GPU Nuclear

GPU Nuclear Corporation
Post Office Box 480
Route 441 South
Middletown, Pennsylvania 17057-0191
717 944-7621
TELEX 84-2386
Writer's Direct Dial Number:
(717) 948-8461

4410-85-L-0011
Document ID 0151A

January 16, 1985

TMI Program Office
Attn: Dr. B. J. Snyder
Program Director
US Nuclear Regulatory Commission
Washington, DC 20555

Dear Dr. Snyder:

Three Mile Island Nuclear Station, Unit 2 (TMI-2)
Operating License No. DPR-73
Docket No. 50-320
Internals Indexing Fixture Safety Evaluation Report
Revision 2

Attached for your information is Revision 2 to the Internals Indexing Fixture (IIF) Safety Evaluation Report (SER). This revision reflects a change to the lower limit boron concentration for the Reactor Coolant System (RCS). The lower limit boron concentration is being raised from 3500 ppm to 4350 ppm. GPU Nuclear had originally intended to perform core inspections after plenum jacking to verify the adequacy of 3500 ppm boron. Due to the complex condition of the rubble bed after jacking, it was determined that the effort required to reaffirm 3500 ppm as adequate to ensure subcriticality was not justified. Thus, the lower limit is being raised to 4350 ppm. Additionally, a Technical Specification Change Request (TSCR) is being prepared to reflect this change and will be submitted in the near future.

Sincerely,

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

FRS/RBS/jep

Attachment

cc: Deputy Program Director - TMI Program Office, Dr. W. D. Travers

D009
1/1

GPU Nuclear

SER 15737-2-G07-103 REV. 2

ISSUE DATE December 1984

☒ ITS

☐ NSR

☐ NITS

TMI-2

DIVISION

SAFETY EVALUATION REPORT

FOR

The Operation of the

IIF Processing System

COG ENG H.K. Boldt DATE 12/23/84

RTR O.S. Wilkins DATE 12/28/84

COG ENG MGR. C.L. R. DATE 12/28/84

2	12/20/84	Issue For Use	JKG	RJK	D	CLR
NO	DATE	REVISIONS	BY	CHECKED	GROUP SUPERVISOR	MGR DESIGN ENGINEERING
				CHIEF ENGINEER		

EPD-33611 11/84

Rev.	SUMMARY OF CHANGE
2	Revised Section 3.3, Boron Dilution, to reference "Hazards Analysis: Potential for Boron Dilution of Reactor Coolant System" and to reflect lower safety limit of 4350 ppm boron. Included appropriate references in Section 6.0.

SHEET	LATEST REV	SHEET	LATEST REV	SHEET	LATEST REV.	SHEET	LATEST REV.	SHEET	LATEST REV.	SHEET	LATEST REV.	SHEET	LATEST REV.
1	2												
2	2												
3	2												
4	2												
5	0												
6	0												
7	0												
8	0												
9	1												
10	2												
11	2												
12	2												
13	2												
14	2												
15	2												
16	2												
17	2												

REVISION STATUS SHEET

BECHTEL

DOCUMENT TITLE: Safety Evaluation Report for the Operation of the IIF Processing System

JOB 15737	REV.
SPEC. NO. 15737-2-G07-103	
PAGE 3 OF 17	2

Table of Contents

1.0 Introduction

1.1 General

This safety evaluation report (SER) addresses operation of the Internals Indexing Fixture (IIF) Processing System.

After removal of the TMI-2 reactor vessel head the IIF will be placed on the vessel flange and the reactor coolant level will be raised to partially fill the IIF. The IIF processing system is designed to provide reactor coolant water processing capability during the time between head removal and plenum removal. The need for the IIF processing system is determined based on limited reactor coolant processing capability in the drained down condition and the desire to provide adequate water cleanup capacity to minimize radiation dose rates around the IIF.

The purpose of this SER is to identify and evaluate safety issues relating to the operation of the IIF processing system to assure that this system may be operated without presenting undue risk to the health and safety of the public.

1.2 Organization

Section 2.0 of this SER provides a description of the IIF processing system, including a detailed system description, a physical description, and a list of major systems required to support the IIF processing system. Section 3.0 addresses safety concerns including boron dilution potential and radiological considerations. Section 4.0 provides the 10CFR 50.59 evaluation, Section 5.0 contains the summary and conclusions, and Section 6.0 is a list of references.

1.3 Conclusions

Based on the evaluation of safety concerns given in this SER, it is concluded that the IIF processing system does not constitute an unreviewed safety question and may be operated without presenting undue risk to the health and safety of the public.

2.0 Functioning of the System

The IIF processing system is designed to use the submerged demineralizer system (SDS) and portions of existing plant liquid radwaste disposal systems to decontaminate reactor coolant. The IIF processing system consists of a submersible pump located inside the IIF which transfers water from the IIF through the SDS to a reactor coolant bleed holdup tank. Reactor coolant grade water is concurrently returned to the reactor vessel from a second bleed tank by a waste transfer pump to maintain the RCS level.

2.1 Detailed System Description

The IIF processing system uses a commercially available, submersible pump (IIF Processing Pump, DWC-P-1) to transfer reactor coolant from the IIF, through the SDS to a reactor coolant bleed holdup tank. This detailed system description assumes that reactor coolant bleed holdup tank A

(WDL-T-1A) is being used for makeup and that tank C (WDL-T-1C) is receiving letdown from the SDS. However the roles of these tanks may be reversed. The pump is supported from the IIF and takes suction approximately 2 1/2 feet above the reactor vessel flange.

The discharge of the pump connects to the fuel transfer canal drain manifold by means of a 1 1/2 inch ID rubber hose having quick-disconnect fittings with two-way shutoff at each end. The manifold serves as a tie-in point for three systems: the reactor building basement pump system, the fuel transfer canal drain system, and the IIF processing system. Double isolation of the IIF processing system from these two systems is provided by disconnection of the remaining two hoses from the manifold and by closure of the branch valves. From the manifold the system uses an existing flow path through reactor building penetration R-626, fuel handling building penetration 1551, and the SDS to WDL-T-1C.

Makeup to the RCS is accomplished by transferring reactor coolant grade water to the reactor vessel by the normal makeup flow path: from WDL-T-1A via a waste transfer pump and an existing flow path through the liquid waste disposal and makeup systems to a cold leg of the reactor vessel.

The IIF processing system may be operated continuously (exclusive of administrative requirements such as RCS leak rate checks) until bleed tank A is drained to the desired level. The roles of bleed tanks A and C may then be reversed by properly realigning valves. Before transferring water to the RCS, however, bleed tank C must be recirculated and sampled according to plant operating procedures. Tank recirculation and sampling is assumed to take approximately 2 days which results in a maximum system availability of 70%. No simultaneous transfer of water is permitted to the bleed tank being used for RCS makeup.

2.2 System Performance Characteristics

The original goal of this system was to achieve a flow rate of 30 gpm through the SDS (see Appendix 2 of Reference 1). Upon review of the SDS it was determined that this flow could not be practically obtained. Therefore, the IIF processing pump was selected based on having a shutoff head approximately equal to the design pressure (150 psig) of the SDS with flow/head characteristics in the range of 0-30 gpm that will maximize the flow through the SDS. It is expected that flow through the SDS will not exceed 15 gpm and will normally average 10-12 gpm.

2.3 Instrumentation and Control

The IIF processing system may be operated in either an automatic or a manual level control mode.

RCS level monitoring for input to the IIF processing system operation is provided by the "bubbler" system described in Reference 2. The RCS level in the IIF can be maintained automatically by valve MU-V9. The control signal to valve MU-V9 is provided by the bubbler system through proportional controller RC-LIC-102 which is located on control room panel SPC-PNL-3.

The IIF processing system may also be operated in the manual level control mode. In this mode the previously described flowpath will still be used. Makeup flow will be manually balanced to match letdown flow to maintain RCS level.

The bubbler also has high and low level alarm points to prevent an unacceptable increase or decrease in the water level. In the event of a high or low level alarm, makeup and letdown are both automatically terminated by closure of valves WDL-V40 and FCC-V003. Closure of valve FCC-V003 automatically trips the IIF processing pump. Level indication and high and low level audible and visual alarms are provided locally on the bubbler control panel as well as remotely on the SDS panel in the fuel handling building and on SPC-PNL-3 in the main control room. Emergency stop switches are provided at the IIF to close valves FCC-V003 and WDL-V40 thereby stopping flow to and from the IIF.

2.4 System Physical Arrangement

The IIF pump is supported by the IIF and will be installed with the IIF. The fuel transfer canal drain manifold is located in the reactor building on the 347'-6" elevation near reactor building penetration R-626 location at the north end of the reactor building. Approximately 50 feet of 1 1/2" inch rubber hose will connect the IIF pump to the manifold. The hose is routed along the edge of the fuel transfer canal at the 347'-6" elevation.

2.5 Normal Operation

To start the IIF processing system the following conditions must be met: valves must be aligned to permit flow from a bleed tank through the waste transfer pump to a reactor vessel cold leg, the SDS must be configured for reactor coolant processing, the automatic trip switches must be in the not-blocked position, the basement pump system and the fuel transfer canal drain system must be isolated by valve closure and hose disconnection at the fuel transfer canal drain manifold, and the bleed tank being used for makeup must contain reactor coolant grade water.

IIF processing is begun by starting the waste transfer pump and opening valve WDL-V40. Valve FCC-V003 is opened from SDS control panel CN-PNL-1, which automatically starts the IIF processing pump transferring water to the SDS. Flow then will be manually balanced or automatically controlled by MU-V9 to maintain the RCS level in the IIF.

2.6 Additional Design Features

The system has incorporated two hand switches (DWC-HIS-1A and DWC-HIS-1266-1) which are located on SDS control panel CN-PNL-1 which can be used to block automatic shutdown of the system for high or low levels. These switches will allow the operators to fill or drain the IIF to the desired water level as needed. These switches must be in the not-blocked position for operation of the IIF processing system in the automatic or manual level control mode.

Relocation of the IIF pump within the IIF may be required to avoid interferences with post head removal activities. By using flexible hose with two-way shutoff quick disconnect couplings on the pump discharge, and the overlapping hanger design for the pump support, movement of the pump can be accomplished using overhead material handling equipment.

2.7 Systems Directly Supporting the IIF Processing System

2.7.1 Fuel Transfer Canal Fill and Drain System (FCC system)

The IIF processing system ties into the fuel transfer canal drain manifold inside the reactor building. Valve FCC-V003 terminates letdown from the IIF when closed manually or on alarm level signal from the bubbler system. Closure of valve FCC-V003 automatically trips the IIF processing pump.

2.7.2 Make Up and Purification System (MU system)

The MU system provides the flow path from the liquid waste disposal system to the reactor vessel. For automatic level control makeup valve MU-V9 acts as the flow controller to maintain RCS level based on level indication from the bubbler system. Manual level control is achieved by positioning valves in the MU system to ensure makeup flow matches letdown flow.

2.7.3 Reactor Coolant Level Monitoring System (Bubbler system)

The bubbler system provides RCS level indication and is required for operation of the IIF processing system. In the automatic level control mode flow to the IIF is automatically controlled based on IIF water level sensed by the bubbler. In both the automatic and manual level control mode the bubbler system will terminate supply and discharge flows automatically in the event of unacceptable water level in the IIF. The bubbler system will not initiate makeup from a bleed tank, but will only adjust flow once the IIF processing system is operating.

2.7.4 Reactor Coolant System (RCS)

The IIF processing system transfers reactor coolant from the IIF to the SDS for decontamination. The safety function of the RCS is to maintain a sufficient volume of adequately borated water for decay heat removal and for maintenance of subcriticality of the core. In addition the reactor coolant serves as a water shield for the radiation sources inside the vessel. The RCS level will be maintained within a controlled range during operation of the IIF processing system.

2.7.5 Submerged Demineralizer System (SDS)

The IIF processing system uses the SDS as the means of decontaminating the reactor coolant. The SDS is comprised of a liquid waste processing system, an off gas system, a monitoring and sampling system, and a solid waste handling system. The liquid waste processing system uses sand type filters for the removal of solids and a series of ion exchange columns for the removal of soluble contaminants. SDS effluent is returned to a bleed tank which is not being used for makeup. The off gas system collects, filters and absorbs radioactive gases during processing, sampling, dewatering and spent SDS liner venting. The sampling system provides the capability of obtaining samples of reactor coolant at several points in the processing stream. The solid waste handling system is provided for moving, dewatering, storing and loading of filters and demineralizer vessels. The operation of the SDS is described in Reference 1.

2.7.6 EPICOR II System

The EPICOR II system will be used to remove antimony-125 from the
reactor coolant if this isotope becomes a significant dose
contributor for workers on the IIF. This system will be used for
reactor coolant processing on a batch basis only. Water processed 1
by EPICOR II will be chemically adjusted before being used as RCS
makeup.

2.7.7 Liquid Waste Disposal System (WDL system)

The WDL system components used to support the IIF processing system are the reactor coolant bleed holdup tanks, the waste transfer pumps, and the flow path from the bleed tanks to the makeup system. Valve WDL-V40 also provides automatic termination of makeup in the event of a high or low level alarm signal from the bubbler system.

2.8 Other Systems Required to Support the IIF Processing System

2.8.1 Mini-Decay Heat Removal System (MDH system)

During IIF processing system operation decay heat removal from the core will be by the loss-to-ambient cooling mode. However, should forced circulation of reactor coolant through the core be required, the MDH system will provide this capability. In addition, the MDH system is capable of injecting borated water into the RCS to assure that the reactor coolant will be maintained within the required boron concentration limits.

2.8.2 Standby Reactor Coolant Pressure Control System (SPC system)

During IIF processing system operation, the SPC system is capable of injecting borated water into the RCS to assure that reactor coolant will be maintained within the required boron concentration limits.

3.0 Safety Concerns

3.1 General

The IIF processing system will be operated in accordance with detailed approved procedures. To assure that the system can be operated safely, an evaluation of safety consideratious was made. The safety issues identified were

- o decay heat removal
- o boron dilution
- o radiological considerations.

These issues are discussed below. Safety issues related to the operation of the SDS are identified and evaluated in Reference 1.

3.2 Decay Heat Removal

During operation of the IIF processing system the RCS level will be maintained well above the plenum cover plate elevation. In the past the bulk RCS temperature has been maintained at less than 100°F by the loss-to-ambient cooling mode with the water level below the plenum cover plate. Therefore no reduction in decay heat removal capability is expected during IIF processing system operation.

In the event that the water level decreases and the low level alarm trip should fail, the RCS level could only be lowered to the pump suction point approximately 2 1/2 feet above the plenum cover plate, which is above the reactor vessel nozzles. Adequate decay heat removal capability has been demonstrated for the RCS level lowered to the nozzles (Attachment 1 of Ref. 2). Therefore it can be concluded that adequate decay heat removal capability will be available in the event of failure of level control and low level trip.

3.3 Boron Dilution

The TMI-2 core is maintained in its safe shutdown condition by virtue of the soluble boron present in high concentrations in the reactor coolant. The reactor coolant temperature and chemistry will be maintained within Technical Specification limits during IIF processing. The only credible way the RCS boron concentration could be changed in an uncontrolled manner during IIF processing system operation is by the dilution of the reactor coolant with water that is either unborated or borated below the operating level. 2

To provide adequate assurance that a return to criticality of the fuel is precluded, measures have been taken to prevent the reduction of boron concentration, to detect a reduction in boron concentration, and to provide the capability to restore the reactor coolant to the operating boron concentration.

Methods for prevention, detection and mitigation of a boron dilution event are examined in detail in the report entitled "Hazards Analysis: Potential for Boron Dilution of Reactor Coolant System" (Ref 5). Appendix D of this reference applies to changes in boron dilution scenarios presented by the 2 operation of the IIF processing system. Reactor coolant sampling frequencies as given in the reference shall be implemented based on a minimum acceptable boron concentration of 4350 ppm (see reference 6). 2

3.4 Radiological Considerations

3.4.1 Normal Operations

The IIF processing system is designed to provide increased water processing capability during the period between head removal and plenum removal. This increased capability is required to reduce radioactive contaminants in the RCS and to thereby reduce radiation dose rates for workers on and around the IIF.

The RCS level in the IIF will be maintained above the control rod guide tubes to provide adequate shielding of the strong plenum source. Reducing the radioactivity in the water will further reduce dose rates for workers on the IIF.

Without RCS processing the concentration of radioactive contaminants in the coolant increases. The concentration of cesium-137 reached levels of 6-8 μCi/ml after several months without processing with the RCS in the drained down condition. It is a goal to have reactor coolant concentrations at approximately 1 μCi/ml at the time of head removal. Based on the capability of the SDS with the IIF processing system operating at 10 gpm, reactor coolant concentrations of 0.1 μCi/ml and lower may be achieved. This is based on a system availability of 70%, which accounts for bleed tank recirculation and sample time.

Calculated radiation dose rates are used here to illustrate the benefits which may be attained by reducing the radioactive materials in the coolant. Based on data from the underhead characterization program, the anticipated dose rate contribution from the plenum and the reactor coolant in the IIF have been calculated. The dose rate increases for workers on the IIF cover were calculated assuming that the IIF cover holds 1 inch of lead shielding and that the water level in the IIF is 5' above the vessel flange. Note that decreasing the water level in the IIF decreases the shielding of the plenum and results in an increase in dose rate. The increases in general area dose rates were calculated for before the IIF processing system is available, i.e., with a reactor coolant (RC) concentration of 1 μCi/ml, and after IIF processing has been operating, i.e., with an RC concentration of 0.1 μCi/ml. The contribution from the plenum was based on the information contained in Reference 4. These dose rate increases are shown below.

RC cesium-137 concentration	Dose rate on IIF cover (excluding background)
0.1 μCi/ml	5 millirem/hr
1.0 μCi/ml	16 millirem/hr

During plenum inspection tasks workers may remove shielding plates from the IIF cover to provide tool and camera access into the vessel. Dose rates calculated as above, but assuming no shielding from the IIF cover, are given below.

RC cesium-137 concentration	Dose rate above opening in IIF cover (excluding background)
0.1 µCi/ml	120 millirem/hr
1.0 µCi/ml	610 millirem/hr

The entire IIF processing system has been examined for radiological impact to the reactor building environment. Considering the long hose lengths which will carry reactor coolant through the reactor building, the potential increase in general area dose rates due to this new source was evaluated. The following dose rates were calculated and show that the increase in worker exposures due to the hose is negligible.

RC cesium-137 concentration	Dose rate 4' from hose (excluding background)
0.1 µCi/ml	0.1 millirem/hr
1.0 µCi/ml	1.0 millirem/hr

Calculated dose rates do not consider any isotope in the reactor coolant except cesium-137. Other isotopes which may contribute significantly to gamma dose rates are cesium-134 and antimony-125. The cesium-134 concentration is normally an order of magnitude less than that of cesium-137. Antimony-125 is not removed from the coolant with a reliable decontamination factor by the SDS in its current configuration. However the dose rate for antimony-125 is less than that of cesium-137 for a given concentration. Current concentrations of antimony-125 are approximately 0.2 µCi/ml. In addition, if antimony-125 in the reactor coolant becomes a significant dose contributor to workers on the IIF cover, the IIF processing system may be used to transfer water to the EPICOR II system in a batch processing mode. EPICOR II will remove the antimony-125 with a satisfactory decontamination factor.

3.4.2 System Failures

During normal operations the IIF processing system will function to reduce dose rates on the IIF cover to minimize worker exposures. However, to provide assurance that system failures will not result in unacceptable radiological conditions, consequences of system failures were examined. Failures which could potentially result in significant changes in radiological conditions are:

- hose leakage
- hose blockage
- pump failure
- bubbler failure
- valve failure

Hose breakage or leakage may occur during IIF processing system operation. Hose is routed in the refueling canal, along the edge of the canal at the 347'-6" elevation, and along the floor at the 347'-6" elevation to the fuel transfer canal drain manifold at the north end of the reactor building. From the manifold, the hose leads a short distance directly to the reactor building penetration. Leakage from hose lines would either collect in the refueling canal or on the floor at the 347'-6" elevation.

To prevent possible leakage from the hoses all discharge hose and pipe will be leak tested in accordance with ANSI B31.1. Periodic visual inspection of the hose will be used to assess its condition. The pressure rating of the hose and couplings are higher than the IIF processing pump shutoff head (approximately 150 psig). An emergency shutoff switch is located on the handrail next to the bubbler panel in the reactor building, to stop the system in case of hose breakage. Although precautions to prevent hose leakage have been taken, it has been determined that even significant leakage of reactor coolant onto the floor or in the canal would not increase radiation dose rates enough to prevent access to the area for cleanup of the spill. Conservative analyses have been done which indicate that large puddles of reactor coolant do not result in large increases in general area dose rates around the spill. These analyses assume cesium-137 concentrations greater than 1 μCi/ml.

In the event the IIF discharge hose is blocked the effect would be similar to closing a valve downstream of FCC-V003. This would result in the pump either shutting down on thermal overload or on high level trip. In either case no unacceptable consequence results.

The pump used in the IIF processing system is a commercially available pump which has been shown to be highly reliable. It is expected that the IIF pump will operate successfully for the operational lifetime of the IIF processing system. However in the event of failure of the IIF pump the bubbler system will act to prevent overflow of the IIF as discussed previously.

In addition the pump installation has been designed such that removal of the pump for repair on replacement can be easily accomplished while minimizing worker exposures. Specifically, steps to remove the pump are

- o Remove the IIF cover shield plate from above the pump location
- o Loosen a single hold down bolt on the pump
- o Lift the pump using overhead lifting equipment.

In the event of pump failure the water processing capability would be greatly reduced, and some increase in radioactivity in the coolant may result. However, since the pump is easily removed and the pump is commercially available, this reduction in water processing capability would be minimized.

2

Bubbler system failures may cause one of two accident conditions: overflow of the IIF or reduction of the RCS level to the pump suction level. It should be noted that for the RCS level to go outside of the alarm setpoint levels there must be two independent instrumentation failures in the bubbler system during the automatic level control mode. Based on the reliability of these instruments this is an extremely unlikely event.

The bubbler system is designed as an Important to Safety system. Testing of all components will be performed prior to installation in the reactor building. Instrumentation is accurate to within $\pm$ 3 inches of water. Redundant level monitoring instrumentation is available (RC-LT-100) and is also equipped with setpoints which will sound an alarm in the control room in the case of unacceptable water level. RC-LT-100 has no control function over the IIF processing system, but will provide level indication in the control room and will alert operators to a potential overflow or low level condition.

Overflow of the IIF will not cause radiological conditions which would prevent access to the area for cleanup operations. All overflow from the IIF would be contained in the refueling canal. If IIF overflow is indicated by level monitoring instrumentation, the canal area can be easily monitored by closed circuit TV from areas outside the reactor building, so that IIF overflow could be verified and terminated. If a large overflow did occur, the fuel transfer canal drain system could be started to pump out the canal. Entry into the reactor building to connect the canal drain system to the manifold would not be precluded by reactor coolant in the canal, and airborne radioactivity would be no worse than that experienced when high activity water was present in the reactor building basement. An emergency stop switch located in the reactor building could be used to terminate overflow from the IIF.

The pumping of the IIF down to the pump suction point would reduce the water shield over the tops of the control rod guide tubes. The top of the pump suction is located at approximately the 325'-4" elevation. The top of the control rod guide tubes is at approximately the 324'-4" elevation. Therefore there exists approximately 12 inches of water above the guide tubes. This 12 inches of water along with the IIF cover, which consists of 3/4 inches of steel and approximately 1 inch of lead, still provides adequate shielding of the plenum source to permit access to the IIF cover.

Valves controlled by the bubbler system are MU-V9, used only during the automatic level control mode, WDL-V40 and FCC-V003. Failure of the controller valve MU-V9 may result in change of RCS level. However if an alarm level is reached the IIF processing system operation is automatically terminated. Valves FCC-V003 and WDL-V40 will both fail closed on the loss of air or electricity. Closure of valve FCC-V003 automatically trips the IIF processing pump, and the closure of WDL-V40 would simply terminate makeup which would soon cause a low level alarm condition and a termination of processing.

2

3.4.3 Dose Assessment

The dose assessement for operating the SDS in conjunction with the IIF processing system is given in Appendix 2 of Reference 1. No increase in release of airborne radioactivity to the reactor building atmosphere or from the reactor building to the environment from use of the IIF processing system is expected. In fact, the IIF processing system will help reduce the reactor coolant radioactive materials concentration which should minimize any airborne radioactivity release from the RCS in the reactor building.

3.4.4 ALARA

A major goal in the design of the IIF processing system has been to assure that radiation exposure to workers is maintained as low as is reasonably achievable. The purpose of the IIF processing system is to reduce radioactive materials in the reactor coolant and thereby reduce radiation dose rates for workers on and around the IIF. Specific design features for the IIF processing system were incorporated to implement the ALARA concept. These features have been discussed previously and are summarized below.

- o The IIF pump is designed to be installed with the IIF immediately after head removal. This eliminates the need for personnel access to the IIF cover for this purpose before reactor coolant cleanup.
- o The IIF pump is a commercially available model, which requires short lead time if replacement becomes necessary, and thereby minimizes the amount of time with reduced water processing capability.
- o The IIF pump is equipped with lifting eyes and a single hold down bolt to simplify removal or movement, which permits operational flexibility.
- o Sufficient hose to the pump is provided to allow relocation of the pump if post head removal activities require it.
- o Evaluation of impact on reactor building dose rates due to the hose routing was performed to assure minimal increase in the general area dose rates, and hoses will be routed to maximize distance to work areas and to take advantage of existing structures for shielding as much as possible.
- o Failures of the IIF processing system components will not result in unacceptable radiological conditions for workers in the reactor building.

All work performed in the reactor building is reviewed by the Radiological Controls Department and is evaluated to assure that personnel radiation exposures are minimized according to established procedures.

2

In-containment work required by the operation of the IIF processing system involves hose disconnections at the fuel transfer canal drain manifold. Realignment of the flow path to the SDS is expected to be infrequent. All hose connections are equipped with quick disconnect fittings to facilitate connection and disconnection, which will minimize time required.

4.0 10CFR50.59 Evaluation

According to 10CFR50, paragraph 50.59, the holder of an operating license may make changes to the facility or perform a test or experiment, provided the change, test or experiment does not involve a change in the plant technical specifications or an unreviewed safety question. A proposed change involves an unreviewed safety question a) if the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the safety analysis report may be increased, or b) if a possibility for an accident or malfunction of a different type than any evaluated previously in the safety analysis report may be created, or c) if the margin of safety as defined in the basis for any technical specification is reduced.

The operation of the IIF processing system does not present an unreviewed safety question as discussed below.

a) Accidents presented and analyzed in the TMI-2 Safety Analysis Report, Technical Evaluation Reports, Systems Descriptions, and Safety Evaluation Reports address events which bound by a wide margin the potential consequences of any planned or postulated unplanned event that might occur in connection with the operation of the IIF processing system. Potential system failures and their consequences are discussed in Section 3.0 of this report.

b) The possibility of an accident or malfunction of a different type than any previously evaluated in the safety analyses is not created by the operation of the IIF processing system. The IIF processing system is essentially a liquid radioactive waste system used to maintain the reactor coolant at low specific activities. As such the possibility of an accident or malfunction is of the same type as previously evaluated for other liquid radioactive waste systems, including the SDS. Since the potential source term in the RCS to be processed by the IIF processing system is much smaller than other liquid radioactive waste streams processed by SDS, any consequences of accidents or malfunctions would be bounded by a large margin by other safety analyses.

c) Operation of the IIF processing system does not result in a reduction in the margin of safety as defined in the basis for any technical specification. Possible releases of radioactive effluents to the environment will be bounded by a large margin by those resulting from the use of the SDS for cleanup of the reactor building basement water which was constrained by Appendix B of the Technical Specifications.

Based on the above the operation of the IIF processing system does not present an unreviewed safety question. No change in plant technical specifications is required by operation of the IIF processing system.

5.0 Conclusions

Based on the safety evaluations contained in this report the following provisions have been demonstrated.

- Adequate measures for the prevention of an RCS boron dilution event will be taken.
- Adequate detection capability exists in the unlikely event that a boron dilution event does occur.
- Subcriticality of the core will be maintained.
- Occupational exposures will be maintained as low as is reasonably achievable.
- Radiological consequences of system failures are acceptable.
- Activities addressed do not present an unreviewed safety question.

In conclusion, the operation of the IIF processing system does not present undue risk to the health and safety of the public.

6.0 List of References

1. Submerged Demineralizer System Technical Evaluation Report, June 1983.
2. Safety Evaluation Report for Removal of the TMI-2 Reactor Vessel Head, Rev. 5, February 1984.
3. Reference deleted. 2
4. TPO/TMI-042 Rev. 1, "Dose Modeling of Underhead Source".
5. Hazards Analysis: Potential for Boron Dilution of Reactor Coolant System, Rev. 1, November 1984 2
6. Criticality Report for the Reactor Coolant System, Rev. 0, October 1984.