RELATED CORRESPONDENCE

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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In the Matter of	:	
METROPOLITAN EDISON COMPANY, et al.,	:	Docket No. 50-289
(Three Mile Island Nuclear Station,	:	
Unit No. 1)	:	

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DIRECT TESTIMONY OF
DR. JAN BEYEA ON BEHALF
OF THE ANTI NUCLEAR GROUP REPRESENTING YORK
REGARDING A.N.G.R.Y. CONTENTION NO V (D)

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DR. JAN BEYEA

QUALIFICATIONS

Dr. Beyea is a nuclear physicist who has specialized in the consequences of nuclear accidents. He received his Doctorate from Columbia University. As of May 1, 1980 he became the Senior Energy Scientist for the National Audubon Society. Prior to that he was for four years a member of the research staff at the Center for Energy and Environmental Studies at Princeton University.

While at Princeton University he prepared a critical analysis of models of reactor accidents.

The lessons learned from this general study of nuclear accidents were applied by Beyea over and over again to specific problems at the request of governmental and nongovernmental bodies around the world. These requests came to Princeton because of the difficulty local governments and organizations faced in obtaining assessments of the seriousness of nuclear safety issues by independent scientists. Because most scientists and engineers knowledgeable about the details of nuclear issues work for organizations which are seen as having a strong bias in favor of nuclear power, the nuclear policy group at Princeton found itself in great demand. Dr. Beyea prepared major reports on the safety of specific nuclear facilities for the President's Council on Environmental Quality (TMI), for the Swedish Energy Energy Commission (Barsebeck), and the state of Lower Saxony in West Germany (Gorleben). He examined in less detail, safety aspects of specific sites for the California Energy and Resources Commission, the Massachusetts Attorney General's Office, The New York City Council and, most recently, for the Governor of Pennsylvania in connection with the Union of Concerned Scientists krypton venting study.

(Dr. Beyea made the dose calculations for the U.C.S. study.)

A computer program useful for reactor emergency planning was written for the New Jersey Department of Environmental Protection.

In addition, Dr. Beyea provided advice on nuclear facility siting policy and emergency planning for the Bureau of Radiation Protection of the City of New York, the Office of Congressman Theodore Weiss, the Environmental Law Institute, the Union of Concerned Scientists, Friends of the Earth, the German Eco-Institute, the Heidelberg Univercity Environmental Group, the Oxford-based Political Ecology Research Group as well as numerous journalists and writers.

His work was discussed in Harpers, Science, Spectrum and New Age magazines, during his appearance on William Buckley's Firing Line and at a National Academy of Sciences debate on nuclear reactor safety.

In addition to the reports written about specific nuclear facilities, which have been widely circulated, an article of Beyea's on resolving conflict at the Indian Plant reactor site appeared in The Bulletin of the Atomic Scientists and an article on Emergency Planning for reactor accidents will appear in the December issue. A Princeton report with Frank von Hippel on the value of improving reactor containment systems has also been written.

A complete resume is attached as Appendix D.

A.N.G.R.Y. Contention V(D)

V. The NRC Order fails to require as conditions for restart the following modifications in the design of the TMI-1 reactor without which there can be no reasonable assurance that TMI-1 can be operated without endangering the public health and safety:

(D) Installation in effluent pathways of systems for the rapid filtration of large volumes of contaminated gases and fluids.

Outline of Testimony on A.N.G.R.Y. Contention No. V (d)

The accident at TMI Unit No. 2 suggests that the probability of a meltdown is sufficiently high that the possibility of a meltdown occurring at TMI Unit No. 1 must be taken into account in the regulatory process.

Although the containment at TMI Unit No. 1 may be strong enough to contain a meltdown, it was not specifically designed to do so. (The NRC's Reactor Safety Study estimated a one in five chance that a PWR containment would fail during a meltdown.)

In light of these considerations, the philosophy of "defense in depth" now requires backfitting the TMI Unit No. 1 containment with the capability to mitigate the consequences during a meltdown of a breached containment. The installation of a large "filtered venting" system would substantially reduce off-site consequences should it be necessary to vent the containment building to prevent a hydrogen explosion or fire, should failure of the containment by overpressurization be imminent, or should a major leakage path develop.

As a first step towards this goal, the licensee should be required to complete a study investigating the compatibility of TMI Unit No. 1 safety systems with the filtered venting concept.

Direct Testimony of Dr. Jan Beyea
on A.N.G.R.Y. Contention
No.V (D).

Q1 What is "Filtered Venting"?

A A reactor containment with "Filtered Venting" would have a filter system large enough to trap a significant fraction of the radioactivity which is projected to be released to the atmosphere in hypothetical core meltdown scenarios (such as those studied in the Reactor Safety Study[1]). If pressure inside the containment during the course of an accident reached dangerously high levels, or, if leakage were already occurring due to isolation failure, the pressure could be reduced by venting some of the gases and aerosols in the containment through a large filtration system which would cleanse them of most radioactivity other than that carried by radioactive noble gases. (A list of references on the subject is attached.[2-10])

Reactors were never designed to contain a meltdown. They might, in fact, do so under certain accident circumstances but they would not be expected to do so under all of the accident sequences envisioned in the Reactor Safety Study. Reactor containments were not designed to contain meltdowns because the assumption was made that regulatory procedures would keep the meltdown probability so low that reactors need not have the capability to handle the enormous pressure which might result from such an accident. (Table I, reprinted from Reference 2, shows the contribution to the containment pressure due to various failures which might occur in a PWR large volume containment during a meltdown. The total pressure is shown to significantly exceed the containment failure design pressure.)

In my view, and that of many others, the occurrence of the TMI accident suggests that meltdowns can no longer be ignored. Should a meltdown occur at TMI Unit #1, without filtered venting installed, the only barrier left between the radioactivity and the public will be a containment which may not be strong enough to survive. In my opinion, the philosophy of "defense in depth," which has guided nuclear regulation in the past, now mandates the addition of filtered venting as a backup to containment systems.

Q2 Do designs for filtered venting systems exist?

A Yes. See reference 8.

Q3 Would filtered venting handle all possible meltdown sequences?

A No. An escape path for radioactivity which bypassed the containment building could also bypass the filtered venting system. The filtered venting system would, however, handle those meltdown accident sequences which are considered most likely--overpressurization and isolation failure.

Q 4 What has the NRC done about this concept?

A To answer that question, let me quote from a letter to Representative Morris Udall from Frank von Hippel (July 22, 1980). von Hippel was a member of the American Physical Society's (APS) 1975 study group[10] -- one of the early promoters of the filtered venting concept. The entire letter is included as Appendix A.)

> "The NRC has sponsored various studies on the value of the particular containment improvement which our APS group proposed (the filtered vent feature)-which incidentally has the strong merit that it can be retrofitted onto existing reactor containments. These NRC sponsored studies have generally come to cautiously stated positive conclusions. As with the case of thyroid protection, however, the agency has not shown any urgency to do anything about containment improvements. The one glimmer of hope I have in this case is based on the order issued by Harold Denton on February 11, 1980

in response to the UCS petition that the NRC "suspend operation of (Indian Point) Units 2 and 3 pending resolution of various safety-related issues." In this order Denton states (pp. 7 and 9) that

> "an NRC Task Force has been formed to review Indian Point Units 2 and 3 and Zion Station Units 1 and 2... Other measures will continue to be evaluated in the next few months. Some of the design changes being considered are a vented, filtered containment atmospheric release system, core retention devices, and hydrogen control."

In summary therefore, after five years the NRC is still studying these questions - in one case apparently as a substitute for action - in the other perhaps as a prelude to some action some day. My overwhelming feeling after observing the NRC in action on these matters for these five years, however, is that the staff is convinced that a serious accident won't happen and that therefore there is no hurry to bring these matters to some decision. Apparently, despite the NRC's finding that it "does not regard as reliable The Reactor Safety Study's numerical estimate of overall risk of reactor accident" (a major release of radioactivity only once in a thousand years from a population of one hundred reactors), the NRC staff still does.

Q5 Why should TMI unit #1 be the first reactor to get filtered venting?

A Let me begin by pointing out that TMI #1 would not be the first reactor to have this feature. The German prototype breeder reactor, SNR-1, has this capability.

In any case, it is my opinion that TMI unit #1 should become the first American commercial power reactor where the licensee is required to seriously pursue filtered venting. First of all, the Babcock and Wilcox reactor contained in Unit #1 is the type which is most suspect. Secondly, the psychological gains from installing the system would be greatest at this site.[11]

Q6 How should the Licensee be ordered to "seriously pursue" filtered venting?

A The licensee should prepare a study investigating the compatibility of filtered venting designs with the existing TMI-1 safety systems. If some potentially harmful interaction should be found, modification of the standard filtered venting design should be investigated. This study would be the basis for a decision by the licensing board as to whether or not this particular safety feature should be required.

If it were found in the study that filtered venting was not compatible with TMI-1 safety systems, I, for one, would recommend against restart of unit #1 on safety grounds alone.

Q7 How expensive would this system be?

A Estimates range from 1-10 million dollars.[5,7,8] so that a filtered venting system would represent an investment which is small compared to the total value of the plant.

Q8 Why do you say that the TMI accident tells us that meltdowns are more likely than previously thought?

A The TMI accident demonstrates that reactors are not the well-understood systems assumed in the regulatory process. The TMI accident suggests regulators must now deal seriously with the possibility that unknown meltdown sequences remain to be discovered.

Q9 Does anyone really know the probability of a meltdown?

A I don't think so. Assigning a probability to a core meltdown has been controversial. The N.R.C. has recently withdrawn its previous expressions of confidence in the accuracy of the Reactor Safety Study's probability estimates for these events.[12]

Q10 Would filtered venting have been useful during the TMI-2 accident under alternative sequences?

A It certainly would have been a desirable safety feature to have had the accident proceeded to a meltdown.

Should the containment spray or heat removal systems be damaged or fail to function properly, the pressure in the containment during a meltdown could rise to the point where it would be highly desirable to vent the containment. With "filtered venting", venting could be carried out without releasing millions of curies of the radioactive isotopes of tellurium, iodine and cesium. (These isotopes are predicted to cause most of the harmful consequences from uncontrolled releases in a meltdown.)

It would not be possible to safely vent through the existing filters in the air handling system because the existing filters would soon become overloaded.

Although a filtered venting system would trap most of the highly dangerous radioactivity under the hypothetical conditions described above, millions of curies of the noble gases, xenon and krypton would be released (perhaps 10 to 100 times as much as was released during the actual TMI accident[13]). Since release of all the noble gases could cause a certain number of delayed cancer deaths in distant populations (from 2 to 50 at the TMI site[13]), venting in a meltdown would not be undertaken lightly, but only to prevent a much larger loss of life. It is possible that the operators of the reactor might wait until the containment actually failed before turning on the filtered venting system. Even then the system would be useful in reducing the consequences of the accident, since a significant fraction of the radioactivity would still pass out through, and be trapped in, the large filters.

Q11 How close did the TMI-2 accident come to a meltdown?

A No one knows for sure how close the Three Mile Island accident came to a meltdown. The NRC Special Inquiry Group headed by Mitchell Rogovin suggests that the accident actually was heading toward severe core melting and that the uncontrolled loss of coolant through the stuck pressure operated relief valve was terminated with only an hour to spare.[15] (The Rogovin group commissioned an analysis of 15 alternative event sequences. It was concluded that several of these alternative sequences might have resulted in substantial fuel melting.[15])

Q12 What is your basis for claiming that the containment buildup at TMI-1 might not be sufficient to contain a meltdown?

A Every major study of reactor safety, including the Nuclear Regulatory Commission's 1975 <u>Reactor Safety Study</u> (WASH-1400),[1,16,17] has concluded that there is a significant probability of a major release of radioactivity into the atmosphere following a core meltdown. <u>In fact, the Reactor Safety Study estimated that about one in five PWR core melts would lead to a failure of the containment building through overpressurization.</u>[18]

Q13 Are there other outcomes of the TMI-2 accident, short of a meltdown, for which filtered venting would have been a desirable safety feature to have available?

A Yes. Let me begin my response with a discussion of the seriousness of the actual accident that occurred. The Rogovin Inquiry Group /Reference 14, Volume II, Page 527/ has summarized estimates of the extent of fuel damage and the percentage releases of radioisotopes from the fuel rods during the Three Mile Island accident. It appears that "no significant quantity of fuel reached the melting point of U_2O (5200°f)", but that "about 50 percent of the reactor core was damaged /enough/ to release the most volatile fission products." Even though complete melting of the fuel did not occur, the quantity of radioactive isotopes released from the fuel was similar to that which would be expected in a meltdown for the volatile elements (noble gases, iodines, bromines, cesiums and isotopes of rubidium). The Rogovin Group concluded, cautiously, that 40 percent to 60 percent of the core inventory of these volatile isotopes were released to the coolant. In particular, average estimates suggest a 46 percent release for the noble gases, a 39 percent release for Iodine 131, a 63 percent release for cesium 137, and a 44 percent release for cesium 134 /Reference 14, Volume II, Table II-57, Page 527/. As for the percentage of the core inventory of these isotopes which ended up in the containment (primarily through overflow of radioactive cooling water), the Rogovin Commission quotes 25 percent (Iodine 131), 51 percent (cesium 137), and 36 percent (cesium 134).

Since radioiodine and radiocesium dominate the long-term consequences of hypothetical meltdown accidents, the TMI-2 accident had the potential for producing the same long-term consequences as a core meltdown. Of course, for this to happen, the radioactivity which escaped from the fuel would have had to become airborne.

Q14 What would those long-term consequences have been?

A I will give two examples based on a study I did for the Council on Environmental Quality.[19] (Excerpts from that study are included as Appendix B.)

Example 1. In this example, 5% of the core inventory of radioiodine is assumed to be released into the atmosphere. (This represents about 20% of the radioiodine which passed into the containment system during the TMI accident). For this hypothetical accident, the following consequences have been calculated for the TMI site under average weather conditions: 2 to 325 delayed cancer deaths,[20] 200 to 27,000 delayed cases of thyroid nodules, 25,000 mi^2 of temporary restriction on cattle grazing to prevent consumption of contaminated milk. (Were the wind to be blowing towards the ocean, the area would be less. The range in the health effects numbers reflects differences in assumed wind directions as well as uncertainty in cancer dose coefficients.)

Example 2: In this example, 10% of the core radiocesium is assumed to be released into the atmosphere. This represents about 20% of the radiocesium which passed into the containment system during the TMI accident.) For this hypothetical accident, the following consequences have been calculated for the TMI site under average weather conditions: 12 to 1650 excess cancer deaths over the following 75 years,[20] 75 square miles of land requiring decontamination or long-term restrictions on use. (If, in the consequence calculations, the core inventory of cesium were taken to be that of a mature reactor core, rather than that of a new reactor operating for only a few months, the calculated consequences for the same percentage release would increase: 62 to 8150 excess cancer deaths over the following 75 years,[20] 550 mi^2 of land requiring decontamination or long-term restrictions on use.)

Q15 Are such airborne releases possible?

A Such releases are certainly possible in a meltdown. In fact, releases of this magnitude would be considered "intermediate" possible outcomes of a meltdown. However, it apparently has not been studied whether or not such releases could have been alternate outcomes of the TMI accident short of a full meltdown. Although a number of detailed alternate event analyses have been made for the TMI accident,[14] concern has been directed at event sequences which could lead to fuel melting, not sequences which could have led to the escape to the environment of the radioactivity which actually entered the coolant water. In the absence of such studies, I have made a preliminary examination of such sequences in Appendix C.

I have found at least two release pathways which are of concern.

1. An initial release into the containment building of radioactive gases and water droplets followed by a major failure of the containment building resulting in an airborne release.

2. Contamination of the secondary coolant loop as a result of leaks in a steam generator followed by a direct release into the atmosphere of contaminated steam and water droplets from the secondary system.

Q16 Would filtered venting handle a leakage path through the secondary system?

A Not in the present designs.

Q 17 Assuming you are correct that radioactivity could have entered the TMI-2 containment in airborne form, how could the containment have failed without a subsequent meltdown?

A Reactor containments can fail or be bypassed theoretically, even without a full core meltdown:

1) due to overpressurization following failure of the pressure-reducing spray systems (as in the PWR4 accident described in the Reactor Safety Study (RSS)).

2) due to failure of the containment to properly isolate from the atmosphere (as in a PWR5 or PWR 7 accident in the RSS). Such an isolation failure actually occurred at TMI for the inert radioactive gases, Xenon and Krypton.[21]

3) conceivably due to a hydrogen explosion.

It is also possible that the containment might be deliberately vented because of concern that a hydrogen explosion or fire might lead to a more catastrophic failure.

(Note that in the case of a full core meltdown, there is the additional theoretical possibility of a violent steam explosion breaching the containment (as in a PWR1 accident of the RSS)--an event which might arise from a large fraction of the molten core falling "in a lump" into a pool of water at the bottom of the pressure vessel or containment building.)

Q18 Therefore, based on an analysis of alternative outcomes of the TMI unit #2 accident, there appear to exist a number of plausible accident sequences (including those which do and do not end in meltdowns) for which a filtered venting capability would be the safety system of last resort?

A. Yes.

Q19 Please summarize your testimony.

A Backfitting the containment building at TMI Unit #1 with the capability for rapid filtration of large volumes of radioactivity-contaminated gases and aerosols could strengthen the capability of the containment building to prevent the worst releases at relatively low cost. Such a filter system could substantially reduce off-site consequences should it be necessary to vent the containment building to prevent a hydrogen explosion or fire, should failure of the containment by overpressurization be imminent, or should a major leakage path develop.

Table I-1: Pressurization Contributions for Typical Reactor Containments

Small Volume Steam Pressure Suppression Type[a]

(designed to contain 4atm. overpressure*)

H_2 pressure from oxidation of 100 percent of zirconium in core	5-11atm.[b]
CO_2 pressure from thermal decomposition during melt-through of cylinder of concrete 6 meters in diameter and 2.5 m. thick	4-9atm.[c]

Large Volume Type[d] (such as at TMI)

(designed to contain 3atm. overpressure*)

Initial pressurization by steam from primary coolant	2.5atm.[e]
Additional pressurization in subsequent three hours in absence of containment cooling	3 atm.[f]

* Actual failure pressure could be considerably higher. Ref. 4 estimates the failure overpressure for a small volume containment at 9-12 atm. (p. VIII-37) and for a large volume containment at 5-7 atm. (p. VIII-22).

(NOTE THAT REF. 4 IS THE REACTOR SAFETY STUDY.)

Notes

a) Typical of containments used in most operating US Boiling Water Reactors. Free volume = $7.9 \times 10^4 m^3$ (40% over the vapor suppression pool - ref. 4, p. VIII-8). The higher pressure values apply if the noncondensible gases are swept by steam into, and are trapped in, the free volume over the vapor suppression pool as assumed in ref. 4.

b) 56,000 kg Zr (ref. 5, p. E-7). At Three Mile Island approximately 50 percent of the zirconium was oxidized (ref. 1, p. 30).

c) Ref. 4 (p. VIII-30) assumes this quantity of concrete decomposes. Ref. 5 (p. D-6) assumes four times as much. The concrete has a density of 2.4 and is approximately 25 percent CO_2 be weight (in $CaCO_3$, Ref. 5, p. D-2)

d) Typical of those used in most US Pressurized Water Reactors. Free volume = $5.1 \times 10^4 m^3$ (Ref. 4, p. VIII-4).

e) Initial mass of water in the primary coolant system = 1.9×10^5 kg at 300°C (ref. 4, p. VIII-4).

f) Ref. 4, Fig. VIII 2-6.

Notes and References

1. U. S. Nuclear Regulatory Commission, Reactor Safety Study. (Washington, D. C., WASH-1400, 1975.)

2. "Nuclear Reactor Accidents: The Value of Improved Containment." J. Beyea, F. von Hippel, (Princeton University, Center for Energy and Environmental Studies, Princeton, N.J., PU/CEES #94, 1980).

3. A detailed review of the issues involved in this concept can be found in Allan S. Benjamin, Program Plan for the Investigation of Vent-filtered Containment Conceptual Designs for Light Water Reactors, (Washington, D.C., Nuclear Regulatory Commission, NUREG/CR-1029, 1979).

4. Recently a U.S. Nuclear Regulatory Commission task force recommended that the agency make a decision within approximately a year on whether or not to require a filtered release system on reactor containments. [NRC, TMI-2 Lessons Learned Task Force Final Report, (Washington, D.C., NUREG-0585, 1979), p. 3-5.]

5. Evaluation of the feasibility, economic impact, and effectiveness of underground nuclear power plants, Aerospace Corporation, Report to the California Energy Commission, [Los Angeles, ATR-78 (7652-14)-1].

6. Effect of Containment Venting on the Risk from LWR Meltdown Accidents, P. Cybulskis, R. O. Wooton, R. S. Denning, (Nuclear Regulatory Commission, Washington, D.C., NUREG/CR-0138, BMI-2002, 1978).

7. A Value-Impact Assessment of Alternate Containment Concepts, D. Carlson, J. Hickman (Nuclear Regulatory Commission, Washington, D.C., NUREG CR-0165, 1978).

8. Post-Accident Filtration as a Means of Improving Containment Effectiveness, B. Gossett, M. Simpson, L. Cave, C.K. Chan, D. Okrent, I. Catton, (Los Angeles, University of California, UCLA-ENG-7775, 1977).

9. "Gas clean-up system for vented containment," 14th ERDA Air Cleaning Conference, J.L. Kovach, Nuclear Consulting Services, Inc., Columbus, Ohio, undated.

10. "Report to the American Physical Society by the Study Group on Light Water Reactor Safety," Reviews of Modern Physics, 47, 1975, p. S110.

11. For a discussion of the "psychic" or "anxiety" costs of an accident see, e.g., U. S. Nuclear Regulatory Commission, United States Experience in Environmental Cost Benefit Analysis for Nuclear Power Plants with Implications for Developing Countries, (Washington, D.C., 1980, NUREG-0701, pp. 64 and Appendix E.)

12. "NRC Statement on Risk Assessment and the Reactor Safety Study Report (WASH-1400) in the Light of the Risk Assessment Review Group Report," (NRC, January 18, 1979).

13. There is conflicting data on the amount of noble gases actually released during the accident. Reference 14 lists the range of estimates as 1.5 to 13 million curies of xenon 133. This would represent .9 to 8 percent of the approximately 170 million curie inventory of xenon 133 (Ref. 1, Table VI 3-1).

Release of 60% of the noble gases at the TMI site has been calculated to cause 1 to 25 delayed cancer deaths (See Table I, Appendix B). Release of 100% would cause less than 50 delayed deaths.

14. Nuclear Regulatory Commission Special Inquiry Group, M. Rogovin, G. T. Frampton, Jr., et al., Three Mile Island, A Report to the Commissioners and to the Public (Washington, D. C., 1980, Volume II, pages 358-360)

15. Ref. 14, Vol. I, Pages 20, 91, Vol II, pages 553-570.

16. Ergen, W. K., et al., Emergency Core Cooling - Report of Advisory Task Force on Power Reactor Emergency Cooling, TID-24226 (1966) N.T.I.S.

17. D L. Morrison, et al., An Evaluation of the Applicability of Existing Data to the Analytical Description of a Nuclear Reactor Accident -- Core Meltdown Evaluation, BMI 1910 (1971), N.T.I.S.

18. The sum of the yearly probabilities given in Ref. 1, Table VI 2-1, for PWR-1, 2 or 3 core melt accidents ($1.3x10^{-6}$) divided by the sum of the probabilities of PWR1 through PWR7 accidents ($6x10^{-5}$).

19. Jan Beyea and Frank von Hippel, "Some Long-Term Consequences of Hypothetical Major Releases of Radioactivity to the Atmosphere from Three Mile Island," Report to the President's Council on Environmental Quality, 722 Jackson Place, N.W., Washington, D.C. 20006 U.S.A. 1979, (Draft).

20. These numbers are obtained from Table 1, Ref. 19. (Reproduced as Appendix B).

21. Ref. 14, Vol. II, pages 352-365.

APPENDIX A

Complete text of letter from Frank von Hippel of
the Center for Energy and Environmental
Studies of Princeton University

to

Representative Morris Udall
Subcommittee on Energy and the Environment

Appendix A-1

July 22, 1980

Representative Morris Udall
Subcommittee on Energy and Environment
House Interior Committee
1626 Longworth House Office Building
Washington, DC 20515

Dear Representative Udall:

In 1974 I was chairman of the subcommittee on reactor accident consequences and their mitigation of the American Physical Society's Study Group on Light Water Reactor Safety. Our subgroup came up with two important proposals to the NRC in the area of reactor accident consequence mitigation:

1) Thyroid Protection from Radioactive Iodine

> "We believe that a national policy of stockpiling thyroid blocking chemicals for possible emergency distribution should be established."[1]

2) Improved Reactor Containment Building Design

> "...more emphasis should be placed on seeking improvements in containment methods and technology. In particular, controlled [filtered] venting of the containment building in case of overpressure should be studied."[2]

Since the APS group was disbanded in the spring of 1975, five years ago, I undertook a personal effort to see that the NRC considered those proposals seriously. I am sorry to say, however, that, despite some studies, the NRC has been unable in the past 5 years to bring itself to the point of a policy decision in either case.

Now that the confusion following Three Mile Island has subsided, I would like to try to get these issues addressed with a higher priority. For the benefit of those who will have a continuing responsibility and involvement

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[1] "Report to the APS by the Study Group on Light Water Reactor Safety," Reviews of Modern Physics 47, pp. S109-S110.

[2] Ibid, p. S7.

Representative Morris Udall July 22, 1980

in the reactor safety area, I have therefore tried to summarize the situation on each issue as it currently stands in the attached reports.

The first report: "Why the U.S. Has No Thyroid Protection Policy: An Account of Paralysis at the Nuclear Regulatory Commission" has been submitted for publication in the October issue of the Bulletin of the Atomic Scientists. It is a short summary of my experiences in trying to get the NRC to develop a thyroid protection policy. I find profoundly distubbing the NRC's inability to face this issue - not only because I think that it is important for the nation to have a strategy for protecting the thyroids of the millions of people who might be downwind in case of a large release to the atmosphere of radioiodine from a reactor accident, but also because my experiences in this case have fed my feeling that the NRC is continuing in general to follow the AEC tradition of avoiding the hard decisions in the reactor safety area.

The second report, Nuclear Reactor Accidents: The Value of Improved Containment, which I have coauthored with Jan Beyea, explains why we should want improved reactor containment buildings which will with greater confidence contain the radioactive gases which would be released by a reactor core melt-down. (You only need read the first eight pages. The rest is all technical backup for figure I-1 on page I-5 which shows the land areas which would be seriously affected by radioactive releases of different magnitudes.)

The NRC has sponsored various studies on the value of the particular containment improvement which our APS group proposed (the filtered vent feature) - which incidentally has the strong merit that it can be retrofitted onto existing reactor containments. These NRC sponsored studies have generally come to cautiously stated positive conclusions. As with the case of thyroid protection, however, the agency has not shown any urgency to do anything about containment improvements. The one glimmer of hope I have in this case is based on the order issued by Harold Denton on February 11, 1980 in response to the UCS petition that the NRC "suspend operation of [Indian Point] Units 2 and 3 pending resolution of various safety-related issues."[3] In this order Denton states (pp. 7 and 9) that

> "an NRC Task Force has been formed to review Indian Point Units 2 and 3 and Zion Station Units 1 and 2... Other measures will continue to be evaluated in the next few months. Some of the design changes being considered are a vented, filtered containment atmospheric release system, core retention devices, and hydrogen control."

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[3] In the Matter of Consolidated Edison Company of New York, Inc. (Indian Point Unit Nos. 1 and 2) and the Power Authority of the State of New York (Indian Point Unit No. 3), Director's Decision Under 10 CFR 2.206, Feb. 11, 1980.

Representative Morris Udall July 22, 1980

In summary therefore, after five years the NRC is still studying these questions - in one case apparently as a substitute for action - in the other perhaps as a prelude to some action someday. My overwhelming feeling after observing the NRC in action on these matters for these five years, however, is that the staff is convinced that a serious accident won't happen and that therefore there is no hurry to bring these matters to some decision. Apparently, despite the NRC's finding that it "does not regard as reliable The Reactor Safety Study's numerical estimate of overall risk of reactor accident"[4] (a major release of radioactivity only once in a thousand years from a population of one hundred reactors), the NRC staff still does.

Best regards,

FvH/ra Frank von Hippel

[4] "NRC Statement on Risk Assessment and the Reactor Safety Study Report (WASH-1400) in the Light of the Risk Assessment Review Group Report," (NRC, January 18, 1979).

APPENDIX B

Excerpts from Reference 19,

Jan Beyea
Some Long-term Consequences of
Hypothetical Major Releases of
Radioactivity to the Atmosphere
from Three Mile Island

(Report to the Council on
Environmental Quality,
September 1979 (Draft))

Table I: Summary Table. Some Long-Term Consequences of Hypothetical Accidents at Three Mile Island[a)]

(Not including any early illness or deaths which might be associated with high doses to unevacuated populations a few tens of miles from the reactor.)

ACCIDENT DESIGNATION	RELEASES TO ATMOSPHERE	DELAYED CANCER DEATHS[b,c] (low/high[d])	THYROID NODULE CASES[c,e] (low/high)	TEMPORARY AGRICULTURAL RESTRICTIONS	AREAS REQUIRING DECONTAMINATION OR LONG-TERM RESTRICTIONS ON OCCUPATION[f]
TMI-0	10% of noble gases (similar to actual accident)	0/4		0	0
RELEASES GREATER THAN ACTUALLY OCCURRED					
TMI-1	60% of noble gases	1/25		0	0
TMI-2	5% Iodines plus 60% noble gases	3/350	200/27,000	25,000mi^2 [g)]	0
TMI-3a	TMI-2 plus 10% of Cesiums	15/2000	200/27,000	25,000mi^2 [g)]	75mi^2
TMI-4a	50% of Cesiums	100/12,000		3700mi^2 [h)]	650mi^2
TMI-5a	"PWR2" Release with complete core melt[i)]	200/23,000	3500/450,000	175,000mi^2 [g)]	1400mi^2
CONSEQUENCES ASSUMING THE REACTOR CORE HAD BEEN IN OPERATION FOR MUCH LONGER THAN 3 MONTHS (MATURE CORE)					
TMI-3b	TMI-2 plus 10% of Cesiums	65/8500	200/27,000	25,000mi^2 [g)]	550mi^2
TMI-4b	50% of Cesiums	440/48,000[j)]		18,000mi^2 [h)]	4300mi^2
TMI-5b	"PWR2" release[i)]	550/60,000[j)]	3500/450,000	175,000mi^2 [g)]	5300mi^2

Footnotes for Table I

a) All accidents are assumed to take place under "typical" meteorological conditions. Wind shifts and changes in weather neglected. Details can be found in the supporting tables in Appendix B and in the technical discussion in Appendix E. Health effects are totalled for people living beyond 50 miles.

b) Cumulative total over a 75 year period after the accident. The range of genetic defects would be equal, very roughly, to the range of delayed cancer deaths.

c) The low number is for the most favorable wind direction (Eastern Maryland), assuming the most optimistic coefficient relating dose to health effects, and evacuation out to 50 miles. (Without evacuation, the low number would be a factor of 2-5 higher depending on the accident.)

The high number is for the least favorable wind direction (N.Y.C./Boston) and assuming the most pessimistic coefficient relating dose to health effects. (Evacuation is also assumed out to 50 miles, but has a small impact on the high results.)

See Appendix E for a discussion of the dose/health-effect coefficient range used.

d) Reduce high value by a factor of about 4 to obtain the prediction which would result using the Reactor Safety Study Model. Multiply by 4 to obtain the prediction which would result using health effects coefficients based on data of Mancuso, Stewart and Kneale. See Appendix E.

e) Cumulative total over a 25 year period after the accident. A blank entry implies a small number.

f) See Table B-V in Appendix B for details.

g) Milk restrictions (see Table B-IV). Much of this area would be water for a wind from the west.

h) First year crop restrictions. (Harvested food not suitable for children.) See Table B-V. Much of this area could be water for a wind from the West.

i) A PWR2 accident as defined in the Reactor Safety Study

j) This number possibly could be reduced in half if massive decontamination or relocation efforts were undertaken in urban areas to avoid low-level radiation doses.

APPENDIX C

A Preliminary Investigation of Some Alternative Event Sequences which Could Have Led, without a Meltdown, to a Significant Release of Radioiodine and Radiocesium at TMI Unit No. 2

As discussed in the main testimony, the TMI Unit No. 2 accident led to the release into the containment of approximately 25 percent of the core inventory of radioiodines and between 36 and 51 percent of the core inventory of radiocesium. In this appendix a preliminary analysis is made of some event sequences which could result in the escape of these isotopes into the air outside of the reactor containment building.

It appears that a substantial fraction of the radioactivity which escaped from the fuel rods could have escaped into the atmosphere as a result of leaks in the primary/secondary cooling system leading to either 1) a direct release into the atmosphere of steam and radioactivity from the secondary cooling system or 2) an initial release into the containment building of radioactive gases and water droplets followed by a major failure of the containment building resulting in an airborne release.

Case 1:

The most plausible pathway for an escape from the secondary loop to have taken place during the actual accident appears to be by way of a leak in one of the steam generators. (The steam generators serve as heat exchangers between the primary and secondary cooling water.)

For such a pathway to develop, two leaks must occur. First, a leak must develop in one or both of the steam generators at the interface between the "primary" coolant containing the radioactivity and the coolant in the secondary side. This did not occur at TMI. However, steam generator leaks have occurred at other reactors and the general problem remains an unresolved safety issue. [Nuclear Regulatory Commission, NRC Progam for the Resolution of Generic Issues Related to Nuclear Power, (Washington, D. C., NUREG-0410, 1978, Task A3); also Task Action Plans from Unresolved Safety Issues Related to Nuclear Power Plants, (Washington, D. C., NUREG-0649, 1980, Tasks A3, A4, A5).]

Second, in order to provide a path to the atmosphere, a leak must develop in the secondary side of the system—an event which actually did occur at TMI. One steam generator did release steam to the atmosphere from the secondary side. Furthermore, the steam escaping from the top of the reactor was not checked for radioactivity for two hours, so that had a leak actually occurred between the primary and secondary system, there definitely would have been a release to the atmosphere [Reference 14, Volume II, Page 328.]--although not necessarily of the magnitude hypothesized for the examples given in the main testimony. We have not made estimates of the probability of a leak in the steam generator developing under the actual accident conditions or during alternative sequences of events which might have stressed the steam generators to such a point that large leaks occurred. Any such estimates would be highly uncertain.

Furthermore, we have not tried to estimate the fraction of liquid which would escape as vapor or as fine water droplets. If the cesium and iodine were carried in the liquid in solution form, the bulk of any escaping radioactivity would be contained in the escaping water droplets, not in the escaping vapor.

Case 2:

Accident sequences at TMI in which the containment could fail without the accident proceeding all the way to a meltdown were discussed in the main testimony. In this section, pathways for the radioactivity to enter the containment atmosphere are discussed.

Considerable quantities of radioactivity did enter the containment building during the TMI accident, but not necessarily in airborne form. However, a leak in the primary coolant system, such as at the seals of the main reactor cooling pumps, would have directly vented highly radioactive steam and water droplets into the containment. (A leak in such seals has occurred in the past at the Arkansas Unit 1 reactor.) Severe vibrations in the cooling pumps did occur during the TMI accident--vibrations capable of damaging the seals and attached piping [Reference 14, Volume II, Page 319]. These vibrations were severe enough to cause the operators to shut down all of the main coolant pumps after about two hours into the accident [Reference 14, Volume II, Page 323]. (The pumps were actually ineffective in cooling the core at this time.) Had the operators felt it was necessary to leave the reactor cooling pumps on, it is possible that a seal leak would have developed. The fact that the operators tried to restart some of the coolant pumps on a number of subsequent occasions suggests that the initial decision to shut them down was not an inevitable decision.

Thus, there appear to be alternative event sequences which could have led to release of airborne radioactivity into the containment atmosphere. There are other possible mechanisms for release of radioactivity to the containment atmosphere which we shall not discuss in detail. For example a steam path could be forced through vents on the pressurizer including a path through the "pilot operated relief valve" (when in an "open" state) into the "reactor coolant drain tank" and then into the containment atmosphere.

APPENDIX D

Resume for Jan Beyea

Resume for Jan Beyea
May 1980

EDUCATION:

Ph.D., Columbia University, 1968 (Nuclear Physics)
B. A., Amherst College, 1962

EMPLOYMENT HISTORY:

1980 to date, Senior Energy Scientist, National Audubon Society, 950 Third Avenue, New York, New York 10022.
1976 to 1980, Research Staff, Center for Energy and Environmental Studies, Princeton University.
1970 to 1976, Assistant Professor of Physics, Holy Cross College.
1968 to 1970, Research Associate, Columbia University Physics Department.

CONSULTING WORK:

Consultant on nuclear energy to the New Jersey Department of Environmental Protection, the Office of the Attorney General, Commonwealth of Massachusetts, the state of lower Saxony in West Germany and the Swedish Energy Commission.

PUBLICATIONS CONCERNING ENERGY CONSERVATION:

"Locating and Eliminating Obscure but Major Energy Losses in Residential Housing", Harrje, Dutt and Beyea, ASHRAE Transactions, 85, Part II (1979). (Winner of ASHRAE outstanding paper award.)

"Attic Heat Loss and Conservation Policy", Dutt, Beyea, Sinden. ASME Technology and Society Division paper 78-TS-5, Houston, Texas, November 1978.

"Comments on the proposed FTC trade regulation rule on labeling and advertising of thermal insulation", Jan Beyea and Gautam Dutt, testimony before the Federal Trade Commission, January 1978.

"Critical Significance of Attics and Basements in the Energy Balance of Twin Rivers Townhouses", Beyea, Dutt, Woteki, Energy and Buildings, Volume I (1977), Page 261. Also Chapter 3 of Saving Energy in the Home, Ballinger, 1978.

"The Two-Resistance Model for Attic Heat Flow: Implications for Conservation Policy", Woteki, Dutt, Beyea, Energy--the International Journal, 3, 657 (1978).

"Energy Conservation in an Old 3-Story Apartment Complex", Jan Beyea, David Harrje, Frank Sinden, Energy Use Management, Fazzolare and Smith, Pergamon 1977, Volume 1, Page 373.

"Load Shifting Techniques Using Home Appliances", Jan Beyea, Robert Weatherwax, Energy Use Management, Fazzolare and Smith, Pergamon 1978, Volume III/IV, Page 121.

PUBLICATIONS CONCERNING NUCLEAR POWER SAFETY:

Articles:

"Neuorientierung der Katastrophenschutz-Planung nach den Erfahrungen von Three Mile Island", Chapter 3 in Im Ernstfall hilflos?, E. R. Koch, Fritz Vahrenholt, editors, Kiepenheuer & Witsch, Cologne, 1980.

"Dispute at Indian Point", Bulletin of the Atomic Scientists, 36, Page 63, May 1980.

Published Debates:

The Crisis of Nuclear Energy, Subject No. 367 on Firing Line, P. B. S. Television. Transcript printed by Southern Educational Communications Association, 928 Woodrow Street, P. O. Box 5966, Columbia, South Carolina, 1979.

Nuclear Reactors: How Safe Are They?, panel discussion sponsored by the Academy Forum of The National Academy of Sciences, 2101 Constitution Avenue, Washington, D. C. 20418, May 5, 1980, to be published.

Reports:

"Decontamination of Krypton 85 from Three Mile Island Nuclear Plant", (with Kendall, et.al.), Report of the Union of Concerned Scientists to the Governor of Pennsylvania, May 15, 1980.

"Some Comments on Consequences of Hypothetical Reactor Accidents at the Philippines Nuclear Power Plant" (with Gordon Thompson), National Audubon Society, Environmental Policy Department Report No. 3, April, 1980.

"Nuclear Reactor Accidents: The Value of Improved Containment", (with Frank von Hippel), Center for Energy and Environmental Studies Report PU/CEES 94, Princeton University, January 1980.

"Some Long-Term Consequences of Hypothetical Major Releases of Radioactivity to the Atmosphere from Three Mile Island", Report to the President's Council on Environmental Quality, September 7, 1979.

"The Effects of Releases to the Atmosphere of Radioactivity from Hypothetical Large-Scale Accidents at the Proposed Gorleben Waste Treatment Facility", report to the Government of lower Saxony, Federal Republic of Germany, as part of the "Gorleben International Review", February, 1979.

"Reactor Safety Research at the Large Consequence End of the Risk Spectrum", presented to the Experts' Meeting on Reactor Safety Research in the Federal Republic of Germany, Bonn, September 1, 1978.

A Study of Some of the Consequences of Hypothetical Reactor Accidents at Barseback, report to the Swedish Energy Commission, Stockholm, DS I 1978:5, January, 1978.

PUBLICATIONS CONCERNING NUCLEAR POWER SAFETY (Continued)

Testimony:

"Alternatives to the Indian Point Nuclear Reactors", Statement before the Environmental Protection Committee of the New York City Council, December 14, 1979. Also before the Committee, "The Impact on New York City of Reactor Accidents at Indian Point", June 11, 1979. Also "Consequences of a Catastrophic Reactor Accident", statement to the New York City Board of Health, August 12, 1976 (with Frank von Hippel).

"Emergency Planning for a Catastrophic Reactor Accident", Testimony before the California Energy Resources and Development Commission, Emergency Response and Evacuation Plans Hearings, November 4, 1978, Page 171.

"Short-term Effects of Catastrophic Accidents on Communities Surrounding the Sundesert Nuclear Installation", testimony before the California Energy Resources and Development Commission, December 3, 1976.

"Consequences of Catastrophic Accidents at Jamesport". Written testimony before the New York State Board on Electric Generation Siting and the Environment in the matter of Long Island Lighting Company (Jamesport Nuclear Power Station, Units 1 and 2), May, 1977.

Miscellaneous:

"Comments on WASH-1400", Statement to the Subcommittee on Energy and the Environment, Oversight Hearings on Reactor Safety, June 11, 1976, Serial No. 94-61, Page 210.

"Upper Limit Calculations of Deaths from Nuclear Reactors", Bull. Am. Phys. Soc. 21, III (1976).

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DOCKETED USNRC OCT - 6 1980 Office of the Secretary Docketing & Service Branch

October 1, 1980

Robert Zahler, Esquire
Shaw, Pittman, Potts & Trowbridge
1800 M Street, N.W.
Washington, DC 20036

Re: Supplemental Answers to Licensee's Interrogatories to Intervenor, Anti-Nuclear Group Representing York, on Revision II of Licensee's Emergency Plan

Dear Bob:

As per your September 16, 1980, letter to me and as per the oral extension of time granted to ANGRY by Delissa Ridgeway, I herewith submit ANGRY's Supplemental Answers as follows:

(1) In supplementing our Answer to Interrogatory No. 4(b), ANGRY relies upon 10 C.F.R. part 50 as amended in the Federal Register, Volume 45, No. 162, Tuesday, August 19, 1980, at Page 55411, IV. Content of Emergency Plans, which states: "In addition, the emergency response plan submitted by an applicant for nuclear power reactor operating license shall contain information needed to demonstrate compliance with the standards described in Section 50.47(b), . . ." The quoted section is followed by a footnote No. 4 which incorporates the provisions of NUREG-0654; FEMA-REP-1, which in turn provides at Page 55 J 11 for protecting the public and by inference, their animals, from contamination. Also NUREG-0654 at Page 60, Section M , requires the operator to develop general plans and procedures for recovery and describes the means by which decisions to relax protective measures are reached. This is contained in M-1, 2, 3 and 4. By implication, measures must be taken to protect livestock and other property of residents within the applicable emergency protection zone.

(2) In answer to Interrogatory No. 5-C, ANGRY supplements its Answers as follows:

(a) Letter to Mr. Herbein from Rescue Hose Company No. 3 and marked June 3, 1980, fails to describe legislation under which Rescue Hose Company No. 3 is operating, and fails to set forth mutually acceptable criteria for implementation of its plan. The letter further fails to specify exactly what actions will be taken by what men and equipment and in what sequence.

(b) Undated letter from Union Hose Company No. 1 to Mr. Herbein, same objections as (a) above.

(c) Letter dated May 15, 1980, from Londonderry Fire Company No. 1, same objections as (a) above.

(d) Undated letter from Bainbridge Fire Company to Mr. Herbein, same objections as (a) above.

(e) Letter dated April 23, 1980, from Borough of Middletown Police Department to Mr. Dennis McClousky, totally fails to indicate exactly what the police would do in the event of an emergency and how many people they would commit to what assignments. Also with respect to this item, the same objections as contained in (a) above.

(f) Letter dated May 28, 1980, from Thomas Jerusky to John Herbein fails to set forth what statutes under which Bureau of Radiation Protection is operating and fails to set forth mutually acceptable criteria for implementation of the BORP plan.

(g) Letter dated May 22, 1980, consisting of two pages from Daniel F. Dunn to Mr. Herbein on behalf of the Pennsylvania State Police is particularly interesting in that it contains the following statement: "Rather than commit ourselves to any specific use of personnel or equipment at this time, I merely wish to say that we would make every effort to cooperate with you. We, of course, must preserve the right to set our own priorities as far as deployment of our personnel and equipment." This letter demonstrates precisely the failure to comply with NUREG-0654 to set forth mutually acceptable criteria for implementation of all of the emergency plans and also demonstrates the fact that the licensee cannot assure the public that the Pennsylvania State Police will act in a coordinated fashion with it or with any other Commonwealth department or agency in the event of a nuclear incident at Three-Mile Island.

(h) Letter dated May 28, 1980, from Daniel F. Dunn, Commissioner of the Pennsylvania State Police to Mr. Herbein. The supplementation contained in this letter to the letter of Commissioner Dunn of May 22, 1980, contains nothing to satisfy the requirements as set forth above of NUREG-0654; and further merely states that helicopters will be used to warn motorists during an emergency. It again reiterates that the Pennsylvania State Police reserve their right to set their own priorities as far as deployment of personnel and equipment in the event of an emergency. This again demonstrates the inability of the licensee to demonstrate that the emergency plan of the licensee is coordinated with any Commonwealth or other agency.

(i) Letter dated May 22, 1980, from R. W. Miller, Captain, U. S. Coast Guard, to Mr. Herbein, is completely deficient in setting forth exactly what the Coast Guard would do in the event of an emergency, what resources would be supplied, when those resources would be supplied, and it is completely devoid of any coordination with any Commonwealth or Federal agency. It fails to state under what statute or statutes the Coast Guard would be operating, and it fails to set forth mutually acceptable criteria for implementation of its plan.

(j) Letter dated May 21, 1980, from Leroy F. A. Bailey, Jr., Second Lieutenant, Ordinance C, Commanding, Department of the Army to John Herbein. This letter completely fails to set forth the statute under which the Department of Army would be operating, fails to set forth what criteria would be involved in its being activated for bomb disposal, exactly how many personnel would be supplied; and in fact, contains a disclaimer that the U. S. Armey or its personnel are responsible for destruction of property during rendering safe procedures. There is no statement as to any coordination with any Commonwealth agency or Federal agency.

(k) Letter dated May 20, 1980, from Ray E. Byers, to John Herbein is completely deficient in that in the critical area of air control over Three-Mile Island and in the surrounding area there is no specific action format set forth to control said air traffic, nor any format set forth on coordination of the various state, Federal and local aircraft which would be in the area.

(l) Letter dated April 25, 1980, from J. G. Robbins to Mr. Herbein, no objection to this letter.

(m) Letter dated January 4, 1980, from Robert Priess to Mr. Herbein, is not objectionable insofar as it merely sets forth DOE's response, but the letter clearly places responsibility back into the hands of the licensee for providing protection to the public health and safety. To that extent, it is objectionable since the rest of the letters which the licensee has attached to its EP, Revision II are inadequate as set forth above.

(n) Letter dated January 28, 1980, from Boyce H. Grier to Mr. Herbein is not objectionable, but it makes clear that the NRC's role is primarily investigative rather than being actively involved in supplying support services during an emergency.

(o) Letter from C. E. Goodall to Mr. Herbein dated December 28, 1979, no objection.

(p) Letter from Dr. Newman dated December 29, 1979, no objection.

(q) Letter from Dr. William Albright, III, M.D., dated December 24, 1979, no objection.

(r) Letter of agreement, Hershey Medical Center cannot be objected to since no copy of this has been provided.

(s) Letter dated November 2, 1979, from Michael S. D'Aries to Mr. Herbein does not set forth how many helicopters or airplanes will be made available nor does it set forth exactly what duties these resources and personnel will pursue.

(t) Letter dated December 3, 1979, from Sydney W. Porter, Jr. to Mr. Herbein, no objection to this letter. However, it is not admitted in any manner that the provisions set forth in this letter are adequate to meet the requirements of NUREG-0654, Table B-1, as set forth on Pages 31 and 32 of said nuclear guidance.

(3) ANGRY supplements its Answers to Interrogatory No. 25(b) as follows: NUREG-0654, Section L-1, requires that all organizations shall describe arrangements for local and back-up hospital and medical services and the capability for evaluation of radiation exposure and update, including assurance that persons providing these services are adequately prepared to handle contaminated individuals. Nowhere in Annex N to the York County Plan is there any explanation what medical personnel will be provided for de-contamination services, what resources will be made available from the hospitals; and nowhere is any training program for these individuals described. NUREG-0654, Section L (4) provides that each organization shall describe arrangements for transporting victims of radiological accidents to medical support facilities. Annex N fails to meet this requirement, since it does not provide any specific description of same. Annex N primarily provides a means of spraying down vehicles at check points on evacuation routes, and giving showers and new clothing to people at mass care centers following evacuation. There is nothing specific provided as to training personnel with regard to de-contamination procedures or with regard to providing medical services or emergency transport to hospitals.

(4) ANGRY stands on its present Answer to Interrogatory No. 31, and there are no other provisions known to ANGRY which exist in Appendix 3, Annex A, under Health-Medical Operations which are not coordinated with the Department of Health plan for distribution of SSKI beyond those contained in its present Answer to licensee's Interrogatory No. 31.

I belive this, for the present, meets the requirements of our agreement.

Very truly yours,

Daniel M. Pell

DMP:ksm

CERTIFICATION OF SERVICE

I, Daniel M. Pell, Esquire, certify that I served a true and accurate copy of the foregoing documents on the following individuals by placing a copy of same in the U. S. Mails, postage prepaid, on the 3rd day of October, 1980, and addressed as follows:

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