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Nuclear Engineering Teaching Laboratory

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U. S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Dr. Mohamed Shams, Director
Division of Advanced Reactors and Non-Power Production and Utilization Facilities
Office of Nuclear Reactor Regulation
11555 Rockville Pike, Rockville, MD 20852-2738

SUBJECT: Response to Apparent Violations in NRC Special Inspection Report 05000602/2022201; EA-22-134

Dear Dr. Shams:

This letter is in response to the apparent violation identified in the US NRC Special Inspection Report No. 05000602/2022201 dated January 25, 2023. This apparent violation is related to the facility operating with fuel that did not meet the requirements of Tech Spec (TS) 5.3, "Reactor Core and Fuel". TS 5.3.1 states, in part, that fuel element cladding will be "304 stainless steel, nominal 0.020 inches thick". Contrary to TS 5.3.1, the Nuclear Engineering Teaching Laboratory (NELT) at the University of Texas at Austin (UT-Austin) operated between January 6 - October 17, 2022 with two aluminum cladded fuel elements installed in the reactor core. We do not dispute the facts pertaining to this apparent violation as stated in the inspection report.

On January 6, 2022, NETL staff performed a core change. As part of the core change, NETL unknowingly installed two aluminum cladded TRIGA [Training, Research, Isotopes, General Atomics] fuel elements in the reactor core. NETL operated the reactor with the two aluminum cladded elements in the reactor core until October 17, 2022, when the acting reactor manager identified the issue while reviewing fuel records. Reactor operations were immediately suspended by NETL management at that time pending an assessment of the issue with development and implementation of corrective actions. NETL notified NRC of the issue on October 17, 2022, and made an event report (EN 56198) to the NRC on November 2, 2022. The aluminum cladded fuel was removed from the core and no damage to any fuel elements was noted. Through multiple methods, NETL staff determined that the integrity of the aluminum cladded fuel elements was maintained throughout the operational period and that peak fuel temperature did not reach 500 degrees Celsius. This is critical because aluminum cladded fuel elements require a more conservative safety limit (peak fuel temperature of 500 degrees Celsius) than that of stainless-steel cladded fuel elements (peak fuel temperature around 1,000 degrees Celsius) to ensure the integrity of the cladding is maintained. We concluded, and the NRC inspection team independently concluded, that no fuel damage occurred and that there were no actual nuclear safety consequences as a result of this event. However, by operating the NETL core with aluminum cladded fuel elements installed, the NETL operated with a safety limit and limiting safety system settings in NETL Technical Specifications that were less conservative than what is necessary to ensure the

integrity of a fission product barrier. Corrective actions were developed and implemented to ensure that this cannot occur again at the NETL.

(1) Reason for the Apparent Violation: The NETL staff conducted a detailed root cause analysis to determine the reason for the apparent violation and to inform the development of corrective actions to be taken. The cause for the violation was the selection of inappropriate fuel elements for installation in the core that resulted from a lack of administrative, procedural, and/or engineering controls designed to keep elements not qualified for use out of the core. Specifically, there were no administrative or engineered barriers implemented that segregated or controlled operator access to disqualified fuel. In addition, this event was a single point failure that could have been prevented with a second check on planned utilization of fuel demonstrating a lack of management oversight on planned and actual core loadings. Lastly, the presence of disqualified fuel at the NETL was a contributing factor. The NETL has two aluminum cladded fuel elements in storage on site even though NETL is not presently, nor ever has been, licensed to operate using aluminum cladded fuel. These two elements have remained at the facility since the State of Idaho has prohibited transfer of spent fuel to the DOE interim waste storage facility in Idaho. NETL management though consider this a contributing factor that is not within the facility control and not a root cause. The root cause is considered to be the lack of administrative or engineered barriers to segregate or control operator access to disqualified fuel is critical for ensuring that fuel disqualified for other reasons (such as apparent cladding corrosion or deviations in fuel length or bend measurements) is not inadvertently installed in the core.

(2) Corrective Steps that Have Been Taken and the Results Achieved: A detailed corrective action plan was developed by NETL staff in coordination with NETL management and the NETL Reactor Oversight committee in response to this event. The root cause was addressed by implementing administrative, procedural, and engineered barriers to ensure that disqualified fuel would not be inserted into the NETL core at any point in the future. This corrective action plan included the following steps that have been completed by the date of this correspondence:
    a. Remove aluminum cladded fuel elements from NETL core (Completed: 10/17/2022)
    b. Revise the surveillance procedure (MAIN-5) for fuel element inspection (Completed: 11/01/2022)
        i. including in the electronic fuel records (named the B159.xls file) to record the date of last inspection and to flag any disqualified fuel elements so that they will not be considered for insertion into the core (Completed: 10/18/2022)
    c. Perform the revised surveillance for the core configuration prior to restart (Completed: 11/17/2022)
    d. Review other procedures that satisfy Technical Specifications surveillances, to evaluate if other non-compliances have been introduced in performance (Completed: 10/28/2022)
    e. Conduct control rod worth calibrations (Completed: 11/23/2022)
    f. Review the event with staff, emphasizing the importance of procedural compliance, the change control process for procedures, the application of license and Technical Specifications as administrative controls, and the incorporation of this into NETL culture. This has becoming part of the NETL operations staff training. (Completed: 11/29/2022)
    g. Revise the fuel handling procedure (FUEL-1) to require fuel not in a tested configuration (i.e., not installed at the last control rod worth calibration) to be verified prior to installation (Completed: 11/23/2022):
        i. Qualified/disqualified for use
        ii. Inspection completed within prior 2 years

iii. Core loading only with qualified fuel verified by NETL management (NETL Director or Associate Director) prior to startup.

h. Develop an engineered control method to designate fuel racks with visible indications that the contents are not allowed to be used in the core (Completed: 11/28/2022)

(3) Corrective Steps Remaining to Be Taken: None

(4) Date When Full Compliance Will Be Achieved: The corrective action plan was completed on 11/28/2022 and the NETL Reactor Oversight Committee was fully briefed on the process and approved the NETL restart, with the special inspection team observing.

We believe all of the measured implemented above bring the University of Texas at Austin NETL facility into full compliance. The corrective actions taken in response to this noncompliance issue have driven the NETL to develop a system that will ensure that no disqualified fuel (disqualified for any reason) will ever be inserted into the core again.

I declare under penalty of perjury that the foregoing is true and correct.

W. S. Charlton
Director, Nuclear Engineering Teaching Laboratory
John J. McKetta Energy Professor, Walker Department of Mechanical Engineering
University of Texas at Austin