AmerGen
A PECO Energy/British Energy Company

AmerGen Energy Company, LLC
Three Mile Island Unit 1
Route 441 South, P.O. Box 480
Middletown, PA 17057
Phone: 717-944-7621

5928-00-20171
September 20, 2000

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

Dear Sir or Madam:

Subject: THREE MILE ISLAND NUCLEAR STATION, UNIT 1 (TMI-1),
OPERATING LICENSE NO. DPR-50
DOCKET NO. 50-289
REQUEST FOR EXEMPTION TO 10 CFR 50.44; 10 CFR 50, APPENDIX A, GENERAL DESIGN CRITERION 41; AND 10 CFR 50, APPENDIX E, SECTION VI AND PROPOSED LICENSE AMENDMENT REQUEST NO. 292 PERTAINING TO THE HYDROGEN CONTROL SYSTEMS

The purpose of this letter is to request an exemption from the requirements of 10 CFR 50.44, "Standards for Combustible Gas Control Systems in light-water-cooled power reactors;" Part 50, Appendix A, General Design Criterion 41, "Containment Atmosphere Cleanup;" and Part 50, Appendix E, Section VI, "Emergency Response Data System" in accordance with the provisions of 10 CFR 50.12 and an accompanying technical specification change request. The purpose of these requests is to remove requirements for hydrogen control systems from the Three Mile Island Nuclear Generating Station, Unit 1 design basis and technical specifications in accordance with risk-informed, performance-based regulations. A relevant bases change is included to clarify this issue. Please include this bases change with the next amendment. The bases change was approved in accordance with our 10 CFR 50.59 process.

The requested exemption and amendment will have a positive impact on public health risk due to a reduction in potential releases, fewer distractions to the operators, and permitting simplification of the Emergency Operating Procedures. This will enable operators to focus on more important safety functions immediately following postulated design basis accidents.

If the above request is granted, Three Mile Island Nuclear Generating Station, Unit 1 will remove these systems from the Updated Final Safety Analysis Report, and from the Emergency Operating Procedures to ensure it is clear that these systems no longer perform a safety related function. No credit is taken for the operation of these systems for design basis event mitigation.

This request is similar to requests of September 10, 1998 and July 19, 1999 granted to San Onofre Nuclear Generating Station Units 2 and 3 (Operating Licenses NPF-10 and NPF-15) on September 3,

A001

1999 and similar to the July 26, 2000 request pending from Duke Energy Corporation, Oconee Nuclear Station, Units 1, 2, and 3 (Operating Licenses DPR-38, DPR 47, and DPR 55).

Pursuant to 10 CFR 50.91(b)(1), a copy of this License Amendment Request is provided to the designated official of the Commonwealth of Pennsylvania, Bureau of Radiation Protection, as well as the chief executives of the township and county in which the facility is located.

Please contact V. Lewis Killpack, Jr. of the TMI Regulatory Engineering Department at (717) 948-8196 regarding any additional concerns or questions on this issue.

Sincerely,

Mark E. Warner
Vice President, TMI Unit 1

MEW:vlk
Enclosures: (1) Exemption Request Supporting Documentation
(2) Technical Specification Change Request 292 Description of Change and Safety Evaluation Supplement
(3) Technical Specification Mark-up

cc: Administrator, Region I
TMI-1 Senior Project Manager
TMI Senior Resident Inspector
Chairman, Board of Supervisors, Londonderry Township, Dauphin County, Pennsylvania
Board of County Commissioners, Dauphin County, Pennsylvania
Pennsylvania Department of Environmental Resources, Bureau of Radiation Protection

File No.00075

AMERGENENERGY, LLC

Operating License No. DPR-50
Docket No. 50-289
Exemption Request and Technical Specification Change Request No. 292

COMMONWEALTH OF PENNSYLVANIA)
) SS:
COUNTY OF DAUPHIN)

This Exemption Request and Technical Specification Change Request is submitted in support of Licensee's request for exemption to certain regulations and to change Appendix A to Operating License for Three Mile Island Nuclear Station, Unit 1. As a part of this request, marked up pages showing proposed changes for Appendix A to the License are also included. All statements contained in this submittal have been reviewed, and all such statements made and matters set forth therein are true and correct to the best of my knowledge.

AMERGEN ENERGY COMPANY, LLC

BY: Mark E Warner
Vice President, TMI Unit 1

Sworn and Subscribed to before me
this 20th day of September, 2000.

Linda C. Witter
Notary Public

Notarial Seal
Linda C. Witter, Notary Public
Londonderry Twp. Dauphin County
My Commission Expires Sept. 25, 2000
Member, Pennsylvania Association of Notaries

ENCLOSURE 1

EXEMPTION REQUEST

SUPPORTING DOCUMENTATION

1.0 INTRODUCTION

1.1 PURPOSE

This enclosure provides information in support of a request for exemption and change to the Technical Specifications pursuant to Title 10 of the Code of Federal Regulations Part 50.12, Specific Exemptions, from requirements contained in 10 CFR 50.44 and 10 CFR 50, Appendix A, General Design Criterion 41, 10 CFR 50, Appendix E, Section VI.2.a.(i).(4) and 10 CFR 50.90.

1.2 REGULATORY REQUIREMENTS

1.2.1 Requirements of 10 CFR 50.44 and 10 CFR 50, Appendix A, General Design Criterion 41

10 CFR 50.44, Standards for combustible gas control system in light-water-cooled power reactors, and 10 CFR 50, Appendix A, General Design Criterion 41, Containment Atmosphere Cleanup, establish requirements for controlling the amount of hydrogen inside the reactor containment following a postulated Loss of Coolant Accident (LOCA). These requirements provide specific assumptions and methods to define the amount of hydrogen generated, the rate at which the hydrogen is generated, and the requirements of a combustible gas control system to control the concentration of hydrogen in the containment following a design basis LOCA to below flammability limits. 10 CFR 50, Appendix E, Emergency Response Data System, contains requirements to provide information on the concentration of hydrogen inside the containment following accidents as part of the Emergency Response Data System.

The regulations require the following:

[1]A means for control of hydrogen gas that may be generated, following a postulated LOCA by:
- # metal-water reaction involving the fuel cladding and the reactor coolant;
- # radiolytic decomposition of the reactor coolant; and,
- # corrosion of metals.

[2]The hydrogen control measures must be capable of:
- # measuring the hydrogen concentration in the containment insuring a mixed atmosphere in

[1] 10CFR50.44(a)

[2] 10CFR50.44(b) and 10CFR50 Appendix E section VI.2.a.(i).(4)

the containment; and,

controlling combustible gas concentrations in the containment following a LOCA.

[3]It must be shown that following a LOCA, but prior to effective operation of the combustible gas control system, either:

an uncontrolled hydrogen-oxygen recombination would not take place in the containment; or,
the plant could withstand the consequences of uncontrolled hydrogen-oxygen recombination without loss of safety function.

[4]A combustible gas control system to maintain the concentrations of combustible gases following a LOCA below flammability limits. Such systems may be of two types:

those allowing controlled release from containment such as a purge system;
those that do not result in a significant release from containment such as recombiners.

[5]Such a system must control hydrogen as necessary following a LOCA to assure that containment integrity is maintained. It must meet redundancy and single failure requirements.

1.2.2 Criteria for Exemptions – 10 CFR 50.12 Requirements

The Nuclear Regulatory Commission has established certain criteria that permit any interested person to request specific exemptions to its rules and regulations provided special circumstances exist. These criteria are promulgated in 10 CFR 50.12, Specific Exemptions:

> 10 CFR 50.12(a) The Commission may, upon application by any interested person or upon its own initiative, grant exemptions from the requirements of the regulations of this part which are
>
> 10 CFR 50.12(a)(1) Authorized by the law, will not present an undue risk to the public health and safety, and are consistent with the common defense and security.
>
> 10 CFR 50.12(a)(2) The Commission will not consider granting an exemption unless special circumstances are present.

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[3]10CFR50.44(c)(1)

[4]10CFR50.44(h)(2)

[5]10CFR50 Appendix A General Design Criterion 41, Containment Atmosphere Cleanup

Special circumstances are identified in 10 CFR 50.12(a)(2). The special circumstance most relevant to Three Mile Island Unit 1 is:

> 10 CFR 50.12(a)(2)(ii) Application of the regulation in the particular circumstances would not serve the underlying purpose of the rule or is not necessary to achieve the underlying purpose of the rule.

Special circumstances may also be present with respect to:

> 10 CFR 50.12(a)(2)(iv) The exemption would result in benefit to the public health and safety that compensates for any decrease in safety that may result from the grant of the exemption.

> 10 CFR 50.12(a)(2)(vi) There is present any other material circumstance not considered when the regulation was adopted for which it would be in the public interest to grant an exemption.

This enclosure provides documentation in support of Three Mile Island Unit 1 request for an exemption and the associated technical specification change.

2.0 TECHNICAL DISCUSSION

2.1 OVERVIEW

The containment combustible gas control system installed in Three Mile Island Unit 1, is in accordance with the requirements of 10 CFR 50.44 and 10 CFR 50, Appendix A, General Design Criterion (GDC) 41, to control the hydrogen concentration inside the reactor building, following design basis Loss of Coolant Accident (LOCA) conditions, below the hydrogen action level of 3.0 volume percent (3.0%). Measurement and reporting of the hydrogen volume percentage is required by 10 CFR 50, Appendix E, Emergency Response Data System. The containment combustible gas control system design basis is provided in the TMI-1 Final Safety Analysis Report (FSAR) Section 6.5.

2.2 DESIGN CONSIDERATIONS

2.2.1 System Description

The Reactor Building Combustible Gas Control System consists of the Hydrogen Monitoring System and the Hydrogen Recombiner System. A backup means of post-accident hydrogen control is also available by use of the Reactor Building Hydrogen Purge System. These are briefly described below.

2.2.1.1 Hydrogen Monitoring System

The redundant hydrogen monitors are a safety-related system that is designed to measure the hydrogen concentration inside the Reactor Building following an accident and to alert the operators in the control room of the need to activate the hydrogen recombiners. The hydrogen monitors are not in operation during normal plant operation. The Hydrogen Monitoring System is actuated only during surveillance or during an accident. Following an accident, when directed by the Emergency Operating Procedures (EOPs) to establish containment combustible gas control, the operators place the hydrogen monitors in operation. Following an accident, startup of the hydrogen monitors will occur at variable times depending on the implementation of the Emergency Operating Procedures.

The hydrogen analyzer cabinets are located in the Intermediate Building at elevation 295 feet and at elevation 322 feet. Hydrogen concentration is indicated and recorded in the Control Room. Hydrogen concentration is also indicated locally at the cabinets. High hydrogen concentration (2.0%) is alarmed in the Control Room and at the local panel. The hydrogen monitor measurement capability is over a range of 0 to 10 volume percent.

2.2.1.2 Hydrogen Recombiner System

The hydrogen recombiners consist of two safety-related recombiners that are located in the west end of the Intermediate Building at floor elevation, 305 feet in the Leak Rate Test equipment area. The control consoles for the hydrogen recombiners are below the recombiners at elevation 295 feet. The recombiners are designed to maintain the hydrogen concentration below the action level of 3.0%, which is below the range of 4% to 6% as specified in Regulatory Guide 1.7.

Each recombiner is a flameless thermal hydrogen recombiner. There are no moving parts inside the recombiner. Air flows by natural convection through the unit at a rate of 50 standard ft^3/min. Heating elements cause the hydrogen to chemically combine with atmospheric oxygen. As presently described in the TMI-1 Emergency Operating Procedures (EOPs), the hydrogen recombiners are manually started by the control room operators before the hydrogen concentration reaches the action level of 3.0%. Following a design basis LOCA, a hydrogen concentration of 3.0% is not reached for at least 8 days after the start of the accident.

2.2.1.3 Reactor Building Hydrogen Purge System

As a backup to the hydrogen recombiners, the Reactor Building Hydrogen Purge System is designed to maintain the hydrogen concentration of the Reactor Building below the lower flammability limit of 4.0 volume percent (4.0%). This is accomplished by introducing fresh outside air into the Reactor Building and allowing the displaced containment atmosphere to be discharged in a controlled manner to the plant vent through the Reactor Building Purge exhaust filters.

The Hydrogen Purge System is placed in service as follows. If the Hydrogen Monitoring System indicates that the Reactor Building hydrogen concentration has reached 2.5% and the hydrogen recombiners are not available, preparations for purging the Reactor Building will begin. A portable compressor will be obtained and connected to the leak rate test connections outside the Intermediate Building. At a sufficient time prior to starting purging, the portable compressor will be used to raise the Reactor Building pressure to approximately 1 psig. The operators in the control room will then monitor wind speed, direction, and direct control of the Hydrogen Purge System in accordance with a specific purge plan. The Hydrogen Purge System is a subset of the Reactor Building Purge System.

2.2.2 Supporting Systems

2.2.2.1 Containment Air Mixing

Hydrogen mixing within the containment is accomplished by the Reactor Building Emergency Cooling System (fans and coolers) and the Reactor Building Spray System. These systems and the internal structures of the containment are designed to maintain a well-mixed containment atmosphere, and to prevent hydrogen pocketing.

The equipment for containment air mixing starts on automatic signals following a LOCA to remove heat and fission products from the containment atmosphere, as well as to minimize localized hydrogen buildup inside containment. This exemption request proposes no changes to the containment air mixing equipment.

2.2.2.2 Controlled Purge of Containment

The Reactor Building Purge System provides the capability for a controlled purge of the reactor containment structure. The use of parts of the Reactor Building Purge System for Post-Accident Hydrogen Control will no longer be necessary if the exemption request is approved.

2.2.3 Impact of Requested Changes on Hydrogen Control

As explained below, the TMI-1 hydrogen control is not significantly impacted by the proposed exemption request due to (1) existing margin in the containment design, and (2) due to its limited capacity, the existing containment combustible gas control system has no value in defense against containment failure resulting from hydrogen buildup inside the containment following severe accidents.

2.2.3.1. Impact of Hydrogen Control on Containment Safety Margin

TMI-1 employs a large, dry containment design with a design pressure of 55 psig. This type of

PWR containment is the least susceptible to damage from a hydrogen burn. The hydrogen burn during the 1979 event at Three Mile Island 2 (TMI-2) with a hydrogen concentration of about 8.1% resulted in a containment peak pressure of about 28 psig, well below the containment design pressure of 60 psig (NSAC-22, 1981). The TMI-1 containment with a similar design has sufficient safety margin against hydrogen burn following design basis and severe accidents without use of the hydrogen control system.

Following a design basis LOCA without operation of the hydrogen control system, hydrogen could accumulate inside the containment and could reach the flammability limit. However, containment failure due to hydrogen combustion is unlikely, based on the results of the TMI-1 Probabilistic Risk Assessment (PRA). The TMI-1 PRA concluded that the containment would remain intact for severe accidents which included hydrogen burns for which no credit was taken for the Combustible Gas Control System as long as the containment heat removal systems (Reactor Building Emergency Cooling and Reactor Building Sprays) work. This exemption request makes no changes to the containment heat removal systems. The Probabilistic Risk Assessment indicates that none of the accident sequences addressed in the Three Mile Island Nuclear Generating Station, Unit 1 PRA that could realistically threaten containment due to hydrogen combustion are impacted by the hydrogen recombiner or sampling system.

Both the nuclear industry and the NRC conducted numerous analyses and tests following the event at TMI-2 in 1979 to determine the containment capability of pressurized water reactor plants with a large, dry containment. NUREG/CR-5662 (1991) reports the computed containment peak pressure due to global hydrogen burn based on a 75% fuel cladding metal-water reaction (MWR) (which can be expected to occur during severe accidents) for a group of pressurized water reactor plants with large, dry containments, similar to the TMI Unit1 containment. The reported containment peak pressure values are all within the plants estimated containment capacities. Therefore, the NRC-sponsored study concludes that it seems unlikely that containment integrity would be threatened by a hydrogen burn from a 75% MWR in the containments examined. The 75% MWR estimate was intended to be representative of a range of core melt accidents. It should be noted that the TMI-2 accident involved about 45% MWR which resulted in a hydrogen concentration of about 8.1% (NUREG/CR-4330, Volume 3, 1987). The NRC concluded that the large, dry containments could withstand the containment pressure following severe accidents and there was no need to backfit these containments with glow plug igniters or to inert the containment atmospheres.

A detailed plant-specific containment integrity analysis for TMI-1 indicates that the ultimate pressure capacity of the containment is between 137 psig and 147 psig (TMI-1 Probabilistic Risk Assessment, Level 2, Appendix 1). Hence, a safety margin exists for containment integrity at higher hydrogen concentration levels following a design basis LOCA, without the use of a hydrogen control system.

With respect to equipment survivability, NUREG/CR-5662 states:

"Equipment survivability depends on the specific plant design and on the containment environment during a specific accident. The large-scale Nevada test site experiments demonstrated that various types of plant equipment are capable of operating successfully when subjected to the severe thermal environments associated with large-volume hydrogen burns.

The recent analytical and experimental study performed at Sandia National Laboratories showed that the simulated equipment can withstand a LOCA and single burn resulting from a 75% MWR in a large, dry containment. However, the multiple burn due to the operation of ignition systems could pose a serious threat to safety-related equipment located in the source compartment."

It should be noted that the TMI-1 containment does not have igniters. This reduces the potential for multiple burns. During the TMI-2 accident, containment was not breached and damage inside containment was essentially limited to plastics and other low melting point materials such as telephone cases and the crane operator's seat (NUREG/CR-4330, Volume 3, 1987).

Summary of Safety Margin Impact

For pressurized water reactor plants with large, dry containments, a safety margin remains for containment rupture from hydrogen burn or detonation at higher hydrogen concentration levels during severe accidents or following a design basis LOCA, without using any hydrogen control system. Additionally, the NRC has determined that pressurized water reactor plants with large, dry containments can withstand the containment pressure following severe accidents and there was no need to backfit these containments with glow plug igniters or to inert the containment atmospheres.

2.2.3.2. Impact of Hydrogen Control on Design Basis Accidents

The existing containment Combustible Gas control System meets the requirements of 10 CFR 50.44 and 10 CFR 50, Appendix A, GDC 41 to control the concentration of hydrogen which may be released into the reactor containment following postulated design basis accidents. The existing containment hydrogen control system is designed to ensure that the hydrogen concentration is maintained below the action level of 3.0% following a design basis LOCA. The Reactor Building Emergency Cooling System, the Reactor Building Spray System, and the internal containment structural design provide excellent hydrogen mixing capability inside the containment that would prevent hydrogen pocketing following a postulated design basis LOCA. These hydrogen-mixing systems are not impacted by this exemption request.

The containment Combustible Gas Control System design basis is provided in TMI-1 Final Safety Analysis Report (FSAR), Section 6.5. The primary means of controlling combustible

gases inside the Reactor Building, following a LOCA, is the Hydrogen Recombiner System. The airflow volume of each hydrogen recombiner train is 50 standard ft^3/min. The control room operators manually start the hydrogen recombiners before the hydrogen concentration reaches 3.0%, which, following a design basis accident is not expected to occur before 8 days after a design basis LOCA.

Following a design basis LOCA, hydrogen could accumulate inside the containment and could reach the lower flammability limit of 4% assuming no activation of the hydrogen recombiners or hydrogen purge. It would take days to reach this lower flammability limit per the assumptions in the design basis analysis. It should be recognized that these times are artifacts of the assumptions in the calculations. For severe accidents, the hydrogen concentration could be above 4% in hours, not days. For accidents where the reactor core is not damaged, the hydrogen concentration would probably never go above 4%. In addition, containment failure due to hydrogen combustion is unlikely, based on the results of the TMI-1 Probabilistic Risk Assessment (PRA) study. The TMI-1 Probabilistic Risk Assessment concluded that the containment would remain intact for severe accidents which included hydrogen burns for which no credit was taken for the Combustible Gas Control System as long as the containment heat removal systems (Reactor Building Emergency Cooling and Reactor Building Sprays) work. The Probabilistic Risk Assessment indicates that none of the accident sequences addressed in the Three Mile Island Nuclear Generating Station, Unit 1 PRA that could realistically threaten containment due to hydrogen combustion are impacted by the hydrogen recombiner or sampling system.

There is also no potential for containment integrity to be challenged due to hydrogen pocketing, based on TMI-1 containment internal structural design (generous vent paths) and availability of safety-related Containment Air Mixing Systems, which are not impacted by this exemption. The results of a study for several PWR plants with large dry containments indicated that, depending on the containment volume and fan capacity, a mixing of the total containment air volume by fans alone would take only 10 to 30 minutes for the PWRs examined (NUREG-CR-5662, Section 2.3). The time required to process one containment volume for TMI-1 is approximately 25 minutes using three reactor building cooling fans in the emergency mode.

Summary of Design Basis Accident Impact

The containment Combustible Gas Control System is designed to maintain the hydrogen concentration level below the flammability limit during design basis accidents. Without operation of the hydrogen control system, the hydrogen concentration could be expected to rise above the lower flammability limit of 4.0% following a design basis LOCA and the assumptions presently used for accident analysis. In actual fact, for accidents where the reactor core is not damaged, the concentration would probably never get above 4.0%. In addition, containment failure due to hydrogen combustion is unlikely based on the results of the TMI-1 Probabilistic Risk Assessment.

2.2.3.3. Impact of Hydrogen Control on Severe Accidents

For severe accidents, i.e., those beyond the design basis, containment hydrogen concentrations in the range of 10% over short periods of time are possible, as demonstrated at the TMI-2 accident in 1979. The containment Combustible Gas Control System is designed to maintain the hydrogen concentration level below the action level of 3.0% during design basis accidents that result in small amounts of hydrogen produced slowly over long periods of time--i.e., many days. For severe accidents during which containment hydrogen concentration will rapidly rise to above the 3.0% level, the present containment Combustible Gas Control System is undersized, and hence would provide no benefit to hydrogen concentration control and containment performance. A NRC-sponsored study (NUREG/CR-5567, 1990) corroborates this point by stating that the hydrogen control systems are designed to accommodate hydrogen accumulation for design basis events (oxidation of 5% Zircalloy surrounding the active fuel). These systems are not designed for the hydrogen generation that might accompany a reactor core meltdown. Consequently, the containment combustible gas control system was determined to be ineffective in mitigating hydrogen in the TMI-1 Probabilistic Risk Assessment study. Subsequent to the TMI-2 accident, improvements in equipment, operator training, and procedures make it extremely unlikely that a severe core damaging event comparable to TMI-2 would occur at TMI-1.

The hydrogen recombiners are ineffective at processing hydrogen at the higher rates expected to be generated during severe core damage accidents. The TMI Unit 1 hydrogen recombiners have a 50 standard ft^3/min capacity each, and would be placed in operation when the hydrogen concentration is in the range of 3.0%.

The Reactor Building Hydrogen Purge System is ineffective at processing hydrogen at the higher rates expected to be generated during severe core damage accidents. The activation of the Reactor Building Hydrogen Purge System during severe accidents could be detrimental to public health and safety.

The usefulness of the hydrogen monitors is very limited during severe accidents. The only safety-related use of hydrogen monitors is to provide indication to the operators as to when they should manually start recombiners or purge. The monitors do nothing except indicate and annunciate. All operations to mitigate high hydrogen are manually initiated.

Summary of Severe Accident Impact

The usefulness of the existing containment Combustible Gas Control System is limited to design basis accidents. The system is undersized for severe accidents, and hence provides no benefit for these accidents. During severe accidents, the activation of the Reactor Building Hydrogen Purge System could be detrimental to public health and safety.

Conclusion

The proposed exemption does not affect the TMI-1 accident control due to (1) existing margin in the containment design, and (2) the limited capacity of the containment Combustible Gas Control System, which provides no benefit for severe accidents and the activation of the Reactor Building Hydrogen Purge System during severe accidents that are detrimental to public health and safety.

2.2.4 Additional Considerations

Risk Reduction Due To Instruction Simplification

In a postulated LOCA, the TMI-1 Emergency Operating Procedures direct the control room operators to monitor and control the hydrogen concentration inside the containment after they have carried out the steps to maintain and control the higher priority critical safety functions such as reactivity, Reactor Coolant System inventory, Reactor Coolant System pressure, and core heat removal. The key operator actions in controlling the hydrogen concentration are to place the hydrogen recombiners in operation. These actions involve many procedural steps and require coordination between the control room operators and other work groups, such as Instrumentation and Control, Chemistry, and Health Physics. In design basis accidents, these procedural steps would take place days after the accident and are therefore not burdensome to the plant operators.

These hydrogen control activities could potentially distract operators during the extremely busy period following an accident, and could therefore have a negative impact on the higher priority critical operator actions. As discussed previously, these hydrogen control activities are of minimal to no benefit in mitigating severe accidents.

An exemption from the requirements for a hydrogen control system will eliminate the need for Emergency Operating Procedure steps for hydrogen control and hence simplify the EOPs. While this elimination of steps will have only a small impact on public health risk, the impact on public health risk will be positive by reducing the probability of operator error during potential accidents and hence reduce the core damage frequency. Also, it will be less likely that the operators would activate the Reactor Building Hydrogen Purge System during severe accidents.

Summary of Risk Reduction Due To Instruction Simplification

The changes described in this exemption request result in a risk positive change (that is the probability of death or injury to the public following accidents will be less if the exemption is granted). Exemption from the requirements for a containment Combustible Gas Control System and, as such, the consideration of hydrogen generation within the TMI-1 design basis, will eliminate the need for EOP steps for hydrogen control and hence simplify the EOPs, resulting in lower operator error probabilities. The changes will also reduce the probability of actuation of

the Reactor Building Hydrogen Purge System during severe accidents.

2.3 INDUSTRY EXPERIENCE

The regulatory requirements for containment hydrogen control systems were based on knowledge that existed before the TMI-2 event in March 1979. Following TMI-2, the nuclear industry and the NRC initiated extensive analysis and testing to increase the scope of knowledge concerning hydrogen generation and hydrogen control following severe accidents. This new knowledge invalidated many of the assumptions and methods in the regulations. Based on the new knowledge, it became clear that hydrogen control systems designed for design basis LOCA conditions were not adequate in severe accidents to maintain the hydrogen concentration below the postulated flammability limit of 4 volume percent. Following TMI-2, the nuclear industry performed extensive analysis and testing which indicated that for large, dry containments, the containment would withstand the burn of large amounts of hydrogen generated in severe accidents. Therefore, the required hydrogen control systems were determined to be unnecessary for design basis LOCA conditions, and ineffective for severe accidents.

In addition, the Nuclear Regulatory Commission conducted analyses with respect to backfitting the installation of igniters to replace the hydrogen recombiners in nuclear units with large, dry containments. The NRC determined that the requirement for igniters could not be justified for nuclear units with large, dry containments according to the provision of 10 CFR 50.109. This was because large, dry containments have a greater ability to accommodate the large quantity of hydrogen associated with a degraded core accident than the smaller containments.[6] To date, the nuclear units with large, dry containments rely exclusively on the containment structure to withstand any postulated uncontrolled burn of hydrogen gas generated in severe accidents.

2.4 CONCLUSION

The existing containment Combustible Gas Control System is of no benefit in severe accidents. Elimination of the present requirements in the Emergency Operating Procedures for the initiation of the hydrogen monitors, the hydrogen recombiners and the backup Reactor Building Hydrogen Purge System will result in a risk positive change (that is the probability of death or injury to the public following accidents will be less if the exemption is granted).

3.0 EXEMPTION CRITERIA OF 10 CFR 50.12

3.1 OVERVIEW

The present compliance with 10 CFR 50.44, and 10 CFR 50, Appendix A, General Design

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[6]NUREG/CR-5662, 1991

Criterion 41 (the rule) at TMI-1 does not serve the underlying purpose of the rule and is not useful in achieving the underlying purpose of the rule. The underlying purpose of the rule was to provide assurance that the containment would not fail due to combustible gas accumulation and ignition in accident situations where fission products were present in the containment. The reliance on the design basis LOCA conditions as described in the rule was ineffective in achieving this result.

The TMI-2 accident produced hydrogen in quantities far exceeding the assumptions in 10 CFR 50.44, and, even though an uncontrolled hydrogen burn did occur, the containment did not fail.

Probabilistic Risk Assessments (PRAs) quantify the probabilities and consequences of similar accidents. In the PRAs performed for the TMI-1 Probabilistic Risk Assessment, the containment Combustible Gas Control System was determined to be ineffective in addressing hydrogen concentrations in severe accidents. The containment Combustible Gas Control System diverts operator attention from more important actions.

As described below, the requested exemption to the requirements of 10 CFR 50.44, and 10 CFR 50, Appendix A, General Design Criterion 41 satisfies the requirements of 10 CFR 50.12. The purpose of this exemption is to remove the requirements for hydrogen monitors, the hydrogen recombiners, and the backup Reactor Building Hydrogen Purge System from the TMI-1 design basis. As such, the consideration of hydrogen generation will no longer be included in the design basis of TMI-1.

3.2 NO UNDUE RISK

Section (a) (1) [There is no undue risk to the public health and safety]

As stated earlier, eliminating the hydrogen control requirements does not affect the TMI Unit 1 containment integrity due to the fact that containment failure due to hydrogen combustion is very unlikely based on the results of the TMI Unit 1 Probabilistic Risk Assessment. Furthermore, the usefulness of the existing containment Combustible Gas Control System is limited to design basis accidents that result in small amounts of hydrogen produced slowly over long periods of time (many days). The system has no benefit for severe accidents.

A detailed TMI-1 containment integrity analysis indicates that the ultimate pressure capacity of containment is between 137 psig and 147 psig (TMI-1 Probabilistic Risk Assessment, Level 2, Appendix 1). Hence, a safety margin exists for containment integrity at higher hydrogen concentration levels without using the existing containment Combustible Gas Control System.

Eliminating the hydrogen control requirements for the TMI-1 large, dry containment has a positive impact on the risk to the public by reducing the potential operator error probabilities due

to simplifying the Emergency Operating Procedures (eliminating their hydrogen control steps). Elimination of existing requirements also minimizes the possibility of activation of the Reactor Building Hydrogen Purge System during severe accidents.

3.3 UNDERLYING PURPOSE OF THE RULE NOT SERVED

Section (a)(2) (ii) [Application of the regulation in the particular circumstances would not serve the underlying purpose of the rule and is not necessary to achieve the underlying purpose of the rule]

The underlying purpose of the rule was to reduce the probability of failure of the containment during accidents and thus prevent fission products from the reactor core from being released through the containment during accidents. Application of the rule at TMI-1 has resulted in equipment and procedures that have no impact on the probability of failure of the containment under conditions where fission products from the reactor core exist in the containment. In the TMI-1 Probabilistic Risk Assessment, the hydrogen monitors and the hydrogen recombiners were determined to be ineffective in controlling hydrogen concentrations in severe accidents. The hydrogen monitors, the hydrogen recombiners, and the Reactor Building Hydrogen Purge System divert operator attention from more important actions.

3.4 BENEFIT TO PUBLIC HEALTH AND SAFETY

Section (a)(2) (iv) [There is a benefit to the public health and safety]

Implementation of the exemption from the hydrogen control requirements would achieve a benefit to the public health and safety. In addition to the direct positive impact on the public health and safety by reducing the public risk (see Section 2.2.4), there is also an indirect safety benefit to the public. The indirect benefit comes from eliminating unnecessary requirements from the TMI-1 Technical Specifications and Emergency Operating Procedures. The recent NRC statement on compliance versus safety[7]: "Requirements that are duplicative, unnecessary, or unnecessarily burdensome can actually have a negative safety impact," is recognition of the indirect safety benefit of the proposed exemption.

3.5 MATERIAL CIRCUMSTANCES NOT CONSIDERED

Section (a)(2)(vi) [There are present material circumstances not considered when the regulation (i.e., 10 CFR 50.44) was adopted]

Experience and information obtained over time provide a better perspective about hydrogen

[7]NRC Inspection Manual Part 9900, AOperations - Safety and Compliance, issued 09/09/97

generation and the impact of hydrogen burning on containment integrity and safety equipment during accidents. Two important material circumstances are (a) the effects and (b) the risks of hydrogen generation.

a. Effects of hydrogen generation

Traditionally, technical and regulatory evaluation perspectives have held that a hydrogen burn is to be avoided due to the uncertainties of containment failure. The TMI-2 accident in March 1979 provided an important benchmark for the effects of a hydrogen burn on safety equipment and containment integrity. TMI-2, which involved about a 45% core cladding-water reaction, resulting in about 8.1% hydrogen concentration, produced no containment breach and minimal damage to equipment (NUREG/CR-4330, Vol. 3, 1987). The containment peak pressure was about 28 psig, well below the containment design pressure of 60 psig. Containment damage was essentially limited to plastics and other low melting point materials such as telephone cases and the crane operator's seat. The TMI-2 hydrogen burn thus provides actual experience, which establishes a significantly higher threshold for containment damage than, was thought to be available when the regulations were promulgated.

b. Risks of containment failure due to hydrogen generation

The hydrogen control system was not designed for severe accidents. It was installed to handle design basis accidents. This change removes a burden for the operator during severe accidents. The TMI-1 Probabilistic Risk Assessment concludes the following concerning containment failure due to hydrogen combustion during severe accidents:

1. The TMI-1 PRA did not credit the hydrogen recombiner or the hydrogen sampling system in the level 2 analysis as a basis for reducing the chances of containment failure.

2. In addition, containment failure due to hydrogen combustion, which can be impacted by the hydrogen recombiner, is unlikely in the time frame analyzed, based on the results of the TMI-1 Probabilistic Risk Assessment (PRA) study. The PRA indicates that none of the accident sequences addressed in the TMI-1 Probabilistic Risk Assessment that could realistically threaten containment due to hydrogen combustion could be impacted by the hydrogen recombiner or monitoring system.

3. Probabilistic Risk Assessments (PRAs) quantify the probabilities and consequences of accidents similar to the TMI-2 accident. In the TMI-1 Probabilistic Risk Assessment, the containment Combustible Gas Control System is ineffective in addressing hydrogen concentrations during the time frames of the accidents analyzed. The containment Combustible Gas Control System diverts operator attention from more important actions.

4. As stated earlier, eliminating the hydrogen control requirements does not affect the TMI Unit 1 containment safety margin during the assumed PRA mission time. This is due to the fact that containment failure due to hydrogen combustion is unlikely to be affected by the hydrogen recombiner or the Combustion Gas Control system.

3.6 CONCLUSION

As discussed above, this exemption request is in compliance with 10 CFR 50.12, specifically, with applicable Sections (a)(1) and (a)(2)(ii). The discussion has demonstrated (1) that granting the exemption will not present an undue risk to public health and safety, and (2) that application of the rule in the particular circumstance would not serve the underlying purpose of the rule and is not necessary to achieve the underlying purpose of the rule. Additionally, special circumstances may also exist with respect to Section (a)(2)(iv) and Section (a)(2)(vi).

ENLOSURE 2

TSCR 292 DESCRIPTION OF CHANGE

AND SAFETY EVALUATION SUPPLEMENT

SUPPORTING DOCUMENTATION OF PROPOSED CHANGE

This is a request to revise Three Mile Island Nuclear Generating Station, Unit 1 Technical Specifications Tables 3.5-3, Post Accident Monitoring Instrumentation and 4.1-4, Post Accident Monitoring Instrumentation and Sections 3.5.5.2, Bases; 3.6, Reactor Building; 4.4.4, Hydrogen Recombiner System; and 4.12.2, Reactor Building Purge Air Treatment System, Bases.

PROPOSED TECHNICAL SPECIFICATIONS MARKUP

See Enclosure 3

DESCRIPTION

This proposed change would (1) delete the specifications for hydrogen monitoring instrumentation from Technical Specification Sections 3.5.5.2, 3.6, and Tables 3.5-3 and 4.1-4; correct a typographical error in item 8 of Table 4.1-4; (2) delete the specifications for hydrogen recombiners in Technical Specification Section 4.4.4; and (3) delete the specifications for hydrogen purge system from Technical Specifications Section 4.12.2. Furthermore, after NRC approval of the requested Technical Specification changes, TMI-1 will be authorized to abandon, change or remove the existing containment combustible gas control systems without further approval. TMI-1 will be released from commitments regarding the combustible gas control systems. As such the consideration of hydrogen generation will no longer be included in the design basis of TMI-1.

NO SIGNIFICANT HAZARDS CONSIDERATIONS

The Commission has provided standards for determining whether a significant hazards consideration exists as stated in 10 CFR 50.92. A proposed amendment to an operating license for a facility involves no significant hazards consideration if operation of the facility in accordance with a proposed amendment would not: (1) involve a significant increase in the probability or consequences of an accident previously evaluated; or (2) create the possibility of a new or different kind of accident from any accident previously evaluated; or (3) involve a significant reduction in a margin of safety. A discussion of these standards as they relate to this change request follows.

1. Will operation of the facility in accordance with this proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?

   Response: No

   The containment combustible gas control systems are currently classified as safety systems. The containment combustible gas control systems are composed of two

hydrogen monitors and two hydrogen recombiners, backed up by the Reactor Building Purge System. Hydrogen control components (monitors, recombiners, and purge) are not considered to be accident initiators. Therefore, this change does not increase the probability of an accident previously evaluated.

The containment combustible gas control system is provided to ensure that the hydrogen concentration is maintained below the action level of 3.0% so that containment integrity is not challenged following a design basis Loss Of Coolant Accident (LOCA). Existing analysis show that the hydrogen concentration will not reach the limit of 3.0% for at least 8 days after a design basis LOCA. Containment failure due to hydrogen combustion without the hydrogen recombiners is unlikely based on the results of the TMI-1 Probabilistic Risk Assessment. The detailed TMI-1 specific containment integrity analysis indicates that the ultimate pressure capacity of the containment is between 137 psig and 147 psig (TMI-1 Probabilistic Risk Assessment, Level 2, Appendix 1). Therefore, this change does not increase the consequences of accidents previously evaluated.

Removal of the existing requirements for hydrogen control will eliminate the Emergency Operating Procedure (EOP) steps for hydrogen control and hence simplify the EOPs. This would have a positive impact on public health risk by reducing the probability of operator error during potential accidents and hence reduce the core damage frequency. In addition, approval of this exemption request will minimize the potential for actuation of the Reactor Building Hydrogen Purge System during severe accidents. The changes described in this request result in a risk positive change.

Therefore, this change does not involve a significant increase in the probability or consequences of any accident previously evaluated.

2. Will operation of the facility in accordance with this proposed change create the possibility of a new or different kind of accident from any accident previously evaluated?

   Response: No

   This proposed change does not change the design or configuration of the plant beyond the containment Combustible Gas Control System. Hydrogen generation following a design basis LOCA has been evaluated in accordance with regulatory requirements. Deletion of the containment Combustible Gas Control System from the Technical Specifications does not alter the hydrogen generation processes post-LOCA. The consideration of hydrogen generation will no longer be included in the design basis of TMI-1. Therefore, this change does not create the possibility of a new or different kind of accident from any previously evaluated.

3. Will operation of the facility in accordance with this proposed change involve a significant reduction in a margin of safety?

   Response: No

   The changes described in this change request result in a risk positive change. Removal of

the existing requirement for a containment Combustible Gas Control System will, by eliminating the EOP steps for hydrogen control, result in lower operator error probabilities. In addition, approval of this exemption request will minimize the potential for actuation of the Reactor Building Hydrogen Purge System. Therefore, this change involves an increase in safety, not a reduction in a margin of safety.

Based on the negative responses to these three criteria, TMI-1 has concluded that the proposed change involves no significant hazards consideration.

ENVIRONMENTAL CONSIDERATION

TMI-1 has determined that the proposed Technical Specification change does not result in any increase in the amount or type of effluent that may be released offsite, and results in no increase in individual or cumulative occupational radiation exposure. As described above, the proposed Technical Specification amendment involves no significant hazards consideration and, as such, meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9).

Enclosure 3
Technical Specifications Mark-Up

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The Emergency Feedwater System is provided with two channels of flow instrumentation on each of the two discharge lines. Local flow indication is also available for the emergency feedwater system.

Although the pressurizer has multiple level indications, the separate indications are selectable via a switch for display on a single display. Pressurizer level, however, can also be determined via the patch panel and the computer log. In addition, a second channel of pressurizer level indication is available independent of the NNI.

Although the instruments identified in Table 3.5-2 are significant in diagnosing situations which could lead to inadequate core cooling, loss of any one of the instruments in Table 3.5-2 would not prevent continued, safe, reactor operation. Therefore, operation is justified for up to 7 days (48 hours for pressurizer level). Alternate indications are available for Saturation Margin Monitors using hand calculations, the PORV/Safety Valve position monitors using discharge line thermocouple and Reactor Coolant Drain Tank indications, and for EFW flow using Steam Generator level and EFW pump discharge pressure. Pressurizer level has two channels, one channel from NNI (3 D/P instrument strings through a single indicator) and one channel independent of the NNI. Operation with the above pressurizer level channels out of service is permitted for up to 48 hours. Alternate indication would be available through the plant computer.

The operability of design basis accident monitoring instrumentation as identified in Table 3.5-3, ensures that sufficient information is available on selected plant parameters to monitor and assess the variables following an accident. (This capability is consistent with the recommendations of Regulatory Guide 1.97, "Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant Conditions During and Following an Accident," Rev. 3, May 1983.) These instruments will be maintained for that purpose.

~~Those same instruments along with the containment hydrogen concentration monitor are useful to evaluate and predict the course of accidents which go beyond the plant design basis. This capability is consistent with the recommendations of NUREG 0737, II.F.1 and the containment hydrogen concentration monitor should be maintained for that purpose.~~

TABLE 3.5-3

POST ACCIDENT MONITORING INSTRUMENTATION

FUNCTION	INSTRUMENTS	REQUIRED NUMBER OF CHANNELS	MINIMUM NUMBER OF CHANNELS	ACTION
1.	High Range Noble Gas Effluent			
	a. Condenser Vacuum Pump Exhaust (RM-A5-Hi)	1	1	A
	b. Condenser Vacuum Pump Exhaust (RM-G25)	1	1	A
	c. Auxiliary and Fuel Handling Building Exhaust (RM-A8-Hi)	1	1	A
	d. Reactor Building Purge Exhaust (RM-A9-Hi)	1	1	A
	e. Reactor Building Purge Exhaust (RM-G24)	1	1	A
	f. Main Steam Lines Radiation (RM-G26/RM-G27)	1 each OTSG	1 each OTSG	A
2.	Containment High Range Radiation (RM-G22/G-23)	2	2	A
3.	Containment Pressure	2	1	B
4.	Containment Water Level			
	a. Containment Flood (LT-806/807)	2	1	B
	b. Containment Sump (LT-804/805)	1	0	C
5.	~~Containment Hydrogen~~ DELETED	~~2~~	~~1~~	~~B~~
6.	Wide Range Neutron Flux	2	1	A
7.	Reactor Coolant System Cold Leg Water Temperature (TE-959, 961; TI-959A, 961A)	2	1	A
8.	Reactor Coolant System Hot Leg Water Temperature (TE-958, 960; TI-958A, 960A)	2	1	A
9.	Reactor Coolant System Pressure (PT-949, 963; PI-949A, 963)	2	1	A
10.	Steam Generator Pressure (PT-950, 951, 1180, 1184; PI-950A, 951A, 1180, 1184)	2/OTSG	1/OTSG	A
11.	Condensate Storage Tank Water Level (LT-1060, 1061, 1062, 1063; LI-1060, 1061, 1062, 1063)	2/Tank	1/Tank	A

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3.6 REACTOR BUILDING

Applicability

Applies to the containment integrity of the reactor building as specified below.

Objective

To assure containment integrity.

Specification

3.6.1 Except as provided in 3.6.6, 3.6.8, and 3.6.12, CONTAINMENT INTEGRITY (Section 1.7) shall be maintained whenever all three of the following conditions exist:

a. Reactor coolant pressure is 300 psig or greater.

b. Reactor coolant temperature is 200°F or greater.

c. Nuclear fuel is in the core.

3.6.2 Containment integrity shall be maintained when both the reactor coolant system is open to the containment atmosphere and a shutdown margin exists that is less than that for a refueling shutdown.

3.6.3 Positive reactivity insertions which would result in a reduction in shutdown margin to less than 1% $\Delta k/k$ shall not be made by control rod motion or boron dilution unless containment integrity is being maintained.

3.6.4 The reactor shall not be critical when the reactor building internal pressure exceeds 2.0 psig or 1.0 psi vacuum.

3.6.5 Prior to criticality following refueling shutdown, a check shall be made to confirm that all manual containment isolation valves which should be closed are closed and are conspicuously marked.

3.6.6 While the reactor is critical, if a reactor building isolation valve (other than a purge valve) is determined to be inoperable in a position other than the required position, the other reactor building isolation valve in the line shall be verified to be OPERABLE. If the inoperable valve is not restored within 48 hours, the OPERABLE valve will be closed or the reactor shall be brought to HOT SHUTDOWN within the next 6 hours and to the COLD SHUTDOWN condition within an additional 30 hours.

3.6.7 DELETED ~~The hydrogen recombiner shall be operable during REACTOR CRITICAL, HOT STANDBY and POWER OPERATION. With the hydrogen recombiner inoperable, restore the recombiner to operable status within 7 days or be in HOT SHUTDOWN within 6 hours.~~

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Bases

The Reactor Coolant System conditions of COLD SHUTDOWN assure that no steam will be formed and hence no pressure will build up in the containment if the Reactor Coolant System ruptures. The selected shutdown conditions are based on the type of activities that are being carried out and will preclude criticality in any occurrence.

A condition requiring integrity of containment exists whenever the Reactor Coolant System is open to the atmosphere and there is insufficient soluble poison in the reactor coolant to maintain the core one percent subcritical in the event all control rods are withdrawn. The Reactor Building is designed for an internal pressure of 55 psig, and an external pressure 2.5 psi greater than the internal pressure.

An analysis of the impact of purging on ECCS performance and an evaluation of the radiological consequences of a design basis accident while purging have been completed and accepted by the NRC staff. Analysis has demonstrated that a purge isolation valve is capable of closing against the dynamic forces associated with a LOCA when the valve is limited to a nominal 30° open position.

Allowing purge operations during STARTUP, HOT STANDBY and POWER OPERATION (T.S. 3.6.10) is more beneficial than requiring a cooldown to COLD SHUTDOWN from the standpoint of (a) avoiding unnecessary thermal stress cycles on the reactor coolant system and its components and (b) reducing the potential for causing unnecessary challenges to the reactor trip and safeguards systems.

The ~~recombiner unit is capable of controlling the expected hydrogen generation associated with 1) zirconium-water reactions, 2) radiolytic decomposition of water and 3) corrosion of metals within containment. The recombiner is designed in accordance with the recommendations of Regulatory Guide 1.7, "Control of Combustible Gas Concentrations in Containment Following a LOCA", March 1971, the acceptance criteria of the Standard Review Plan (S.R.P.) 6.2.5., and NUREG 0578, July 1979. In addition to the installed hydrogen recombiner, a second recombiner including all piping, electrical, and structural provisions is available on site.~~

The hydrogen mixing is provided by the reactor building ventilation system to ensure adequate mixing of the containment atmosphere following a LOCA. This mixing action will prevent localized accumulations of hydrogen from exceeding the flammable limit.

TABLE 4.1-4

POST ACCIDENT MONITORING INSTRUMENTATION

FUNCTION	INSTRUMENTS	CHECK	TEST	CALIBRATE	REMARKS
1.	Noble Gas Effluent				
	a. Condenser Vacuum Pump Exhaust (RM-A5-Hi)	W	M	F	(1) Using the installed check source when background is less than twice the expected increase in cpm which would result from the check source alone. Background readings greater than this value are sufficient in themselves to show that this monitor is functioning.
	b. Condenser Vacuum Pump Exhaust (RM-G25)	W(1)	M	F	
	c. Auxiliary and Fuel Handling Building Exhaust (RM-A8-Hi)	W	M	F	
	d. Reactor Building Purge Exhaust (RM-A9-Hi)	W	M	F	
	e. Reactor Building Purge Exhaust (RM-G24)	W(1)	M	F	
	f. Main Steam Lines Radiation (RM-G26/RM-G27)	W(1)	M	F	
2.	Containment High Range Radiation (RM-G22/G23)	W	M	R	
3.	Containment Pressure	W	N/A	F	
4.	Containment Water Level	W	N/A	R	
5.	~~Containment Hydrogen~~ DELETED	~~W~~	~~M~~	~~F~~	
6.	Wide Range Neutron Flux	W	N/A	F	

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TABLE 4.1-4 (Continued)

POST ACCIDENT MONITORING INSTRUMENTATION

FUNCTION	INSTRUMENTS	CHECK	TEST	CALIBRATE	REMARKS
7.	Reactor Coolant System Cold Leg Water Temperature (TE-959, 961; TI-959A, 961A)	W	N/A	R	
8.	Reactor Coolant System Hot Leg (TE-958, 960; TI-958A, 960A)	W	N/A	R	
9.	Reactor Coolant System Pressure (PT-949, 963; PI-949A, 963)	W	N/A	R	
10.	Steam Generator Pressure (PT-950, 951, 1180, 1184; PI-950A, 951A, 1180, 1184)	W	N/A	R	
11.	Condensate Storage Tank Water Level (LT-1060, 1061, 1062, 1063; LI-1060, 1061, 1062, 1063)	W	N/A	F	

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~~4.4.4 Hydrogen Recombiner System~~

~~Applicability~~

~~Applies to the testing of the hydrogen recombiner and associated controls.~~

~~Objective~~

~~To verify that the hydrogen recombiner and associated controls are operable.~~

~~4.4.4.1 Specification~~

~~a. Perform a system functional test for the hydrogen recombiner each refueling interval by verifying that the reaction chamber gas temperature is maintained ≥1200°F for at least 4 hours.~~

~~b. Visually examine the hydrogen recombiner enclosure and verify there is no evidence of abnormal conditions each refueling interval.~~

~~c. Perform a resistance to ground test for each heater phase each refueling interval and verify that the resistance to ground for any heater phase is ≥ 10,000 ohms.~~

~~Bases~~

~~The surveillance program described above provides high assurance that the hydrogen recombiner system will be available to perform its post-LOCA function of maintaining the containment hydrogen concentration below 4.1 volume percent. This system is not credited to mitigate any accident analyzed in Chapter 14 of the TMI-1 FSAR. The frequency of the surveillance of the hydrogen recombiner system is based on the safety significance of the system. TMI-1 FSAR Section 6.5.3.1 indicates that the hydrogen recombiner system is not required until 9.8 days following a LOCA. This is adequate time to place a hydrogen recombiner in service.~~

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Bases

Pressure drop across the combined HEPA filters and charcoal adsorbers of less than 6 inches of water at the system design flow rate will indicate that the filters and adsorbers are not clogged by excessive amounts of foreign matter. Pressure drop should be determined at least once every refueling interval to show system performance capability.

The frequency of tests and sample analysis are necessary to show that the HEPA filters and charcoal adsorbers can perform as evaluated. Tests of the charcoal adsorbers with halogenated hydrocarbon refrigerant shall be performed in accordance with approved test procedures. The charcoal efficiency test procedures should allow for the removal of one adsorber tray, emptying of one bed from the tray, mixing the adsorbent thoroughly and obtaining at least two samples. Each sample should be at least two inches in diameter and a length equal to the thickness of the bed. If test results are unacceptable all adsorbent in the system should be replaced with an adsorbent qualified according to Regulatory Guide 1.52, March 1978. Tests of the HEPA filters with DOP aerosol shall also be performed in accordance with approved test procedures. Any HEPA filters found defective should be replaced with filters qualified according to Regulatory Guide 1.52, March 1978.

Fans AH-E7A&B performance verification is necessary to ensure adequate flow to perform the filter surveillance of T.S. 4.12.2.1 and 4.12.2.3 and can only be demonstrated by running both fans simultaneously. This can only be accomplished when purge valves are not limited to 30° open (i.e., cold shutdown).

~~Since H_2 purge has been superseded by the installation of H2 recombiners at TMI-1,~~ the reactor building purge exhaust system no longer is relied upon to serve an operating accident mitigating (i.e. LOCA) function. The retest requirement of T.S. 4.12.2.2a has therefore been changed to reflect the same retest requirements as the auxiliary and fuel handling building ventilation system which similarly serves no operating accident mitigating function.

If significant painting, steam, fire, or chemical release occurs such that the HEPA filter or charcoal could become contaminated from the fumes, chemicals or foreign material, the same tests and sample analysis shall be performed as required for operational use. The determination of significant shall be made by the Vice President-TMI Unit 1.

References

(1) UFSAR, Section 5.6 - "Ventilation and Purge Systems"