



Tennessee Valley Authority, Post Office Box 2000, Decatur, Alabama 35609-2000

May 22, 2019

10 CFR 50.73

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

Browns Ferry Nuclear Plant, Unit 2
Renewed Facility Operating License No. DPR-52
NRC Docket No. 50-260

Subject: **Licensee Event Report 50-260/2019-001-00**

The enclosed Licensee Event Report provides details of a degraded condition on the Unit 2 Primary Containment System. The Tennessee Valley Authority is submitting this report in accordance with Title 10 of the Code of Federal Regulations (10 CFR) 50.73(a)(2)(ii)(A), as a condition that resulted in a principal safety barrier of the nuclear power plant being seriously degraded; in accordance with 10 CFR 50.73(a)(2)(i)(B), as a condition which was prohibited by the plant's Technical Specifications; and in accordance with 10 CFR 50.73(a)(2)(v)(C), as an event that could have prevented the fulfillment of the safety function of a system that is needed to control the release of radioactive material.

There are no new regulatory commitments contained in this letter. Should you have any questions concerning this submittal, please contact J. L. Paul, Nuclear Site Licensing Manager, at (256) 729-2636.

Respectfully,

A handwritten signature in blue ink, appearing to read 'DLH'.

D. L. Hughes
Site Vice President

Enclosure: Licensee Event Report 50-260/2019-001-00 –Traversing In-core Probe Purge Header Check Valve Leak Rate in Excess of Technical Specifications Limits.

cc (w/ Enclosure):

NRC Regional Administrator - Region II
NRC Senior Resident Inspector - Browns Ferry Nuclear Plant

ENCLOSURE

**Browns Ferry Nuclear Plant
Unit 2**

Licensee Event Report 50-260/2019-001-00

**Traversing In-core Probe Purge Header Check Valve Leak Rate in Excess of Technical Specifications
Limits.**

See Enclosed



LICENSEE EVENT REPORT (LER)

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Information Services Branch (T-2 F43), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to Infocollects.Resource@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

| | | |
|---|-------------------------------------|--------------------------|
| 1. Facility Name Browns Ferry Nuclear Plant, Unit 2 | 2. Docket Number 05000260 | 3. Page 1 OF 6 |
|---|-------------------------------------|--------------------------|

4. Title
Traversing In-core Probe Purge Header Check Valve Leak Rate in Excess of Technical Specifications Limits

| 5. Event Date | | | 6. LER Number | | | 7. Report Date | | | 8. Other Facilities Involved | |
|---------------|-----|------|---------------|-------------------|---------|----------------|-----|------|------------------------------|---------------|
| Month | Day | Year | Year | Sequential Number | Rev No. | Month | Day | Year | Facility Name | Docket Number |
| 03 | 23 | 2019 | 2019 | 001 | 00 | 05 | 22 | 2019 | N/A | N/A |
| | | | | | | | | | Facility Name | Docket Number |
| | | | | | | | | | N/A | N/A |

| 9. Operating Mode | | 11. This Report is Submitted Pursuant to the Requirements of 10 CFR §: (Check all that apply) | | | |
|-------------------|---|---|--|---|--------------------------------------|
| 5 | <input type="checkbox"/> 20.2201(b) | <input type="checkbox"/> 20.2203(a)(3)(i) | <input checked="" type="checkbox"/> 50.73(a)(2)(ii)(A) | <input type="checkbox"/> 50.73(a)(2)(viii)(A) | |
| | <input type="checkbox"/> 20.2201(d) | <input type="checkbox"/> 20.2203(a)(3)(ii) | <input type="checkbox"/> 50.73(a)(2)(ii)(B) | <input type="checkbox"/> 50.73(a)(2)(viii)(B) | |
| | <input type="checkbox"/> 20.2203(a)(1) | <input type="checkbox"/> 20.2203(a)(4) | <input type="checkbox"/> 50.73(a)(2)(iii) | <input type="checkbox"/> 50.73(a)(2)(ix)(A) | |
| | <input type="checkbox"/> 20.2203(a)(2)(i) | <input type="checkbox"/> 50.36(c)(1)(i)(A) | <input type="checkbox"/> 50.73(a)(2)(iv)(A) | <input type="checkbox"/> 50.73(a)(2)(x) | |
| 10. Power Level | | <input type="checkbox"/> 20.2203(a)(2)(ii) | <input type="checkbox"/> 50.36(c)(1)(ii)(A) | <input type="checkbox"/> 50.73(a)(2)(v)(A) | <input type="checkbox"/> 73.71(a)(4) |
| 0 | <input type="checkbox"/> 20.2203(a)(2)(iii) | <input type="checkbox"/> 50.36(c)(2) | <input type="checkbox"/> 50.73(a)(2)(v)(B) | <input type="checkbox"/> 73.71(a)(5) | |
| | <input type="checkbox"/> 20.2203(a)(2)(iv) | <input type="checkbox"/> 50.46(a)(3)(ii) | <input checked="" type="checkbox"/> 50.73(a)(2)(v)(C) | <input type="checkbox"/> 73.77(a)(1) | |
| | <input type="checkbox"/> 20.2203(a)(2)(v) | <input type="checkbox"/> 50.73(a)(2)(i)(A) | <input type="checkbox"/> 50.73(a)(2)(v)(D) | <input type="checkbox"/> 73.77(a)(2)(i) | |
| | <input type="checkbox"/> 20.2203(a)(2)(vi) | <input checked="" type="checkbox"/> 50.73(a)(2)(i)(B) | <input type="checkbox"/> 50.73(a)(2)(vii) | <input type="checkbox"/> 73.77(a)(2)(ii) | |
| | | <input type="checkbox"/> 50.73(a)(2)(i)(C) | <input type="checkbox"/> OTHER | Specify in Abstract below or in NRC Form 366A | |

12. Licensee Contact for this LER

| | |
|---|--|
| Licensee Contact Baruch Calkin, Licensing Engineer | Telephone Number (Include Area Code) 256-614-6713 |
|---|--|

13. Complete One Line for each Component Failure Described in this Report

| Cause | System | Component | Manufacturer | Reportable to ICES | Cause | System | Component | Manufacturer | Reportable to ICES |
|-------|--------|-----------|--------------|--------------------|-------|--------|-----------|--------------|--------------------|
| X | IG | CKV | T103 | Y | N/A | N/A | N/A | N/A | N/A |

| 14. Supplemental Report Expected | | 15. Expected Submission Date | | |
|---|--|------------------------------|-----|------|
| <input type="checkbox"/> Yes (If yes, complete 15. Expected Submission Date) <input checked="" type="checkbox"/> No | | Month | Day | Year |
| | | N/A | N/A | N/A |

Abstract (Limit to 1400 spaces, i.e., approximately 14 single-spaced typewritten lines)

On March 23, 2019, at approximately 1600 Central Daylight Time (CDT), while performing surveillance testing required prior to initial startup from the Unit 2 Refueling Outage, Local Leak Rate Testing (LLRT) identified the failure of a Primary Containment penetration for the Traversing In-core Probe (TIP) system. Further troubleshooting determined that the TIP Purge Header check valve was leaking by, rendering the test volume unable to be pressurized. The gross leakage Leak Rate value exceeded the Technical Specification allowable value for Type C valves of less than 60 percent of the allowable limit. On March 26, 2019, at approximately 1030 CDT, Engineering evaluation determined that the TIP System leakage test results related to LLRT of the TIP Purge Header Check Valve resulted in a reportable condition. At 1508 CDT, Event Notification 53959 was made to the NRC for a serious degradation of the reactor's principle safety barriers.

The apparent cause of this event was foreign material in the body of the TIP Purge Header check valve which prevented the valve from seating. The immediate corrective action for this condition was to replace the failed valve. An additional corrective action will be implemented to add another check valve in series for penetrations affected by this condition to allow dual barrier containment isolation for Units 1, 2, and 3.



**LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET**

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Information Services Branch (T-2 F43), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to Infocollects.Resource@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

| 1. FACILITY NAME | 2. DOCKET NUMBER | 3. LER NUMBER | | |
|------------------------------------|------------------|---------------|-------------------|---------|
| | | YEAR | SEQUENTIAL NUMBER | REV NO. |
| Browns Ferry Nuclear Plant, Unit 2 | 05000260 | 2019 | - 001 | - 00 |

NARRATIVE

I. Plant Operating Conditions Before the Event

At the time of discovery, Browns Ferry Nuclear Plant (BFN), Unit 2, was in Mode 5 at approximately 0 percent power for the Unit 2 Cycle 20 (2R20) Refueling Outage.

II. Description of Event

A. Event Summary

On March 23, 2019, at approximately 1600 Central Daylight Time (CDT), while performing surveillance testing required prior to initial startup from the Unit 2 Refueling Outage, Local Leak Rate Testing (LLRT) identified a LLRT failure of a Primary Containment penetration [PEN] for the Traversing In-core Probe (TIP) system, 2-X-35F. Further troubleshooting determined that the TIP Purge Header check valve [V], 2-CKV-76-653, was leaking by, which rendered the test volume unable to be pressurized. The gross leakage Leak Rate value exceeded the Technical Specification allowable value for Type C valves of less than 60 percent of the allowable limit. On March 26, 2019, at approximately 1030 CDT, Engineering evaluation determined that the TIP System leakage test results related to LLRT of the TIP Purge Header Check Valve resulted in a reportable condition. At 1508 CDT, Event Notification (EN) 53959 was made to the NRC for a serious degradation of the reactor's principle safety barriers.

The Tennessee Valley Authority is submitting this report in accordance with Title 10 of the Code of Federal Regulations 50.73(a)(2)(i)(B), as a condition which was prohibited by the plant's TS; in accordance with 10 CFR 50.73(a)(2)(ii)(A), as an event that resulted in the condition of the nuclear power plant, including its principal safety barriers, being seriously degraded; and in accordance with 10 CFR 50.73(a)(2)(v)(C), as a condition that could have prevented the fulfillment of the safety function of structures or systems that are needed to control the release of radioactive material.

B. Status of structures, components, or systems that were inoperable at the start of the event and that contributed to the event

There were no structures, systems, or components (SSCs) whose inoperability contributed to this event.



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NARRATIVE

C. Dates and approximate times of occurrences

| <u>Dates & Approximate Times</u> | <u>Occurrence</u> |
|--------------------------------------|--|
| March 23, 2019, 1600 CDT | Operations personnel determined that LLRT of penetration 2-X-35F did not meet acceptance criteria. |
| March 23, 2019, 1801 CDT | Operations personnel declared the TIP Purge Header check valve inoperable. |
| March 26, 2019, 1508 CDT | Engineering evaluation determined that Primary Containment was inoperable, and EN # 53959 was made to the NRC. |

D. Manufacturer and model number of each component that failed during the event

The failed valve was a Teledyne Republic / Parker Series 480 stainless steel 0.375" check valve (part number 483-1/4 B1-2).

E. Other systems or secondary functions affected

The TIP Purge Header Check Valve is a Primary Containment Isolation Valve (PCIV) in a single isolation penetration flow path. Therefore, the failure of this valve resulted in the inoperability of the Primary Containment Isolation System (PCIS) for the entire 2R19 cycle where PCIS was required to be operable in Modes 1, 2, and 3, from March 31, 2017 to March 2, 2019.

F. Method of discovery of each component or system failure or procedural error

The failed valve was discovered when test pressure could not be attained during a Primary Containment Local Leak Rate Test of the TIP system penetration X-35F.

G. The failure mode, mechanism, and effect of each failed component

Foreign material in the body of the check valve prevented the valve from seating.

H. Operator actions

There were no operator actions associated with this event.

I. Automatically and manually initiated safety system responses

No safety system responses resulted from this event.



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III. Cause of the event

A. Cause of each component or system failure or personnel error

The apparent cause of the check valve failure was foreign material in the body of the valve which prevented the valve from seating.

B. Cause(s) and circumstances for each human performance related root cause

There was no human performance related root cause.

IV. Analysis of the event

The safety objective of the Primary Containment System (PCS) is to isolate and contain fission products released from the Reactor Primary System following a Loss of Coolant Design Basis Accident (DBA) and to confine the postulated release of radioactive material. Primary Containment operability is maintained by limiting leakage less than or equal to the maximum allowable leakage rate, except prior to the first startup after performing a required Primary Containment Leakage Rate Testing Program leakage test. At the time of this test, a leakage limit of 60 percent of the maximum allowable leakage rate must be met. Because this limit was exceeded and the timeframe for which the valve failure existed could not be established, the PCS was considered to have been inoperable since the end of the last Unit 2 refueling outage in March 2017. This condition constituted a serious degradation of the reactor's principle safety barriers, which resulted in EN 53959 being reported to the NRC. It was subsequently determined that this condition also resulted in a safety system functional failure of the Unit 2 PCS, but the condition no longer existed, and Unit 2 was not in a Mode of applicability for PCS at the time when the condition was identified.

Technical Specification (TS) Limiting Condition for Operation (LCO) 3.6.1.1 requires the PCS to be operable in Modes 1, 2, and 3. Condition A requires an inoperable containment to be restored to operability within one hour. Condition B requires that the unit be in Mode 3 within twelve hours and in Mode 4 within thirty-six hours if Condition A is not met. Because the PCS was inoperable for longer than the allowed outage time, Unit 2 was in violation of the LCO.

The safety objective of the PCIVs, in combination with other accident mitigation systems, is to limit fission product release during and following postulated DBAs to within limits. Because the time at which TIP Purge Header check valve failed could not be established, the valve was considered to have been inoperable since the end of the last Unit 2 refueling outage in March 2017.

TS LCO 3.6.1.3 requires each PCIV, except reactor building-to-suppression chamber vacuum breakers, to be operable in Modes 1, 2, and 3 when associated instrumentation is required to be OPERABLE per LCO 3.3.6.1, "Primary Containment Isolation Instrumentation." Condition C requires a penetration flow path where the single PCIV for that path is inoperable to be isolated



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NARRATIVE

within four hours (for a valve that is not an excess flow check valve). Condition E requires that the unit be in Mode 3 within twelve hours and in Mode 4 within thirty-six hours if Condition C is not met. Because the valve was inoperable for longer than the allowed outage time, Unit 2 was in violation of the LCO.

TS LCO 3.0.4 states that when an LCO is not met, entry into a Mode or other specified condition in the Applicability shall only be made when the associated ACTIONS to be entered permit continued operation in the MODE or other specified condition in the Applicability for an unlimited period of time. Because Unit 2 made Mode changes from the 2R19 Refueling Outage on March 31, 2017 and from a Forced Outage on May 10, 2018, while this valve was inoperable, Unit 2 was in violation of the LCO.

V. Assessment of Safety Consequences

Risk associated with releases from containment is measured solely in terms of Large Early Release Frequency (LERF). Only containment breaches of two inches in diameter or greater have the potential to credibly result in a Large Early Release. The failed valve was only 0.375 inches in diameter and due to its small size was not capable of allowing a Large Early Release. Therefore this event did not result in a significant increase in risk to the health and safety of the public.

A. Availability of systems or components that could have performed the same function as the components and systems that failed during the event

There were no systems or components that could have performed the same function as the check valve that failed concurrently with the valve.

B. For events that occurred when the reactor was shut down, availability of systems or components needed to shut down the reactor and maintain safe shutdown conditions, remove residual heat, control the release of radioactive material, or mitigate the consequences of an accident

PCIVs are not required to remain operable for their containment isolation functions while the reactor is shut down. All safety systems required in Modes 4 and 5 remained operable.

C. For failure that rendered a train of a safety system inoperable, estimate of the elapsed time from discovery of the failure until the train was returned to service

Work to replace the valve was completed on March 31, 2019, approximately eight days following discovery on March 23. However, the PCS was not required to be operable during this time.



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NARRATIVE

VI. Corrective Actions

Corrective actions for this event are being managed under Condition Report 1501555.

A. Immediate Corrective Actions

The failed valve was replaced.

B. Corrective Actions to Prevent Recurrence or to reduce the probability of similar events occurring in the future

Design changes will be implemented to add another check valve in series for penetrations 1-X-35F, 2-X-35F, and 3-X-35F to allow dual barrier containment isolation for Units 1, 2, and 3. While 1-X-35F and 3-X-35F were not affected by this event, they are both single isolation penetrations and therefore vulnerable to a similar condition.

VII. Previous Similar Events at the Same Site

A search of LERs and the BFN Corrective Action Program found no instance within the past five years of the failure of any single isolation PCIV, or of inoperability of any PCIV due to foreign material in the valve.

VIII. Additional Information

There is no additional information.

IX. Commitments

There are no new commitments.