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SUBJECT: Final deficiency rept re failure to meet design pressure, temp &/or min wall thickness requirements in DHR sys. Initially reported on 930505.Nonconforming flanges will be stress analyzed using final loads from stress analysis.

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MAY 2 4 1993

BLRD-50-438/93-02
BLRD-50-439/93-02

10 CFR 50.55(e)

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

Gentlemen:

In the Matter of the Application of)
Tennessee Valley Authority)

Docket Nos. 50-438
50-439

BELLEFONTE NUCLEAR PLANT (BLN) - UNITS 1 AND 2 - FAILURE TO MEET DESIGN PRESSURE, TEMPERATURE, AND/OR MINIMUM WALL THICKNESS REQUIREMENTS IN THE DECAY HEAT REMOVAL SYSTEM - BLRD-50-438/93-02 AND BLRD-50-439/93-02 - FINAL REPORT

The subject deficiency was reported to the NRC Operations Center on May 5, 1993 in accordance with 10 CFR 50.55(e)(3) as Significant Corrective Action Reports (SCARs) BLSCA930003 and BLSCA930004. Enclosed is TVA's final report on this subject.

Should there be any questions regarding this information, please telephone Ralph Shell, BLN Acting Site Licensing Manager, at (205) 574-8058.

Fred McCluskey
H. Fred McCluskey

Enclosure

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ENCLOSURE
BELLEFONTE NUCLEAR PLANT (BLN) UNITS 1 AND 2
FAILURE TO MEET DESIGN PRESSURE, TEMPERATURE, AND/OR MINIMUM WALL THICKNESS REQUIREMENTS IN THE DECAY HEAT REMOVAL SYSTEM
SIGNIFICANT CORRECTIVE ACTION REPORTS (SCARs)
BLSCA930003 AND BLSCA930004
BLRD-50-438/93-02 AND BLRD-50-439/93-02

FINAL REPORT

DESCRIPTION OF DEFICIENCY

During the design review of the Decay Heat Removal (DHR) system (approximately March 29, 1993), discrepancies were found between the procurement specifications and the National Valve and Manufacturing Company (NAVCO) supplied spool pieces. As BLN's principal piping supplier, only NAVCO supplied spool pieces to BLN. Flanges were found that were defined in the procurement document to require stainless steel Type 316 but were described on NAVCO drawings and supplied as Type 304 by NAVCO. The operating temperature and pressure ratings that the Type 304 material may see will exceed the design ratings for that material.

Fittings (elbows, reducers, weldolets, etc.) were also found that were defined in the procurement document to require a different schedule material than that described on NAVCO drawings and supplied by NAVCO. The material received may not meet the minimum wall thickness requirements for the DHR system.

The flanges involved are located in the Auxiliary Building at elevation 590' and 610', Rooms A4, A7, A17, A20, A25, A27, A40, and A45. The fittings involved are located in the Auxiliary Building at elevation 610', Rooms A4, A7, A25, and A27. See the attachment for a listing of the Unit 1 and Unit 2 material identified to date.

Thirty (30) flanges and twenty-nine (29) fittings have been identified to be involved in the Unit 1 DHR system. Twenty (20) additional flanges have been identified in the Unit 2 DHR system. Unit 2 fittings have not been identified since some of them are not yet installed and a detailed engineering review of the Unit 2 systems has not yet been performed.

SAFETY IMPLICATIONS

The flanges have a specified design condition of 675 psig at 350°F. The Type 304 flanges supplied have a maximum pressure rating of 470 psig at a service temperature 350°F per the ASME Boiler and Pressure Vessel Code. The design condition that these flanges could be subjected to exceeds the allowable pressure-temperature ratings for the Type 304 flanges.

The incorrect piping schedule was received from NAVCO for some fittings. The minimum wall thickness requirements may not be met by the schedule provided.

The primary safety function of the DHR system is to supply low pressure injection to the reactor vessel following a loss-of-coolant accident (LOCA). A failure of a flange or a fitting in a single DHR train in conjunction with the loss of the redundant train may result in a total loss of low pressure injection capabilities.

A cursory review of other systems indicates that NAVCO-supplied spool pieces containing the same schedule and material problems have been installed.

CAUSE

These spool pieces were received onsite from approximately 1974 through 1977. A Root Cause Analysis shows that the procedural requirements to ensure that details such as the materials and/or wall thickness schedule listed on the NAVCO Bill of Material were compared item-by-item to the TVA specified Bill of Material were not adequately implemented. An implicit policy at the time of material acceptance was to rely on the NAVCO ASME QA program that supplied 'NPT' stamped components to prevent discrepancies. TVA's review of the NAVCO Bill of Materials did not include the material and/or wall thickness schedule used in the spool pieces. NAVCO spool assemblies were inspected to TVA-approved NAVCO drawings, which contained the material and schedule substitution errors.

CORRECTIVE ACTIONS

Unit 1 and Unit 2 systems containing shop fabricated spools manufactured by NAVCO will be identified. A comparison will be made between NAVCO Certified Material Test Reports and the TVA Bill of Materials via the NAVCO Bill of Materials for fittings that are a part of these spool pieces. The pressure class ratings of the flanges will be reviewed for systems containing stainless steel NAVCO spool pieces with design pressures greater than 150 psig.

Nonconforming flanges will be identified and stress analyzed per the ASME Code using final loads from the piping system stress analysis; those in overstress will be replaced with flanges conforming to the required design conditions. Those flanges which meet the stress analysis limits will be accepted-as-is with the formal stress analysis calculations demonstrating compliance with the ASME Code providing the technical justification for this disposition.

Nonconforming fittings will be identified and evaluated for acceptable wall thickness. Those fittings found to have adequate wall thickness will be accepted-as-is, with the wall thickness calculations forming the basis for this disposition, and will be included in the final stress analysis of the piping system. Those fittings found to have potentially

inadequate wall thickness will have their wall thickness ultrasonically measured in the field. Fittings with acceptable wall thickness based on ultrasonic measurements will be accepted-as-is and these field measurements, attached to the wall thickness calculation, will form the technical basis for the disposition. Those fittings found to have inadequate wall thickness will be evaluated on a case-by-case basis to determine whether they can be repaired by weld metal addition to the pipe wall. Repaired fittings will be ultrasonically measured to confirm acceptable wall thickness. Fittings which can not be repaired will be replaced with fittings in conformance with the original design specification.

Current procedures require the verification of material attributes upon receipt to the procurement document rather than to drawings, as was allowed previously. Therefore, procedural controls are in place to preclude recurrence.

These corrective actions will be completed by December 1, 1997 for Unit 1 and by December 1, 2000 for Unit 2.

ATTACHMENT
BELLEFONTE NUCLEAR PLANT (BLN) UNITS 1 AND 2
BLRD-50-438/93-02 AND BLRD-50-439/93-02

SPOOL #	TVA PROCUREMENT DOCUMENT REQUIREMENTS	NAVCO SUPPLIED MATERIAL FABRICATION SHEETS	ERROR
1ND-19	18" 300# SA182 F316 WN FLANGE	18" 300# SA182 F304 WN FLANGE	TYPE
2ND-19	18" 300# SA182 F316 WN FLANGE	18" 300# SA182 F304 WN FLANGE	TYPE
1ND-19	3" SCH 40S WELDOLET	3" SCH 80S WELDOLET	SCHEDULE
1ND-19	1" SCH 40S WELDOLET	1" SCH 80S WELDOLET	SCHEDULE
1ND-19	2" SCH 40S WELDOLET	2" SCH 80S WELDOLET	SCHEDULE
1ND-20	14" SCH 40 90° LR ELL	14" SCH 40S 90° LR ELL	SCHEDULE
1ND-20	18" SCH 80S x 14" SCH 40 CONC RED	18" SCH 80S x 14" SCH 40S CONC RED	SCHEDULE
1ND-20	18" 300# SA182 F316 WN FLANGE	18" 300# SA182 F304 WN FLANGE	TYPE
2ND-20	18" 300# SA182 F316 WN FLANGE	18" 300# SA182 F304 WN FLANGE	TYPE
1ND-20	14" 600# SA182 F316 WN FLANGE	14" 600# SA182 F304 WN FLANGE	TYPE
1ND-29	18" SCH 80S x 18" SCH 80S x 14" SCH 40 RED TEE	18" SCH 80S x 18" SCH 80S x 14" SCH 40S RED TEE	SCHEDULE
1ND-29	18" 300# SA182 F316 WN FLANGE	18" 300# SA182 F304 WN FLANGE	TYPE
2ND-29	18" 300# SA182 F316 WN FLANGE	18" 300# SA182 F304 WN FLANGE	TYPE
1ND-29	4" SCH 40S WELDOLET	4" SCH 80S WELDOLET	SCHEDULE
1ND-29	1" SCH 40S WELDOLET	1" SCH 80S WELDOLET	SCHEDULE
1ND-29	2" SCH 40S WELDOLET	2" SCH 80S WELDOLET	SCHEDULE
1ND-30	14" SCH 40 90° LR ELL	14" SCH 40S 90° LR ELL	SCHEDULE
1ND-30	18" SCH 80S x 14" SCH 40 CONC RED	18" SCH 80S x 14" SCH 40S CONC RED	SCHEDULE
1ND-30	18" 300# SA182 F316 WN FLANGE	18" 300# SA182 F304 WN FLANGE	TYPE
2ND-30	18" 300# SA182 F316 WN FLANGE	18" 300# SA182 F304 WN FLANGE	TYPE
1ND-30	14" 600# SA182 F316 WN FLANGE	14" 600# SA182 F304 WN FLANGE	TYPE
1ND-31	14" SCH 40 90° LR ELL	14" SCH 40S 90° LR ELL	SCHEDULE
1ND-31	14" SCH 40 45° LR ELL	14" SCH 40S 45° LR ELL	SCHEDULE
1ND-32	14" SCH 40 90°LR ELL	14" SCH 40S 90°LR ELL	SCHEDULE
1ND-33	14" SCH 40 90°LR ELL	14" SCH 40S 90°LR ELL	SCHEDULE
1ND-34	14" SCH 40 90°LR ELL	14" SCH 40S 90°LR ELL	SCHEDULE

SPOOL #	TVA PROCUREMENT DOCUMENT REQUIREMENTS	NAVCO SUPPLIED MATERIAL FABRICATION SHEETS	ERROR
1ND-35	14" SCH 40 90°LR ELL	14" SCH 40S 90°LR ELL	SCHEDULE
1ND-37	14" SCH 40 90°LR ELL	14" SCH 40S 90°LR ELL	SCHEDULE
1ND-39	14" SCH 40 90°LR ELL	14" SCH 40S 90°LR ELL	SCHEDULE
1ND-41	14" SCH 40 90°LR ELL	14" SCH 40S 90°LR ELL	SCHEDULE
1ND-42	14" SCH 40 90°LR ELL	14" SCH 40 on one end and SCH 40S on other 90°LR ELL	SCHEDULE
1ND-42	14" SCH 40 45°LR ELL	14" SCH 40S 45°LR ELL	SCHEDULE
1ND-43	14" SCH 40 90°LR ELL	14" SCH 40S 90°LR ELL	SCHEDULE
1ND-44	14" SCH 40 90°LR ELL	14" SCH 40S 90°LR ELL	SCHEDULE
1ND-45	14" SCH 40 90°LR ELL	14" SCH 40S 90°LR ELL	SCHEDULE
1ND-46	10" 300# SA182 F316 WN FLANGE	10" 300# SA182 F304 WN FLANGE	TYPE
2ND-46	10" 300# SA182 F316 WN FLANGE	10" 300# SA182 F304 WN FLANGE	TYPE
1ND-46	12" 600# SA182 F316 WN FLANGE	12" 600# SA182 F304 WN FLANGE	TYPE
1ND-47	10" 300# SA182 F316 WN FLANGE	10" 300# SA182 F304 WN FLANGE	TYPE
2ND-47	10" 300# SA182 F316 WN FLANGE	10" 300# SA182 F304 WN FLANGE	TYPE
1ND-51	8" 300# SA182 F316 WN FLANGE	8" 300# SA182 F304 WN FLANGE	TYPE
2ND-51	8" 300# SA182 F316 WN FLANGE	8" 300# SA182 F304 WN FLANGE	TYPE
1ND-52	18" SCH 80S x 10" SCH 40S CONC RED	18" SCH 40S x 10" SCH 40S CONC RED	SCHEDULE
1ND-52	18" 300# SA182 F316 WN FLANGE BORE SCH 80S	18" 300# SA182 F304 WN FLANGE BORE SCH 40S	TYPE & SCHEDULE
2ND-52	18" 300# SA182 F316 WN FLANGE BORE SCH 80S	18" 300# SA182 F304 WN FLANGE BORE SCH 40S	TYPE & SCHEDULE
1ND-53	18" SCH 80S x 10" SCH 40S CONC RED	18" SCH 40S x 10" SCH 40S CONC RED	SCHEDULE
1ND-53	18" 300# SA182 F316 WN FLANGE BORE SCH 80S	18" 300# SA182 F304 WN FLANGE BORE SCH 40S	TYPE & SCHEDULE
2ND-53	18" 300# SA182 F316 WN FLANGE BORE SCH 80S	18" 300# SA182 F304 WN FLANGE BORE SCH 40S	TYPE & SCHEDULE
1ND-58	12" 300# SA182 F316 ORIFICE FLANGE	12" 300# SA182 F304 ORIFICE FLANGE	TYPE
2ND-58	12" 300# SA182 F316 ORIFICE FLANGE	12" 300# SA182 F304 ORIFICE FLANGE	TYPE
1ND-58	8" 300# SA182 F316 WN FLANGE	8" 300# SA182 F304 WN FLANGE	TYPE
2ND-58	8" 300# SA182 F316 WN FLANGE	8" 300# SA182 F304 WN FLANGE	TYPE

SPOOL #	TVA PROCUREMENT DOCUMENT REQUIREMENTS	NAVCO SUPPLIED MATERIAL FABRICATION SHEETS	ERROR
1ND-59	12" 300# SA182 F316 ORIFICE FLANGE	12" 300# SA182 F304 ORIFICE FLANGE	TYPE
2ND-59	12" 300# SA182 F316 ORIFICE FLANGE	12" 300# SA182 F304 ORIFICE FLANGE	TYPE
1ND-63	12" 600# SA182 F316 WN FLANGE	12" 600# SA182 F304 WN FLANGE	TYPE
1ND-63	10" 300# SA182 F316 WN FLANGE	10" 300# SA182 F304 WN FLANGE	TYPE
2ND-63	10" 300# SA182 F316 WN FLANGE	10" 300# SA182 F304 WN FLANGE	TYPE
1ND-64	10" 300# SA182 F316 WN FLANGE	10" 300# SA182 F304 WN FLANGE	TYPE
2ND-64	10" 300# SA182 F316 WN FLANGE	10" 300# SA182 F304 WN FLANGE	TYPE
1ND-68	18" SCH 80S x 10" SCH 40S CONC RED	18" SCH 40S x 10" SCH 40S CONC RED	SCHEDULE
1ND-68	18" 300# SA182 F316 WN FLANGE BORE SCH 80S	18" 300# SA182 F304 WN FLANGE BORE SCH 40S	TYPE & SCHEDULE
2ND-68	18" 300# SA182 F316 WN FLANGE BORE SCH 80S	18" 300# SA182 F304 WN FLANGE BORE SCH 40S	TYPE & SCHEDULE
1ND-68	8" 300# SA182 F316 WN FLANGE	8" 300# SA182 F304 WN FLANGE	TYPE
2ND-68	8" 300# SA182 F316 WN FLANGE	8" 300# SA182 F304 WN FLANGE	TYPE
1ND-69	18" SCH 80S x 10" SCH 40S CONC RED	18" SCH 40S x 10" SCH 40S CONC RED	SCHEDULE
1ND-69	18" 300# SA182 F316 WN FLANGE BORE SCH 80S	18" 300# SA182 F304 WN FLANGE BORE SCH 40S	TYPE & SCHEDULE
2ND-69	18" 300# SA182 F316 WN FLANGE BORE SCH 80S	18" 300# SA182 F304 WN FLANGE BORE SCH 40S	TYPE & SCHEDULE
1ND-74	12" 300# SA182 F316 ORIFICE FLANGE	12" 300# SA182 F304 ORIFICE FLANGE	TYPE
2ND-74	12" 300# SA182 F316 ORIFICE FLANGE	12" 300# SA182 F304 ORIFICE FLANGE	TYPE
1ND-74	8" 300# SA182 F316 WN FLANGE	8" 300# SA182 F304 WN FLANGE	TYPE
2ND-74	8" 300# SA182 F316 WN FLANGE	8" 300# SA182 F304 WN FLANGE	TYPE
1ND-75	12" 300# SA182 F316 ORIFICE FLANGE	12" 300# SA182 F304 ORIFICE FLANGE	TYPE
2ND-75	12" 300# SA182 F316 ORIFICE FLANGE	12" 300# SA182 F304 ORIFICE FLANGE	TYPE
1ND-173	8" 150# SA182 F316 WN FLANGE	8" 150# SA182 F304 WN FLANGE	TYPE
1ND-187	8" 150# SA182 F316 WN FLANGE	8" 150# SA182 F304 WN FLANGE	TYPE
1ND-198	3" 150# SA182 F316 WN FLANGE	3" 150# SA182 F304 WN FLANGE	TYPE
1ND-200	3" 150# SA182 F316 WN FLANGE	3" 150# SA182 F304 WN FLANGE	TYPE

SPOOL #	TVA PROCUREMENT DOCUMENT REQUIREMENTS	NAVCO SUPPLIED MATERIAL FABRICATION SHEETS	ERROR
1ND-202	3" 150# SA182 F316 WN FLANGE	3" 150# SA182 F304 WN FLANGE	TYPE
1ND-204	3" 150# SA182 F316 WN FLANGE	3" 150# SA182 F304 WN FLANGE	TYPE