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December 31, 1986

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
Use of Coagulants

The purpose of this letter is to request NRC approval of the use of a coagulant that is different from that which was previously evaluated in GPU Nuclear letter 4410-86-L-0213 dated December 15, 1986. GPU Nuclear has evaluated this alternative coagulant; the results indicate an increased potential as a filter aid additive in the Defueling Water Cleanup System (DWCS). The possible modes of coagulant addition to the DWCS stream do not differ from the modes described and evaluated in the referenced letter. Thus, only the use of a different coagulant needs to be evaluated. The attached evaluation is submitted for your review and approval.

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

Sincerely,

Thomas G. Broughton

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

FRS/RES/eml

Attachment

Enclosure: GPU Nuclear Corp. Check No. 00939

D009 1/1 w/check $150 # 000939

ATTACHMENT
4410-86-L-0216

10 CFR 50.59 EVALUATION FOR THE USE OF A COAGULANT IN DWCS

The Safety Evaluation Report (SER) for the Addition of Coagulants to the Reactor Coolant System (RCS) (Reference 1) evaluated the use of a specific coagulant in the Defueling Water Cleanup System (DWCS) to improve DWCS filter performance. Another coagulant has been identified which shows greater potential as a filter aid. The active polymer in this alternate coagulant is melamine-formaldehyde (MF). The undiluted solution of this coagulant is approximately 8% of the polymer and 92% unborated water. The expected dosage of the undiluted solution to the DWCS processing stream is between 10 to 20 ppm with a maximum dosage of 50 ppm.

The safety issues to be evaluated for the use of an alternative coagulant are given below.

Reactor Vessel Subcriticality

Subcriticality in the reactor vessel (RV) is maintained by the presence of water borated to at least 4350 ppm. Administrative procedures require that the RCS be borated to at least 4950 ppm. Therefore, laboratory testing of RCS-grade water at various concentrations of MF has been performed to demonstrate that the presence of the coagulant in the water will not cause the precipitation of boron nor the inclusion of boron in the coagulant polymer such that boron is removed during filtration. Therefore, this coagulant can be used without affecting the soluble boron concentration in the RCS. Additionally, because only a small quantity of coagulant will be used, the coagulant would not be a credible source for a boron dilution event.

The moderating ability of the coagulant is also a consideration and is currently being evaluated. However, if the coagulant should be found to be a somewhat better moderator than water, the addition of the coagulant to the RCS would not impact previous core criticality calculations since the concentration of the coagulant in the RCS would be orders of magnitude less than the boron concentration in the RCS. In addition, the accumulation of a non-borated mass of insoluble coagulant in the RV, which might cause a boron displacement, is not credible because the coagulant addition rates are small and the coagulant passing through the DWCS filter media is substantially smaller in particle size than the filtered polymer. Due to their small size, any particles passing through the filter will be stable in suspension and will not settle out.

Canister Subcriticality

Criticality prevention in the defueling canisters is achieved by the poison material placed in the canisters. The accumulation of coagulant in the filter canister is a consideration with respect to assuring canister subcriticality. However, while the canisters are stored at TMI-2, the borated water in and between the canisters will compensate for the potential impact of the

coagulant. Thus, subcriticality of the canisters would not be adversely impacted, even if the coagulant is found to be a better moderator than unborated water.

Canister Shipping Requirements

The canister shipping requirements which could be impacted by the addition of coagulant are subcriticality and gas generation rate and control. An evaluation of the coagulant affect on filter canister subcriticality will be submitted for NRC approval prior to shipment of affected filter canisters. Because the quantity of coagulant in the fuel and knockout canisters would be insignificant, the introduction of coagulant in these canisters will not affect previous criticality evaluations. With respect to gas generation, the radiolytic breakdown of the coagulant may generate additional combustible gases. However, the limiting gas concentration for the determination of allowable storage and shipping times for a dewatered canister would be hydrogen. The allowable storage and shipping time will be determined based on actual hydrogen appearance rates obtained from gas samples of dewatered canisters. Additionally, the recombiner catalyst installed in the canisters is being tested by exposing the catalyst to a 50 ppm concentration of the coagulant solution to determine its impact on catalyst performance. The results of this testing, coupled with the minimum quantity of exposed catalyst (based on the dewatered canister void volume), will assure that a sufficient quantity of catalyst will be available in the canister to control the gases generated from the radiolysis of entrained water in the dewatered canister.

Compliance to RCS Requirements

The RCS must meet the following requirements by administrative procedures:

- Boron = 4950 to 6000 ppm
- pH = 7.5 to 8.4
- Cl = $\leq$ 5 ppm

The coagulant has been tested in the laboratory with RCS-grade water. It has demonstrated no adverse affect on the above listed RCS chemistry requirements.

Canister Integrity

Filter canisters will accumulate coagulant. Therefore, these canisters will be evaluated prior to their shipment to ensure no impact on canister integrity. This evaluation will consist of analyzing water samples, taken during filter canister dewatering, to determine if a departure from RCS chemistry requirements has occurred. If so, appropriate corrective actions will be implemented, as necessary. Unlike the filter canisters, fuel and knockout canisters will contain an insignificant quantity of coagulant which has passed through the filter canisters and been diluted with the RCS water inventory. Therefore, coagulant will not accumulate in the fuel and knockout canister and is not expected to cause detrimental effects on canister integrity.

Summary

The use of this alternative coagulant has been shown to demonstrate no adverse effect on the boron concentration or other RCS chemistry requirements. The use of this coagulant also would not adversely affect fuel and knockout canister integrity because the quantity of coagulant in these canisters would be insignificant. If necessary, corrective actions would be employed on filter canisters based on analysis of water samples obtained from the filter canisters. In addition, the use of this coagulant does not impact previous core criticality evaluations and would not adversely affect canister subcriticality while the canisters are stored at TMI-2. Therefore, the use of this coagulant would not increase the probability nor the consequences of previously evaluated accidents. This coagulant also would not create any accident of a different type nor affect the margin of safety inherent in the basis for the Technical Specification on RCS boron concentration. Further, no modifications to existing Technical Specifications are required to use this coagulant. The results of evaluations performed on this coagulant to determine its affects, if any, on canister criticality will be provided for NRC approval prior to canister shipment.

ATTACHMENT
4410-86-L-0216

REFERENCES

1. Safety Evaluation Report for the Addition of Coagulants to the Reactor Coolant System, GPU Nuclear Letter 4410-86-L-0213 dated December 15, 1986, from F. R. Standerfer to W. D. Travers