



Carolina Power & Light Company
P.O. Box 10429
Southport, NC 28461-0429

MAR 30 2000

SERIAL: BSEP 00-0044

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NO. 1
DOCKET NO. 50-325/LICENSE NO. DPR-71
INSERVICE INSPECTION PROGRAM FOR THE THIRD 10-YEAR INTERVAL -
EVALUATION FOR LEAKAGE AT BOLTED CONNECTIONS

Gentlemen:

In accordance with subparagraph IWB-3144(b) of the 1989 Edition of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI, Carolina Power & Light (CP&L) Company is submitting the enclosed evaluation, for the Brunswick Steam Electric Plant (BSEP), Unit No. 1, of leakage identified at ASME Class 1 bolted connections.

The third 10-year Inservice Inspection (ISI) Program is based on the 1989 Edition of the ASME Code, Section XI. By letter dated August 11, 1999 (Serial: BSEP 99-0128), CP&L submitted a request for relief, designated as Relief Request RR-17, "Leakage at Bolted Connections," Revision 3, from the requirements of subparagraph IWA-5250(a)(2). In this relief request, as an alternative, CP&L proposed to follow the requirements of ASME Code Case N-566-1. By letter dated February 17, 2000, the NRC approved Relief Request RR-17.

Subparagraph IWB-3144(b) requires that evaluation analyses of examination results for the affected components be submitted to the regulatory authority having jurisdiction at the plant site. The evaluation of the examination results for leakage at bolted connections identified during BSEP, Unit 1 Refueling Outage 12 is documented in Engineering Service Request 99-00418, a copy of which is enclosed.

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Please refer any questions regarding this submittal to Mr. Steven F. Tabor, Supervisor - Licensing, at (910) 457-2178.

Sincerely,

A handwritten signature in black ink, appearing to read "W. J. Dorman", with a long horizontal flourish extending to the right.

Warren J. Dorman
Manager - Regulatory Affairs
Brunswick Steam Electric Plant

WRM/wrm

Enclosure: Engineering Service Request 99-00418, "Evaluate Pressure Retaining Bolts per ASME Section XI"

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cc (with enclosure):

U. S. Nuclear Regulatory Commission, Region II
ATTN: Mr. Luis A. Reyes, Regional Administrator
Atlanta Federal Center
61 Forsyth Street, SW, Suite 23T85
Atlanta, GA 30303-8931

U. S. Nuclear Regulatory Commission
ATTN: Mr. Theodore A. Easlick, NRC Senior Resident Inspector
8470 River Road
Southport, NC 28461-8869

U. S. Nuclear Regulatory Commission
ATTN: Mr. Allen G. Hansen (Mail Stop OWFN 8G9)
11555 Rockville Pike
Rockville, MD 20852-2738

Ms. Jo A. Sanford
Chair - North Carolina Utilities Commission
P.O. Box 29510
Raleigh, NC 27626-0510

Division of Boiler and Pressure Vessel
North Carolina Department of Labor
ATTN: Mr. Jack Given, Assistant Director of Boiler & Pressure Vessels
4 West Edenton Street
Raleigh, NC 27601-1092

ENCLOSURE

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NO. 1
DOCKET NO. 50-325/LICENSE NO. DPR-71
INSERVICE INSPECTION PROGRAM FOR THE THIRD 10-YEAR INTERVAL -
EVALUATION FOR LEAKAGE AT BOLTED CONNECTIONS

Engineering Service Request 99-00418,
"Evaluate Pressure Retaining Bolts per ASME Section XI"

Form 1 ENGINEERING SERVICE REQUEST			
ESR # 99-00418	Rev # 0	WR/JO #	Other Documents (CR, OEF, etc.) -RELIEF REQ
Plant/Unit BNP 1	Primary System Number & Name 1005 B21,B11-NUCLEAR BOILER (INC.RX VESSEL & INTERNALS)		<input checked="" type="checkbox"/> Multiple Systems Affected
Title Evaluate Pressure Retaining Bolts per ASME Sec XI		Originator/Phone STANLEY, BOYD J /850-2495	
Due Date: / /		TURNOVER REQUIRED <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Reviews (Print Name, Sign, Date) Design Verification <u>B. Stanley</u> <input type="checkbox"/> Other Reviews Required <input checked="" type="checkbox"/> Records Attached		OTHER REVIEWS (print name, sign, date) ANII <u>Ray Adams per telecom Jerry W. Crider 3/19/00</u> <u>Ray Adams 3/29/00</u>	
ENGINEERING DISCIPLINES (print name, sign, date)			
Materials Design	<u>M.W. GUTHRIE M.Y. Mathis, P.E. 3/19/00</u>		
Syst Engr 1005	<u>Phillip Gore / Phillip Gore 3/19/00</u> <u>K.R. Woodard / K.R. Woodard 3/19/00</u>		
Syst Engr 1070	<u>John R. Bass J.R.B. 3/19/00</u>		
Syst Engr 2020	<u>John R. Bass J.R.B. 3/19/00</u>		
Syst Engr 3020	<u>N/A J.R. 3/19/00</u>		
ENGINEERING PROGRAMS (print name, sign, date)			
ISI/IST/App	<u>L.W. Whetley L.W. Whetley 3/19/00</u>		
OTHER REVIEWS (print name, sign, date)			
QC	<u>Heidi Bordeaux 3/19/00</u>		
Product Type ENG EVAL	Additional Systems 1070 2020 3020	ESR Team N/A	Quality Class A Safety-Related
APPROVALS			
<input type="checkbox"/> NAS Before Approval/Implementation <input type="checkbox"/> PNSC Before Approval/Implementation <input type="checkbox"/> NRC Before Implementation		Is a 10CFR 50.59 Safety Review required per (plant specific procedure)? <input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> Safety Screen ONLY <input type="checkbox"/> USQD <input type="checkbox"/> N/A (Engineering Disposition Only)	
Responsible Engineer JERRY W CRIDER <u>Jerry W. Crider</u>			
Responsible Manager (Print Name, Sign, Date) <u>J. McINTYRE Jr. McIntyre 03/21/00</u>			
Plant General Manager (Print Name, Sign, Date)			
Procedure: Form EGR-NGGC-0005-1-10		DCM01a2a 7/13/1999	

Form 1

ENGINEERING SERVICE REQUEST

ESR #	Rev #	Title
99-00418	0	Evaluate Pressure Retaining Bolts per ASME Sec XI.

Request:

ASME Section XI, 1989 edition, has been implemented at BNP. Subsection IWA-5250(a)(2) requires a bolting evaluation be performed for pressure retaining bolted connections which are observed leaking via VT-2 Examination for class 1 components during the RPV Hydrotest (OPT-80.1). BNP Relief Request 17 has been approved modifying the requirement to remove the bolting adjacent to each leak, and perform a VT-3 Examination of the bolts.

Please evaluate the pressure retaining bolted connections identified during the last two Unit 1 refueling outage OPT-80.1 RPV Hydrostatic Tests as generic examples of pressure retaining bolted connection leakage. Establish corrective action level guidelines for corrective measures to be used during the performance of the B113R1 test in accordance with the requirements of Relief Request 17 and ASME Section XI.

Note: Similar evaluation was performed in U2 per ESR 99-00279

NOTE: OPT-80.1 RPV Hydrostatic Test leakage will be evaluated by ESR 99-00417.

Form 1

ENGINEERING SERVICE REQUEST

ESR #	Rev #	Title
99-00418	0	Evaluate Pressure Retaining Bolts per ASME Sec XI

Response:

A review of the previous two OPT-80.1 pressure tests for the B111R1 and B112R1 outage was performed to identify pressure retaining bolted connections that have routinely leaked during this test. For these bolted connections, an evaluation was performed to address their joint integrity when the specified conditions are met.

Guidance for corrective measures to be taken were also established. This guidance should be followed to provide timely resolution to identified leakage.

To assure evidence of corrosion and other abnormal conditions are properly identified, requirements associated with the visual examination were established. These requirements also define the criteria for recording abnormal conditions.

Although not considered pressure retaining, disposition of leakage at mechanical packing and/or seal connections was addressed. For clarification, leakage from these connections is outside the scope of Relief Request #17.

Guidance for the evaluation and follow-up actions specified in Relief Request #17 were also provided. This guidance was added to assure compliance to this request for relief.

The evaluation of bolted connections specified in this ESR is applicable to the B113R1 outage. However, the methodology and guidance specified in this ESR can be used to support future Unit 1 and Unit 2 pressure tests.

LIST OF EFFECTIVE PAGES

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Attachment 2:

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ATTACHMENTS

A. PROBLEM STATEMENT

Based on the approval of Relief Request #17, evaluate the pressure retaining bolted connections identified during the last two Unit 1 OPT-80.1, Reactor Pressure Vessel ASME Section XI Pressure Test, as generic examples of pressure retaining bolted connection leakage. Establish corrective action level guidelines for corrective measures to be used during the performance of the B113R1 test in accordance with the requirements of Relief Request #17 and the ASME Section XI Code.

ESR Team Members:

An ESR Team was not established.

B. SOLUTION STATEMENT

A review of the previous two OPT-80.1 pressure tests for the B111R1 and B112R1 outage was performed to identify pressure retaining bolted connections that have routinely leaked during this test. For these bolted connections, an evaluation was performed to address their joint integrity when the specified conditions are met.

Guidance for corrective measures to be taken were also established. This guidance should be followed to provide timely resolution to identified leakage.

To assure evidence of corrosion and other abnormal conditions are properly identified, requirements associated with the visual examination were established. These requirements also define the criteria for recording abnormal conditions.

Although not considered pressure retaining, disposition of leakage at mechanical packing and/or seal connections was addressed. For clarification, leakage from these connections is outside the scope of Relief Request #17.

Guidance for the evaluation and follow-up actions specified in Relief Request #17 were also provided. This guidance was added to assure compliance to this request for relief.

The evaluation of bolted connections specified in this ESR is applicable to the B113R1 outage. However, the methodology and guidance specified in this ESR can be used to support future Unit 1 and Unit 2 pressure tests.

C. DESIGN SPECIFICATION**C.1. Scope Description**

The scope of this ESR is to (1) evaluate the pressure retaining bolted connections that have routinely leaked during the last two pressure tests and (2) establish corrective action guidelines for identified leakage at bolted connections during the performance of OPT-80.1 during the B113R1 outage.

This ESR complies with the applicable requirements specified in the ASME Section XI Code, ASME Code Case N-566-1, and Relief Request #17.

C.2. ReferencesIndustry Standards:

1. ASME Code, Section XI, Rules for Inservice Inspection of Nuclear Power Plant Components, 1989 Edition
2. Case N-566-1, Corrective Action for Leakage Identified at Bolted Connections, Section XI, Division 1, Approval Date: February 15, 1999
3. ASME N45.2.6, Qualification of Inspection, Examination, and Testing Personnel for Nuclear Power Plants

Design Basis Documents:

None.

Specifications:

None.

Drawings:

None.

Calculations:

None.

Nuclear Generating Group (NGG) Procedures:

1. EGR-NGGC-0003, Design Review Requirements, Revision 4
2. EGR-NGGC-0005, Engineering Service Requests, Revision 12
3. NGGM-PM-0007, Corporate Quality Program Manual, Revision 3

Plant Procedures:

1. Engineering Procedure (ENP)-16, Procedure For Administrative Control of Inservice Inspection Activities, Revision 40
2. ENP-16.9, Administrative Control of the ASME Section XI Pressure Testing Program, Revision 6
3. Periodic Test Procedure, OPT-80.1, Reactor Pressure Vessel ASME Section XI Pressure Test, Revision 40

Plant Change Documents:

None.

Regulatory Documents:

1. Section 55a, Codes and Standards, of Part 50 of Title 10 of the Code of Federal Regulations (10 CFR 50.55a)
2. Letter from the NRC, Brunswick Steam Electric Plant, Unit Nos. 1 and 2 - Inservice Inspection Program - Third 10-Year Interval - Evaluation of Requests for Relief Nos. RR-1 Through RR-25 (TAC Nos. MA2108 and MA2109), Dated February 17, 2000

Other References:

1. Brunswick Nuclear Plant (BNP), Unit 1 and 2 Technical Specifications
2. Updated Final Safety Analysis Report (UFSAR)
3. Technical Requirements Manual, Unit 1 and 2
4. Third Inspection Interval ISI Program Plan for Class 1, 2, & 3 Components and Their Supports for the Third Inspection Interval, Revision 2
5. Relief Request #17, Leakage at Bolted Connection, Revision 3
6. ESR 99-00279, B214R1 RPV Hydrotest Bolted Connection Action Evaluation, Revision 0
7. ESR 98-00066, OPT-80.1 Component Leakage Evaluation, Revision 0
8. ESR 96-00588, Evaluate Leakage Identified During OPT-80.1, Revision 0
9. OPT-80.1, Reactor Pressure Vessel ASME Section XI Pressure Test, Completion Date 11/03/96
10. OPT-80.1, Reactor Pressure Vessel ASME Section XI Pressure Test, Completion Date 05/19/98
11. NDEP-0611, VT-1 Visual Examination of Nuclear Power Plant Components, Revision 13
12. General Electric (GE) Specification 22A6485, Control Rod Drives, Revision 0
13. 1-FP-55013, Sheets 3, Rockwell International Mainsteam Isolation Valve List of Material, Revision C
14. 1-FP-05363, General Electric Reactor Recirculation System 600# Double Disc Gate Valve, Revision A
15. 0-FP-05364, Darling Valve & Manufacturing No. S150WDD Series 600 Double Disc Gate Valve, Revision A
16. 0-FP-05365, Anchor/Darling Valve S150WDD Double Disc Gate Valve, Revision B

17. 0-FP-05366, Darling Valve & Manufacturing No. S150WDD Series 600 Doubles Disc Gate Valve, Revision A

C.3. Design Inputs

The following items are those applicable to this ESR from the list provided in Attachment 2 of Procedure EGR-NGGC-0005.

1. Basic Functions:

The components affected by this ESR are part of the Reactor Coolant Pressure Boundary (RCPB). Components which comprise the RCPB are identified in Table 3.2.2.6 of the UFSAR. The Code classification for these components is ISI Class 1.

2. Codes, Standards, and Regulatory Requirements:

10 CFR 50.55a

Section 55a(g)(4) of 10 CFR 50.55a requires that inservice examination of components and system pressure tests conducted during successive Inspection Intervals comply with the requirements in the latest edition and addenda of the ASME Section XI Code incorporated by reference in paragraph (b)(2) of Section 55a on the date twelve months prior to the start of the successive interval.

The third successive Inspection Interval for BNP became effective on May 11, 1998. The edition and addenda incorporated by reference in paragraph (b)(2) on the date twelve months prior to May 11, 1998 was the 1989 Edition of the ASME Code, Section XI. Accordingly, the Code of record for the Third Inspection Interval is the 1989 Edition (no Addenda) of the ASME Code, Section XI.

The requirements for inservice inspection (ISI) are outlined in paragraph (g), Inservice Inspection Requirements, of 10 CFR 50.55a. The applicable requirements specified in this paragraph are based on the issuance date of the construction permit. Since the construction permit for Unit 1 and 2 were issued in February 1970, the requirements specified in paragraph (g)(1) are applicable.

In summary, paragraph (g)(1) states that components which are part of the RCPB and their supports must meet the requirements of the ASME Section XI applicable to those components which are classified as ASME Code Class 1.

ASME SECTION XI CODE, 1989 EDITION

Since these components are within the RCPB and classified as ISI Class 1, the applicable requirements of Subsection IWA, General Requirements and Subsection IWB, Requirements for Class 1 Components are to be met.

3. Test Requirements:

RELIEF REQUEST #17

The following alternative requirements were approved by the Nuclear Regulatory Commission by letter dated February 17, 2000:

When leakage is detected at bolted connections, as an alternative to the requirements of IWA-5250(a)(2), the requirement of either 1 or 2 below shall be met:

- 1) The leakage shall be stopped and the bolting and component material shall be evaluated to determine joint integrity and the susceptibility of the bolting to corrosion and failure. The evaluation will, at a minimum, consider the following factors:
 - The number and service age of the bolts
 - Bolt and component materials
 - Corrosiveness of the process fluid that is leaking
 - Leakage location and system function
 - Leakage history at the connection or other system components
 - Visual evidence of corrosion at the connection (i.e., while the connection is assembled).

- 2) If the leakage is not stopped, the joint shall be evaluated in accordance with IWB-3142.4 to determine joint integrity and the susceptibility of the bolting to corrosion and failure. The evaluation will, at a minimum, consider the following factors:
 - The number and service age of the bolts
 - Bolt and component materials
 - Corrosiveness of the process fluid that is leaking
 - Leakage location and system function
 - Leakage history at the connection or other system components
 - Visual evidence of corrosion at the connection (i.e., while the connection is assembled).

When the evaluation of the above factors is concluded, and if the evaluation determines that the leaking conditions has not degraded the fasteners, then no further action is required. However, reasonable attempts shall be made to stop the leakage as appropriate. In accordance with IWB-3144(b), the evaluation analyses will be submitted to the regulatory authority having jurisdiction at the plant site.

If the evaluation of the factors in 1 or 2 above indicates the need for further evaluation, then a bolt closest to the source of leakage shall be removed. The bolt will receive a VT-1 examination and be evaluated and dispositioned in accordance with IWB-3517. If the removed bolting shows evidence of rejectable degradation, all remaining bolts shall be removed and receive a VT-1 examination in accordance

with IWB-3140. If leakage is identified when the bolted connection is in service and the information in the evaluation is supportive, the removal of the bolt for the VT-1 examination may be deferred until the next refueling outage.

4. Accessibility, Maintenance, Repair, and ISI Requirements:

As it applies to this ESR, the applicable requirements are defined in Subsection IWA and IWB of the ASME Section XI Code, 1989 Edition, ASME Code Case N-566-1, and Relief Request #17.

C.4. Assumptions

None.

C.5. Evaluations

Background

During the Third Inspection Interval, the Code of record for BNP is the ASME Section XI Code, 1989 Edition. Paragraph IWA-5250(a)(2) of this edition states "if leakage occurs at a bolted connection, the bolting shall be removed, VT-3 visually examined for corrosion, and evaluated in accordance with IWA-3100.

As allowed by 10 CFR 50.55a(a)(3)(i), a request for relief from the requirements of IWA-5250(a)(2) was submitted. As an alternative to the requirements of IWA-5250(a)(2), CP&L proposed to follow the requirements of ASME Code Case N-566-1. In addition to the requirements specified in ASME Code Case N-566-1, CP&L proposed to implement additional action in those cases where the evaluation of the specified factors indicates the need for further evaluation.

The alternative requirements discussed above are specified in Relief Request #17. These acceptable alternative requirements were evaluated by the Nuclear Regulatory Commission (NRC) and determined to provide an acceptable level of quality and safety by letter dated February 17, 2000.

Evaluation

CORRECTIVE MEASURES

As required by paragraph IWA-5250(a) of the ASME Section XI Code, leakage detected during a pressure test is to be disposition by the Owner (CP&L) for corrective measure. To provide a timely resolution to this identified leakage, guidance for taking corrective measures has been established. As such, this guidance should be implemented unless otherwise specified by the System Engineer or the OPT-80.1 Leakage Evaluation Team:

Leakage Rate Thresholds**Corrective Measures**

GREATER Than 120 Drops Per Minute

- Actions (e.g., re-torque of bolting) SHALL be taken to stop or reduce the leakage AND
- PERFORM an integrity evaluation of the affected pressure retaining bolted connection AND
- If the evaluation warrants bolt removal, REMOVE the bolt closest to the leakage and PERFORM a VT-1 examination. If the removed bolt shows EVIDENCE of rejectable degradation, ALL remaining bolts are to be REMOVED and EXAMINED.

GREATER Than 30 Drops Per Minute and EQUAL TO or LESS Than 120 Drops Per Minute

- Reasonable attempts (e.g., re-torque of bolting) should be taken to stop or reduce the leakage, as appropriate.
- If leakage is not stopped, this small amount of leakage is expected to seal during normal plant heat up and would be acceptable for the current operating cycle.
- Integrity of the bolted connection is bounded by this ESR provided NO abnormal degradation is detected.

EQUAL TO or LESS Than 30 Drops per Minute

- Because of ALARA, corrective measures are ONLY required when specified by the System Engineer or the OPT-80.1 Leakage Evaluation Team.
- This small amount of leakage is expected to seal during normal plant heat up and would be acceptable for the current operating cycle.
- Integrity of the bolted connection is bounded by this ESR provided NO abnormal degradation is detected.

EXAMINATION OF BOLTED CONNECTIONS

As specified in Relief Request #17, visual examination of corrosion at the bolted connection is one of the required attributes to support the integrity evaluation. Although a visual examination is required, the type and method for this examination are not specified. To assure evidence of corrosion and/or other abnormal conditions are

properly identified and characterized, the following requirements have been established:

Visual Examination Method:

When leakage is identified at a bolted connection, a general visual examination is to be performed to determine if evidence of corrosion and/or other abnormal conditions are present. The general visual examination is to be performed either **DIRECTLY** or **REMOTELY** with adequate illumination (natural or artificial) and resolution (suitable for the local environmental conditions) to detect evidence of corrosion and/or other abnormal conditions.

The general visual examination is to be performed on the accessible surfaces of the "as-found" bolted connection.

Examiner Qualification:

Personnel performing the general visual examination are to be qualified and/or certified per an approved procedure which meets the applicable requirements of ASME N45.2.6.

Recordable Conditions:

During the performance of the general visual examination, any of the following conditions are to be recorded on the General Visual Examination Data Sheet (Attachment 1). If one of the following conditions is identified, the magnitude and extent of the condition is to be characterized on the data sheet.

- Localized corrosion and/or pitting that visually appears to have **REDUCED** the bolt or stud cross-section or **REDUCED** the material thickness of affected component. **NOTE:** General corrosion and light surface pitting are **NOT** considered abnormal and are **NOT** required to be recorded
- Bent, twisted, fractured, and/or deformed bolts, studs, nuts, or washers.
- Missing bolts, studs, nuts, or washers,
- Other conditions (e.g., gouges, excessive wear, corrosion staining emerging from the connection) which may indicate degradation of the bolted connection. **NOTE:** Conditions, such as fabrication marks, scratches, surface abrasion, material roughness, and any other conditions acceptable by the material, design, and manufacturing specification are **NOT** considered abnormal and are **NOT** required to be recorded.

Relevant Conditions:

The relevant conditions listed below will require evaluation to determine if the integrity of the bolted connection has been affected. This evaluation is to be documented on the Integrity Disposition Data Sheet (Attachment 3). If the evaluation determines that the recorded condition is rejectable and warrants bolt removal, the bolt closest to the source of leakage is to be removed and visually (VT-1) examined. The following represent relevant conditions:

- Localized corrosion and/or pitting that has REDUCED the bolt or stud cross-section by more than five percent.
- Localized corrosion and/or pitting that has REDUCED the required material thickness (i.e., design) of affected component.
- Bending, twisting, or deformation of bolts or studs to the extent that the joint integrity is impaired.
- Fractured bolts, studs, and/or nuts.
- Other conditions (e.g., gouges, excessive wear, corrosion staining emerging from the connection) which may indicate that joint integrity has been impaired.

PACKING AND SEAL LEAKAGE

During the performance of OPT-80.1, leakage at mechanical packing and/or seal connections may be identified. Although this leakage is required to be dispositioned, these connections are not considered pressure retaining and are outside the scope of Relief Request #17. The guidance for corrective measures discussed earlier should be used to disposition any leakage past these non-pressure retaining connections.

EVALUATION OF BOLTED CONNECTIONS

When leakage is detected at pressure retaining bolted connections, an evaluation is to be performed to determine joint integrity and the susceptibility of the bolting to corrosion and failure. The evaluation is to be documented on an Integrity Disposition Data Sheet (Attachment 3) and at a minimum, consider the following factors:

- The number and service age of the bolts
- Bolt and component materials
- Corrosiveness of the process fluid that is leaking
- Leakage location and system function

- Leakage history at the connection or other system components
- Visual evidence of corrosion at the connection (i.e., while the connection is assembled).

When the evaluation of the above factors is concluded, and if the evaluation determines that the leaking conditions has not degraded the fasteners, then no further action is required.

If the evaluation of the above factors indicates the need for further evaluation, then a bolt closest to the source of leakage is to be REMOVED. The removed bolt is to receive a visual (VT-1) examination per an approved Non-Destructive Examination Procedure (e.g., NDEP-611). The examination results are to be evaluated and disposition in accordance with paragraph IWB-3517 of the ASME Section XI Code, 1989 Edition.

If the removed bolting shows evidence of rejectable degradation, all remaining bolts are to be removed and receive a visual (VT-1) examination.

EVALUATION OF BOLTED CONNECTIONS WITH HISTORICAL LEAKAGE

Based on the results of the previous two OPT-80.1 pressure tests on Unit 1, leakage associated with the components listed below was identified. In most cases, leakage at these connections that was less than 120 drops per minute will typically seal following the startup of the unit and heat-up of the affected bolted connection. For this reason and ALARA, actions to stop all leakage at these connections may not be taken.

As required by ASME Code Case N-566-1, any leakage that is not stopped shall be evaluated for joint integrity. As such, the following bolted connections have been pre-evaluated in accordance with requirements specified in Relief Request #17 to support the timely completion of OPT-80.1. An Integrity Disposition Data Sheet (Attachment 4) is not required for these bolted connections.

Control Rod Drive (CRD) Housing Flange (Total 137 Units)

- a) The number and service age of the bolts

Each flange contains eight cap screws. Since the cap screws are replaced every time a CRD mechanism is replaced or rebuilt, the service age will vary. However, all cap screws were replaced between 1991 and 1993. As such, the service age will be assumed as less than ten years.

- b) Bolt and component material

The original cap screws were SA-193 Grade B7 (AISI 4140). Bolting material AISI 4340 was approved for use per SEEF 94-0009.

Per the GE Specification 22A6485, the flange material is SA-182, F304.

c) Leakage location and system function

Previous leakage of 55 drops per minute or less has been located at the housing flange. The housing flange is part of the Control Rod Drive Hydraulic System (CRDHS). The function of this system is to provide filtered, demineralized water at regulated pressures and flow rates to support the (1) CRD mechanism movement, (2) cooling for the CRD mechanism, (3) scram accumulator charging, and (4) reactor recirculation pump seal purging.

d) Leakage history at the connection or other system components

During the past two pressure tests, only leakage at the housing flange has been identified.

Reactor Recirculation Valves (Total 10 Valves)

a) The number and service age of the bolts

Valve #	# of Bolts
B32-F023A/B	28
B32-F031A/B	28
B32-F032A/B	8
B32-F043A/B	24
B32-F044A/B	8

The service age of the above will vary. For this reason, the service age will be assumed as greater than ten years.

b) Bolt and component material

Bonnet Studs - A-193 Grade B7
 Bonnet Nuts - A-194 Grade B8
 Valve Body/Bonnet - A-351 Grade CF8

c) Leakage location and system function

Previous leakage of 120 drops per minute or less has been located at the body to bonnet bolted connection of the above listed valves. These valves are part of the Reactor Recirculation System. The function of this system is to provide a means of controlling reactor power level by utilizing a system to control the amount of forced circulation of reactor moderator through the core.

d) Leakage history at the connection or other system components

During the previous pressure tests, only leakage at the valve to bonnet connection has been observed. This condition has been routinely limited to those valves identified above.

Main Steam Isolation Valves (Total 8 Valves)

- a) The number and service age of the bolts

Valve #	# of Bolts
B21-F022A/B/C/D	20
B21-F028A/B/C/D	20

The service age of the above will vary. For this reason, the service age will be assumed as greater than ten years.

- b) Bolt and component material

Bonnet Studs & Nuts - A-540 Grade B23
Valve Body - A-216 Grade WCB
Valve Bonnet - A-105 Grade II

- c) Leakage location and system function

Previous leakage of 42 drops per minute or less has been located at the body to bonnet bolted connection of the above listed valves. These valves are part of the Main Steam System. The function of this system is to provide the pathway that transports high quality steam from the Reactor Vessel to various steam driven components.

- d) Leakage history at the connection or other system components

During the previous pressure tests, only leakage at the valve to bonnet connection has been observed. This condition is limited to those valves identified above.

Corrosiveness Of The Process Fluid That Is Leaking

The process fluid for all of the above bolted connections during the performance of OPT-80.1 is reactor coolant. During normal operation, the reactor coolant is demineralized water with hydrogen and zinc addition. As such, the coolant is slightly acidic to close to neutral. With a loss of the hydrogen addition, the pH of the coolant will become more acidic. Since interruptions of the hydrogen addition are infrequent, the corrosiveness of the reactor coolant is minimal because of its generally neutral environment.

When the unit is shutdown, the coolant will become acidic. During this condition, the corrosion rate is slightly higher. However during this short period of time, this acidic condition would not compromise the integrity of these bolted connections.

In summary, the susceptibility of the bolting to corrosion because of the reactor coolant leakage is minimal. As such, the integrity of the bolted connection would not be compromised.

Integrity of Bolted Connections

The bolted connections listed above have routinely exhibited leaking during the performance of OPT-80.1. Provided the leakage is equal to or less than 120 drops per minute, historical verification has confirmed that this small amount of leakage will typically seal as the unit heats up and the bolted connection expands. As such, continued leakage at these bolted connections is unlikely.

Assuming the leakage does not completely seal following heat up, this small amount of leakage would not compromise the integrity of the affected bolted connection over one cycle of operation. As discussed above, the corrosiveness of the process fluid during normal operation is insignificant. In addition, the material design of these connections is adequate for the temperatures and pressures that will be experienced during normal plant operation.

The affected bolted connections within the Control Rod Drive and Reactor Recirculation System were designed using SA-193, SA-182, A-194, and A-351 material. These materials are very resistant to general corrosion, and are not adversely affected by small amounts of leakage during the operating cycle.

For the Main Steam System, the affected bolted connections are designed with A-540, A-216 and A-105 material. These materials have acceptable resistance to limited exposure to reactor coolant; but, are subject to light general corrosion if exposed to water and oxygen over long periods of time. Although subject to reactor coolant during the pressure tests, these bolted connections are not subject to this process fluid during normal operation.

As discussed above, general corrosion of the bolted connections may be observed during the performance of the pressure test. The observed general corrosion is a dissolution process on the surface of a metal or alloy exposed to a corrosive environment. The rate of corrosion is time dependent and tends to decrease to a low level after prolonged exposure in neutral environments particularly in the absence of aggressive anions such as chloride and sulfate. With the systems in question, the affected bolted connections are designed with materials that have acceptable resistance to general corrosion. As such, general corrosion and light surface pitting on these bolted connections will not affect their integrity and are acceptable.

In summary, the integrity of the above bolted connections and other bolted connections with similar material is acceptable provided no rejectable conditions are observed during the general visual examination and the observed leakage is less than 120 drops per minute. No further actions are required on these bolted connection unless otherwise specified by the System Engineer or the OPT-80.1 Leakage Evaluation Team.

C.6. Quality Class Determinations

Quality class of the components involved in this ESR is Quality Class A.

D. INSTALLATION SECTION

This section is not applicable to this ESR.

E. TURNOVER SUMMARY

No turnover to Operation is required for this ESR.

ATTACHMENT 1
Sheet 1 of 1
GENERAL VISUAL EXAMINATION DATA SHEET

Component: _____ Exam Date: _____

Exam Method: Direct Remote

Check the following applicable examination attributes:

The "as-found" condition was found to be acceptable.

Recordable Conditions:

Localized corrosion and/or pitting that visually appears to have REDUCED the bolt or stud cross-section or REDUCED the material thickness of the affected component. **NOTE:** General corrosion and light surface pitting are NOT considered abnormal and are NOT required to be recorded

Bent, twisted, fractured, and/or deformed bolts, studs, nuts, or washers.

Missing bolts, studs, nuts, or washers,

Other conditions (e.g., gouges, excessive wear, corrosion staining emerging from the connection) which may indicate degradation of the bolted connection. **NOTE:** Conditions, such as fabrication marks, scratches, surface abrasion, material roughness, and any other conditions acceptable by the material, design, and manufacturing specification are NOT considered abnormal and are NOT required to be recorded

Remarks: _____

QC Examiner _____

ATTACHMENT 3
Sheet 1 of 1
INTEGRITY DISPOSITION DATA SHEET

Exam Date:

Affected Component(s):

- 1) The number and service age of the bolts:
- 2) Bolt and component materials:
- 3) Corrosiveness of the process fluid that is leaking: (See the Evaluation section of this ESR for Reactor Coolant)
- 4) Leakage location and system function:
- 5) Leakage history at the connection or other system components:
- 6) Visual evidence of corrosion at the connection:

Disposition:

Evaluator: _____ Date: _____

ATTACHMENT 4

OPT-80.1 FOR THE B113R1 OUTAGE

COMPLETED GENERAL VISUAL EXAMINATION DATA SHEETS

AND

COMPLETED INTEGRITY DISPOSITION DATA SHEETS

ATTACHMENT 1
Sheet 1 of 1
GENERAL VISUAL EXAMINATION DATA SHEET

Component: CRD 46-15 Exam Date: 3/19/00

Exam Method: Direct Remote

Check the following applicable examination attributes:

The "as-found" condition was found to be acceptable.

Recordable Conditions:

Localized corrosion and/or pitting that visually appears to have REDUCED the bolt or stud cross-section or REDUCED the material thickness of the affected component. **NOTE:** General corrosion and light surface pitting are NOT considered abnormal and are NOT required to be recorded

Bent, twisted, fractured, and/or deformed bolts, studs, nuts, or washers.

Missing bolts, studs, nuts, or washers,

Other conditions (e.g., gouges, excessive wear, corrosion staining emerging from the connection) which may indicate degradation of the bolted connection. **NOTE:** Conditions, such as fabrication marks, scratches, surface abrasion, material roughness, and any other conditions acceptable by the material, design, and manufacturing specification are NOT considered abnormal and are NOT required to be recorded

Remarks: Bolting appears minor surface corrosion.
to have →

QC Examiner *Kevin By*

ATTACHMENT 1
Sheet 1 of 1
GENERAL VISUAL EXAMINATION DATA SHEET

Component: CRD 14-31 Exam Date: 3/19/00

Exam Method: Direct Remote

Check the following applicable examination attributes:

The "as-found" condition was found to be acceptable.

Recordable Conditions:

Localized corrosion and/or pitting that visually appears to have REDUCED the bolt or stud cross-section or REDUCED the material thickness of the affected component. **NOTE:** General corrosion and light surface pitting are NOT considered abnormal and are NOT required to be recorded

Bent, twisted, fractured, and/or deformed bolts, studs, nuts, or washers.

Missing bolts, studs, nuts, or washers,

Other conditions (e.g., gouges, excessive wear, corrosion staining emerging from the connection) which may indicate degradation of the bolted connection. **NOTE:** Conditions, such as fabrication marks, scratches, surface abrasion, material roughness, and any other conditions acceptable by the material, design, and manufacturing specification are NOT considered abnormal and are NOT required to be recorded

Remarks: Leak at flange connection - bolting
looks acceptable.

QC Examiner *[Signature]*

ATTACHMENT 1
Sheet 1 of 1
GENERAL VISUAL EXAMINATION DATA SHEET

Component: CRD 14-27 Exam Date: 3/19/00

Exam Method: Direct Remote

Check the following applicable examination attributes:

The "as-found" condition was found to be acceptable.

Recordable Conditions:

Localized corrosion and/or pitting that visually appears to have REDUCED the bolt or stud cross-section or REDUCED the material thickness of the affected component. **NOTE:** General corrosion and light surface pitting are NOT considered abnormal and are NOT required to be recorded

Bent, twisted, fractured, and/or deformed bolts, studs, nuts, or washers.

Missing bolts, studs, nuts, or washers,

Other conditions (e.g., gouges, excessive wear, corrosion staining emerging from the connection) which may indicate degradation of the bolted connection.

NOTE: Conditions, such as fabrication marks, scratches, surface abrasion, material roughness, and any other conditions acceptable by the material, design, and manufacturing specification are NOT considered abnormal and are NOT required to be recorded

Remarks: Bolting appears to have minor surface
corrosion

QC Examiner [Signature]

ATTACHMENT 1
Sheet 1 of 1
GENERAL VISUAL EXAMINATION DATA SHEET

Component: 1B21-F028P Exam Date: 3-19-2000

Exam Method: Direct Remote

Check the following applicable examination attributes:

The "as-found" condition was found to be acceptable.

Recordable Conditions:

Localized corrosion and/or pitting that visually appears to have REDUCED the bolt or stud cross-section or REDUCED the material thickness of the affected component. **NOTE:** General corrosion and light surface pitting are NOT considered abnormal and are NOT required to be recorded

Bent, twisted, fractured, and/or deformed bolts, studs, nuts, or washers.

Missing bolts, studs, nuts, or washers,

Other conditions (e.g., gouges, excessive wear, corrosion staining emerging from the connection) which may indicate degradation of the bolted connection.
NOTE: Conditions, such as fabrication marks, scratches, surface abrasion, material roughness, and any other conditions acceptable by the material, design, and manufacturing specification are NOT considered abnormal and are NOT required to be recorded

Remarks: Light Rust

QC Examiner 

Evaluate Pressure Retaining Bolts Per ASME Section XI

ATTACHMENT 1
Sheet 1 of 1
GENERAL VISUAL EXAMINATION DATA SHEET

Component: 1621-F028A Exam Date: 3-19-2000

Exam Method: Direct Remote

Check the following applicable examination attributes:

The "as-found" condition was found to be acceptable.

Recordable Conditions:

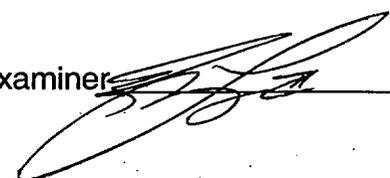
Localized corrosion and/or pitting that visually appears to have REDUCED the bolt or stud cross-section or REDUCED the material thickness of the affected component.
NOTE: General corrosion and light surface pitting are NOT considered abnormal and are NOT required to be recorded

Bent, twisted, fractured, and/or deformed bolts, studs, nuts, or washers.

Missing bolts, studs, nuts, or washers,

Other conditions (e.g., gouges, excessive wear, corrosion staining emerging from the connection) which may indicate degradation of the bolted connection.
NOTE: Conditions, such as fabrication marks, scratches, surface abrasion, material roughness, and any other conditions acceptable by the material, design, and manufacturing specification are NOT considered abnormal and are NOT required to be recorded

Remarks: Light Rust

QC Examiner  _____

ATTACHMENT 1
Sheet 1 of 1
GENERAL VISUAL EXAMINATION DATA SHEET

Component: 1-B21-F028B Exam Date: 3-19-2000

Exam Method: Direct Remote

Check the following applicable examination attributes:

The "as-found" condition was found to be acceptable.

Recordable Conditions:

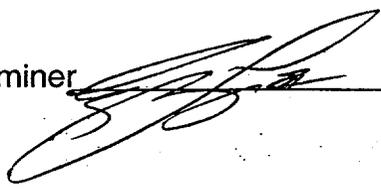
Localized corrosion and/or pitting that visually appears to have REDUCED the bolt or stud cross-section or REDUCED the material thickness of the affected component. **NOTE:** General corrosion and light surface pitting are NOT considered abnormal and are NOT required to be recorded

Bent, twisted, fractured, and/or deformed bolts, studs, nuts, or washers.

Missing bolts, studs, nuts, or washers,

Other conditions (e.g., gouges, excessive wear, corrosion staining emerging from the connection) which may indicate degradation of the bolted connection.
NOTE: Conditions, such as fabrication marks, scratches, surface abrasion, material roughness, and any other conditions acceptable by the material, design, and manufacturing specification are NOT considered abnormal and are NOT required to be recorded

Remarks: Light Rust

QC Examiner  _____

NC
3/19/00

ATTACHMENT 1

Sheet 1 of 1

GENERAL VISUAL EXAMINATION DATA SHEET

Component: 22-43 Exam Date: 3-19-2000

Exam Method: Direct Remote

Check the following applicable examination attributes:

The "as-found" condition was found to be acceptable.

Recordable Conditions:

Localized corrosion and/or pitting that visually appears to have REDUCED the bolt or stud cross-section or REDUCED the material thickness of the affected component. **NOTE:** General corrosion and light surface pitting are NOT considered abnormal and are NOT required to be recorded

Bent, twisted, fractured, and/or deformed bolts, studs, nuts, or washers.

Missing bolts, studs, nuts, or washers,

Other conditions (e.g., gouges, excessive wear, corrosion staining emerging from the connection) which may indicate degradation of the bolted connection. **NOTE:** Conditions, such as fabrication marks, scratches, surface abrasion, material roughness, and any other conditions acceptable by the material, design, and manufacturing specification are NOT considered abnormal and are NOT required to be recorded

Remarks: _____

QC Examiner John Campbell

JK
3/21/00

ATTACHMENT 1
Sheet 1 of 1
GENERAL VISUAL EXAMINATION DATA SHEET

Component: 06-15 Exam Date: 3-21-2000

Exam Method: Direct Remote

Check the following applicable examination attributes:

The "as-found" condition was found to be acceptable.

Recordable Conditions:

- Localized corrosion and/or pitting that visually appears to have REDUCED the bolt or stud cross-section or REDUCED the material thickness of the affected component. **NOTE:** General corrosion and light surface pitting are NOT considered abnormal and are NOT required to be recorded
- Bent, twisted, fractured, and/or deformed bolts, studs, nuts, or washers.
- Missing bolts, studs, nuts, or washers,
- Other conditions (e.g., gouges, excessive wear, corrosion staining emerging from the connection) which may indicate degradation of the bolted connection. **NOTE:** Conditions, such as fabrication marks, scratches, surface abrasion, material roughness, and any other conditions acceptable by the material, design, and manufacturing specification are NOT considered abnormal and are NOT required to be recorded

Remarks: _____

QC Examiner John Campbell

ATTACHMENT 1
Sheet 1 of 1
GENERAL VISUAL EXAMINATION DATA SHEET

Component: 30-15 Exam Date: 3-21-2000

Exam Method: Direct Remote

Check the following applicable examination attributes:

The "as-found" condition was found to be acceptable.

Recordable Conditions:

- Localized corrosion and/or pitting that visually appears to have REDUCED the bolt or stud cross-section or REDUCED the material thickness of the affected component. **NOTE:** General corrosion and light surface pitting are NOT considered abnormal and are NOT required to be recorded
- Bent, twisted, fractured, and/or deformed bolts, studs, nuts, or washers.
- Missing bolts, studs, nuts, or washers,
- Other conditions (e.g., gouges, excessive wear, corrosion staining emerging from the connection) which may indicate degradation of the bolted connection. **NOTE:** Conditions, such as fabrication marks, scratches, surface abrasion, material roughness, and any other conditions acceptable by the material, design, and manufacturing specification are NOT considered abnormal and are NOT required to be recorded

Remarks: _____

QC Examiner *John Campbell*

ATTACHMENT 1
Sheet 1 of 1
GENERAL VISUAL EXAMINATION DATA SHEET

Component: 14-19 Exam Date: 3-21-2000

Exam Method: Direct Remote

Check the following applicable examination attributes:

The "as-found" condition was found to be acceptable.

Recordable Conditions:

- Localized corrosion and/or pitting that visually appears to have REDUCED the bolt or stud cross-section or REDUCED the material thickness of the affected component. **NOTE:** General corrosion and light surface pitting are NOT considered abnormal and are NOT required to be recorded
- Bent, twisted, fractured, and/or deformed bolts, studs, nuts, or washers.
- Missing bolts, studs, nuts, or washers,
- Other conditions (e.g., gouges, excessive wear, corrosion staining emerging from the connection) which may indicate degradation of the bolted connection.
NOTE: Conditions, such as fabrication marks, scratches, surface abrasion, material roughness, and any other conditions acceptable by the material, design, and manufacturing specification are NOT considered abnormal and are NOT required to be recorded

Remarks: _____

QC Examiner *John Campbell*

**Attachment 1
Screening Criteria Checklist**

Identification No. 00-0544 BNP HNP RNP Revision 0

Implementing Document No. ESR 99-00418 Revision 0

References: Technical Specifications 3.1.3, 3.4.1, 3.4.4, 3.4.5, 3.6.1.3, 3.10.1, B3.4.4, B3.6.1.3, & B3.10; UFSAR sections 5.2.4; and TRM 3.14 & 5.5.14.

- | | | | |
|----|---|--------------------------|-------------------------------------|
| 3. | Does the proposed activity constitute one of the following changes: | <u>YES</u> | <u>NO</u> |
| | A change to the facility as described in the SAR | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | A change to procedures as described in the SAR | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | A special test or experiment not described in the SAR | <input type="checkbox"/> | <input checked="" type="checkbox"/> |

If the answer provided to any part of question 3 is "Yes," ensure completion of Attachment 3. If the answers to question 3 are "No," provide justification and references. Continue answering the remaining screen questions.

Justification and references: *ESR 99-00418 evaluates the pressure retaining bolted connections that have routinely leaked during the last two Unit 1 OPT-80.1 pressure tests. In addition, this ESR establishes corrective action guidelines for identified leakage at bolted connections during the performance of this pressure test. As such, the issuance of this ESR will not alter the function or configuration of any plant structure, system, or component described in the UFSAR. For this reason, the approval and issuance of this ESR will not involve a change to the facility as described in the UFSAR.*

Approval and implementation of this revision will not alter the requirements specified in sections 5.2.4 or 5.2.5 of the UFSAR. As stated earlier, this ESR is written to assure compliance with the applicable requirements specified in the ASME Section XI Code, Relief Request #17, and 10 CFR 50.55a. Therefore, the implementation of this ESR will not alter any existing procedures described in referenced UFSAR sections.

ESR 99-00418 will not direct the performance of any activity that will affect a plant structure, system or component. As such, the implementation of this ESR will not introduce any new testing or experiment not described in the UFSAR.

References: UFSAR sections 5.2, 5.3, 5.2.4, 5.2.5, 5.4.1, & 5.4.5; ASME Section XI Code; 10 CFR 50.55a, Relief Request #17, and Letter from the NRC, Brunswick Steam Electric Plant, Unit Nos. 1 and 2 - In-service Inspection Program - Third 10-Year Interval - Evaluation of Requests for Relief Nos. RR-1 Through RR-25 (TAC Nos. MA2108 and MA2109), Dated February 17, 2000

NOTE: If FSAR/UFSAR changes are needed as a result of the proposed activity, refer to procedures AP-603 [HNP], AP-021 [RNP], 0AP-024 [BNP].

**Attachment 1
Screening Criteria Checklist**

Identification No. 00-0544 BNP HNP RNP

Revision 0

Implementing Document No. ESR 99-00418

Revision 0

For questions 4 through 10 apply the following:

If the answer to the question is "Yes" and a previously completed evaluation does not exist which fully bounds this change, ensure completion of the associated attachment (e.g., Question 4 and Attachment 4) and answer the remaining questions.

If the answer to the question is "Yes" and a previously completed evaluation exists which fully bounds this change, then document the previous evaluation's identification number in the applicable section and answer the remaining questions.

If the answer to the question is "No" proceed to the next screen question.

The information sources used in determining the answers to the following questions may be documented in the appropriate spaces provided below, although not required.

- | | | | |
|-----|--|---------------------------------|---|
| 4. | Does the proposed activity involve a change to the equipment, procedures, or other processes related to the Emergency Preparedness Program? | YES
<input type="checkbox"/> | NO
<input checked="" type="checkbox"/> |
| 5. | Does the proposed activity involve a change to the Security Plan, the Safeguards Contingency Plan or the Security Personnel Training and Qualification Plan? | YES
<input type="checkbox"/> | NO
<input checked="" type="checkbox"/> |
| 6. | Does the proposed activity involve a change to the Quality Assurance Program Description? | YES
<input type="checkbox"/> | NO
<input checked="" type="checkbox"/> |
| 7. | Does the proposed activity involve a change to the Emergency Response Data System? | YES
<input type="checkbox"/> | NO
<input checked="" type="checkbox"/> |
| 8. | Does the proposed activity involve a change to the Process Control Program or the Offsite Dose Calculation Manual? | YES
<input type="checkbox"/> | NO
<input checked="" type="checkbox"/> |
| 9. | Does the proposed activity involve a change to the Fire Protection Program? | YES
<input type="checkbox"/> | NO
<input checked="" type="checkbox"/> |
| 10. | Does the proposed activity involve a change to the licensed operator requalification program? | YES
<input type="checkbox"/> | NO
<input checked="" type="checkbox"/> |

Proceed to the appropriate site specific screening checklist(s).

Attachment 1
Screening Criteria Checklist

Identification No. 00-0544 BNP HNP RNP Revision 0
Implementing Document No. ESR 99-00418 Revision 0

11. Does the proposed activity involve a change in thermal or chemical effluents or involve a significant change to land use that could impact the environment? YES NO

If "Yes" and a previously completed evaluation does not exist which fully bounds this change, complete Attachment 11 [BNP].

If "Yes" and a previously completed evaluation exists which fully bounds this change, then document the previous evaluation's identification number.

Continue answering the remaining questions.

12. Does the proposed activity involve a major change to a Radwaste Treatment System that could potentially cause a deviation from the type or quantity of radioactive effluent released (ref. 0E&RC-2015)? YES NO

If "Yes," refer to the indicated plant procedure for disposition. Continue answering the remaining questions.

13. Does the proposed activity impact, or have the potential to impact, the Technical Specification Bases or the Technical Requirements Manual? YES NO

If "Yes," process a Technical Specification Bases change in accordance with 0AP-19 or a TRM change in accordance with the TRM.

The information sources used in determining the answers to the above may be documented in the appropriate spaces provided.

Attach this screen any completed evaluations to the document package for the change or activity being evaluated.

Preparer: Jerry W. Croce / Jerry W. Croce (Print/Sign) Date: 3/19/00

Reviewer: B. Straley / B. Straley (Print/Sign) Date: 21 MAR 2000

Interdiscipline Review (if required): _____ Date: _____
Discipline/Print Name/Signature

Interdiscipline Review (if required): _____ Date: _____
Discipline/Print Name/Signature

Interdiscipline Review (if required): _____ Date: _____
Discipline/Print Name/Signature

Supervisor: J. McIntyre / J. McIntyre (Print/Sign) Date: 03/21/00

Distribution Determination: Yes No

If an unreviewed safety question determination will be performed to complete this evaluation or if credit is being taken for a previously approved unreviewed safety question determination, indicate "Yes" in the block provided.