NRR-PMDAPEm Resource

From: jessica@allianceforagreeneconomy.org
Sent: Tuesday, June 30, 2015 10:56 AM
To: Chereskin, Alexander
Subject: [External_Sender] Documents
Attachments: pg-1-8-2013-0010_Rel_in_Full_Docs.pdf; pg-33-41-2013-0010_Rel_in_Full_Docs.pdf; pg-286-290-2013-0010_Rel_in_Full_Docs-2.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Alex,

Please find attached the documents I referenced in my statement today. (I will send them in two parts because of the size of the files).

Additionally, I would like to request that the audio recording of the hearing be made available to the public, since there is no video recording.

Sincerely,
Jessica Azulay

Hearing Identifier: NRR_PMDA
Email Number: 2236

Mail Envelope Properties (135401d0b344$dfd09040$9f71b0c0$)

Subject: [External_Sender] Documents
Sent Date: 6/30/2015 10:55:49 AM
Received Date: 6/30/2015 10:58:16 AM
From: jessica@allianceforagreeneconomy.org

Created By: jessica@allianceforagreeneconomy.org

Recipients:
"Chereskin, Alexander" <Alexander.Chereskin@nrc.gov>
Tracking Status: None

Post Office: allianceforagreeneconomy.org

Files	**Size**	**Date & Time**
MESSAGE	350	6/30/2015 10:58:16 AM
pg-1-8-2013-0010_Rel_in_Full_Docs.pdf	1811548	
pg-33-41-2013-0010_Rel_in_Full_Docs.pdf	1719293	
pg-286-290-2013-0010_Rel_in_Full_Docs-2.pdf	765407	

Options
Priority: Standard
Return Notification: No
Reply Requested: No
Sensitivity: Normal
Expiration Date:
Recipients Received: Follow up

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

September 28, 1992

Docket No. 50-333

Mr. Ralph E. Beedle
Executive Vice President - Nuclear Generation
Power Authority of the State of New York
123 Main Street
White Plains, New York 10601

Dear Mr. Beedle:

SUBJECT: HARDENED WETWELL VENT CAPABILITY AT THE JAMES A. FITZPATRICK NUCLEAR POWER PLANT (TAC NOS. M74868 AND M82364)

As a part of a comprehensive plan for closing severe accident issues, the NRC staff undertook a program to determine if any actions should be taker, on a generic basis, to reduce the vulnerability of BWR Mark I containments to severe accident challenges. At the conclusion of the Mark I Containment Performance Improvement Program, the NRC staff identified a number of plant modifications that substantially enhance the plant's capability to both prevent and mitigate the consequences of severe accidents. One of the modifications recommended was improved hardened wetwell vent capability. After considering the proposed Mark I Containment Performance Program (described in SECY 89-017, January 1989), the Commission directed the staff to pursue Mark I enhancements on a plant-specific basis in order to account for possible unique design differences that may bear on the necessity and nature of specific safety improvements. Accordingly, the Commission concluded that the recommended safety improvements, with one exception, that is, hardened wetwell vent capability, should be evaluated by licensees as part of the Individual Plant Examination (IPE) Program. With regard to the recommended plant improvement dealing with hardened vent capability, the Commission, in recognition of the circumstances and benefits associated with this modification, directed the staff to facilitate installation of a hardened vent under the provisions of 10 CFR 50.59 for licensees, who on their own initiative, elect to incorporate this plant improvement. On September 1, 1989, the staff issued Generic Letter 89-16, "Installation of a Hardened Wetwell Vent," which encouraged licensees to implement a hardened wetwell vent capability under the provisions of 10 CFR 50.59.

By letters dated October 27, 1989, and July 25, 1990, the Power Authority of the State of New York (PASNY) notified the NRC staff that it would defer making a decision on whether to install a hardened wetwell vent until the FitzPatrick Individual Plant Examination (IPE) was completed. In those letters, PASNY provided "plant specific" design information and engineering analyses that justified this approach on the hardened vent issue. The NRC staff reviewed the information provided by PASNY in the stated letters. Additionally, on August 22, 1990, the staff inspected the existing wetwell vent path at the FitzPatrick plant. As a result of the staff's review of PASNY's submittals, the inspection of the FitzPatrick wetwell vent path, and a

B/1

review of the existing venting procedures and training, the NRC, by letter dated January 24, 1991, approved PASNY's approach to defer its decision to fully implement the industry's hardened vent general design criteria until completion of the IPE.

By letter dated December 6, 1991, PASNY provided the NRC with its final position regarding implementation of the hardened vent design criteria along with insights gained from performing the IPE and the status of investigations into accident management strategies associated with severe accidents. In a letter dated August 14, 1992, PASNY provided additional information on the hardened vent capability. PASNY determined that the current design of the FitzPatrick hardened wetwell vent meets many of the Boiling Water Reactor Owners Group (BWROG) design criteria and represents an acceptable deviation from the remainder. Furthermore, PASNY concluded that hardware modifications needed to fully meet the BWROG design criteria are not necessary to ensure that the vent performs its decay heat removal and scrubbing functions and would not produce significant public benefits.

Based on the information provided by PASNY and the results of the NRC inspection of the FitzPatrick hardened wetwell vent path, the NRC staff has determined that the current vent path meets the hardened vent design criteria or their intent. Furthermore, the NRC staff finds that the plant procedures and training are adequate to provide the information and guidance necessary for operators to effectively use the FitzPatrick hardened wetwell vent capability. Therefore, the NRC staff concludes that the existing wetwell vent capability at the FitzPatrick plant is acceptable.

A copy of the staff's evaluation of the plant-specific features, procedures, and training related to the FitzPatrick hardened wetwell vent capability is enclosed. This action completes our review activities associated with GL 89-16 and closes TAC Nos. M74868 and M82364.

Sincerely,

Steven A. Varga, Director
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Enclosure:
Safety Evaluation

cc w/enclosure:
See next page

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SAFETY EVALUATION REPORT BY THE OFFICE OF NUCLEAR REACTOR REGULATION

POWER AUTHORITY OF THE STATE OF NEW YORK

HARDENED WETWELL VENT CAPABILITY

JAMES A. FITZPATRICK NUCLEAR POWER PLANT

DOCKET NO. 50-333

1.0 INTRODUCTION

Generic Letter (GL) 89-16 encouraged licensees to implement a hardened wetwell vent capability under the provision of 10 CFR 50.59. By letter dated July 25, 1990, the Power Authority of the State of New York (PASNY, the licensee) submitted an analysis of the potential benefits of a hardened wetwell vent at the James A. FitzPatrick Nuclear Power Plant (FitzPatrick). The analysis indicated that the existing wetwell vent is hardened and capable of withstanding anticipated venting pressures, except for the interface with the standby gas treatment system (SGTS). The SGTS is located in a building adjacent to the reactor building. PASNY affirmed its willingness to make cost beneficial modifications to fully meet the approved hardened vent general design criteria; however, it wanted to defer such actions until completing its individual plant examination (IPE) program.

By letter dated January 24, 1991, the NRC staff approved the licensee's request to integrate the results of its IPE program into its decision to make any modifications to the existing vent design to fully implement the approved hardened vent general design criteria. Upon completion of the IPE program, the licensee was to: (1) provide the NRC with its final position regarding implementation of the hardened vent design criteria, and (2) use the results of the IPE to re-examine the venting procedures and training of operators. By letter dated December 6, 1991, the licensee provided this information along with insights gained from performing the IPE and the status of investigations into accident management strategies associated with severe accidents. In a letter dated August 14, 1992, the licensee provided additional information on the hardened vent capability.

2.0 EVALUATION

The FitzPatrick plant has a hardened vent system that originates at the primary containment suppression chamber and terminates at the inlet to the SGTS. The hardened vent system is located in the reactor building while the SGTS is located in a building adjacent to the reactor building. The SGTS consists, in part, of a series of filters connected by sheet metal ducting with an expected rupture pressure of a few psig. Outlet piping of the SGTS is routed through the building and to the plant stack. The hardened vent piping is rated for 150 psig internal pressure. As the vent system is already hardened up to the SGTS, the licensee performed an analysis to determine whether additional hardened piping should be added to bypass the SGTS and any

additional modifications were necessary to meet the hardened vent design criteria.

Through completion of the IPE, the licensee gained several insights for post-accident venting. For the TW (loss of decay heat removal) accident sequence, the containment pressure approaches the primary containment pressure limit (PCPL) of 44 psig in approximately 20 hours. The emergency operating procedures (EOPs) then direct the operators to vent the containment to maintain pressure below the PCPL. If the containment is not vented, the pressure will continue to rise leading to failure due to overpressurization. The licensee calculated the core damage frequency (CDF) with venting (1.92 E-6/yr) and without venting (2.72 E-5/yr). These calculations demonstrated a reduction in CDF by a factor of 14 due to venting.

For the station blackout (SBO) accident scenario, decay heat is transferred to the suppression pool causing an increase in containment pressure. Depletion of station batteries after about 8 hours causes failure of the remaining core cooling systems and core damage ensues. Core damage occurs approximately 13 hours into the scenario with containment pressure remaining below the PCPL vent setpoint pressure of 44 psig. Therefore, the licensee has concluded that venting cannot be considered as a mitigative concept for an SBO event, under the guidance of the existing Emergency Operating Procedures. During SBO sequences, core damage is calculated to occur around 13 hours whereas the pressure necessary to reach the primary containment pressure limit (PCPL) venting pressure occurs at approximately 20 hours.

The January 24, 1991, NRC staff evaluation of plant-specific features, procedures, and training related to the hardened wetwell vent capability at the FitzPatrick plant concluded that the existing venting capability was expected to achieve the desired reduction in core damage frequency; however, the hardened vent path did not completely meet the hardened vent design criteria. As a result, FitzPatrick was allowed to integrate the results of its IPE program into its decision to fully implement the hardened vent design criteria. The following is an evaluation of the FitzPatrick position relative to the hardened vent design criteria.

Criterion (a): The vent shall be sized such that under conditions of: (1) constant heat input at a rate equal to 1 percent of rated thermal power (unless lower limit justified by analysis), and (2) containment pressure equal to the PCPL, the exhaust flow through the vent is sufficient to prevent the containment pressure from increasing.

The FitzPatrick vent path will relieve pressure through parallel 6 and 12-inch lines. Based on the licensee analysis, one percent decay heat (24.36 MW) produces 25.183 lbm/sec of steam at the PCPL of 44 psig or a volumetric rate of 269.964 ft^3/sec. Since the initial flow of gases through the vent will consist of nitrogen and steam, the licensee concluded that a conservative vent mass flow rate of 44.21 lbm/sec was required to limit the primary containment pressure to the PCPL level. The 6-inch line is capable of passing 17 lbm/sec and the 12-inch line is capable of passing 71 lbm/sec.

Based on these results, FitzPatrick meets the vent criteria through use of the 12-inch line or combination of the 6 and 12-inch line. The NRC staff concludes that criterion (a) has been met.

Criterion (b): The hardened vent shall be capable of operating up to the PCPL. It shall not compromise the existing containment design basis.

The PCPL at FitzPatrick is 44 psig. The hardened vent piping has a design pressure rating of 150 psig, with the exception of the SGTS which is located in a building adjacent to the reactor building. The SGTS room contains sheetmetal ductwork and filters which are assumed to fail under most venting scenarios. After ductwork failure, high pressure venting will pressurize the SGTS room until failure of the access doors to the outside. They are double doors that normally open to the environment thereby providing a large release path for the steam mixture. As a result, the pressurization on the reactor building wall will be limited to relatively low pressures which will be well within the wall structural capability.

Although failure of the sheetmetal ductwork will render the SGTS inoperable, this failure should not affect any safety equipment located within the reactor building. The SGTS building is adequately isolated from the systems within the reactor building by the reactor building wall. Further, the containment design pressure is 56 psig and the PCPL is 44 psig. Both values are well below the piping design pressure of 150 psig. The NRC staff concludes that criterion (b) has been met.

Criterion (c): The hardened vent shall be designed to operate during conditions associated with the TW sequence. The need for SBO venting will be addressed during the IPE.

The FitzPatrick hardened vent is capable of relieving at least one percent of rated thermal power and withstanding the associated pressures, with the exception of the SGTS piping which is assumed to fail. The containment isolation valves in the vent path are also capable of operation at the PCPL. In the event electrical or pneumatic power is not available to operate the vent valves, manual operation from the reactor building is possible. The IPE determined that the PCPL would be reached after 20 hours into a TW sequence, which should provide sufficient time for any manual vent actuations, if required. The PASNY also provided preliminary insights into the need and feasibility of venting during SBO sequences and was examining several new accident management strategies. However, since core damage would occur long before venting was needed, venting was not credited in the IPE for an SBO event. The NRC staff concludes that criterion (c) has been met.

Criterion (d): The hardened vent shall include a means to prevent inadvertent actuation.

Inadvertent actuation of the hardened vent at FitzPatrick is prevented through several mechanisms. The emergency operating procedures are specific as to when venting is to be performed. Venting involves operation of several valves

from the relay room, which is physically separated from the control room. The TW sequence most likely would involve loss of some emergency power, and therefore, some manual vent valve operation would be required. Containment isolation signals from high drywell pressure and possibly high containment radiation would have to be bypassed. Therefore, either the need for manual operation or deliberate bypass actions makes the potential of inadvertent venting a remote possibility. As a result, the NRC staff concludes that the intent of criterion (d) has been met.

Criterion (e): The vent path up to and including the second containment isolation barrier shall be designed consistent with the design basis of the plant.

The NRC staff concluded, in its January 24, 1991, evaluation of the hardened vent design, that the vent path meets the design basis of the plant. The NRC staff concludes that criterion (e) has been met.

Criterion (f): The hard vent path shall be capable of withstanding, without loss of functional capability, expected venting conditions associated with the TW sequence.

The NRC staff concluded, in its January 24, 1991, evaluation of the hardened vent design, that the vent piping, with the exception of the SGTS piping, was capable of withstanding, without loss of functional capability, all expected venting conditions. In addition, the NRC staff concluded that the damage to the SGTS may be an acceptable deviation pending completion of the IPE. The licensee evaluated loss of the SGTS based on the IPE and performed a cost-benefit analysis for providing a hardened pipe bypass around the SGTS for SBO scenarios. The licensee concluded that loss of the SGTS was an acceptable consequence of venting and that modifications to the piping configuration were not justified. Modifications to the piping configuration could reduce the offsite dose but would not decrease the core damage frequency. The NRC staff concludes that the existing design is sufficient and that the intent of criterion (f) has been met.

Criterion (g): Radiation monitoring shall be provided to alert control room operators of radioactive releases during venting.

FitzPatrick will use the existing containment high range monitor (CHRM) and postaccident sampling system (PASS) to assess the radiological consequences of venting. These monitoring systems are capable of assessing severe accident conditions and will be operable under the environmental conditions associated with venting. The CHRM provide indication of radiation levels with the drywell. The PASS can take samples from the drywell, wetwell, suppression pool, and reactor coolant. The results from a PASS sample are available within the 3-hour criterion of NUREG-0737. The NRC staff concludes that the intent of criterion (g) has been met.

Criterion (h): The hardened vent design shall ensure that no ignition sources are present in the pipeway.

In the January 24, 1991, evaluation, the NRC staff indicated that there was a potential for a hydrogen deflagration upon rupture of the SGTS ducts. Large amounts of hydrogen could be produced during a core melt scenario; however, the TW sequence is prevented from progressing to a core melt by relieving both mass and energy through the containment vent. Therefore, large amounts of hydrogen are not expected for the TW sequence. However, the EOPs are symptom based, not sequence based procedures. In the event that hydrogen is released into the SGTS room, the vent flow will also consist of nitrogen and steam which will provide some amount of natural inerting. In addition, the barrier between the SGTS room and the reactor building is a 2-foot thick reinforced concrete wall which provides a barrier against the adverse consequences of a hydrogen deflagration.

A hard pipe bypass around the SGTS could prevent any hydrogen deflagration within the SGTS room. The licensee estimated the cost of this modification at $680,000. The licensee concluded that combustion in the existing vent path is not risk significant and does not plan to modify the vent design. Based on the uncertainty as to whether a combustible mixture could develop, the prevention potential of steam and nitrogen to suppress a hydrogen deflagration, the mitigation potential of the concrete wall between the SGTS room and the safety related equipment, and the costs associated with modifications, the NRC staff concludes that the existing design is acceptable and the intent of criterion (h) has been met.

As stated in the January 24, 1991, evaluation, the NRC staff identified several weaknesses in the technical and human factors aspects of F-AOP-35, "Post Accident Venting of the Primary Containment," which could prove detrimental to effective operator use of the procedure. Subsequent to the issuance of that evaluation, F-AOP-35 was revised to provide significant improvements including: step clarification, more detailed instructions, enhanced caution statements, and standardized phraseology and format. Also noted in the January 24, 1991, evaluation were several deficiencies in the operator training pertaining to containment venting. Subsequently, the licensee has committed to integrate the results of the IPE into the operator training program. This training will provide operators with guidance regarding severe accident phenomena such as the consequences of venting during severe accidents. Other improvements to the operator training program which have already been implemented include:

1. Training which provided clarification of procedural references to the FitzPatrick PCPL, containment failure pressure, and alternative methods of heat removal; and

2. Training which provided guidance on use of the 2" bypass line flowpath to protect the SGTS, unless flow is insufficient to counteract the decay heat addition to the containment thus requiring the main vent line to be used.

The NRC staff has reviewed the revised venting procedure and enhancements to the operator training as they relate to conformance to the human factor issues

of the Standard Review Plan (NUREG-0800) Sections 13.2.1, "Reactor Operator Training," and 13.5.1, "Operating and Maintenance Procedures." The NRC staff finds the revised procedural guidance and operator training acceptable.

The licensee has identified several accident management strategies associated with operation of the vent which may be beneficial. These venting strategies include venting until containment pressure is reduced to near atmospheric pressure and initiating venting early for certain circumstances. The NRC staff agrees with the licensee's approach of bringing these issues to the attention of the Boiling Water Reactor Owners Group (BWROG) for future generic consideration. However, the NRC staff has concluded that the design and procedures currently implemented at the FitzPatrick plant are sufficient to satisfy the hardened vent design criteria and ensure adequate plant safety.

3.0 CONCLUSION

Based on the above evaluation, the NRC staff concludes that PASNY either meets the hardened vent design criteria or its intent at the FitzPatrick plant. Furthermore, the NRC staff finds the revised procedural guidance and operator training regarding containment venting acceptable. Therefore, the staff has determined that existing containment vent path capability at the FitzPatrick plant is acceptable.

Principal Contributors:
J. Monninger
J. Arildsen

Date: September 28, 1992

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

January 24, 1991

Docket No. 50-333

Mr. John C. Brons
Executive Vice President, Nuclear Generation
Power Authority of the State of New York
123 Main Street
White Plains, New York 10601

Dear Mr. Brons:

SUBJECT: INSTALLATION OF HARDENED WETWELL VENT CAPABILITY AT THE JAMES A. FITZPATRICK NUCLEAR POWER PLANT (TAC NO. 74868)

By letter dated July 25, 1990, the Power Authority of the State of New York (PASNY) submitted an analysis of the potential benefits of a hardened wetwell vent at the James A. FitzPatrick Nuclear Power Plant (FitzPatrick). In that letter, PASNY stated that the existing wetwell vent path at FitzPatrick is scheduled 40 hard pipe throughout the reactor building, and is fully capable of withstanding the anticipated venting pressures. The vent path is "soft" only at the standby gas treatment system (SGTS) located outside the reactor building. PASNY further stated that its operators are not hesitant to use the vent when called for by the procedures, and the "averted costs" calculated by the NRC for damage to the safety equipment in the reactor building are not applicable to the FitzPatrick's vent design. Although PASNY continues to affirm its willingness to make modifications judged cost beneficial, it wishes to defer such action till after it complets its individual plant examination (IPE) program.

The NRC staff has reviewed the information provided by PASNY in its letter dated July 25, 1990, including new information that the existing wetwell vent path is hardened up to the reactor building's outer wall. Additionally, on August 22, 1990, the NRC staff visited the FitzPatrick site to inspect the existing wetwell vent path at the FitzPatrick plant. Specifically, the staff inspection was directed at determining the plant-specific features of the FitzPatrick vent path and the potential downside of venting at the primary containment pressure limit (PCPL) without any modification to the existing vent path.

As a result of the NRC staff's review of PASNY's submittal of July 25, 1990, the inspection of the FitzPatrick wetwell vent path, and review of the existing venting procedures and training, the NRC staff concludes that although the present vent design does not fully meet the industry's general design criteria for hardenced vents that were approved by the staff, there is a reasonable expectation that if the existing wetwell vent path at FitzPatrick were operated when the containment pressure reached the PCPL, the only safety-related equipment that could be damaged as a result of venting are the two trains of SGTS located outside the reactor building. Therefore, there would be no releases within the reactor building that could damage safety equipment.

IFO1 B/5

Accordingly, the staff approves PASNY's request to be allowed sufficient time to properly integrate the results of its IPE program into its decision to fully implement the approved hardened vent general design criteria.

A copy of the staff's evaluation of the plant-specific features, procedures, and training related to the proposed hardened wetwell vent capability of the FitzPatrick is enclosed.

Following completion of the IPE (presently scheduled for June 30, 1991), PASNY is requested to integrate the results of the pertinent sections of the IPE into a final position regarding implementation of the hardened vent criteria. Also, PASNY is requested to use the results of the IPE to re-examine the venting procedures and training of operators. Details of the analysis, justification for the positions taken, and any proposed plant modifications and resulting procedure changes, should be submitted to the NRC within 60 days following completion of the IPE. The staff will then incorporate this information into a final decision concerning implementation of the hardened vent capability.

PASNY also took issue with the NRC staff's backfit analysis for FitzPatrick, issued June 15, 1990. PASNY indicated that there appears to be a large number of flaws in the NRC's backfit analysis used to justify a need for a hardened vent capability and that PASNY's own plant specific analysis indicates that other accident management strategies are far more effective than the hardened vent modifications sought by NRC.

The staff has reviewed the supporting information provided by PASNY. Based on that review, the staff disagrees with the PASNY's conclusions that the containment failure frequency as a result of postulated sequences involving a loss of decay heat removal capability (TW sequences) is two orders of magnitude smaller than that calculated by the staff in its backfit analysis for FitzPatrick. Based on recalculations using FitzPatricks plant-specific features and the information contained in NUREG-1150, the NRC staff determined that the core damage frequency would not change significantly from that calculated in NRC's backfit analysis. The staff explained the above conclusions and their basis to PASNY's staff during several telephone conversations.

Any questions regarding this response should be addressed to Mohan C. Thadani (301) 492-1419 or David E. LaBarge (301) 492-1421.

Sincerely,

Original signed by

Steven A. Varga, Director
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

cc w/enclosure:
See next page

Enclosure:
As stated

DISTRIBUTION:

Docket File	NRC/Local PDRs	MThadani	OGC
PDI-1 Reading	SVarga	EJordan	ACRS(10)
AThadani	BSheron	Plant File	JKudrick
EGreenman	RACapra	ABuslik	JRoe
CVogan	DLaBarge	JWermiel	JArildsen

*See previous concurrence

PDI-1:LA	PDI-1:PM	PDI-1:PM	PDI-1:D
CVogan*	DLaBarge*	MThadani:rsc	RACapra
12/12/90	12/12/90	1/15/91	1/8/91

DRP:AD	DST:D	DRP:D
EGreenman*	AThadani*	SVarga*
12/16/90	12/14/90	01/24/91

DOCUMENT NAME: FITZ LTR TO BRONS 74868

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

ENCLOSURE

EVALUATION OF PLANT-SPECIFIC FEATURES, PROCEDURES, AND TRAINING RELATED TO THE PROPOSED HARDENED WETWELL VENT CAPABILITY AT THE JAMES A. FITZPATRICK NUCLEAR POWER PLANT

1.0 INTRODUCTION

By letter dated July 25, 1990, the Power Authority of the State of New York (PASNY) indicated that a substantial portion of the existing wetwell vent pathway in the reactor building was hardened. The portion of piping, which could rupture under high pressure venting conditions, was located in a separate building outside the reactor building. Since this piping is located outside of the reactor building, PASNY claimed that an adequate hardened vent path presently exists which satisfies the NRC concerns regarding accidents involving loss of decay heat removal capability. PASNY indicated that the piping within the reactor building was fully capable of withstanding the anticipated pressures resulting from venting when it was required by procedures, and meets the NRC staff's objectives for requiring hardened vent capability at James A. FitzPatrick Nuclear Power Plant (FitzPatrick).

On August 22, 1990, the NRC staff visited the FitzPatrick site to inspect the existing wetwell vent path and verify that the piping in the reactor building meets the NRC objectives. The results of the NRC inspection are summarized as follows:

2.0 WALKDOWN

PIPING

The post-accident wetwell vent pathway is the same pathway used during normal venting evolutions. The piping is open to the wetwell air space and contains 24-inch containment isolation valves, with 2-inch bypass valves around the 24-inch valves for pressure control. The piping continues through the reactor building to the reactor building wall and to valves located at the inlet to the standby gas treatment system (SGTS), which is located in a building attached to the outside of the reactor building. The outlet piping of the SGTS is routed to the plant stack. The piping in the reactor building is rated at 150 psi.

Except for the piping in the immediate vicinity of the isolation valves, the piping supports and hangers are designed for dead weight loads only, with supports located approximately 20 feet apart and where there is a directional change in the piping. The seismic portion consists of the wetwell piping out to and including the outer containment isolation valve and a portion of the SGTS piping. Beyond the valves in the SGTS room, the piping changes to sheet metal square ducting, which, in turn, connects to the inlet of the SGTS filter trains. Both the sheet metal ducting and the SGTS are considered to be low pressure boundaries, with rupture expected at a few psig (Nameplate Rating: Maximum Working Pressure - 0.5 psi, Test Pressure - 1 psi, Maximum Operating Temperature - 150F).

SGTS ROOM

Normal entry to the SGTS room is via a single metal door. This door opens into the SGTS room from the railway entrance areas to the reactor building, between the two secondary containment boundary railroad doors (one of which leads to the reactor building and the other leads to the outside). To enter the SGTS room, it is necessary to first pass through one of the railroad doors. These three doors are normally shut and are interlocked.

In an emergency, exit from the SGTS room is possible through a double sheet metal door which opens to the outside.

BYPASS VENT LINE OPERATION

The use of the 2-inch bypass line during high pressure, post-accident venting has been analyzed by the licensee, but venting using the larger valves has not been analyzed. The analysis using the 2-inch bypass indicates that no damage is expected to the vent piping, which is consistent with similar analysis performed by other licensees with Mark I Containments.

MAIN VENT LINE OPERATION

In the event that the 24-inch valves were used as the wetwell vent path rather than the 2-inch valves, it is expected that the low pressure ducting at the inlet to the SGTS system, and the SGTS train enclosure itself, would rupture. This would most likely cause electrical failures of the SGTS equipment in the room since the equipment was not designed to withstand a harsh environment. Because the SGTS room is not vented, the double doors most likely would be forced open by the pressure increase in the room. This should terminate the pressure rise, thereby stopping any further damage to safety-related equipment. Even if the pressure buildup in the SGTS room forced open the door into the railroad access area, it should have no significant effect on the safety equipment in the reactor building since the railroad door would remain shut.

HYDROGEN CONTROL

Aside from the dangers of pressure increases as a result of a rupture, a potential of hydrogen detonation exists in the SGTS room if the water vapor, nitrogen, and hydrogen being vented form a combustible mixture with the air inside the room. Several ignition sources exist and it is possible that the resulting pressure surge may cause damage to the common wall that the SGTS room shares with the reactor building. However, the safety equipment located in the reactor building is not expected to be significantly affected.

PROCEDURES

The following procedures are available should venting of the primary containment become necessary:

EOP-4	Primary Containment Control
F-AOP-35	Post Accident Venting of the Primary Containment
F-OP-20	Standby Gas Treatment System
F-OP-37	Nitrogen Ventilation and Purge; Containment Atmosphere Dilution (CAD); Containment Vacuum Relief and Containment Differential Pressure Systems

Section PC/P (Primary Containment Pressure Control) and Section PC/H (Primary Containment Hydrogen Control) of Emergency Operating Procedure 4 (EOP-4) direct the operator to vent the primary containment using Procedure F-AOP-35. Other actions are also described which are intended to control atmospheric conditions in the primary containment, including hydrogen concentrations. The procedure was written according to the Boiling Water Reactor Owners Group (BWROG) Emergency Procedure Guidelines, Revision 4.

Procedure F-AOP-35 is entered only if EOP-4 requires venting in order to control the primary containment pressure or combustible gas concentrations. The operator is specifically directed to perform the venting evolutions regardless of the radioactive release rate. The operator is directed to use the 2-inch vent valves initially and then, if specified conditions exist, to use the 24-inch vent valves. Venting of the wetwell would be started initially, followed by venting of the drywell if necessary.

Procedure F-OP-20 contains steps for automatic and manual operation of the SGTS under normal and abnormal plant conditions.

Procedure F-OP-37 describes operator actions for using the Containment Atmosphere Dilution (CAD) system to vent the primary containment while adding nitrogen. The system uses the same piping and valves described in other venting procedures.

OPERATOR TRAINING AND UNDERSTANDING OF PROCEDURES

Operators showed a firm understanding of the significance of the required wetwell venting. In order to preclude containment rupture, they would expeditiously initiate venting when required by the procedures, irrespective of the radioactive

release concerns. However, based on operator interviews, the staff concludes that: (1) operators are untrained regarding venting consequences and do not expect a rupture in the SBGT portion of the venting pathway; (2) operators are not familiar with other methods expected to be employed to stretch out the time to reach containment failure pressure and other decay heat removal pathways; (3) present simulator scenarios involving loss of decay heat removal sequences do not result in containment venting; and (4) procedural guidance is not provided to determine when to secure venting once it has been started. In addition, the procedures do not clearly indicate the conditions which would require use of the drywell, suppression chamber, or both, vent paths. Also, F-AOP-35 contains human factors weaknesses which could prove detrimental to operator use of the procedure.

3.0 EVALUATION

The NRC staff's evaluation of FitzPatrick's existing wetwell vent path indicates that the existing vent design does not fully meet the hardened vent general design criteria (Letter from NRC to BWR Owners Group, dated April 16, 1990). We have evaluated the deviations in design and their impact on safe and adequate venting to assure that the desired reduction in the frequency of core damage can still be achieved.

Criterion (a): The vent shall be sized such that under conditions of (1) constant heat input at a rate equal to one percent of rated thermal power (unless lower limit justified by analysis), and (2) containment pressure equal to the primary containment pressure limit (PCPL), the exhaust flow through the vent is sufficient to prevent the containment pressure from increasing.

The FitzPatrick hardened vent is sized to prevent the containment pressure from increasing, when a constant input of energy occurs at a rate equal to one percent of rated thermal power and when containment pressure approaches the primary containment pressure limit specified in the procedures. Since the capability of the vent when the bypass line is used is inadequate to satisfy the capacity requirement, only the use of the main vent was considered acceptable in satisfying Criterion (a).

Criterion (b): The hardened vent shall be capable of operating up to the PCPL. It shall not compromise the existing containment design basis.

Criterion (f): The hard vent path shall be capable of withstanding, without loss of functional capability, expected venting conditions associated with the TW Sequence.

The vent piping consists of piping with different schedules, but all piping is at least Schedule 10. The schedule varied with line diameter but the pressure rating is a constant 150 psi. The piping up to the SGTS room is capable of withstanding, without loss of functional capability, all expected venting conditions. However, the vent design deviates from the design criteria due to the SGTS, which is designed to handle pressures

of a few psi only. At greater pressures the system will rupture. The probable pressure relief path from the SGTS room will be through the double door to the outside, resulting in a ground level release of fission products. The NRC staff estimates related to NUREG-0851 studies indicates that the radiological consequences of noble gas releases are small compared to the averted consequences used in the NRC staff's backfit analysis. Therefore, the benefits of elevated release of noble gases are not expected to be significant.

Since the SGTS trains are expected to fail during venting, the criteria (b) and (f) are not fully met. However, the damage of SGTS outside the reactor building could be an acceptable deviation, pending completion of IPE.

Criterion (c): The hardened vent shall be designed to operate during conditions associated with the TW sequence. The need for station blackout venting will be addressed during the IPE.

The licensee has not addressed this Criterion.

Criterion (d): The hardened vent shall include a means to prevent inadvertent actuation.

To prevent inadvertent actuation of the vent, the plant relies on operator training and adherence to the EOPs. Upgrading procedures to address actions resulting from the consequences of using the vent path, once these conditions are analyzed and the results determined, would enhance operator awareness and ability to handle such conditions, and could decrease the potential for inadvertent actuation under adverse conditions. Therefore, the staff believes that procedure changes should be addressed as soon as practicable. The staff concludes that the existing design does not meet Criterion (d).

Criterion (e): The vent path up to and including the second containment isolation barrier shall be designed consistent with the design basis of the plant.

The second containment isolation barrier consists of the piping up to and including the second outboard isolation valve. Since the equipment in this vent path has not been modified by the licensee, it continues to meet the design basis of the plant. Therefore, the design meets criterion (e).

Criterion (g): Radiation monitoring shall be provided to alert control room operators of radioactive releases during venting.

The capability to monitor the radiation level for releases during venting was not addressed by the licensee because it was assumed that the operators would vent irrespective of the radiological consequences. The staff concludes that the existing design does not meet design Criterion (g).

Criterion (h): The hardened vent design shall ensure that no ignition sources are present in the pipeway.

Because the equipment in the SGTS room will remain energized from the safety bus, there exist sources which could ignite the hydrogen released in the room as a result of rupture of the SGTS. Therefore, there is a potential of a hydrogen deflagration upon rupture of the SGTS ducts.

The procedures do not consider the potential damage to the SGTS resulting from using a particular vent path. Also, in the recovery phase, the procedures do not require a check for possible damage to the SGTS or the SGTS room, nor is there a requirement to check the atmospheric conditions in the room. In fact, there is no method of sampling the atmosphere in the SGTS room without opening one of the access doors. It was noted that the outside door cannot be opened from outside the building, because the outside door handles have been removed. The staff concludes that the existing design does not meet Criterion (h).

4.0 CONCLUSION

The wetwell venting pathway at FitzPatrick has been found to be hardened between the primary containment and the location outside the reactor building (SGTS room). The piping would remain intact within the reactor building. The safety-related equipment located in the reactor building will not be damaged due to wetwell venting, and will be available to bring the plant to a safe condition and maintain it in that condition for an extended period of time.

The vent pathway does not completely meet the hardened vent criteria as defined by the staff. The venting is expected to result in the loss of the SGTS and, as a minimum, will result in a ground level release of contamination rather than a desirable elevated release through the plant stack. However, the differences in the consequences of ground level release and the elevated release are not expected to be significant when compared to the risk averted by venting.

The staff finds that the capabilities of the existing wetwell vent path acceptable to meet most of the safety objectives of a primary containment hardened wetwell vent, and the existing venting capability is expected to achieve the desired reduction in core damage frequency. It is, therefore, reasonable that PASNY should be allowed sufficient time to properly integrate the results of its IPE program into its decision to fully implement the approved hardened vent general design criteria.

Doerflein, Lawrence

From: Brown, Frederick
Sent: Friday, May 20, 2011 7:13 AM
To: Sanfilippo, Nathan
Cc: Grobe, Jack; Doerflein, Lawrence; Giitter, Joseph; Westreich, Barry
Subject: FW: Heads up: Chairman request for BWR Mark I brief

See 2 highlighted sections below.

From: Doerflein, Lawrence
Sent: Thursday, May 19, 2011 6:37 PM
To: Circle, Jeff; Brown, Frederick; Lewin, Aron; Kobetz, Timothy
Cc: Cartwright, William; Westreich, Barry; Giitter, Joseph; Cheok, Michael; Nelson, Robert; Miller, Chris; Wilson, Peter; Lew, David; Dean, Bill; Roberts, Darrell; Clifford, James; Knutson, Ed; Richmond, John
Subject: RE: Heads up: Chairman request for BWR Mark I brief

Fred,

A little more background on the Fitz harden vent. Jeff is right, the original design was hard pipe from the torus and DW purge valves to the standby gas treatment system. The SBGTS is in a structure adjacent to the reactor building. Fitz did not make additional piping modifications to meet the BWROG design criteria (accepted in an internal memo dated March 30, 1990) that it be hard piped to an elevated release point. We accepted this is an SER dated September 28, 1992. The SER states that for a TW sequence, there is a chance SBGTS will be lost and the structure doors blown out (which would result in a ground release), and how this risk was acceptable compared to the cost of hard piping around the SBGTS (similar to what Pilgrim did).

The SER notes that "existing venting capability was expected to achieve the desired reduction in core damage frequency; however, the hardened vent path did not completely meet the hardened vent design criteria. As a result, FitzPatrick was allowed to integrate the results of its IPE program into its decision to fully implement the hardened vent design criteria."

An evaluation was done against the other BWROG design criteria, and the SER concluded "the NRC staff has determined that the current vent path meets the hardened vent design criteria **or their intent**."

So it is not the classic hardened vent, but we accepted it.

Second issue, I noticed in the SER it states "For the station blackout (SBO) accident scenario, ...Core damage occurs approximately 13 hours into the scenario with containment pressure remaining below the PCPL vent setpoint pressure of 44 psig. Therefore, the licensee has concluded that venting cannot be considered as a mitigative concept for a SBO event, under the guidance of the existing Emergency Operating Procedures. During SBO sequences, core damage is calculated to occur around 13 hours whereas the pressure necessary to reach the primary containment limit (PCPL) venting pressure occurs at approximately 20 hours."

I don't know if anything was changed regarding this since the SER was issued, but for a extended SBO, it doesn't sound like they will be able to get to the valves to operate when they need to because of radiation levels. This is the kind of issue I'm assuming the Task Force is evaluating.

Regards,

Larry

B/31

From: Circle, Jeff
Sent: Thursday, May 19, 2011 11:11 AM
To: Brown, Frederick; Lewin, Aron; Kobetz, Timothy
Cc: Cartwright, William; Westreich, Barry; Doerflein, Lawrence; Giitter, Joseph; Cheok, Michael; Nelson, Robert
Subject: RE: Heads up: Chairman request for BWR Mark I brief

Fred,

FitzPatrick has had hard pipe vent most of the way to the SGTS in their original design. However, the licensee (NY Power Authority) declined to further modify the system to be in line with the rest of the Mark I fleet. A risk analysis was performed to show that on "TW sequences", loses of containment heat removal, that having some vulnerability of ductwork failure as a consequence of venting would be acceptable. The initiating events and random failures were taken from the Individual Plant Examination (IPE) and considered internal events only.

In comparison with Fukushima, the main difference is that the FitzPatrick analysis assumed that containment venting would be performed early on, before the onset of core damage. So, it was assumed that there wouldn't be a large amount of hydrogen or fission products present. Also, I recall that any failed ductwork was shown not to impact important, risk-relevant SSCs in the Reactor Building. Venting was still recognized as an important action so, the operation of the wetwell vent valves were changed with an EOP support procedure to allow for local non-powered operation. In any event, The Authority did not perform any modification of the piping, we (NRC) inspected it, and was found acceptable, all around the November 1991 timeframe.

I hope that this will clarify it, from one of the racked-out grey-beards! If you have any questions, please feel free to ask me.

Jeff.

From: Brown, Frederick
Sent: Thursday, May 19, 2011 10:03 AM
To: Lewin, Aron; Kobetz, Timothy
Cc: Cartwright, William; Westreich, Barry; Doerflein, Lawrence; Giitter, Joseph; Cheok, Michael; Nelson, Robert; Circle, Jeff
Subject: RE: Heads up: Chairman request for BWR Mark I brief

While on-shift in the OpCenter, Jeff Circle told me that Fitz had not put hardened vent in – that when he worked for the licensee they had done a (risk?) evaluation that demonstrated it was not justified.

From: Lewin, Aron
Sent: Thursday, May 19, 2011 8:52 AM
To: Kobetz, Timothy
Cc: Lewin, Aron; Cartwright, William; Brown, Frederick; Westreich, Barry; Doerflein, Lawrence
Subject: FW: Heads up: Chairman request for BWR Mark I brief

Tim,

As discussed, the DORL research indicates that Fitzpatrick has a hardened vent. At first glance, this appears to contradict with information found in the TI 2515/183 report for the plant.

Thanks,
Aron
X2259

From: Cartwright, William
Sent: Thursday, May 19, 2011 8:11 AM

To: Lewin, Aron; Cauffman, Christopher
Subject: FW: Heads up: Chairman request for BWR Mark I brief

Interesting to note that DORL research indicates that Fitzpatrick has a hardened vent.

Maybe it was painted a different color, and the inspectors didn't recognize it . . .

From: Brown, Frederick
Sent: Thursday, May 19, 2011 7:05 AM
To: Ashley, MaryAnn; Cartwright, William; Elliott, Robert; Franovich, Rani; Kobetz, Timothy; McHale, John; Shoop, Undine; Thorp, John; Westreich, Barry
Subject: FW: Heads up: Chairman request for BWR Mark I brief

FYI

From: Giitter, Joseph
Sent: Wednesday, May 18, 2011 5:58 PM
To: Collins, Timothy
Cc: Givvines, Mary; Bahadur, Sher; Blount, Tom; Brown, Frederick; Cheok, Michael; Galloway, Melanie; Hiland, Patrick; Holian, Brian; Howe, Allen; Lee, Samson; Lubinski, John; McGinty, Tim; Nelson, Robert; Ruland, William; Skeen, David; Westreich, Barry
Subject: RE: Heads up: Chairman request for BWR Mark I brief

Tim- Mary Givvines—the current LT Chair—sent this out to the LT members. I think you hit the major points. I'm resending the table that documents the fact that the vast majority of the BWR Mark I plants have implemented all of the safety enhancements recommended in GL 89-16.

From: Givvines, Mary
Sent: Wednesday, May 18, 2011 5:32 PM
To: Bahadur, Sher; Blount, Tom; Brown, Frederick; Cheok, Michael; Galloway, Melanie; Giitter, Joseph; Givvines, Mary; Hiland, Patrick; Holian, Brian; Howe, Allen; Lee, Samson; Lubinski, John; McGinty, Tim; Nelson, Robert; Ruland, William; Skeen, David; Westreich, Barry
Subject: FW: Heads up: Chairman request for BWR Mark I brief

For your awareness.

From: Collins, Timothy
Sent: Wednesday, May 18, 2011 5:28 PM
To: Ruland, William; Leeds, Eric; Bahadur, Sher; Weerakkody, Sunil
Cc: Boger, Bruce; Givvines, Mary; Brown, Frederick; Cheok, Michael; Miller, Charles; Jones, Steve; Bowman, Eric; Dinsmore, Stephen
Subject: RE: Heads up: Chairman request for BWR Mark I brief

Attached is my recommendation for the briefing

From: Ruland, William
Sent: Tuesday, May 17, 2011 5:25 PM
To: Leeds, Eric; Bahadur, Sher; Weerakkody, Sunil
Cc: Collins, Timothy; Boger, Bruce; Givvines, Mary; Brown, Frederick; Cheok, Michael
Subject: Re: Heads up: Chairman request for BWR Mark I brief

We have had further discussions with Charlie Miller and left a msg w/Tom Hipshmann for additional info/backgnd.
Bill Ruland, from
USNRC Blackberry

From: Leeds, Eric
To: Ruland, William; Bahadur, Sher; Weerakkody, Sunil
Cc: Collins, Timothy; Boger, Bruce; Givvines, Mary; Brown, Frederick; Cheok, Michael
Sent: Tue May 17 17:14:49 2011
Subject: RE: Heads up: Chairman request for BWR Mark I brief

I've asked the Chairman's office to reserve Monday 10 to noon. We may need Bill or Bruce to support. Both Marty and I will be out of the office the first part of next week.

Eric J. Leeds, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
301-415-1270

From: Ruland, William
Sent: Tuesday, May 17, 2011 11:26 AM
To: Bahadur, Sher; Weerakkody, Sunil
Cc: Collins, Timothy; Leeds, Eric; Boger, Bruce; Givvines, Mary; Brown, Frederick; Cheok, Michael
Subject: FW: Heads up: Chairman request for BWR Mark I brief

Guys,

Please take the lead for this briefing and get support from others as needed. The proposed times are this Friday from 3:30 to 5:30 p.m., and Monday either from 10 to noon or 3:00 to 5:00 p.m.

Mary, I'm providing this to you for LT information.

Bill

From: Wiggins, Jim
Sent: Tuesday, May 17, 2011 11:12 AM
To: Leeds, Eric
Cc: Boger, Bruce; Ruland, William
Subject: RE: Heads up: Chairman request for BWR Mark I brief

This will be an opportunity to recapture all the stuff in the Mk I loads program of the 80s for KM purposes..... Might be challenged by all the stuff that existed prior to ADAMS...

Rack out the greybeards.....

From: Leeds, Eric
Sent: Tuesday, May 17, 2011 11:02 AM
To: Virgilio, Martin
Cc: Weber, Michael; Borchardt, Bill; Boger, Bruce; Ruland, William; Wiggins, Jim
Subject: Heads up: Chairman request for BWR Mark I brief

Marty –

The Chairman has requested an "extended" brief that focuses on responding to the question< "Why should BWR Mark I plants be allowed to continue to operate?" Tom Hipschman called me this morning and requested that we set up a brief that goes for 1.5 – 2 hours on the subject. I don't have a clear idea of how much the Chairman knows about the basic

technology of a BWR or the containment enhancements we've implemented. Tom seemed to think that you or I should attend the brief and I'll be in Switzerland for the IRRS bag-man trip.

NRR will put together a small team of folks to discuss basic BWR design info, Mark I enhancements, SFP arrangement, SAMGs, and a little bit on the differences between the Iso condenser and HPCI/RCIC designs. We'll see if we can get the meeting on your calendar.

Eric J. Leeds, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
301-415-1270