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TMI-2 Cleanup Project Directorate
Attn: Dr. W. D. Travers
Director
US Nuclear Regulatory Commission
c/o Three Mile Island Nuclear Station
Middletown, PA 17057

Dear Dr. Travers:

Three Mile Island Nuclear Station, Unit 2 (TMI-2)
Operating License No. DPR-73
Docket No. 50-320
Safety Evaluation for the Operation of the Filter-Aid Feed System
and Use of Diatomaceous Earth As Feed Material

The performance to-date of the filter canisters in the Defueling Water Cleanup System (DWCS) has identified the need to improve the through-put of the filter canisters. It is the opinion of GPU Nuclear that the addition of feed material into the filter canisters will promote the build-up of cake on the filter media, thereby significantly improving the performance of the DWCS filter canisters. To accomplish this, GPU Nuclear will install a filter-aid feed system as an ancilliary system to DWCS using diatomaceous earth as the feed material.

Attached for your review is a safety evaluation of the proposed filter-aid feed system and feed material. GPU Nuclear requests NRC concurrence that the addition and use of this ancilliary system is bounded by the evaluations given in the DWCS Technical Evaluation Report (TER) and the Defueling Canisters TER.

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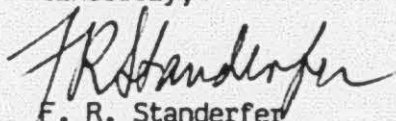
Dr. Travers

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June 30, 1986
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Per the requirements of 10 CFR 170, an application fee of \$150.00 is enclosed.

Sincerely,

A handwritten signature in dark ink, appearing to read 'F. R. Standerfer', written in a cursive style.

F. R. Standerfer
Vice President/Director, TMI-2

FRS/RES/eml

Attachment

Enclosed: GPU Nuclear Corp. Check No. 00024441

Safety Evaluation for the Operation of the Filter-Aid Feed System
and Use of Diatomaceous Earth As Feed Material

BACKGROUND

The Defueling Water Cleanup System (DWCS) is designed to maintain water clarity by processing reactor vessel water through filter canisters via the DWCS Reactor Vessel Clean System. The internal filter assembly bundle in each filter canister consists of a circular cluster of 17 filter elements. Each filter element consists of 11 modules with each module comprised of pleated filter media fabricated from porous stainless steel material. The filter media is precoated with a sintered metal powder to control pore size and is designed to remove particulates down to 0.5 (nominal) microns in size. DWCS operation to-date has shown a significant reduction of the expected throughput performance of the filter canisters by premature high pressure increases across the filter canisters. These premature high pressures have been attributed to the colloidal suspension of silicon and iron oxides in the reactor vessel water which are blinding the filter media before a cake can be built on the filter media. To improve filter canister performance, a filter-aid feed system will be installed. The filter-aid feed system will inject body-feed material into the filter canisters to promote cake build-up on the filter media.

SYSTEM DESCRIPTION

The filter-aid feed system is comprised of two subsystems - a precoat feed subsystem and a body-feed subsystem. These two subsystems will be utilized, as required. Tests are planned to determine the most effective mode of operation. The planned tests included:

1. Use of the precoat subsystem alone.
2. Use of the body-feed subsystem alone.
3. Use of the precoat subsystem followed by use of body-feed subsystem.

The results of the planned tests will determine the preferred mode of operation of the filter-aid feed system. Both subsystems tie into the existing DWCS Reactor Vessel Cleanup System via a common tie-in with an isolation valve in the inlet line of each filter canister.

As presently conceived, the precoat subsystem consists of two 55 gallon drums, a hand controlled motorized agitator, valves, a hand controlled slurry pump, a pressure indicator, pipe, and hose. One of the 55 gallon drums is a reservoir of borated water to be used for system flushing. The other 55 gallon drum is a mixing tank in which the feed material will be mixed with borated water to form a slurry (at approximately 18 w/o feed material). The slurry pump will then inject the slurry into the DWCS process stream at approximately 10 gpm. Following completion of the precoat of one of the filter canisters, the precoat subsystem is shutdown, the isolation valve is closed, and the precoat subsystem is disconnected from DWCS. The precoat subsystem will be available to precoat other filter canisters, as needed.

As presently conceived, the body-feed subsystem consists of a slurry mixing tank with a motorized agitator, cables and conduits, local and automatic instrumentation/controls/ interlocks and manual overrides. The maximum capacity of the slurry mixing tank is 200 gallons. The slurry is prepared by mixing borated water and filter-aid material to the desired concentrations, between 3000 ppm and 8000 ppm of filter-aid material. The quantity of slurry to be used will be determined by performing tests to maximize the filter life. Once mixed, the slurry is delivered to the filter canisters in either train "A" or "B" of the DWCS Reactor Vessel Cleanup System by one of two slurry feed pumps. The slurry feed pumps are metering-type pumps capable of delivering 2 to 20 gallons of slurry per hour. The body-feed subsystem is expected to operate continuously during DWCS operation.

FEED MATERIAL

The proposed feed material is diatomaceous earth (d.e.) which is primarily SiO_2 (approximately 90%). The characteristics and consistency of d.e. has been proven to be an ideal filter-aid material for precoat and body-feed material.

SAFETY EVALUATION

The operation of the filter-aid feed system and the use of d.e. as the feed material have been evaluated with respect to the following safety issues:

- o criticality control
- o gas generation control

These safety issues are addressed below.

Criticality Control

Criticality control of the TMI-2 core is achieved by maintaining the boron level in the reactor coolant system (RCS) greater than 4350 ppm. Water used in the precoat and body-feed subsystems is taken directly from the charging water storage tank SPC-T-4 which is borated to at least 4350 ppm. The water supplied from SPC-T-4 is obtained via a tie-in to the existing DWCS borated water flush line. Downstream of this tie-in one branch supplies borated water to the precoat subsystem and the other branch supplies borated water to the body-feed subsystem. During operation administrative controls (i.e., via approved procedures) will ensure that SPC-T-4 is the water source being used. The RCS is maintained at a boron concentration of at least 4950 ppm; thus, should unborated water be inadvertently used, the small injection rate of water into the RCS via the filter-aid subsystems would not significantly reduce the boron concentration in the RCS prior to detection and correction. Each branch from the borated water flush line tie-in contains isolation valves to maintain double barrier configuration control and minimize the probability of a boron dilution event in the RCS while the subsystems are not operating.

The moderating ability of d.e. has been evaluated and found to be significantly less than that of water. Therefore, in the event of an addition of d.e. to the RCS, the multiplication (Keff) will not exceed 0.99, even for the situation in which d.e. becomes intermixed with the fuel.

Criticality control within the DWCS filter canisters is achieved by the placement of poison in the defueling canisters. The low moderating ability of d.e. would not affect the canister criticality evaluations.

Gas Generation Control

The control of gas generation in the defueling canisters (including the DWCS filter canisters) is achieved by the presence of recombining catalyst in the canisters. The use of d.e. as a filter-aid material will not inhibit the performance of the catalyst in the defueling canisters. D.E. is inert and would not chemically react with the catalyst. Additionally, the very characteristics and consistency of d.e., which make it an ideal filter-aid material, prevent it from isolating the catalyst from generated hydrogen and oxygen. This is true even if the d.e. were to settle on the catalyst retainer screens or the catalyst material; i.e., filter-aid d.e. would not "pack down" to form an impenetrable barrier against gases.

10 CFR 50.59 EVALUATION

The evaluation of the safety concerns addressed above have shown that the operation of the filter-aid feed system and the use of d.e. as the feed material will not cause a criticality safety concern, nor will the d.e. affect gas generation control. Thus, it is concluded that the operation of the filter-aid feed system and the use of d.e. in the filter canisters does not increase the probability of an accident, create the possibility of an accident of a different type or increase the consequences of an accident previously evaluated. In addition, the margin of safety as defined in the bases for the TMI-2 Technical Specifications will not be reduced. Therefore, the proposed operation of the filter-aid feed system and the use of d.e. as the feed material does not present an unreviewed safety question as defined in 10 CFR 50.59. Additionally, no Technical Specification changes are necessary to allow the operation of the filter-aid feed system and the use of d.e. as the feed material.

CONCLUSION

Based on the above evaluation, the operation of the filter-aid feed system and the use of diatomaceous earth as the feed material will not pose a risk to the health and safety of the public.