April 26, 1982

SECY-82-177

For: The Commissioners

From: Martin G. Malsch
Deputy General Counsel

Subject: DIRECTOR'S DENIAL OF 2.206 RELIEF (IN THE MATTER OF PETITION REQUESTING "CLOSEDOWN (OF) ALL SUSPECT REACTORS" PENDING RESOLUTION OF ALL PRESSURIZED-THERMAL-SHOCK NON-CONSERVATISMS)

Facilities: All Plants.

Purpose: To inform the Commission of the Director's denial of a request to shutdown all suspect reactors pending resolution of all non-conservatisms in the analysis of pressurized thermal shock which, in our opinion,

Review Time Expires: May 10, 1982 (as extended).

Discussion: By letter of October 16, 1981, Mr. Marvin I. Lewis petitioned the Commission to shutdown all BWRs and PWRs which the NRC suspects may not be able to withstand a pressurized thermal shock (PTS). (Attachment 1). He requested that such a shutdown be effective until the staff resolves the potential sources of non-conservatism it has identified in the analysis of PTS and four additional items of non-conservatism identified by him. These additional items are: seismic loads, hydrodynamic loads, vibratory loads, "and any other source of non-conservatism." On March 31, 1982, the Director, Nuclear Reactor Regulation denied the petition based on his finding of reasonable assurance that BWRs and PWRs can continue to operate

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CONTACT:
Sheldon L. Trubatch, OGC
634-3224

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without endangering public health and safety pending resolution of PTS. (Attachment 2). In our opinion,

Ex. 5

The Director's decision briefly discussed the effects of three items raised by Mr. Lewis: seismic, hydrodynamic, and vibratory loads that could contribute to a PTS event. The Director concluded that these effects are either very unlikely to occur or will not contribute significantly to the non-conservatism of PTS analyses. His conclusion is based in part on analyses of precuror events and fracture mechanics, and is supported in part by two SECY papers incorporated by reference into the decision. As for other unidentified significant sources of non-conservatism, staff's response that it believes there are none is sufficient.

Ex. 5

Ex. 5

Ex. 5 [redacted]

In summary, we believe that

Ex 5

Recommendation:

Martin G. Malsch
Deputy General Counsel

Attachments as stated

Commissioners comments should be provided directly to the Office of the Secretary by c.o.b. Monday, May 10, 1982.

Commission Staff Office comments, if any, should be submitted to the Commissioners NLT Monday, May 3, 1982, with an information copy to the Office of the Secretary. If the paper is of such a nature that it requires additional time for analytical review and comment, the Commissioners and the Secretariat should be apprised of when comments may be expected.

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ATTACHMENT 1

42 00 y 3904
October 16,1981.

Thomas E. Murley,DirectorUSNRC
r. Mr. Murley,
. ou very much for the materials which you included in your letter of the
. ey were exactly what I asked for. However, the contents of those materials
ngs up a immediate concern in my mind about the imminent failure of BWRs & PWRs.

efer specifically to your September 11,1981, Presentation to the ACRS entitled,
ssurized Thermal Shock of Pressure Vessels, on Page headed, Potential Sources
Nonconservatism in Analysis. Specifically these are not all the sources of
conservatism. Other sources of nonconservatism must be incorporated into the
lysis.

er sources of nonconservatism , which have not been looked at in the analysis,
lude
Seismic loads which may have been the prime mover for the transient in question;
Hydrodynamic loads , both normal and abnormal to the operation of a transient;
Vibratory loads , either associated with hydrodynamic and seismic loads or not;
any other sourcesof nonconservatism mentioned or not mentioned on this page
of your ACRS presentation.

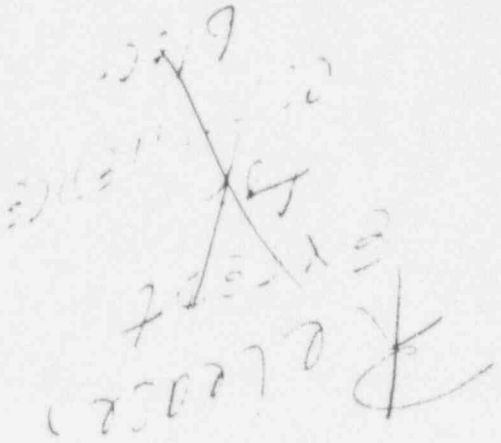
t this amounts to is that there are possibly and probably several reactors ,
ch could not survive a transient of any intensity , operating in this
ntry right now.

espectfully petition the Commission to close down all suspect reactors, BWRs
PWRs , until and unless all areas of nonconservatism are exposed , analyzed
put to rest. I request that Mr Murley to whom this letter is addressed
this letter to the Commissioners with his recommendations. He has done
job bringing many of these problems to the light of day.

Respectfully submitted ,
Marvin I. Lewis
Marvin I. Lewis
6504 Bradford Terrace
Phila PA 19149

Secretaryy of the Commission
Senator Heinz
Senator Spector
Dr J H Johnsrud
Phyllis Zitzer

ATTACHMENT 2



MAR 31 1982

Mr. Marvin I. Lewis
6504 Bradford Terrace
Philadelphia, Pennsylvania 19149

Dear Mr. Lewis:

This is in response to your letter dated October 16, 1981 regarding the pressurized thermal shock issue, in which you requested "...the Commission close down all suspect reactors, BWRs and PWRs, until and unless all areas of nonconservatism are explored, analyzed and put to rest."

For the reasons set forth in the enclosed Director's Decision, your request is hereby denied.

A copy of this determination will be placed in the Commission's Public Document Room located at 1717 H Street, N.W., Washington, D. C. 20555. A copy will also be filed with the Office of the Secretary of the Commission for its review in accordance with 10 CFR 2.205(c) of the Commission's regulations.

Sincerely,

Original Signed by
H. R. Denton

Harold R. Denton, Director
Office of Nuclear Reactor Regulation

Enclosure:
Director's Decision Under
10 CFR 2.206

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DD-82-1

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

OFFICE OF NUCLEAR REACTOR REGULATION
Harold R. Denton, Director

In the Matter of	)
	)
PETITION REQUESTING "CLOSEDOWN (OF) ALL SUSPECT REACTORS" PENDING RESOLUTION OF ALL PRESSURIZED-THERMAL-SHOCK NON-CONSERVATISMS	)

DIRECTOR'S DECISION UNDER 10 CFR 2.206

By letter dated October 16, 1981, Mr. Marvin I. Lewis petitioned that the U. S. Nuclear Regulatory Commission "close down all suspect reactors, BWRs and PWRs, until and unless all areas of non-conservatism are explored." Mr. Lewis stated that the areas of non-conservatism which must be explored are:

"A. Seismic loads which may have been the prime mover for the transient in question;

B. Hydrodynamic loads, both normal and abnormal to the operation of a transient;

C. Vibratory loads, either associated with hydrodynamic and seismic loads or not;

D. Any other sources of nonconservatism mentioned or not mentioned on this page of your ACRS presentation." (This last item refers to Dr. T. Murley's September 11, 1981 presentation to the ACRS, in transcript thereof on page headed, "Potential Sources of Nonconservatism in Analysis.)"

The staff has evaluated the issues raised in the subject petition. For the reasons set forth below, I find there is reasonable assurance that operation of BWRs and PWRs can continue pending resolution of the pressurized thermal shock issue without endangering the health and safety of the public. For this reason the petitioner's request for shutdown of "suspect reactors" is denied.

Background

In an earlier paper[1], the staff outlined the technical aspects of the issue of pressurized thermal shock (PTS) and provided the bases for the conclusion that no immediate licensing actions were required for operating reactors. In a later paper[2], the staff further examined the issues and concluded that no new information had come to light that would alter the staff's conclusion that no immediate licensing actions are required for operating reactors.

The above conclusions are partially based upon the fact that PTS events require a precursor event, such as a pipe break or control system failure, plus several additional coincident or subsequent failures

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(1) SECY-81-285 dated May 4, 1981 to the Commissioners from W. J. Dircks.

(2) SECY-81-286A dated September 8, 1981 to the Commissioners from W. J. Dircks.

that exacerbate pressure and temperature behavior during the event. Plant operating experience and supporting analyses show that, although certain types of precursor events such as control and instrumentation system failures do occur, the combined probability of the occurrence of both the precursor and exacerbating failures that would result in a significant PTS event is sufficiently low to allow continued plant operation in the interim period while the PTS issue is being resolved by ongoing NRC and industry programs. The acceptability of continued plant operation is further supported by fracture mechanics analytical results which show that if one assumes the existence of preexisting cracks and the occurrence of a severe yet realistic transient,* reactor vessel failure would be unlikely even in the most vulnerable plants within the next few years. The general rationale involving a precursor plus other events that make the transient more serious or more difficult to recover from is important and relevant to several of the issues raised in the subject letter. The occurrence probability of many exacerbating failures or events was considered in reaching our conclusions, including the occurrence probability of the exacerbating events cited in the subject letter. Mr. Lewis' points are discussed below in the same order as quoted.

A. A PTS event involves superposition of thermal stress loads on pressure loads, or the sequential application of thermal stress loads followed by pressure loads from repressurization. Thermal

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* The example used in the analyses was the transient which occurred at Rancho Seco on March 20, 1978.

stress loads do not become significant until several minutes after a reactor shutdown. Therefore a seismic event would have to be severe enough to cause reactor shutdown before it could contribute to a PTS event, and then it would only be the random cause of shutdown (precursor), requiring subsequent exacerbating failures to occur before a significant PTS event could develop. One might postulate that these exacerbating failures could conceivably be caused by the seismic event itself or by a severe aftershock, but the primary coolant system is seismic Class I which means that it is specifically designed to resist failure from a seismic event. The main steam lines are seismic Class I up to and including the main steam isolation valves. Failure in the non-seismic portions of the steam system can be isolated by closing the isolation valve which happens automatically for large breaks. Thus the plant design will prevent seismically-caused exacerbating failures and we view them as very unlikely to occur.

There is some small possibility that a seismic event may cause multiple control system failures and contribute to operator confusion and error. The reactor control system, as distinguished from the reactor protection system is not designed to standards equivalent to seismic Class I. The possibility of contributing failures, however, is being addressed in the Task Action Plans of Unresolved Safety Issues A-46 and A-47, "Seismic Qualification of Equipment in Operating Plants," and "Safety Implications of Control Systems," respectively, and results will be incorporated into PTS regulatory positions as appropriate.

The critical region for PTS is the vessel beltline. The neutron radiation is greatest there and some of the welds exposed to the neutron radiation have been found to be sensitive in terms of the loss of ductility or toughness (i.e., embrittlement). The primary stresses at the beltline from internal pressure and from thermal shock during a PTS event will be very much greater than those that would accrue from an SSE* event. Therefore, the latter may be neglected. Because the vessel has a very low natural vibration frequency there will be no significant stresses for seismic-induced resonance. The SSE-induced stresses will be within the uncertainty generally ascribed to the principal PTS stresses. It is reasonable to conclude that seismic events will not contribute significantly to the non-conservatism of PTS analyses.

B. Discussion of hydrodynamic loads as possible sources of non-conservatism in PTS calculations must begin with a qualifying statement. The nuclear industry and the NRC have established a working definition of hydrodynamic loads for purposes of analysis. Strict adherence to that definition would lead to the conclusion that hydrodynamic loads can be discounted in PTS events. The basis for such a conclusion is that this category of loads are of concern only in BWR plants. For example, when coolant is blown into the suppression pool in a Boiling Water Reactor (BWR) as a result of a plant malfunction severe shaking is induced in the

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* SSE: Safe Shutdown, Earthquake; a design-basis accident.

supports and is transmitted to the vessel. Strick adherence to the working definition allows the assertion that there will be no hydrodyamic loads on a PWR vessel. Since PTS is of relatively little concern in BWRs it follows that hydrodynamic loads play no role in PTS.

For the sake of completeness, there are some hydraulic sources of loads in PWR plants which should be mentioned although technically they are non hydrodynamic. One source of hydraulic loading is the phenomenon of water hammer. The affected PWR systems, however, would be confined to other than the primary loop. Since water hammer would not occur in a PWR primary loop there would be no significant load on the vessel, thus no influence on a PTS transient. A second class of PWR hydraulic loads would occur as a result of a major cold-leg LOCA and the assymetric blowdown forces. The loads, although significant, would be essentially confined to the supports, not the vessel itself. More importantly, the magnitude of the load on the supports would be proportional to the size of the break but a large LOCA would discharge so much coolant that the pressure (or repressurization) would be kept to a low value and, absent the pressure, there would be no PTS event at all. Finally, PWRs may be subjected to pressure spikes during a number of transients. In all cases, the resulting hydraulic loadings are reckoned with by including them in the piping system design both by analysis and pre-operational testing. Such transient-induced hydraulic loads will be too low in magnitude at the vessel beltline to be a factor in PTS analyses.

It is reasonable to conclude that hydrodynamic or hydraulic loads will be insignificant with respect to PTS events.

C. The location of pumps and valves or other sources of mechanical vibration in the system is such that there is negligible probability of significant vibratory loads at the critical time and location as described in item B above. Vibratory loads can be significant with respect to the fatigue life of piping but the duration of a PTS event is too brief for them to influence the outcome. Also, the magnitude of vibratory loads at the vessel beltline is so low as to be well within the uncertainty allowances used in calculating pressure and thermal stresses. Thus there is no reason to expect that vibratory loads could contribute significantly to the severity of a PTS event.

D. The NRC staff believes it has duly considered the contribution of all known sources of non-conservatism in reaching our conclusions regarding PTS. We do not believe there are other significant sources of non-conservatism that have not been considered.

Based on the foregoing discussion, I have concluded that acceptable bases exist for continued operation of all PWRs and BWRs pending resolution of the PTS issue. I believe that our previous conclusions and bases for those conclusions are valid in that regard, and that there is reasonable assurance that the health and safety of the public is protected. Therefore, I have determined that the petitioner's request for shutdown of all "suspect" PWRs and BWRs is denied.

A copy of this decision will be placed in the Commission's Public Document Room located at 1717 H Street, N.W., Washington, D. C. 20555. A copy of this decision will be filed with the Office of the Secretary of the Commission for its review in accordance with 10 CFR 2.206(c) of the Commission's regulations.

FOR THE NUCLEAR REGULATORY COMMISSION

Harold R. Denton

Harold R. Denton, Director
Office of Nuclear Reactor Regulation

Dated at Bethesda, Maryland,
this 31st day of March 1982