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

NOV 22 1989

Mr. George J. Sterzinger, Chairman
Vermont State Nuclear Advisory Panel
Department of Public Service
120 State Street
State Office Building
Montpelier, Vermont 05602

Dear Mr. Sterzinger:

Your letter dated October 23, 1989, to William Russell of Region I has been referred to me for a reply. Before responding to your requests, I believe that a brief history of the hardened wetwell vent issue is appropriate.

Several years ago, the U.S. Nuclear Regulatory Commission (NRC) staff undertook a comprehensive plan for closure of severe accident issues. This plan consisted of six major program elements. One of these elements, the development of generic containment improvements, was formed (1) to assess generic severe accident challenges to each light water reactor containment type and to confirm the adequacy of existing Commission policy or (2) to determine whether additional regulatory guidance was warranted. The Mark I Containment Performance Improvement Program arose from this element to further reduce overall risk in boiling water reactor (BWR) Mark I plants by pursuing a balanced approach toward accident prevention and mitigation. The results of this program, documented in SECY 89-017 (enclosed), have continued to show that the risk to the public from BWR Mark I plants is low.

SECY 89-017 provided the Commission with a generic Mark I plant analysis of specific containment performance improvements and other safety enhancements to both prevent and mitigate the consequences of severe accidents. The Commission concluded that the recommended safety improvements, with one exception, the hardened wetwell vent capability, should be evaluated by licensees as part of their Individual Plant Examination (IPE) Program. The Commission directed the staff to allow licensees, who on their own initiative elected to incorporate this plant improvement, to install a hardened wetwell vent in accordance with the Commission's regulations (10 CFR 50.59). For licensees who do not voluntarily install a vent, the staff was directed to initiate plant-specific backfit analyses to evaluate the efficacy of requiring the installation of the vents. The staff was directed to impose modifications to install a reliable hardened wetwell vent if the backfit analysis supported such an imposition. The NRC staff informed the licensee for Vermont Yankee Nuclear Power Station (VY) of these actions through the issuance of Generic Letter (GL) 89-16, dated September 1, 1989.

DF03
1/1

L-422
VERMONT

NRC FILE CENTER COPY

8912070291 891122
PDR ORG NRRB
PNU

GL 89-16 requested the licensee for VY to provide notification of its plans for addressing resolution of this issue. If the licensee elected to voluntarily proceed with plant modifications, it should inform the staff and submit an estimated schedule for implementation. Otherwise, the licensee was to provide the staff with cost estimates for implementation of a hardened vent along with an estimate of the incremental cost of installing a design independent of ac power in comparison to a design relying on its availability.

The licensee for VY provided the staff with preliminary indications of its intent to voluntarily install a hardened wetwell vent in a letter dated September 1, 1989. This letter also provided the NRC staff with an update of the status of the plant's Containment Safety Initiatives Program, which included completion of the installation of an enhanced containment spray capability. In subsequent communications, the licensee informed the NRC that it would install the hardened wetwell vent in accordance with the guidance of GL 89-16. On October 5, 1989, the licensee, in a meeting with the Vermont State Nuclear Advisory Panel (V-SNAP) and the NRC staff informed V-SNAP of its intent to install a hardened wetwell vent. Finally, in a letter dated October 30, 1989, the licensee formally responded to GL 89-16 and reiterated its commitment to install a hardened wetwell vent by the end of the 1992 refueling outage. The installation of this vent pathway provides assurance of pressure relief capability through a path with significant scrubbing (filtering) of fission products and of the benefits of an elevated release from the plant stack. Upon installation of this hardened wetwell vent, the licensee for VY will have fulfilled the NRC requirements for addressing this issue. Therefore, the NRC staff will not pursue any design-specific cost-benefit analysis for VY related to the hardened wetwell vent.

Recent correspondence with the licensee for VY indicated that the following improvements identified by the Commission in SECY 89-017 to be evaluated as part of a licensees IPE program have been or will be implemented. These three safety improvements were reviewed by the Commission but are not requirements.

1. <u>Alternate Water Supply for Drywell Spray/Vessel Injection</u>

   VY has the capability to inject an alternate supply of water either into the vessel or to the containment spray through the use of a diesel fire pump.

2. <u>Enhanced Reactor Pressure Vessel Depressurization System Reliability</u>

   Through the use of a nonsafety-related diesel generator connected to the station battery chargers, VY has the capability to prolong station battery capacities, and during the next refueling outage the licensee will be replacing the safety relief valve (SRV) accumulators with larger ones. Additionally, VY has the ability to supply nitrogen from the bulk tank to the SRV system, thereby providing an additional supply of nitrogen to actuate valves in an emergency.

3. Emergency Procedures and Training

The licensee is developing revisions to its emergency operating procedures, to be followed by the necessary operator training. The procedures will reflect the most current emergency procedure guidelines (BWROG EPG Revision 4) and are expected to be implemented by April 1990.

These additional improvements will further enhance the licensee's ability to prevent and mitigate the consequences of severe accidents.

In your letter, you requested the NRC staff to

1. Research the cost benefit of a filter in the hardened venting scenario at Vermont Yankee

2. Perform a cost-benefit analysis of the possibility of a holding tank on this same hardened vent path

3. Provide V-SNAP with radioactive source term information on venting scenarios

The NRC staff considers that the primary justification for venting in the case of a BWR Mark I containment is to reduce the likelihood of core damage by permitting removal of decay heat from the containment and the suppression pool. The types of sequences on which venting has the most effect are transients involving loss of long-term decay heat removal. The chance of survivability of the containment is increased with venting; therefore, the core damage frequency from the loss of long-term decay heat removal type sequences is reduced. We have enclosed a copy of NUREG/CR-5225 for information on this subject. Additional information can be found in NUREG-1150, "Severe Accident Risk: An Assessment for Five U.S. Nuclear Power Plants," June 1989, available in your Local Public Document Room.

A hardened wetwell vent provides substantial cost-effective safety improvements. The addition of a hardened wetwell vent (1) prevents the majority of loss of decay heat removal capability sequences (TW) from resulting in core melt, and (2) mitigates the consequences of residual sequences involving core melt where venting through the suppression pool is found necessary. A core melt, combined with reactor vessel rupture and containment failure, would release significant amounts of fission products. Although of extremely low probability if a challenge were to occur to initiate venting, a likely cause would be the TW sequences. The installation of a hardened wetwell vent greatly reduces the likelihood of a core melt from these TW sequences. For the remaining sequences where core melt is predicted, venting could be effective in preventing containment failure arising from slow overpressurization and in mitigating the release of fission products. Venting via the suppression pool would provide scrubbing of non-gaseous fission products by "factors of 10 to 100 if no containment shell failure occurs."

Venting of the containment is currently included in BWR emergency operating procedures. The vent path contains an external ductwork system with a low design pressure. Venting under high pressure severe accident conditions

could fail this ductwork, release the containment atmosphere into the reactor building, and damage equipment, or for core melt sequences contaminate equipment needed for accident recovery. Venting via this ductwork is likely to greatly hamper or complicate post accident recovery activities and is therefore viewed by the staff as yielding reduced improvements in safety. The objective of adding a reliable hardened wetwell vent to the containment was to allow controlled venting through the plant stack in order to prevent damage to equipment needed for accident recovery. The licensee for Vermont Yankee has committed to installing a hardened wetwell vent that will meet these venting objectives. Therefore, the staff believes that VY actions are sufficient in improving overall plant safety.

The NRC staff has completed a generic-plant analysis of the installation of a hardened pipe vent to an external filter system. One type of external filter utilizes large containment-like buildings filled with crushed gravel and stone for filtering purposes. These buildings have been estimated to cost between $5 million and $30 million whereas a hardened wetwell vent is estimated to cost approximately $750,000. SECY 89-017 considered the scenarios in which venting could be of value. A hardened vent path is generically judged to be cost-effective as described in enclosures 3 and 4 of SECY 89-017. In recognition of the substantial increase in the cost of a filtered vent beyond that of the hardened wetwell vent, the staff believes that it is unlikely to be cost-effective nor will it lead to substantial additional risk reduction. Therefore, it has been generically concluded that external filters have minimal benefits. Based on this evaluation, the staff has concluded that the addition of an external filter system is not considered a practical or reasonable alternative.

The NRC staff has not performed an analysis of the impact of the addition of a hold-up tank attached to the hardened vent path. The hold-up tank would essentially serve as a continuation of the primary containment for the storage of effluent expelled from the vent. The costs associated with a hold-up tank would likely be similar to those of the filter system previously described, but the tank would likely be even less beneficial than the additional filter.

Based on the above considerations, the staff does not believe that an additional filter or hold-up tank beyond the incorporation of a hardened wetwell vent would result in significant additional risk reduction.

The following discussion provides source term information and addresses the consequences of using a hardened wetwell vent. As noted above, venting is expected to reduce the likelihood of core damage and therefore, for the vast majority of TW sequence cases, it would be initiated <u>before</u> core damage. Venting under these circumstances would release only the very low level of radioactivity contained in the coolant system water. Although precise calculations have not been made, total releases to the environment are estimated to be less than about 10 curies of iodine fission products and several thousand curies of noble gases. The radiological consequences of these releases are estimated to result in individual doses to members of the public that are well below the lower values (1 rem whole body; 5 rem thyroid) of the EPA Protective Action Guidance values.

For the low probability sequences leading to core melt, it is likely that venting might be initiated after core damage has occurred. Given a core melt accident, venting of the wetwell would provide a scrubbed venting path to reduce releases of particulate fission products to the environment (see Enclosures 1 and 3). Venting under these circumstances could release substantial fractions of the noble gases in the core and would be undertaken only as a last-ditch measure to prevent or delay the catastrophic failure of the containment, which might result in even greater uncontrolled releases. In this event, the addition of a filter or hold-up tank would not significantly affect the risk consequences.

I hope this information is responsive to your questions. If I can be of further assistance, please contact me.

Sincerely,

T E Murley

Thomas E. Murley, Director
Office of Nuclear Reactor Regulation

Enclosures:
1. SECY-89-017, USNRC, "Mark I Containment Performance Improvement Programs," dated January 23, 1989
2. NUREG/CR-5225, "An Overview of BWR Mark I Containment Venting Risk Implications," EG&G Idaho, Inc., dated November 1988
3. SECY-88-206, USNRC, "Status of Mark I Containment Performance Evaluation," dated July 15, 1988

For the low probability sequences leading to core melt, it is likely that venting might be initiated after core damage has occurred. Given a core melt accident, venting of the wetwell would provide a scrubbed venting path to reduce releases of particulate fission products to the environment (see Enclosures 1 and 3). Venting under these circumstances could release substantial fractions of the noble gases in the core and would be undertaken only as a last-ditch measure to prevent or delay the catastrophic failure of the containment, which might result in even greater uncontrolled releases. In this event, the addition of a filter or hold-up tank would not significantly affect the risk consequences.

I hope this information is responsive to your questions. If I can be of further assistance, please contact me.

Sincerely,

Original signed by
Thomas E. Murley

Thomas E. Murley, Director
Office of Nuclear Reactor Regulation

Enclosures:
1. SECY-89-017, USNRC, "Mark I Containment Performance Improvement Programs," dated January 23, 1989
2. NUREG/CR-5225, "An Overview of BWR Mark I Containment Venting Risk Implications," EG&G Idaho, Inc., dated November 1988
3. SECY-88-206, USNRC, "Status of Mark I Containment Performance Evaluation," dated July 15, 1988

DISTRIBUTION

Central File	FMiraglia
NRC PDR	JTaylor
SPLB File	HThompson
EDO Rdg	JBlaha
EDO #0004871	EBeckjord, RES
TMurley/JSniezek	HDenton, GPA
AThadani	WRussell, RI
SECY	JPartlow
DMossburg (0004871)	FGillespie
JMonninger	DCrutchfield
JKudrick	

W. Russell, RI, concurred by telephone 11/20/89.

*See previous concurrences

OFC	SPLB:DST	SPLB:DST	SPLB:DST	D:DST	NRR:PD13	NRR:PD12	RES:SAIB
NAME	*JMonninger	*JKudrick	*CMcCracken	*AThadani	*MFairtile	*MThadani	*LSoffer
DATE	11/9/89	11/9/89	11/9/89	11/9/89	11/9/89	11/9/89	11/9/89

OFC	Tech Edit.*	NRR:ADT	D:NRR				
NAME		*FMiraglia	TMurley				
DATE	11/9/89	11/13/89	11/21/89				

OFFICIAL RECORD COPY
Document Name: GREEN TICKET 4871