UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

Before the Atomic Safety and Licensing Board

DOCKETED
USNRC

In the Matter of
Philadelphia Electric Company
(LGS Units 1and 2)

Docket Nos 50-352 and 50-353

'83 OCT 26 A10:22

OFFICE OF SECRETARY
DOCKETING & SERVICE
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Statement of Marvin I. Lewis
In support of His Response to Applicant's
Motion for Summary Disposition of Contention
I-62.

Q.1. State your name.

A.1.a. Marvin I. Lewis. A statement of my professional and other qualifications is attached and entitled "Resume' ."

Q.2. You are familiar with Contention I-62. Answer yes or no.

A.2.a. Yes.

Q.3. What sections of the FSAR for LGS are pertinent to your Contention I-62?

A.3. Although several sections of the FSAR are related to the considerations of thermal shock , there are presently very few parts of the FSAR which bear directly upon my belief that the PTS in the LGS has not been properly analyzed.

Perhaps FSAR Section 4.3.2.8 comes closest to answering my concerns, but it is also deficient in several material and important characteristics.

Q.4. Please define PTS.

A.4. PTS is a condition that may affect some PWRs and BWRs. PTS results from the introduction of cold coolant onto , into , or close to a hot pressure vessel while pressure is or becomes high. Thermal stresses are produced in the pressure temperature boundary when cold coolant is introduced into , onto or proximate to the RPV. These thermal stresses , in conjunction with stresses which occur as a result of high vessel pressure, chugging load, vibration, seismic load, and any other cumulative effect, have the potential to cause crack propagation in vessel materials and materials in the pressure temperature boundary. The materials of which the reactor pressure vessel is made can become embrittled as a result of substantial neutron bombardment. What constitutes substantial neutron bombardment is still a matter that requires further research. This embrittlement could adversely affect the ability of the RPV materials to withstand all the combined and additive or cumulative stresses which exist in a RPV.

PTS has been recognized as a problem in some PWRs because

1.) Very high temperatures have been observed in PWRs during rapid cooldowns.

Q.5. Describe why you believe that PTS is significant in BWRs such as the LGS.

A.5. PTS can be a significant problem for BWRs since the necessary ingredients-- high reactor pressure combined with thermal and other stresses and determination of what constitutes significant neutron embrittlement -- have not been adequately analyzed or in some cases ignored. Specific reasons for these statements include , but are not limited to, the following:

1) The pressure in a BWR follows the water steam saturation curve. However, those instances and scenarios wherein the water steam saturation curve does not enter the temperature pressure determination are ignored. Two particular examples come to mind:

a) At Indian Point 2 on 10-17-80 ,the RPV was submerged in .9 feet of cold river water.(1This event is especially significant to the LGS. A previous contention submitted to the Board by this intervenor was dismissed partially on the basis that the LGS site had a very large reserve of water. (2

b) The possibility of stratification within the RPV has not been fully analyzed. This stratification could allow a steam bubble to form at the top of the reactor. The water at the bottom of the reactor would stratify with the hottest water in contact with the steam at the top of the reactor. Any circumstance wherein water circulation would be adversely affected could give rise to this set of circumstances. The insulating properties of the steam in comparison to water or water steam mixture could then provide an "unanalyzed Reactor Stress During Cooldown." (3.

There are many possibilities for a BWR to experience PTS that have not been analyzed. The above are only two. Nonetheless , they demonstrate that the thermal and combined stresses in a BWR have not been adequately considered for PTS.

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1)Nuclear Safety Magazine Volume 24-4 Jul Aug 83 Pressure Vessel Thermal Shock: Experience at US PWRs 1963 1981 " by D.L.Phung and Wm. B.Cottrell.

2) Contention I-57 (Lewis) There is an insufficient inventory of water on site or in the BWST to provide adequate assurance of cooling in the case of an SDV pipe break.

3/ "UNANALYZED REACTOR VESSEL THERMAL STRESS DURING COOLDOWN(BN 83-42)" April 12, 1983, Eisenhut to Commissioners.

2)The neutron fluence at the vessel wall in a BWR should be low compared with a PWR because of the presence of a large water filled annulus, a 2" shroud , and a substantially lower reactor core power density. However, several competing considerations were not included in the LGS analysis of neutron fluence. These competing considerations include, but are not limited to,

a)fuel management considerations in a BWR consider hig burnup rates as a primary consideration . (1) PWRs have been recently required to consider minimization of neutron flux to the RPV wall.(2) These two points taken together give rise to a concern that the fluence at a BWR vessel wall may be greater than a nominal flux obtained thru colculational techniques.

b)the water filled annulus in a BWR may not be completely filled with water. A steam water,2 phase, system could also exist in the annulus. Over time a steam water attenuation can be substantially less than a single phase water attenuation of the neutron flux.(3)

c) the shroud may not be continuous. There has been a history of bolts com ing off non-safety related parts in reactors and other debris breaking loose. (4) Whether or not an hiatus in the shroud could occur at a dangerous point as far as neutron embrittlement is involved and whether or not that hiatus can endanger the toughness of the RPV materials are matters that bear analysis.

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(1) NUCLEAR REACTOR ENGINEERING 3rd Edition S. Glasstone and A. Sesonske Para 8.183 and 8.188.

(2) Enclosure A ,NRC Staff Evaluation of PTS Nov 1982 Para 9.4 Page 9.4 and Appendix I Flux Reduction Programs.

(3) N R E (See (1) above) Para 1.102.

(4) Regulatory Guide 1.133 , Loose Part Detection Program for the Primary System of LWRs. This Reg Guide grew out of a history ond need caused by parts that broke off of non safety related and occasiinally safety related equipment.

Intervenor respectfully brings the Board's attention to the fact that he submitted comments on this Reg Guide in 10-15-77, and is therefore very familiar with the Reg Guide history.

The design , construction , testing , operation and surveillance , together with the physical behavior of the BWR assures that PTS is not a problem for the LGS only if competing considerations that can make PTS a problem at BWRs are ignored.

Q.6 and Q.7 Please describe the codes and standards to which the LGS RPV are designe d and fabricated.

A.6 and A.7 The statement of Smpath Ranganath in support of Motion for Summary Disposition of Contention I-62 describes the codes sufficiently. There is no need to repeat it here.

Q.8. In the "Statement of Sampath Ranganath In Suport of Motion for Summary Disposition of Contention I-62" a statement ," thesematerials were tested to the augmented requirements specified by GE" appears. Do you know what these "augmented requirements are , and why they were "augmented"by GE?

A.8 No, but I would sure like to. This is definitely an area to explore in cross examinatinn.

Q.9 Again in the "Stateme nt ..." what specifically does"operational experience" refer to?

A.9 Often "operational experience"will not really refer to experience at operating commercial nuclear power plants of the same or similar design. Sometime "operational experience may merely refer to calculational techniques using other computers. Unless "operational experience"isclearly defined as to reactor, placement in reactor, operating history in reactor and many other variables, "operational experience "can mean almost anything.

"Operational experience " may or may not bear directly on this contention. Any answer that depends on an undefined "operational experience " should not be relied upon at this stage of litigation.

A.10 What specifically dees the intervenor believe is inadequate or lacking in the Applicant's determination of fluences?

A.10 The Applicant admits that the fluences are just calculations. This is as it should be in light of the incompleteness of the LGS. However, the Applicant believes that "these calculations have been compared to field measurements and found to conservatively (sic) overpredict the neutron flux."

This overprediction is most probably for only a few points in some reactor where there are neutron dosimeters. I am particulary troubled about points in the LGS that may not be adequately monitored by dosimeters. There is no reason to believe that the calculations , which are admittedly only representative,will hold sway for all important welds and structures in the LGS.

Q.11What are the possible effects of those points which are not adequately monitored by dosimeters in the LGS?

A.11 As described in the Intervenor's answer to Q.5 above, there are considerations that allow a point to be bombarded by higher fluxes than calculated by the Applicant. There has not been sufficient analysis to assure that these points will not sustain significant neutron fluence which can cause crack propogation during a PTS.

Q.12 The Applicant has performed "confirmatory fracture analysis." Do you have any apprehensions about fracture analysis? Please state them.

A.12 Yes. I have several apprehensions about fracture analysis:

1) Fracture analysis is a highly empirical calculational technique. It depends upon choosing the right parameters and equations. These parameters and equations change with size and other variables. Presently the fracture analysis has never been verified with a full scale test. The largest size of pressure vessel used to verify the fracture analysis calculations have been 1/6th scale models of PWR vessels. There are many differences between PWRs and BWRs.

I n light of the fact that only 1/6th scale models of PWRshave been used to verify the fracture analysis and that there are many differences between BWR and PWRs, I am most apprehensive about accepting fracture analysis and fracture mechanics calculational techniques as adequate.

2) The assumption about crack depth , crack tip geometry , and crack propogation seem to jump out of the air and do not appear to have substantive justification. (1)

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(1) NUREG 0744 Vol 1 Rev 1 Resolution of Task A 11 Reactor Vessel Materials Toughness Safety Issue

Appendix H discusses the 1/6th scale models used.See 1) above.

Comment 12d "The most important omission in the criteria is the reference size to be used in the calculations. The J/T equals 50 line suggests an assumed flaw depth of 0.25 inches."

Please note how this comment is phrased,"most important", "suggests", "assumed." These are my problems in accepting the fracture analysis. Further , this intervenor did not send in these comments so these comments were not planted by this intervenor, but are real concerns of other interested parties. See 2) above.

Q.13. What particular concerns do you have about the neutron surveillance program at the LGS?

A.13 This is a very sore subject. Part of the original reason that PTS was brought forward as a problem is that the predicted vessel fluence at several rea ctors was much less than the fluence actually experienced during operation.
The Applicant has stated that his calculations "conservatively overpredict ... compared to field measurements." Nonetheless, there have been several instances where experienced and calculational fluences have not compared favorably. Also ORNL states,"(The estimated uncertainty) of Fluences at the vessel wall locations may be as high as 50%." (1)
This is only part of my concern about fluences and the actual differences may be much higher as I pointed out in my answer to A.10.

Q.14. What are your overall conclusions concerning the effectof PTS on th LGS RPV?
A.14 The conditions necessary for the ocurrence of PTS on PWRs can occur at LGS. The only way that an opposite conclusion can be reached is to ignore all pertinent and important facts and history .

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1) Evaluation of the Threat To PWR Vessel Integrity Posed by PTS Events.Kryteret al ORNL/ TM 8072 ;NUREG /CR 2083 Oct. 7 1981 Page 6-6 Para 6.3 .
Although I use a quote that suggests that the uncertainty is limited to 50%, I am not emphasizing Table6.1."Uncertainties for calculational and Dosimetry Measurement Procedures in LWRs" wherein a simple addition of the known uncertainties leads to a figure for uncertainty well in excess of 100%.

9.

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In the Matter of Philadelphia Electric Company (Limerick Generating Station Units 1 and 2.)	)	Dockets No 50-352 and 50-353

AFFIDAVIT OF MARVIN I. LEWIS, R.P.E., INTERVENOR AT THE LGS OL HEARINGS.

1. My name is Marvin I. Lewis. I am a Registered Professional Engineer adnd and intervenor at the LGS OL Hearings before the Nuclear Regulatory Commission Atomic Safety and Limcensing Board.
2. I have written the enclosed response to the Applicant's Motion for Summary Disposition of Contention I-62. The statements are true and correct and complete to the best of my knowledge , information and belief.

10.24.83

Date

Marvin I Lewis

Marvin I. Lewis

Subscribed and Sworn to Before me this date October 24 1983.

Marie [illegible]

Notary Public

My Commission expires ______________________.

RESUME'

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Name: Marvin I. Lewis

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Phila PA 19149

Telephone: (215) CU 9 5964 (Home)
725 7825 (CANE answerphone)

College experience:

B.A.			
B.Sc. Metallurgical	Engineering	Drexel Institute of Technology	1960
Graduate work	Engineering	University of Penna	1961
Graduate work	Chemistry	St. Joseph's	1964 thru 1968

Professional License:

Registered Professional Engineer No. 011729-E 1960 to present

Technician experience:

U.S.Naval Materials Laboratory Bd 599	Phila Naval Base	1956 thru 1958
N.Y. Shipbuilding Corp.	Camden, N.J.	1958 thru 1959

Professional experience:

General Electric Company	1960 1968
Philadelphia Board of Education	1968 thru 1971

Energy related experience:

Environmental Coalition on Nuclear Power	Action Director	1971 thru 1976
	Board Member	1976 to present
Citizen Action in the North East(CANE)	Energy Chairman	1982 to present

I have been active in energy-related concerns over a decade. During this time, I have provided many environmental and citizen-action groups my expertise and time on many energy related subjects. I have also appeared on television and radio shows including several appearances on Pennsylvania Perspective with Joe Hunter and a regular talk show on WIBF FM. I have also intervened either for myself or citizen action groups in proceedings before the Nuclear Regulatory Commission, Department of Energy, and the Pennsylvania Public Utility Commission. My formal comments to the Department of Energy, Nuclear Regulatory Commission and the Environmental Protection Agency have been accepted and incorporated into the respective regulations on the subjects of transportation of nuclear wastes and radioactive waste gas systems.

Previous to my involvement with energy, I was employed as a materials engineer with the General Electric Company . My employment with GE was at several different locations and in several different capacities. I started in a Thermophysical Properties Laboratory. I organized the laboratory from the start and was in charge of it. I was transferred to several locations within GE to write materials specifications. I wrote materials specifications on all manner of materials from astronaut drinking water to superinsulation.

As an undergraduate at Drexel, I worked as a technician. In the Naval Materials Laboratory, I worked in the Metallurgical Section. I investigated and performed tests on ferrous , non ferrous and ceramic materials. I also worked as a welding inspector for the New York Shipbuilding Corporation. Aside from the magnaflux inspection of welds, I also ultrasonically inspected the reactor vessel for the NSS Savannah.