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February 10, 1988
4410-88-L-0009/0208P

US Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

Dear Sirs:

Three Mile Island Nuclear Station, Unit 2 (TMI-2)
Operating License No. DPR-73
Docket No. 50-320
Nuclear Instrumentation

The purpose of this letter is to request NRC approval of the proposed remedial actions that GPU Nuclear would implement in the event that the TMI-2 Nuclear Instruments are adversely affected during future defueling operations.

GPU Nuclear plans to use an Automatic Cutting Equipment System (ACES) to cut and remove portions of the Lower Core Support Assembly (LCSA) to provide access to the lower head for defueling. The ACES utilizes a plasma arc torch for cutting operations. This system is discussed in the Lower Core Support Assembly (LCSA) Safety Evaluation Report (SER) submitted via GPU Nuclear letter 4410-88-L-0003, dated January 18, 1988. A scenario has been postulated in which electrical noise generated by the plasma arc torch could adversely affect the Technical Specification (Tech. Spec.) required Nuclear Instruments (NIs) either temporarily or permanently. However, due to the nature of the concern (i.e., electrical noise problems are difficult to analyze theoretically), GPU Nuclear cannot determine conclusively the form or duration of potential disruptions. Therefore, GPU Nuclear will take appropriate action during plasma arc torch operation to comply with the restrictions noted in NRC letter NRC/TMI-87-064, dated August 20, 1987, which approved plasma arc cutting of upper end fittings. In addition, GPU Nuclear is proposing to provide an alternative monitoring system in the event the NIs do not return to "normal" after termination of torch operations. These actions will permit the continuation of core alterations (i.e., defueling) without an extended disruption.

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I. Technical Specification (Tech. Spec.) Requirements

Tech. Spec. Limiting Conditions for Operation 3.3.1.1 requires two (2) source range neutron monitoring instrumentation channels to be operable. The original plant design source range instrumentation, which is currently in use, consists of two (2) redundant count rate channels that utilize high sensitivity BF_3 proportional counters as sensors. In the event that both of these source range neutron monitoring instrumentation channels become inoperable, the action statement for Tech. Spec. 3.3.1.1 requires suspension of all activities involving core alterations. The action statement also requires a Special Report to be submitted within 30 days of the occurrence. This report must outline the cause of the malfunction, the plans for monitoring the condition of the core, and the plans for resumption of activities involving core alterations. In anticipation of possible future NI inoperability during plasma arc torch operations, GPU Nuclear is submitting this Special Report in order to permit the continuation of core alterations (i.e., defueling) without an extended disruption.

II. Design Function of the Neutron Monitoring Instrumentation

Tech. Spec. Bases 3/4.3.1. "Neutron Monitoring Instrumentation," states: "The neutron monitoring instrumentation, which was included in the normal Reactor Protection System Instrumentation, provides information regarding the shutdown status of the core and it will be used to monitor changes in neutron generation." Additionally, TMI-2 FSAR Section 7.8.1, "Nuclear Instrumentation," states, "The nuclear instrumentation is designed to provide neutron flux information over the full range of reactor operations."

The alternate monitoring system, described in Section V of this letter, will have a monitoring capability similar to that of the present source range neutron monitoring instrumentation.

III. ACES System Description

The ACES utilizes three (3) Thermal Dynamics PAK 45 plasma arc cutting units. These units are wired in parallel and, as a system, are capable of generating 1,200 amps at approximately 200 volts DC. The cutting current is variable between 150 and 1,200 amps with current feedback control. Each unit is fed by a separate 480 VAC, 3 phase, 60 HZ, 150 amp source.

There are two (2) phases of electrical operation (i.e., arc starting and arc cutting). The arc starter generates a 15 HZ saw tooth waveform which triggers a Silicon Controlled Rectifier (SCR) firing circuit to generate a 7,000 volt (peak), 2 microsecond pulse between the electrode and the torch tip. This initiates the pilot arc. The pilot arc is extended beyond the torch tip chamber when a secondary power supply activates inducing a 360 volt, 8 millisecond pulse across the ionized gas column within the torch tip. As this voltage decays, the pilot arc goes out and the process repeats at the generation of the next saw tooth.

The arc starter ionizes the primary gas chamber. When the "start" command is initiated, the main cutting arc is transferred from electrode to work piece. During the initial cut, the cutting current is increased to the current command setting and then maintained within 10% of this value throughout the cut. When main arc transfer occurs, the pilot arc relay drops out and the arc starter is deactivated.

There are slight variations in the cutting amperage due to changes in material thickness and changes in cutting speeds. These fluctuations are minor (i.e., less than 10%) relative to the current command setting. The torch for ACES is maintained at the proper standoff distance via a motor driven control unit with position feedback. The cutting voltage will fluctuate slightly as the standoff control unit seeks the proper distance. These fluctuations in voltage are minor relative to the system voltage (i.e., less than 10%).

If main arc transfer is lost at any time during the programmed cut, the arc starter will automatically reactivate momentarily to reionize the primary gas. The system will then automatically attempt main arc transfer.

IV. Interference Phenomena

As discussed above, the ACES will maintain a relatively constant DC voltage and current during the cutting process. It is unlikely that sufficient noise will be generated during this phase to interfere with the NIs (i.e., create spikes). However, due to the inherent instability of the plasma stream, local noise will exist at the torch tip. Although there is natural shielding provided by the water and the heavy case of the instrument wells, this noise could affect the NIs.

During the arc starting phase, the arc starter generates a fluctuating field which could have an effect on the NIs. The arc starter circuit is activated during the "find height" mode (for positioning the torch prior to cutting), during the initial phase of cutting, and when the arc transfer is momentarily lost during a cut. Theoretically, these brief operations could create momentary spikes on the NIs.

GPU Nuclear contacted the vendor to discuss the possibility of damaging the NIs during operation of the plasma arc torch. The vendor does not believe that the BF_3 proportional counter will be damaged. However, the vendor did state that other components (e.g., preamplifier) are likely to be affected causing erratic indication on the instrumentation.

V. Remedial Actions

As discussed previously, momentary spikes may occur on the NIs during plasma arc torch operations. Therefore the NIs will be monitored during cutting operations. If disruptions occur, the performance of core alterations other than plasma arc torch operations will be prohibited as

specified in the referenced NRC letter. Operators will be advised that interference spikes may occur during torch operations. The NIs will be deemed inoperable, per the Tech. Specs., if the instruments do not return to "normal" after termination of torch operations.

As a remedial action, GPU Nuclear will be prepared to provide an alternative monitoring system for the inoperable channel(s). The alternate monitoring system will consist of a commercially available, fission chamber-based, neutron counting instrumentation loop capable of operating in the expected count rate range. Since locating the alternate detector at the present NI detector location is not feasible, the base count rate may differ. However, the capability to detect count rate changes of interest will be maintained. The instrumentation loop includes the following components.

Fission Chamber
Coax Cable
Preamplifier
Power Supply
High Voltage Power Supply
Lin/Log Ratemeter
Strip Chart Recorder
Linear Amplifier and Single Channel Analyzer
Counter and Timer

The location of the alternate NIs in the Reactor Building (RB) will be procedurally controlled based on an engineering analysis. The Lin/Log Ratemeter and Strip Chart Recorder will be remotely monitored from inside the Control Room and/or Command Center. If it becomes necessary to install an alternate monitoring system, surveillance procedures applicable to the system will be implemented and performed at the frequencies required in Table 4.3-1 of the Recovery Operations Plan.

VI. CONCLUSION

In anticipation of potential future NI inoperability as a result of plasma arc torch cutting of the LCSA, this letter is being submitted as a Special Report per Tech. Spec. 3.3.1.1 in order to permit the continuation of core alterations without an extended disruption.

During cutting operations, momentary spikes may occur on the NIs. Therefore, the NIs will be monitored during cutting operations. Core alterations, other than plasma arc torch operations, will be prohibited if interference disrupts the NIs. In the event the NIs do not return to "normal" after termination of torch operations, GPU Nuclear will be prepared to install an alternative core monitoring system. GPU Nuclear believes that these actions will permit the safe continuation of core alterations.

Per the requirements of 10 CFR 170, an application fee of $150.00 is enclosed.

Sincerely,

for F. R. Standerfer
Director, TMI-2

RDW/emf

Enclosed: GPU Nuclear Corp. Check No. 009800

cc: Regional Administrator, Region 1 - W. T. Russell
Director, TMI-2 Cleanup Project Directorate - Dr. W. D. Travers