarington, Ontario, Canada

Power



Darlington Unit 2 Feeder Removal

SECTOR OF ACTIVITY
Nuclear Power

CLIENT
Ontario Power Generation (OPG)

YEAR OF COMPLETION
2016

TOTAL PROJECT COST
CA $12,800,000,000

SNC-LAVALIN
CA $1,375,000,000

CAPACITY
3,740 MWe (gross)

PROFESSIONAL PERSONNEL ASSIGNED TO PROJECT
Number of persons - 300

KEY PERSONNEL
Marie Gillman

MANDATE
SNC-Lavalin and its Canatom JV partner, Aecon Industrial, were contracted to deliver EPC services to the Darlington Retube and Feeder Replacement (RFR) Project in 1) a project definition phase and 2) an execution phase. The definition phase (now completed) included design and deliver of the necessary automated tooling that would disassemble and reassemble the high radiation field reactor core, construction of a full-scale reactor mock-up facility to simulate work activities, train unionised trades in the refurbishment work and support the overall project delivery team. The execution phase of the project will involve the removal and replacement of highly active pressure and calandria tubes and related reactor components, the segmentation and packaging of the resting wastes and the overhaul of many NSP and BOP systems and components. Each of the four Darlington reactors will be taken out of service sequentially for approximately three years each.

The high performing Darlington NGS comprising four (4) units, the first commissioned in 1990 is one of the largest multi-unit CANDU reactor sites constructed globally and is part of the 47 CANDU or CANDU-type reactors currently operating (updated to 2017) and has a gross output of 3,740MWe supplying 20% of Ontario's power needs

DESCRIPTION
As a full service nuclear reactor vendor SNC-Lavalin as part of the JV provided EPC, project management and construction management services in replacing reactor & fuel channel components in all four (4) Darlington reactors. The Aecon-SNC JV's scope is to deliver $2.75Bn of EPC services as the General Contractor to the Client funded Darlington Retube and Feeder Replacement (RFR) Project of total Project value $12.8Bn and 14 year duration as follows:

Definition phase (now completed)

- design, deliver, assemble, test, commission and maintain automated tooling for disassembly and reassembly of the high radiation field reactor core fuel channel components,
- construction of a full-scale reactor mock-up facility to simulate and prove work activities,
- produce validated work procedures and train unionised trades in the refurbishment work, and
- support the overall project delivery team.

Execution phase (for each of four (4) large, commercial reactors

- remove highly radioactive reactor components and replace with new fuel channel components including pressure tubes, calandria tubes, end fittings, positioning assemblies, shield plugs, closure plugs, tube spacers, journal rings and bearing sleeves,
- remove and replace all heat transport (primary coolant) feeders from Graylock connection to headers including removal and restoration of all seismically qualified feeder supports,
- controlled revision of material and fabrication specifications to reflect

changes to the feeder, tube and shield plug materials and code changes,
- procurement, logistics and materials management under the JV's own Certificate of Authorization of necessary nuclear safety significant and commercial components, equipment, items and materials,
- supply of up to 1,500 dedicated staff to the worksite, Field Office and Client Office,
- supply of 24/7 Home Office support and engineering services as required to support execution,
- hire, train, manage and supervise specialised construction trades and coordinate work with unionised Client labour under Client IR and Safety Rules.

SERVICES PROVIDED

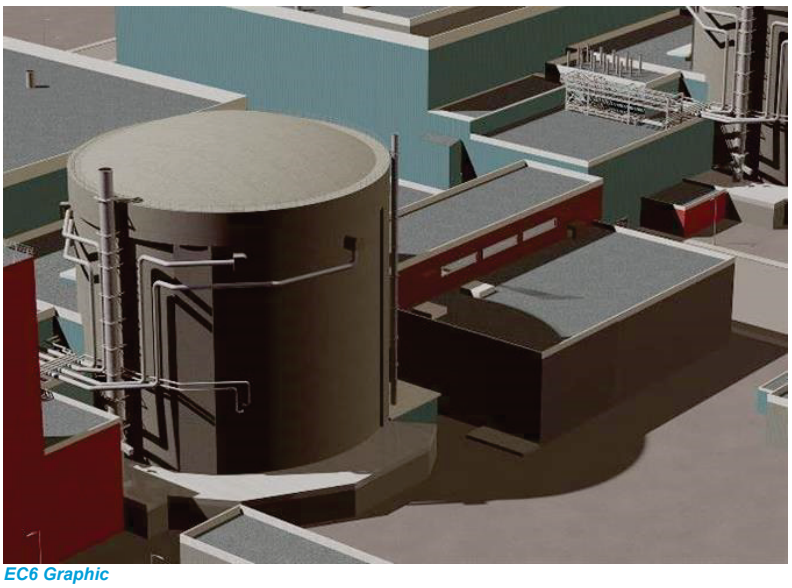
SNC-Lavalin as part of the JV completed the definition phase comprising tooling design, procurement, assembly, training, construction/installation and preparation allowing the first of four (4) units to enter execution. The services to be provided include:

- supply of automated specialised tooling,
- design, construction and erection of a full-scale reactor face mock-up facility,
- provision of 300 SQEP staff to support work scope,
- procurement of to nuclear standards nuclear safety significant and commercial components, equipment, items and materials,
- operation, maintenance and training of trade labour in use of the tooling,
- dismantling and transfer of tooling to the worksite,
- Project Management and Construction Management of supplied & Client workforce on a licensed nuclear facility to Client labour and safety rules,
- preparation and localisation with Client of schedule, procedures, approvals, CWP and FIWP for total work scope,
- preparation of the reactor and worksite for work execution,
- removal of interferences inside the reactor building, provision of temporary facilities and services and engineering required to support the retube work activities
- draining and recovering for reuse the tritiated heavy water from each fuel channel and the calandria,
- drying and preservation of the affected systems e.g. heat transport (primary coolant) systems and moderator systems,
- execution in series of the removal and replacement of highly radioactive pressure and calandria tubes and related reactor components in containment for each of four (4) large, commercial reactors alongside licensed and operational power generating units,
- disposition of field changes in accordance with regulatory requirements to maintain configuration management of nuclear safety significant systems,
- restoration of pressure boundary in accordance with codes and standards.
- manual fuel loading, including design and manufacture of the required tooling,
- testing, commissioning and production of as-built records required by regulatory requirements.

Pre-licensing Vendor Design Review for CANDU Enhanced CANDU 6 (EC6) Reactor

Canada

Power



EC6 Graphic

SECTOR OF ACTIVITY
Nuclear Power

CLIENT
SNC-Lavalin Inc.

YEAR OF COMPLETION
2013

TOTAL PROJECT COST
CA $174,000,000

SNC-LAVALIN
CA $174,000,000

CAPACITY
740 MWe gross

MANDATE

To upgrade the CANDU C6 commercial power reactor design to exceed modern & anticipated regulatory expectations and improve operational performance. A systematic approach was used with Suitably Qualified and Experienced staff (SQEP) reviewing performance and regulations and raising Design Change Notices for processing through the proven nuclear standard design development and engineering change process. To then expedite the revised EC6 design through the Canadian Nuclear Safety Commission's (CNSC) Pre-licensing Vendor Design Review (VDR) process.

The C6 design underpins eleven (11) CANDU 6 units constructed globally and is one of the 47 CANDU or CANDU-type reactors currently operating (to 2017).

DESCRIPTION

The well-established Home Office nuclear design development and engineering change processes were implemented under a nuclear quality system to systematically review the existing standard CANDU C6 reactor design to improve safety & operational performance, apply modern engineering standards, embed operational experience, use higher performing materials and to exceed modern and anticipated regulatory expectations. The proven nuclear engineering design change process resulted in a revised EC6 design and such information was collated, packaged, reviewed and released to the CNSC in an agreed framework, format and to an agreed schedule.

SNC-Lavalin (as Candu Energy Inc.) project managed the nuclear safety system design & reactor design work and interfaced with the CNSC to release EC6 design information, make subject presentations, respond to queries and agree actions in a timely manner. The CNSC assessment was against regulatory expectations as set out in the Nuclear Safety and Control Act, Regulatory Document RD-337 Design of New Nuclear Power Plants, related regulatory documents & standards and the recommendations from the CNSC Fukushima Task Force Report. The CNSC pre-licensing vendor design review for the Enhanced CANDU 6 reactor was carried out in three phases:

- Phase 1: Compliance with Regulatory Requirements.
- Phase 2: Assessment for Any Potential Fundamental Barriers to Licensing.
- Phase 3: Follow-up.

SERVICES PROVIDED

Design Development:

- Established project management and quality system arrangements for the control of 250+ SQEP staff contributing to the following Home Office based activities
- Reviewed C6 design against newly developed nuclear safety & operational performance requirements that had been derived from Client and Owner feedback;
- Reviewed C6 design against modern engineering standards, modern requirements for operability & decommissioning preparation, fleet operational experience, design life extension, life extension refurbishment requirements, in service material performance and modern high performance construction material specifications.

Pre-licensing Vendor Design Review for CANDU Enhanced CANDU 6 (EC6) Reactor

SNC·LAVALIN

Canada

Power

- Reviewed C6 design against modern global regulatory standards in markets of interest and anticipated enhanced regulatory expectations resulting from design life extension.
- Prepared necessary Design Change Requests and initiated program of design development through engineering change processes under a nuclear standard quality system:

Phase 1

- Prepared and submitted design & other documentation in support of demonstrating how the NPP design meets the nuclear safety regulatory requirements and expectations of the CNSC
- Compliance Assessment against regulatory document Design of New Nuclear Power Plants (RD-337), EC6 Technical Description, CANDU 6 Generic Safety Analysis Report, and other design documentation
- Provided familiarization sessions to CNSC staff on EC6 design
- Discussed submissions and responded to requests for information.
- Processed 17 review topics agreed to be covered.

Phase 2

- Prepared and submitted documentation demonstrating how the NPP design meets the regulatory requirements and expectations of the CNSC e.g. Interim Preliminary Safety Analysis Report, Safety Design Guides, Design Guides, Design Manuals, Design Analysis, and other design documents
- Provided familiarization sessions to CNSC staff,
- Discussed submissions and responded to requests for information.
- Processed 21 review topics (19 topics from GD-385 plus two (2) additional special topics) agreed to be covered.

Phase 3

- Prepared and submitted documentation demonstrating how the nuclear power plant design for each review topic meets the regulatory requirements and expectations of the CNSC:

  - Updated Safety Design Guide for Classification of Structures, Systems and Components
  - Updated Design Guide for Beyond Design Basis Accident and Severe Accident Prevention and Mitigation
  - Updated Assessment Document on application of single failure criterion
  - Updated R&D plan, Design documents to describe design changes to address Fukushima lessons learned, analysis Documents for extreme severe accidents, an design documents for fuel design and qualification, control systems and facilities, containment, radiation protection, and safety analysis.

- Provided several familiarization sessions,
- Provided additional information requested by CNSC staff on an as-needed basis and held many technical meetings responding to CNSC staff questions and comments as well as pursue specific technical aspects for the individual topical areas.
- Processed ten (10) review topics and two special topics agreed to be covered

- **Phase 1**:The Phase 1 review was completed in April 2010.
- **Phase 2**:The Phase 2 review was completed in April 2012.
- **Phase 3**:The Phase 3 review was completed in June 2013.

Cernavoda NPP Unit 2 New Build Completion

Cernavoda, Romania

Power

SECTOR OF ACTIVITY
Nuclear Power

CLIENT
Societatea Nationala "Nuclearelectrica" S.A.

TOTAL PROJECT COST
CA $1,300,000,000

SNC-LAVALIN
CA $400,000,000

MANDATE
Completion of construction and commissioning of Unit 2 700MWe class Nuclear Power Plant (NPP) on a five-unit Pressurized Heavy Water Reactor Site.

DESCRIPTION
The Cernavoda Nuclear Power site is situated on the Danube River between the inland capital city of Bucharest and the second largest city Constanta situated on the Black Sea shore. It is a brownfield nuclear completion project Ansaldo and SNN (the existing operator of Unit 1).
Key features of this nuclear completion project is the due diligence examination and qualification of existing construction and equipment to modern day standards and codes (e.g. RCC design, nuclear and conventional pressure vessel codes), disposition or mitigation of non-compliant equipment or construction through rework, replacement or reinforcement, confirmation of safety case against modern regulations and startup and commissioning of NPP.

SERVICES PROVIDED
SNC-Lavalin provided the following services:

- Due diligence of equipment, construction and facilities
- Specification of mitigation measures
- Completion re-engineering
- Procurement
- Construction Management (including home and field support, equipment inspection/ testing and installation)
- Commissioning
- Startup

Embalse Refurbishment Project

Cordoba, Argentina

Power

SECTOR OF ACTIVITY
Nuclear Power

CLIENT
NUCLEOELECTRICA ARGENTINA S.A.

YEAR OF COMPLETION
2018

TOTAL PROJECT COST
CA $1,800,000,000

SNC-LAVALIN
CA $390,000,000

CAPACITY
683 MWe (gross)

Fuel Channel Completion

MANDATE

In August 2011, Candu Energy Inc. (part of SNC-Lavalin's Nuclear Team) was retained by Nucleoelectrica Argentina Sociedad Anonima (NA-SA) for the major nuclear systems engineering of the mid-life Refurbishment Project that extend the operational life of Embalse Nuclear Generating Station (NGS) by a minimum of 30 years. NA-SA will engineer and procure the materials for the retrofit and uprate.

The high performing Embalse (NGS) commissioned in 1983 is one of eleven (11) CANDU 6 units constructed globally and is one of the 47 CANDU or CANDU-type reactors currently operating (updated to 2017) and has a gross output of 648MWe intending to be uprated to 683MWe as part of the Project.

DESCRIPTION

Candu's scope is to perform specified engineering, procurement and support services as set out in the following seven contracts:

- Supply of up to 40 dedicated technical assistance nuclear engineering staff to be located at the worksite in Argentina.
- Supply reactor fuel channel retubing tools: includes fixed price lease of engineering tooling, and supply of documentation and procedures to perform retubing, design analysis (of the new reactor components that will be installed), design of the waste management facility to accept the radioactive reactor components removed during retubing, and the design and supply of associated waste handling equipment.
- Supply of 24/7 Home Office support and nuclear engineering services from Canada.
- Supply of replacement Digital Control Computer (DCC) equipment and software from Canada: includes fixed priced purchase of the gateway and development, supply, installation and testing of software on new DCCs.
- DCC installation, testing and commissioning support in Argentina.
- Supply of nuclear systems engineering services, safety related design change documentation, safety analysis, procurement specifications for related equipment from Canada, engineering & procurement of equipment for upgrades to the station's safety systems, probabilistic & deterministic safety analysis and licensing support to NA-SA.
- Supply of power upgrade design changes and related equipment from Canada: includes supply of engineering and procurement of upgrades to valves and other related equipment to take advantage of the greater steam output from new steam generators and support/analysis for thermal hydraulic testing of the plant before and after implementation of the uprated equipment.

In December 2017 the primary pressure boundary of the reactor was restablished through installation of the 380 new fuel channels was successfully completed with a peak production rate of 9.1 effective channels installed in a 24 hour period.

SERVICES PROVIDED

Embalse Refurbishment Project

Cordoba, Argentina

Power

- Technical assistance from 40+ dedicated Suitably Qualified and Experienced staff (SQEP) working in the Field office during project execution with 24/7 Home Office support.
- Localisation of work processes, procedures and work plans for the removal, segmentation, radioactive waste packaging and replacement (with restoration of the primary circuit pressure boundary) of all 380 fuel channels (comprising pressure and calandria tubes) .
- Shipping of tooling and execution operational and maintenance support for retubing activities
- Post-order engineering and quality surveillance support services for NA-SA procurement group.
- Software upgrading and integration with NA-SA provided hardware and on-site commissioning support.
- Preparation of safety design and licensing analyses, codes and standards reviews and seismic margin assessment.
- Design development engineering of upgrade changes to permanent plant equipment.
- Procurement services for equipment and materials related to the design changes

From the total team in the Field Office SNC-Lavalin's Nuclear Team provided reactor face advisors who worked rotating shifts in the reactor building to oversee the critical fuel channel installation work being carried out by utility workforce.