



**HITACHI**

**GE Hitachi Nuclear Energy**

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M230122

August 31, 2023  
U.S. Nuclear Regulatory Commission  
Document Control Desk  
Washington, D.C. 20555-0001

**Subject: Updated - Part 21 60-Day Interim Report Notification: Failure of the CRD  
Collet Retainer Tube/Outer Tube Weld (SC-23-01)**

This letter provides an update to GE Hitachi's (GEH) interim report regarding a 10 CFR Part 21 evaluation. The update is to remove the following statement from the interim report summary page, "*This 10 CFR Part 21 Notification, its attachments and enclosures may contain proprietary information of GEH/GNF that is maintained in confidence by GEH/GNF and is subject to withholding from public disclosure under 10 CFR 2.390 and 9.17. Such GEH/GNF proprietary information is furnished in confidence solely for the purpose(s) stated in the attached transmittal letter; no other use, direct or indirect, of this GEH/GNF proprietary information is authorized, absent the prior written permission of GEH/GNF.*" This statement has been removed to avoid any confusion regarding the proprietary nature of this interim report. There is no proprietary information in the interim report. There are no other changes to the original report submitted in Reference 1.

The updated information required for this GEH 60-Day Interim Report Notification per §21.21 (a)(2) is attached as Enclosure 1.

Please contact me if there are any questions.

Sincerely,

*Michelle P. Catts*

Michelle P. Catts  
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Reference:

1. M230057, Letter from Michelle P. Catts (GEH) to document control desk dated April 27, 2023, "60-Day Interim Report Notification Information per §21.21(a)(2) and Safety Communication-Non-Proprietary."

cc: E. Lenning, USNRC NRR/DORL/LLPB  
G. George, USNRC NRR/DORL/LLPB  
R. Lorson, USNRC Region I Administrator  
L. Dudes, USNRC Region II Administrator  
J. Giessner, USNRC Region III Administrator  
R. Lewis, USNRC Region IV Administrator (Acting)  
PLM Spec 008N0430

**Document Components:**  
001 M230122 Letter.pdf

ENCLOSURE 1

M230122

Part 21 60-Day Interim Report Notification: Failure of the CRD Collet Retainer  
Tube/Outer Tube Weld (SC-23-01)

Non-Proprietary Information



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# 10 CFR Part 21 Communication

**SC 23-01 R0**  
**007N7348 R0**

*April 27, 2023*

**To: BWR Customers Identified on Attachment 1**

**Subject: Failure of the CRD Collet Retainer Tube/Outer Tube Weld – Interim Notification**

Reportable Condition [21.21(d)]       60 Day Interim Report [21.21(a)(2)]

Transfer of Information [21.21(b)]       Safety Information Communication

**Summary:**

On or about February 27, 2023, following removal of a Control Rod Drive Mechanism (CRDM) from a domestic plant, GE-Hitachi Nuclear Energy (GEH) was notified of the discovery of a 360° failure of the collet retainer tube fillet weld. The weld failure allowed for movement of the retainer tube up the outside of the Cylinder, Tube and Flange (CTF) assembly’s outer tube and spacer. The movement of the retainer tube adversely impacted the CRDM’s operation.

The evaluation of the identified condition, which is potentially associated with a Substantial Safety Hazard (SSH), is ongoing. A Root Cause Analysis is also in-progress, to determine the cause of weld failure and separation of the collet retainer tube, the extent of condition, and corrective actions.

As more time is needed for evaluation, GEH is issuing this 60-Day Interim Notification, in accordance with 10 CFR Part 21.21(a)(2).

GEH expects to complete the evaluation by July 27th, 2023.

Please contact me if there are any questions.

**Issued by:** *Michelle P. Catts*  
Michelle Catts, Safety Evaluation Program Manager  
GE Hitachi Nuclear Energy  
3901 Castle Hayne Rd., Wilmington NC 28402  
(910) 200-9836

*Notice: This 10 CFR Part 21 Notification pertains only to the plants or facilities specifically indicated as being affected. GE Hitachi Nuclear Energy (GEH) and/or Global Nuclear Fuel (GNF) have not considered or evaluated the applicability, if any, of this information to any plants or facilities other than those specifically indicated as being affected and for which GEH/GNF supplied the equipment or services addressed in the Notification. Determination of applicability of this information to a particular plant or facility, and the decision of whether or not to take action based on the Notification, are the responsibilities of the Owner of that plant or facility.*

## Background

During removal of a Control Rod Drive Mechanism (CRDM) from a domestic plant in February 2023, the plant operator discovered that a 360° failure of the collet retainer tube fillet weld had occurred, and the retainer tube had displaced approximately 1.125" from its original position. This retainer tube is part of the CRDM 919D258G003 Cylinder, Tube and Flange (CTF) assembly (see Figure 1). This is the first reported occurrence of significant displacement of the retainer tube on any in-service CTF assembly. The function of this assembly is to react to the applied hydraulic loads allowing the collet fingers to be retracted from the index tube and allow the CRDM to be moved for control rod positioning or scram.

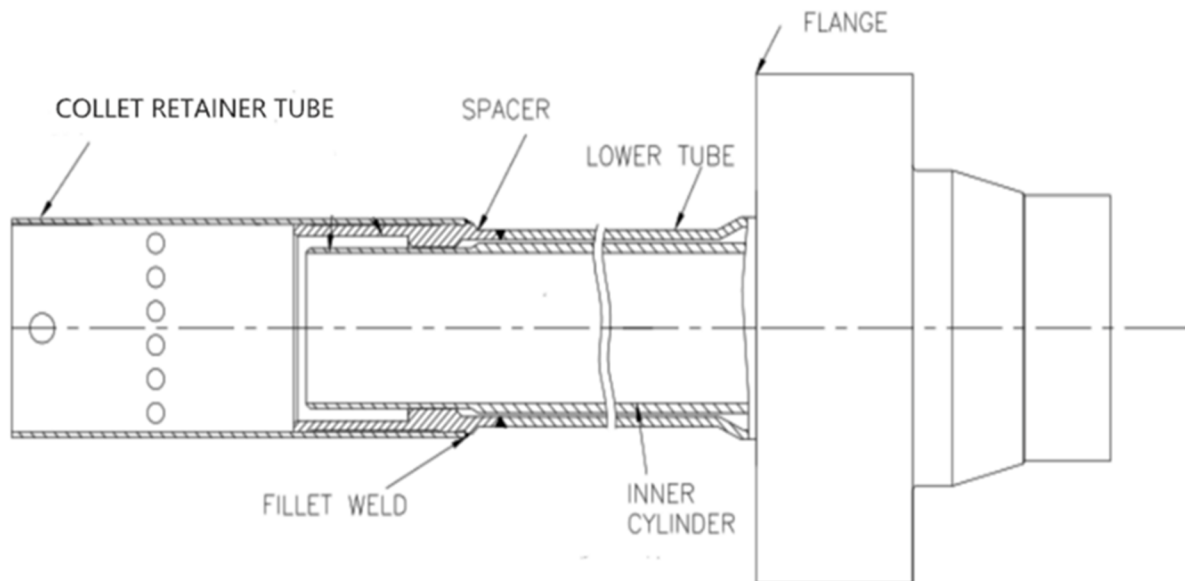


Figure 1 - CTF Assembly

The subject CTF assembly had been in-service since 1992. From 1992 until August 2021, the associated CRDM operated without significant performance issues. Then, during routine control rod exercising in August 2021, the control rod would not withdraw from position 46 to 48. Subsequent troubleshooting by the operator determined the control rod would not insert normally and could not be withdrawn. However, the plant operator was able to fully insert the control rod using elevated drive water differential pressure (DP), and left it inserted until a recent refuel outage.

GEH is conducting a root cause analysis (RCA) to determine the cause of weld failure and separation of the collet retainer tube, the extent of condition, and corrective actions.

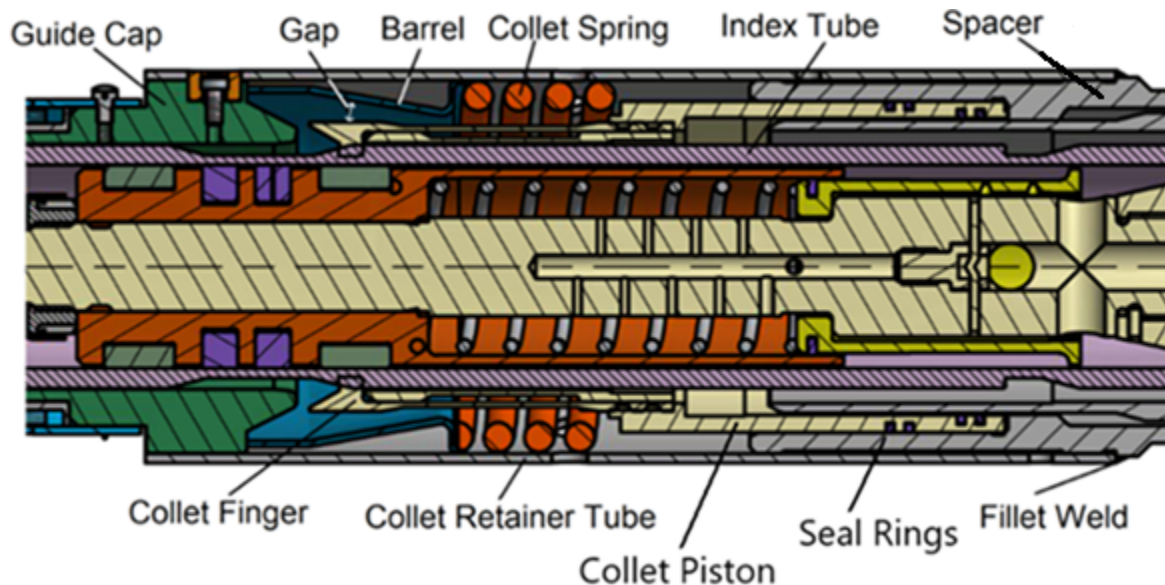
## Discussion

During control rod withdrawal, drive water pressure is applied to the bottom of the collet piston causing it to actuate and press the collet fingers against the guide cap (see Figure 2). With the guide cap fastened to the collet retainer tube the upward force is applied to the tube. With failure of the retainer tube fillet weld, movement of the collet retainer tube is no longer constrained. Therefore, it is expected that movement of the retainer tube may occur during attempts to withdraw the control rod. With significant movement or separation of the collet retainer tube, the

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collet spring expands narrowing the gap between the collet fingers and the barrel and spring. With insufficient gap size, the fingers are restrained which adversely impacts actuation of the collet piston needed for control rod withdrawal.

During normal control rod insertion (not scram), pressure is applied to the under-piston area of the CRDM drive piston connected to the bottom of the index tube. This pressure exerts an upward force which results in control rod insertion. Normally during insertion, the collet piston stays in the latched (down and seated) position and the collet fingers ratchet in and out of the index tube notches as the tube moves up. However, with significant retainer tube movement and narrowing of the gap between the collet fingers and the barrel and spring, the fingers can no longer freely move out of the notches. This creates a friction force opposing rod insertion which then exerts an opposite upward force on the collet fingers and piston. With the collet spring no longer compressed, this upward force can cause upward movement of the fingers with respect to the barrel and spring, which increases the gap. When the gap size increases, this allows the fingers to sufficiently clear the index tube notches, which permits rod insertion. For the recent event, the movement of the retainer tube was such that the positioning of the barrel, spring and collet fingers allowed the fingers to clear the notches, allowing insertion of the control rod, although at elevated drive water DP (325 psid).



**Figure 2**  
**Upper Section of CRDM Assembly**

As discussed above, with significant movement of the collet retainer tube, the ability to insert and withdraw the control rod will be impacted. That is, during an attempt to notch the control rod, either insert or withdraw, if the control rod fails to leave the initial position, or it moves in slightly then fails to normally settle back to the initial position, collet retainer tube separation should be considered as a possible cause for subsequent troubleshooting. The troubleshooting plan should recognize that if collet retainer tube separation has occurred, when a withdraw signal is applied with the use of elevated drive water DP, the potential exists to drive the outer piston seal rings above the top of the spacer and key the collet piston and fingers in the unlatched position. With the collet piston fingers unlatched from the index tube notches, the control rod will drift out to the fully withdrawn position.

### ***Recommended Actions***

The recommendations below are interim actions intended to further reduce the probability of collet retainer tube separation on in-service CRDMs, and to help ensure actions taken by plant operators will not result in inadvertent rod withdrawal should separation occur.

1. Limit use of elevated drive water differential pressure when excessive collet piston seal leakage is preventing the collet mechanism from actuating during attempts to notch out from position 00. Specifically, elevated DP may be used to allow for unlatching after it has been confirmed that the control rod is inserting as expected, and the withdrawal stall flow has been confirmed to be high (significantly above trend) due to suspected collet piston seal leakage. It's recognized that other issues may prevent normal control rod insertion. Use of elevated drive water DP to assist with rod insertion is not limited by the above recommendation.
2. If a control rod fails to insert or withdraw with normal drive water DP (250 to 265 psid), recognize that these are potentially symptoms of a separated collet retainer tube on the CTF assembly.
3. Review SIL 139 and its supplements (References 1-7) and ensure recommendations provided in these SILs are adequately addressed in plant procedures.

### ***References***

1. SIL-139, Control Rod Drive Collet Retainer Tube Cracking
2. SIL-139 Supplement 1, Revision 1, CRD Collet Retainer Tube Inspection Reports
3. SIL-139 Supplement 2, Control Rod Drive Collet Retainer Tube Cracking
4. SIL-139 Supplement 3, Control Rod Drive Collet Retainer Tube Cracking
5. SIL-139 Supplement 4, Control Rod Drive Collet Retainer Tube Cracking
6. SIL-139 Supplement 5, Revision 1, Control Rod Drive Collet Retainer Tube Cracking
7. SIL-139 Supplement 6, Control Rod Drive Collet Retainer Tube Cracking

**Attachment 1**  
**List of Potentially Affected Plants**

***BWR Plants and Associated Facilities***

<b><u>Utility</u></b>	<b><u>Plant</u></b>
<u>X</u> Detroit Edison Co.	Fermi 2
<u>X</u> Energy Northwest	Columbia
<u>X</u> Entergy	Grand Gulf
<u>X</u> Entergy	River Bend
<u>X</u> Entergy	Pilgrim
<u>X</u> Entergy	Vermont Yankee
<u>X</u> Constellation	Nine Mile Point 1-2
<u>X</u> Constellation	Clinton
<u>X</u> Constellation	Dresden 2-3
<u>X</u> Constellation	FitzPatrick
<u>X</u> Constellation	LaSalle 1-2
<u>X</u> Constellation	Limerick 1-2
<u>X</u> Constellation	Oyster Creek
<u>X</u> Constellation	Peach Bottom 2-3
<u>X</u> Constellation	Quad Cities 1-2
<u>X</u> FirstEnergy Nuclear Operating Co.	Perry 1
<u>X</u> Nextera Energy Resources	Duane Arnold
<u>X</u> Nebraska Public Power District	Cooper
<u>X</u> Talen Energy	Susquehanna 1-2
<u>X</u> Duke Energy - Progress	Brunswick 1-2
<u>X</u> Public Service Enterprise Group Incorporated	Hope Creek
<u>X</u> Southern Nuclear Operating Co.	Hatch 1 - 2
<u>X</u> Southern Nuclear Operating Co.	Pooled Equipment Inventory Co.
<u>X</u> Tennessee Valley Authority	Browns Ferry 1-3
<u>X</u> Xcel Energy	Monticello



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***US PWR Plants***

<b><u>Utility</u></b>	<b><u>Plant</u></b>
_____ AmerenUE	Callaway
_____ Arizona Public Service	Palo Verde 1-3
_____ Entergy	Arkansas Nuclear One 1-2
_____ Entergy	Indian Point 2-3
_____ Entergy	Palisades
_____ Entergy	Waterford 3
_____ Dominion	Kewaunee
_____ Dominion	Millstone 2
_____ Dominion	Millstone 3
_____ Dominion	North Anna 1-2
_____ Dominion	Surry 1-2
_____ Duke Energy Corporation	Catawba 1-2
_____ Duke Energy Corporation	Crystal River 3
_____ Duke Energy Corporation	McGuire 1-2
_____ Duke Energy Corporation	Oconee 1-3
_____ Duke Energy Corporation	Robinson
_____ Duke Energy Corporation	Shearon Harris
_____ Constellation	Braidwood 1-2
_____ Constellation	Byron 1-2
_____ Constellation	Calvert Cliffs 1-2
_____ Constellation	Fort Calhoun
_____ Constellation	Ginna
_____ Constellation	Three Mile Island 1
_____ FirstEnergy Nuclear Operations Co.	Beaver Valley 1-2
_____ FirstEnergy Nuclear Operating Co.	Davis-Besse
_____ Florida Power & Light	Seabrook
_____ Florida Power & Light	St. Lucie 1-2
_____ Florida Power & Light	Turkey Point 3-4
_____ Florida Power & Light	Point Beach 1-2
_____ Indiana Michigan Power Corp	D C Cook 1-2
_____ Northern States Power	Prairie Island 1-2
_____ Pacific Gas & Electric Co.	Diablo Canyon 1-2
_____ PSEG Nuclear LLC	Salem 1
_____ PSEG Nuclear LLC	Salem 2
_____ South Carolina Electric & Gas Co.	Summer
_____ South Texas Project Nuclear Operating Co.	South Texas Project 1-2
_____ Southern California Edison Co.	San Onofre 2-3
_____ Southern Nuclear Operating Co.	Farley 1-2
_____ Southern Nuclear Operating Co.	Vogtle 1-2
_____ Tennessee Valley Authority	Sequoyah 1-2
_____ Tennessee Valley Authority	Watts Bar 1
_____ Tennessee Valley Authority	Watts Bar 2

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**Attachment 2 – Recent GE Hitachi Nuclear Energy 10 CFR Part 21 Communications**

The following is a list of recent 10 CFR Part 21 communications that GE Hitachi Nuclear Energy (GEH) and Global Nuclear Fuel (GNF) have provided to affected licensees as Reportable Conditions (RC), Transfers of Information (TI), 60-Day Interim Reports (60 Day) and/or Safety Information Communications (SC).

<b><u>Number</u></b>	<b><u>Ref.</u></b>	<b><u>Subject</u></b>	<b><u>Date</u></b>
<b>SC 23-01</b>	<b>PRC 23-01</b>	<b>Failure of the CRD Collet Retainer Tube/Outer Tube Weld</b>	<b>04/27/2023</b>