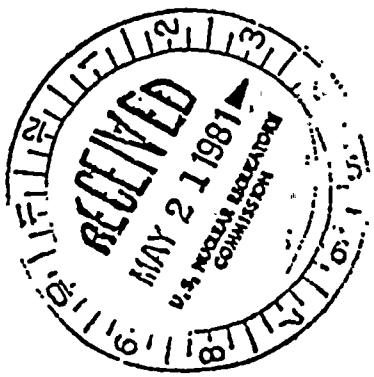
FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON 20426

IN REPLY REFER TO:

May 14, 1981



Mr. B. J. Youngblood
Chief, Licensing Branch No. 1
Division of Licensing
U.S. Nuclear Regulatory Comm.
Washington, D. C. 20555

Dear Mr. Youngblood:

I am replying to your request of May 8, 1981 to the Federal Energy Regulatory Commission for comments on the Draft Environmental Impact Statement on the Enrico Fermi Atomic Power Plant, Unit No. 2. This Draft EIS has been reviewed by appropriate FERC staff components upon whose evaluation this response is based.

This staff concentrates its review of other agencies' environmental impact statements basically on those areas of the electric power, natural gas, and oil pipeline industries for which the Commission has jurisdiction by law, or where staff has special expertise in evaluating environmental impacts involved with the proposed action. It does not appear that there would be any significant impacts in these areas of concern nor serious conflicts with this agency's responsibilities should this action be undertaken.

Thank you for the opportunity to review this statement.

Sincerely,

Jack M. Heinemann
Advisor on Environmental Quality

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United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

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MAY 18 1981

Mr. B. J. Youngblood, Chief
Licensing Branch No. 1
Division of Licensing
Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Youngblood:

Thank you for your letter of March 31, 1981, which transmitted copies of Supplement No. 2 to the draft environmental statement for the Susquehanna Steam Electric Station, Units 1 and 2, Luzerne County, Pennsylvania. We have the following comments.

The final supplement should assess potential impacts to fish and wildlife resources from a nuclear accident. The impacts such radioactive releases to water or the atmosphere would have on aquatic and terrestrial ecosystems should be assessed. In particular, the effect on fish and wildlife growth and reproduction from radioactive materials likely to accumulate or magnify in the food chain during and after an accident should be described. The short- and long-term effects on the human use of fish and wildlife resources, especially in downstream reaches of the Susquehanna River and Chesapeake Bay, which otherwise would be consumed if not exposed or contaminated by accidentally released radioactive materials should be presented. DOI(1)

Our Bureau of Mines Mineral Industry Location System (MILS) shows that an active sand and gravel pit and processing plant is located within the 3-mile radius of the low population zone (LPZ) as defined on page 6-8 of the supplement. This operation should be mentioned in section 6.1.3.2, Site Features, of the supplement. An active mineral producer within the LPZ would include a work force that requires the "appropriate and effective measures...in the event of a serious accident," referred to in the first paragraph on page 6-8. DOI(2) DOI(3)

We hope these comments will be helpful to you in the preparation of a final statement.

Sincerely,

CECIL S. HOFFMANN
Special Assistant to
Assistant SECRETARY

-DOI(1)

Only localized impacts on terrestrial ecosystems from atmospheric releases of radionuclides in serious reactor accidents are likely to occur. Such local impacts (over areas of a few square miles or less) would not significantly affect the ecological stability of widely distributed species, since normal mortality is relatively high in most species. Impacts on aquatic or terrestrial ecosystems from the releases to the ground water would be very small because of long travel times of the radionuclides before any contamination of the surface waters would occur.

-DOI(2)

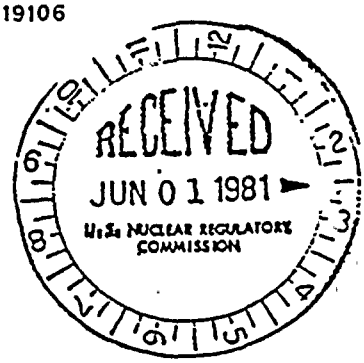
The discussion of Site Features in the DES is intended to provide a general overview and how the site complies with the NRC's siting regulation, 10 CFR Part 100. The staff's Safety Evaluation Report (NUREG-0776) did note the existence of two sand and gravel processing facilities about 2.5 miles southwest of the Susquehanna plant, and indicated that no explosives were used or stored there. Section 6.1.3.2 of the FES has been revised to reflect this.

-DOI(3)

New NRC emergency planning regulations 10CFR50 and Appendix E thereto require emergency plans and the ability to take protective action for a plume exposure pathway Emergency Planning Zone (EPZ) of about 10 miles (NUREG-0654 provides further guidance). There is no requirement for specifically addressing industry or institutions in the LPZ. Susquehanna is procurring and installing a prompt alerting system with about 105 sirens to warn the public within the 10 mile EPZ within about 15 minutes of a decision to warn the public. This system should be capable of warning the mining operation referenced in the comment. Later, after installation of the Siren Systems, FEMA (Federal Emergency Management Agency) will conduct surveys to determine the effectiveness of the Warning System as well as the ability to take offsite protective actions.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
6TH AND WALNUT STREETS
PHILADELPHIA, PENNSYLVANIA 19106

MAY 28 1981



Mr. B. J. Youngblood, Chief
Licensing Branch No. 1
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Mr. Youngblood:

We have completed our review of the Supplement to the Draft Environmental Impact Statement related to the operation of the Susquehanna Steam Electric Station Units 1 and 2. We offer the following comments for your consideration.

The Commission is to be commended for its decision to prepare this Supplement discussing the environmental and societal impacts of a core melt down accident.

EPA has emphasized the need to review an evaluation of the environmental impacts resulting from different LWR accident scenarios including Class 9 accidents.

The assessment of environmental impacts relating to severe accidents at the plant employs methods originally developed in the Reactor Safety Study (WASH-1400). These two studies will be the basis for similar environmental assessments of other nuclear power plants so that we recommend that NRC refer to EPA's original technical comments on these studies. The comments are included in the publication "Reactor Safety Study (WASH-1400): A Review of the Final Report" and a letter from EPA's Office of Federal Activities to NRC dated February 8, 1977.

The Table 6.1.4-4 (p. 6-26) should correspond on a one-to-one basis with the accident sequence or sequence groups of Table 6.1.4-2 (p. 6-23). The notations relating to this Table (6.1.4-2) and described in Appendix H needs clarification. The uninitiated reading this, we believe would be very confused. EPA(1)

The discussion of impacts of infrequent accidents and limiting faults, in both the original DES and the Supplement, addresses probabilities of occurrence qualitatively. In the discussion, however, of the more severe core melt accidents, the probabilities of occurrence are quantified (Table 6.1.4-2). For uniformity in the presentation of all environmental risks, the probabilities of occurrence of infrequent accidents and limiting faults Design Basis Accidents should be provided. EPA(2)

It is not clear whether the risks listed in Table 6.1.4-5, Annual Average Values of Environmental Risks Due to Accidents, include those from infrequent accidents

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and limiting faults (Table 6.1.4-1), postulated accidents (Table 6.2 of the original Draft Environmental Impact Statement), and accidents leading to the sequence groups listed in Table 6.1.4-2. The Final Environmental Impact Statement should include all risks from moderate frequency accidents, infrequent accidents, limiting faults and severe core melt accidents. The risk of the infrequent accidents, and limiting faults is "judged to be extremely small" but should be fully presented and not overshadowed by the risks from core melt accidents. The risks from the more probable yet lower consequence accidents may indeed be significant to the individual risk and should be listed. It would also be informative to extend Figures 6.1.4-3 and 6.1.4-5 to include higher probability accidents. EPA (3)

It would also be helpful to develop a summary table of the annual average value of the environmental risks from operation of all the reactors at the Susquehanna site. The risks should include those from normal operations, moderate frequency accidents, infrequent accidents, limiting faults and severe core melt accidents; societal and individual risks should also be addressed. EPA (4)

The Three Mile Island-2 accident demonstrated a factor that should be addressed: The cost of reactor building decontamination and the replacement power economics have proved to be very sizeable items. These factors are significant and important to the benefit-cost analysis. These facts underscore the need to develop standard methods for estimating the contribution of these costs to economic risks. Impact Statements or Supplements should include these economics in their benefit-cost balance. EPA (5)

We would classify this document in EPA's Reporting Category ER-2. This means we have reservations concerning the manner in which the accidents are treated and we also believe additional clarification is required.

We thank you for the opportunity to review the document and await the issuance of the final.

Sincerely yours,

John R. Pomponio

John R. Pomponio
Chief
EIS & Wetlands Review Section

-EPA(1)

Six (6) tables could have been provided to show the impact contributions of each of the six accident sequences or sequence groups. It is the staff's judgement, however, that the summary table, reflecting the sums of contributions from all of the sequences and sequence groups, provides a better overview, while giving sufficient detail to support the staff's conclusions.

Notations used in the Table 6.1.4-2 and Appendix H are the same as used in WASH-1400. A copy of the page 82 of WASH-1400 Main Report which provides the key to BWR accident sequence symbols is now provided as on page H-4.

-EPA(2)

Accidents bounded by the envelope of the design basis accidents are not significant contributors to environmental risk, and therefore have not been subjected to the same kind of probabilistic analysis.

-EPA(3)

Table 6.1.4-5 contains annual average values of environmental risks calculated for the accident sequences or sequence groups shown in Table 6.1.4-2. Accidents falling within the design basis envelope are negligible contributors to either individual or societal risk. The risk estimates would not noticeably change even if the precisely calculated contributions from the accidents within the design basis accidents envelope would be added to these values. It may be concluded, therefore, that the Table 6.1.4-5 presents the total annual average values of environmental risks from the entire spectrum of reactor accidents.

-EPA(4)

The risk from normal operation has been analysed for all (i.e. two) reactors at the Susquehanna site. (See chapter 4 of the FES) The accident risks have been calculated for one reactor to facilitate easy comparison with other sites and facilities. To obtain an estimate of the accident risk from two reactors, the reported risk values should be doubled.

-EPA(5)

See Section 6.1.4.6, Risk Considerations.

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, D. C. 20555

May 13, 1981

MEMORANDUM FOR: Mr. Richard Stark, Project Manager
Susquehanna Steam Electric Station, Units 1 and 2

FROM: Garry G. Young
Staff Engineer Garry G. Young

SUBJECT: NUREG-0564, SUPPLEMENT NO. 2, "SUPPLEMENT TO DRAFT ENVIRONMENTAL STATEMENT RELATED TO THE OPERATION OF SUSQUEHANNA STEAM ELECTRIC STATION, UNITS 1 AND 2"

In preparation for the ACRS Subcommittee Meeting on Susquehanna, currently scheduled for July 23 and 24, 1981, Dr. Kerr has requested that the NRC Staff be prepared to respond to the attached comments, questions and suggestions concerning the Draft Environmental Statement, Supplement No. 2, for Susquehanna (NUREG-0564). These comments were forwarded to Dr. Kerr by another ACRS Member based on his personal review of the environmental statement. If you have any questions concerning this request, please contact me.

Attachment:
Comments on NUREG-0564, Supplement No. 2

cc: W. Kerr, ACRS
C. Mark, ACRS
D. Moeller, ACRS
R. Fraley, ACRS
M. Libarkin, ACRS
J. McKinley, ACRS
R. Tedesco, NRR
B. Youngblood, NRR

COMMENTS ON NUREG-0564, SUPPLEMENT NO. 2

(1) Subsection 6.1.2 (4th Para.)

"The same population receives each year from natural background radiation about 240,000 person-rem and approximately a half-million cancers are expected ...."

The two statements should be separated since, as put, it could be taken to imply about 2 cancers per person-rem. The person-rem datum should be moved up to where it compares directly with the estimated person-rem from the accident; and the cancer estimates (accident-induced vs. normal incidence) should similarly be brought together for a direct comparison.

(2) Subsection 6.1.4.3 (Top Page 6-14)

Much more is needed concerning the evacuation model:

a) Is a "down wind direction" what is actually used?, or is it radial?

b) Is this really the most effective tactic? Or is it merely a limitation of the CRAC code? Since people out to a distance of about 7 miles on the axis of the sector are closer to the edge of the sector than they are to the 10-mile radial point, it might seem preferable for them to proceed cross-wind. Supposing this restriction to be a limitation of the code, why is it deemed useful to publish the results?

(3) Is it assumed (as the text would seem to suggest) that the evacuees would come to a halt at the 10-mile point? If so, why make this assumption?

(4) Subsection 6.1.4.5 (3rd Para. P. 6-16)

The discussion of "travel times" could rather easily be clarified by stating:

a) That the travel time for water has been estimated to be 9.2 years.

b) That the travel time for materials transported by the water is at least this long; and usually considerably longer, because of physico-chemical interactions between the water, the soil, and the material considered.

c) That the degree of retardation in the motion of some particular material is strongly dependent on the chemical properties of the material, the physical and chemical properties of the rock or soil through which it is moving, and the chemical properties of the ground water; and, as a consequence, that the arrival of any such transported material --though it may begin at 9.2 years -- is stretched out over a considerable period (and in some cases over an enormously extended period) after the first arrival of the groundwater itself.

d) (in the following paragraph)

The statement that, "We therefore conclude that the contribution -- is smaller --." could much better be replaced by a statement to the effect that the contribution is trivial.

5) Subsection 6.1.5 (final Paragraph, P 6-21)

Since there is no indication on the part of the NRC Staff to allow any credit for "additional" engineered safety features, this is a vacuous statement.

6) Subsection Table 6.1.4-5

The only "protection action" described in the body of the text is that of dashing off "downwind" to the 10-mile marker, and piling up there. It is true that in Subsection 6.1.4.6 it is said that "early evacuation of the population within 10 miles and other protective actions" are considered. None of this prepares one to imagine what (if any) protective actions may have been taken into account at distances greater than 50 miles. However, this Table claims that by "protective action" the person-rem beyond 50 miles is reduced from 600 to 290. What does the Table actually show?

7) Subsection Figure 6.1.4-2

The curve for $\geq$ 300 rem to the thyroid shows, for example, 200,000 affected people, with a probability of 10^{-8} per year. Does this include the ingestion estimates of WASH-1400, whereby everyone drinks 0.7 liters per day of milk from cows on contaminated pasture? If it does not, OK. If it does (and this term is significant), then the curve is nonsense; since there is nothing more straightforward and certain than that such milk would be impounded -- as it was at Windscale, without any "benefits" from Class 9 and emergency procedures rulemakings.

ACRS(1)

In the FES, "primarily from causes other than radiation". has been added at the end of the sentence for clarification.

ACRS(2)

See Appendix I in the FES for more information on the evacuation model. CRAC code treats the wind directions as radial only - it is a limitation of the code. Evacuation model assumed movement of evacuees in the downwind direction only for assessment of radiation exposure. This is a limitation of the evacuation model in CRAC. Actual movement of the people will involve intelligent use of the available road net-work to avoid the radioactive plume.

ACRS(3)

The particular sentence in the text in DES was inadvertently mis-structured. The Sections 6.1.4.2 and 6.1.4.3 have been re-written for the FES.

ACRS(5)

The final paragraph has been revised in the FES.

ACRS(6)

Please see the revised text in Section 6.1.4.2

ACRS(7)

Please see the foot-note in Section 6.1.4.3

Susquehanna Alliance
P O Box 249
Lewisburg, PA 17837
May 23, 1981

Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Att: Director, Division of Licensing

Sir/Madam:

We are enclosing our comments in relation to the Supplement to the Draft Environmental Impact Statement related to the operation of Susquehanna Steam Electric Station, Units 1 and 2. Docket numbers 50-387 and 50-388.

Since so much time has elapsed from the date of the original Draft EIS, it would be in the highest public interest to issue a 2nd full Draft EIS incorporating all previous comments and NRC responses. This 2nd full draft would provide the Commission with further information with which to base its decision regarding the environmental impacts of operating the Susquehanna Steam Electric Station.

Sincerely,

Michael M. Molesevich

Michael M. Molesevich

for the Susquehanna Alliance

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COMMENTS ON DRAFT SUPPLEMENT TO DRAFT EIS FOR THE SUSQUEHANNA STEAM ELECTRIC STATION, NUREG-0564, SUPPLEMENT NO. 2

1) The purpose of this supplement was to assess the additional environmental risks due to class nine accidents. These accidents previously have been considered to have minimal environmental effects because their probabilities have been thought to be low. However, since the accident at Three Mile Island, the conclusion of this supplement has not changed from the conclusion of the original Draft, EIS, of June 1979. Supplement: "These impacts could be severe, but the likelihood of their occurrence is judged to be small." Page 6-2 of the original Draft states: "Their consequences could be severe. However, the probability of their occurrence is judged so small that their environmental risk is extremely low." It is obvious that this supplement does not achieve its purpose. Therefore, the Susquehanna Alliance requests that another supplement be made available that adequately addresses the additional environmental risks due to class nine accidents.

2) This supplement does not address the long-term, man-made, and natural surface contamination from radionucleides. According to one source the delayed cancers and genetic defects due to radiation from ground and buildings contaminated with long-lived radioactive cesium could be the most severe consequence from a major release. (J. Beyea, Some Long-Term Consequences of Hypothetical Major Releases of Radioactivity to the Atmosphere from Three Mile Island, President's Council on Environmental Quality, September, 1979)

3) To always assume that downwind recipients of radioactive fallout will receive less dosage than those closer to the plant (source of radionucleides) is false.(Section 6.1.1.2) The plume does not always disperse more radionucleides closer and less further away due to certain meteorlogical conditions, i.e. ground base inversion. Also, the dosimeter readings 9 miles northeast of TMI, near Harrisburg, were higher than were the readings closer to the plant.

4) The supplement relies too much on sheltering and evacuation measures to help mitigate the effects on the local population. This ignores the potential for for the sequences of an accident which can take place in a very short time.(6.1.1.3) For example, anticipated transients without SCRAM which, according to Dr. Richard Webb can breach the reactor vessel within 6 seconds.

5) On page 6-5, section 6.1.2 the supplement states, "This experience base is not large enough to permit a reliable quantitative statistical inference." No large-scale-commercial reactor has yet gone through a complete life cycle. Therefore, to state that, "...significant environmental impacts due to accidents are very unlikely to occur over time periods of a few decades.", is an inaccurate conclusion.

6) To state that, "...a few million curies of xenon-133,..." were released at TMI implies a lesser severity when the NRC has stated that at least 13 million curies were released.

7) The Unit 2 reactor at TMI was very young. The fuel was only in service (fissioning) for three months. Had an accident of this severity occured with an older fuel assembly, then the inventory of the fission products available for release to the environment would have been much greater.

8) There are many assumptions based on the events, data, and results on the accident at TMI. However, there are many uncertainties in the analysis of the accident itself. While the supplement recognizes that the numbers used for population exposures are estimates, it does not discuss the uncertainties within those estimates.(6.1.2) "It has been estimated that..." For example, the monitors located on the stack vents were pegged off scale, and many of the off-site dosimeters were not brought into service until 3 days after the accident—when most of the radionucleides had already escaped.

9) The psychological impacts of the population surrounding the plant for at least a 75-mile radius must also be considered. It is obvious that the psychological effects of the people surrounding TMI and of central Pennsylvania were profound and continue today.

10) The supplement assumes that the owners of the Susquehanna Plant will have control of the water from the river by restricting its use during and after an accident.(6.1.4.5) thereby claiming that the consequences would be more economic and social, and not radiological. The supplement does not address the use of water from the river by: the borough of Danville, the city of Sunbury and other downstream communities who withdraw their drinking water from the river, farmers that use water from the river for irrigation and other agricultural related activities (and especially Amish farmers who might not be aware of an accident miles downstream), industries that are located on the river that also use its water i.e. Merck Co. in Danville, and unalerted people who may be fishing the river at the time of the accident. The supplement should also address the uptake of radionucleides into the aquatic food chain.

11) The statement that arrangements have already been made to control highway traffic (6.1.3.2) seem premature since the Emergency Preparedness Plans for Susquehanna are in an advanced but not fully completed stage.

12) The supplement recognizes the substantial uncertainties calculated by the Reactor Safety Study. However, these uncertainties are not reflected in the tables where firm numbers are used. These tables should use ranges of numbers to reflect these uncertainties. Also, the range of accidents do *not* appear to have been adjusted to reflect the accident at TMI.(6.1.4.7)

13) The calculated, estimated, economic risk per year (p.6-19) reflects an inconsistency in the use of the Reactor Safety Study. In taking the example of an average decontamination cost of one billion dollars, the supplement assumes the probability of 2.4 chances of this occuring in 100,000 reactor years. Thus yielding an estimated economic cost of

SUPPLEMENT COMMENTS CONTINUED

24,000 dollars per year. However, on page 6-20, section 6.1.4.7, it is implied that the reactor safety study predicted the probability of a TMI-type accident as greater than one chance in 400 reactor years. Since this accident has an estimated clean-up cost of at least one billion dollars, then the economic risk could be calculated at 2.5 million dollars using the latter probability. It should be noted that this figure is somewhat larger than 24,000 dollars.

14) An obvious shortcoming of the accident at TMI was that there was no plan of recovery-either with the facility itself or the off-site consequences. At present they are developing the strategy and plans for the recovery of that accident along with its environmental impact. With the safety of the public in mind, this should have been prepared before the accident had occurred. Therefore, a plan of recovery and its environmental impact should be included in the analysis of an accident.

15) The economic risk associated with protective action and decontamination cannot be compared with the property damage costs associated with alternative energy technologies—especially anthracite coal. Anthracite does not have the same amount of sulfur compounds that most other coals have and would not lead to a substantial amount of acid rain as would the use of bituminous. Also, the increased use of anthracite can only lead to improved environmental conditions in that area. Since much of the area is already impacted then more mining would alleviate such problems found in that area such as: acid mine drainage, abandoned mines and spoils, a distressed economy, and the elimination of underground mine fires, open shafts and pits, and other dangerous conditions. This would be possible because all new/recent mining would meet stringent environmental laws and guidelines that were not in effect years ago when most of the damage was done. Page 6-18,(sect. 6.1.4.6)

16) Why are there no thyroid doses included on table 6.1.4-1?

17) Accident sequence or sequence groups should be expressed in terms rather than symbols or letters. (table 6.1.4-2)

18) Probability should be expressed as a range in table 6.1.4-2.

19) Other tables should include sum totals of land/surface accumulations of radionucleides based on probability and economics of decontamination.(table 6.1.4-4)

20) Evacuation item can also be considered probabilistically and the health effects should be more properly treated using site specific data. Considering the range of susceptibility to the health effects of radiation and other factors would be helpful to place on the figures the background radiation and other data from TMI. (figures 6.1.4-1, -2, -3, -4, -5)

21) The consequences of the accident at TMI should also be included in figure 6.1.4-6.

SUPPLEMENT COMMENTS CONTINUED

22) The maps are of the poorest quality and should be improved so that they could be read more clearly. (figures 6.1.4-7 and 6.1.4-8)

23) Add a map or maps that would show the isopleths of costs of mitigation.

24) The speed of groundwater movement seems to be highly underestimated, especially in the local glacial material, and epspecially under saturated ground conditions.(6.1.4.5)

25) There should be references sited of past work or studies that show effective isolation of radioactive contaminants in groundwater. (6.1.4.5)

26) This supplement should address site-specific conditions and not generic conditions as it seems to have done.

Susq. Alliance(1)

Ths staff believes that this FES provides a fair evaluation of impacts of reactor accidents and that the analysis as presented in the FES meets the intent of the Commission's Statement of the Interim Policy on plant accidents. The detailed analyses of severe core melt accidents included in this evaluation supports the conclusion that the risks of reactor accidents are low compared to the risks associated with many other human activities, even when accidents in the category previously identified as "Class 9" are included.

Susq. Alliance(2)

Contributions to risks from long-term (Chronic) exposure from the contaminated environment are included in the risks presented in Section 6.

Susq. Alliance(3)

The analysis of accident consequences, is based on actual meteorological data collected at the Susquehanna site. Although the observation concerning possible meteorological conditions is correct this observation does not negate the validity of the FES analysis, since the extent to which such conditions occur at the Susquehanna site have been included in the analysis.

Susq. Alliance(4)

All accident sequences and sequence groups included in Table 6.1.4-2 have values of time to release, release duration and warning time of at least 1.5 hr, 0.5 hr, and 1.0 hr. respectively (See WASH-1400, Appendix VI, Section 2 for definitions of these times). The staff has not taken any extra credit for public evacuation, sheltering or relocation which is not consistant with these times associated with the accident sequences and sequence groups used, and the evacuation parameters (see FES Appendix I) for the Susquehanna site.

Regarding the speculation of the six-second accident scenario credited to Dr. Richard Webb, the staff is familiar with it and considers it to be highly unlikely for the Susquehanna BWRs. Even if such a sequence would occur, the associated release magnitudes would be small since the core would take a much longer time than six-seconds to melt. Risks from such speculated sequence would be small compared to those from the sequences in Table 6.1.4-2.

Susq. Alliance(5)

The staff's conclusions concerning the likelihood of severe accidents are based on about 500 reactor years of power reactor operation, as well as sound engineering principle and conservatism employeed in their evaluation. The stated conclusion is supported by analytical evaluations of the nuclear power plant systems together with the fact that the experience base to date is accommodated within the theoretical calculations.

Susq. Alliance(6)

13 million curies as the magnitude of xe-133 release from TMI-2 accident was the result of early and preliminary estimate. This figure has been revised and 1.5 million curies is considered as the best estimate of xe-133 release from that accident. See Rogovin Report, vol. 2, Pt. 2, pp 359-360.

Susq. Alliance(7)

This comment is a correct statement. The Susquehanna FES analysis is based on a fully irradiated equilibrium core.

-Susq. Alliance(8)

A number of estimates of population exposures were made following the accident based largely on thermoluminescent dosimeters (TLDs) located around the plant site to distances of several miles. Estimates of radioactive releases and of total dose have been independently made by several groups including the President's commission and the NRC's internal investigation by M. Rogovin. In addition, A. Hull of Brookhaven National Lab. and K. Woodard of Pickard, Lowe & Garrick have estimated radioactivity releases and public doses. All these sources provide confirmation that the maximum individual dose was less than 100 mrem and the integrated population dose was less than 3500 person-rem with some estimates lower than 1000 person-rem.

Susq. Alliance(9)

It is the judgement of the Commission that the assessment of psychological impact is not required under the scope of NEPA.

-Susq. Alliance(10)

The staff has adequately demonstrated that the potential consequences of releases from core melt accidents to the ground water system would be much smaller than those of a "typical" generic site used in the Liquid Pathway Generic Study (NUREG-0440). The current NRC practice in evaluating core melt accident liquid pathway consequences relies on the comparison of the existing site with those sites presented in NUREG-0440.

The staff clearly states in section 6.1.4.5 that the minimum travel time for radioactive contamination via the ground water pathway would be 9.2 years, and that the travel time for Sr-90 and Cs-137 would be much greater. The staff has further concluded that there would be ample time for engineering measures to isolate the contaminated water from the river if it were found to be necessary.

-Susq. Alliance(11)

The NRC's siting regulation, 10 CFR Part 100, requires an applicant to show that arrangements have been made to control traffic on any transportation routes traversing the exclusion area, thus, the discussion in Section 6.1.3.2 was intended to show how the applicant was in compliance with the NRC's site criteria. There was no implication that the Emergency Plans, or the staff's review, has been completed.

With regard to the comment that the DES writeup does acknowledge the uncertainties calculated by the Reactor Safety Study (RSS) but that the DES tables do not reflect these uncertainties, the staff assumes that this comment reflects an editorial preference by the Commentor. For example, we have acknowledged the uncertainties on Table 6.1.4-2 which contains consequence model inputs quite similar to the RSS tables (although the RSS tables did not contain such an acknowledgement as has been done in DES). The staff will accept this editorial comment and explicitly include such an acknowledgement of uncertainties on tables where none now appears.

With regard to the comment that the tables do not appear to have been adjusted to reflect the accident at TMI (which involved PWR accident sequences of the type previously identified in the RSS for the PWR deisgn therein) the staff believes it is not necessary to include the PWR sequences into sequences for the BWR design- although this could be done. However, we believe that the overall health related risks to the public shown in the DES for various BWR core damage accidents dominate and adequately cover those from the TMI accident.

-Susq. Alliance(13)

The RSS economic modeling considered only the off-site costs as public property damage. The on-site costs and loss of returns to the plant owner(s) associated with plant damage, downtime purchased power, cleanup etc. were assumed to be private costs and were not included in the RSS modeling. If private costs associated with plant damage, loss of returns etc. were to be included into the RSS modeling then it is obvious that accidents (core damage or otherwise) involving long plant downtimes - whether or not such accidents present any off-site radiological health impacts - which would have large economic losses could be predicted. It is an arguable question whether or not the RSS should have included such private costs into an assessment of the public risk from reactor accidents. One point should be obvious from TMI-2 and that is that the plant owners should have considerable economic incentive to maintain a high level of safety in their plant design and operations or the private economic risks can far outweigh those predicted for the public off-site. Please also see responses to JP(7) and JP(9).

Susq. Alliance(14)

Procedures for plant recovery following an accident would depend on the type of the accident the plant would actually experience and the actual conditions prevailing in the plant in the post accident period. The environmental impact of such recovery procedures cannot be determined at this time. The impact of a specific recovery operation would be assessed at that time when the need for such an operation arises.

-Susq. Alliance(15)

The staff does not state that such risk cannot be compared because of philosophical differences; the DES states that such comparisons cannot be made because the costs of acid rain, etc. have not been "sufficiently quantified to draw a useful comparison at this time." Such comparisons may become possible in the years ahead as better data becomes available. The argument of the use of anthracite vs. bituminous coal is irrelevant since all fossil fuels emit sulfur and nitrogen oxides (and therefore acid rain), only the quantities vary. Secondly, anthracite is a very limited and irreplaceable resource that is seldom used for generating electricity. Because of its low sulfur content, the major use of anthracite is the manufacture of metallurgical coke for smelting iron ore. Byproducts include benzene (used in unleaded gasoline and pharmaceuaticals, for example), toluene, xylenes, naphthalene, anthracene, phenol, cresol and pyridine. These chemicals in turn are used to make many of the materials necessary for modern life such as medicines, dyes, explosives, preservatives, fungicides, lubricants and plastics.

Susq. Alliance(16)

Thyroid doses from the accidents included in Table 6.1.4-1 were not reported explicity because these doses would not show any trends different from that which is demonstrated by the WB doses shown in the table.. It should be noted that the consequences of the exposure of the thyroid (i.e. thyroid nodules) from the more severe accidents are shown in Fig. 6.1.4-5. The risk from the thyroid exposure for the accidents within the design basis are negligible by comparison . The staff's experience with the methodologies and assumptions used for calculation of realistic doses such as shown in Table 6.1.4-1 (See Section 6.1.4.1) is that these doses are in the range of factors of 10 to 1000 lower than the doses calculated conservatively for the Safety Evaluation Report (SER).

Susq. Alliance(17)

A table of keys to BWR accident sequence symbols is provided on page H-4.

-Susq. Alliance(18)

This comment appears to reflect an editorial preference similar to that reflected in comment #12. The staff believes that the foot note on table 6.1.4-2 should suffice as acknowledgement of uncertainties.

Susq. Alliance(19)

The calculations of areas of decontamination and interdiction are intermediate steps in the determination of the costs of decontamination and interdiction of land areas. The latter results are reported in order to provide a complete assessment of the costs associated with ground contamination.

Susq. Alliance(20)

Probabilistic treatment of evacuation parameters would substantially increase the complexity of the reported results. The effects of changing the evacuation parameters, however, have been analysed, and are discussed in Appendix I in FES. With respect to using TMI as a reference point for health effects estimates, it should be noted that measurable consequences at TMI were so small that they would be off-scale on all figures of the supplement or FES.

Susq. Alliance(21)

Accurate cost figures for TMI-2 accident mitigation measures are not available at this time. It is the staff's judgement, however, that these costs would not exceed those shown in Figure 6.1.4-6.

Susq. Alliance(22)

A different map is now provided.

Susq. Alliance(23)

Risk isopleths for cost, as well as other consequences would have trends and patterns similar to those evidient from Fig. 6.1.4-8

-Susq. Alliance(24)

The ground water velocities used in our analysis are based on well-founded principles of hydrology and on conservative values of hydrologic parameters measured at the site.

-Susq. Alliance(25)

It is a well-established fact that many radioactive and stable elements are retarded by the process of "sorption" and therefore move at a rate much slower than that of the water itself. Rather than list references, which are too numerous to mention, the staff refers you to a survey article: M. P. Anderson, "Using models to simulate the movement of contaminants through ground water flow systems" in CRC Critical Reviews in Environmental Control, Vol. 9, Issue 2, pp 97-156, 1979.

Susq. Alliance(26)

The Supplement mostly addressed site specific conditions.

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[PM]
28 APR
1981

USPOSTAGE

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29-62

Docket 50-361
-362
-387
-388

Marvin I. Lewis
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Tedesco

4-27-81.

Director, Division of Licensing
Office of Nuclear Regulation
USNRC

RECEIVED
1981 APR 31 AM 9 51
U.S. NUCLEAR REG. COMMISSION
DOCKETING & SERVICE SECTION

Dear SIR;

Please accept the following comments as my comments on both the Supplement 2 NUREG 0564 Supplement to DES Susquehanna Units 1 and 2 and also NUREG 0490 Supplement to DES San Onofre Units 2 and 3. Both of these NUREGS are very, very similar. In fact, they are exactly the same page for page. Except for using the number 7 in NUREG 0490 and the number 6 in Nureg 0564, they both have identical Table of Contents.

The use of boilerplate (identical forms and wording) is acceptable in many instances. I do not believe that boilerplate shows reasonable care where human lives and the safety of the public is at stake. Boilerplate can too easily hide the reality of inadequate care and attention to detail. There is no way to see beyond the 'boilerplate' to verify the correctness of the prose and technical details. MIL(1)

Paragraph 7.13.1 (NUREG 0490) 6.1.3.1 (NUREG 0564). This paragraph in their respective NUREGs refer to mitigative measures included in the Design Features. Several of the design features discussed to mitigate accidents do not appear to be ESF, engineered safety features, which have fulfilled all the GDC, General Design Criteria. For a feature to be ESF and for that feature to be considered a mitigative feature in an accident, that feature must meet all applicable General Design Criteria. In both nuregs, mitigative features discussed in the Paragraph Design Features have not all passed all applicable General Design Criteria. MIL(2)

Apparently, some mitigative value is attached to non-ESF systems. This is in direct conflict with GDC requirements and the Atomic Energy Act.

Although there are many expremely misleading and error-filled sections in this report, I shall limit my comments to the very worst and most misleading paragraphs in these NUREGS: 6.1.13 (NUREG 0564) and 7.1.1.3 (NUREG 0490).

both these NUREGS start the respective health effects pragragh exactly the same": "The cause and effects relationships between radiation and adverse health effects are quite complex but they have been more exhaustively studied than any other environmental contaminant." The point is not that radiation has been studied more than any other environmental contaminant, the point is what has this study accomplished. To understand what this exhaustive study has accomplished, we must look at what this exhaustive studied was supposed to accomplish.

MIL(3)

For instance the purposeR and goal of a 1964 federal study of cancer a nd related radiation exposure anong workers at US facilities was originally undertaken for 'Political ' reasons; namely, to thwart workers efforts to obtain compensation for illness. These findings were reported by the House subcommittee on Health and the Environment in Feb, 1978 and confimed by a Freedom of Information Request from Dr Mancuso and the Public Citizen Litigation Group.(Critical Mass Journal Feb 1979.)

Obviously research done for such nefarious and unworthy reasons cannot be trusted. This is the research that Dr Gotchy , who wrote this chapter,wouldhave us believe. (NUREG 0564 Page vii)

The entire field of radiation research is tainted with questionable research by Government and other interests who have a stake in lulling the justifiable fears of an informed public.

I respectfully request that the reviewers of my comments read "SECRET FALLOUT" by Ernest Sterngaass(McGraw Hill 1981.) The government and the nuclear industries are still attempting to cover up the dangers of radiation. Dr Tokuhata (Penna Do Health) is still messaging data in a most sinuous way to come out with distorted data. (Commonwealth of PA , Testimony of Ge Tokuhata , NRC Docket 50 -289, Submitted 4-16-81.)

To demonstrate the backround that Dr Tokuhata co mes from, he and the State of Penna are presently being sued for sex discrimination. This is the type of person that we are entrusting our radiation research to.

There has been good radiation researdh. The vested interests and the NRC have consistently shied away from any research that displayed radiation effects higher than those determined by Government and industry backed research. Even Acedemia has fallen prey to being a vested interest . Funding is few and far between for researchers like Dr Rosalie Bertell,GSN.

Mancuso and Erous have gotten their funding cut off. Dr. Sternglass has been the object of slurs and vituperation. Dr Xxtgx Webb has xhd had difficulty finding employment despite unique credentials. Much good research has come from across the sea only to be ignored by the Atomic Establishment. (Heidelberg Report 1978 NRC Translation 520 TIOC 520)

Equally good research has been done in America and consistently ignored by the Atomic Establishment.

METHODOLOGIES FOR THE STUDY OF LOW LEVEL RADIATION IN THE MIDWEST Dixon Anvil Press 1979.

RADIATION STANDARDS ADN PUBLIC HEALTH Proceedings of a scond Congressional Seminar on Low Level Radiation 2-10-78 Lib of Congress.

Truly excellent and telling research has been accomplished in the USSR on the fauna and flora exposed to nuclear radiation in the release ata place called Zyshtym. How this release happened and how th research the data in the literature is detailed in an interesting book by Zhores A. Medvedev entitled NUCLEAR DISASTE R IN THE URALS.(Vantage 1980)

All of these source s have been consistently ignored because the data show clearly that the effect of low level radiation is higher by orders of magnitude than that which the NRC used .

The remainder of the paragraph or section is as flawed as the opening sentence.

"10 th 500 ~~xxxxxxxxxxxxxxxxxxxx~~ potential cancer deaths per million person-rem"

In order to be"conservative, " the highest number of deaths must be used in the calculations. The choice of"150"in <u>not</u> conservative! The same argument is valid for using 260 genetic changes per million person-rems instead of 220.

<u>Disclaimer</u>: I have neither the time nor inclination to comment upon all the insufficiencies, errors, and just plain lies in these NUREGS. This is a farce that will eventuall y take the lives of American Citizens just as surely as xxxx War.

May God forgive this Great Evil of Nuclear Power for I do not have it in me to forgive this treepass against Mankind.

If anyone wishes to contact me confidentially, my number is ~~xxxxxxxxxx~~ 215 CU 9 5964. You need not give your name and all information will be used without giving the source.

For a better tomorrow,

Marvin I . Lewis. 6-65

MIL(1)

The staff does not agree that an identical Table of Contents for several environmental statements demonstrates a lack of care concerning the health and safety of the public. By following a detailed, standardized outline, the staff assures that all significant environmental impacts are properly addressed for each application. Sections of the FES having the same or similar prose are intended for general and background information for the reader, addressing common aspects of reactor accidents, and the methods of analysis employed by the staff.

MIL(2)

The term "pressure suppression system" has been substituted for "heat removal system" to clarify the specific engineered safety feature discussed in this section. This system, as well as the other systems and features described in this section are indeed engineered safety features meeting the requirements of Part 50.

With regard to his claim that the staff estimate of 150 cancer deaths per million person-rem and 260 genetic effects per million person-rem are not conservative, the staff makes the following response:

The National Academy of Sciences BEIR III range of 10 to 500 cancer deaths per million person-rems shows the latest authoritative estimates of uncertainty are fairly wide, (and for radiation of the type released from nuclear power reactors, could be zero). However, it also shows that the value used by the staff (140) is about a factor of 4 below the maximum possible value and about a factor of 14 above the lowest value considered plausible by this dedicated and responsible group of expert scientists. Even Dr. Radford, whose dissenting views have been widely publicized, was only arguing that cancer risks are a factor of 2 to 3 times higher than the "best estimates" of the majority of the BEIR III committee. Since the staff risk estimate is much nearer the upper end of the possible range, it is regarded as realistically conservative.

Similarly, 260 genetic effects per million person-rem over all future generations represents the geometric mean of the range of possible values in BEIR I. Since the genetic effects estimates are based primarily on animal data (the survivors of the Japanese A-bomb survivors have not yet shown any detectable increase in mutations), such a value appears to be reasonable and is in fact higher (i.e., more conservative) than the value derived from the BEIR III report in the same manner. However, the value used by the staff is a factor of 4 lower than the maximum possible value and about a factor of 4 higher than the lowest possible value considered plausible by the BEIR III Committee.

Box 1378
State College, Pa. 16801

May 22, 1981

Office of Nuclear Reactor Regulation
USNRC
Washington, DC 20555

ATTN: Director, Division of Licensing

Hello:

Attached is a copy of my comments on the Supplement #2 to the DES for Susquehanna 1 and 2. Dockets 50-387, 388.

The comments are divided into two parts. First come specific responses to specific claims I noted as I read the draft. Next is a longer treatment of the section dealing with estimated economic risk.

It is in this second section that I think the draft is at its worst. My analyses indicate that the draft's estimates are low by a factor of 100 to 150. These are the figures that affect the cost estimates for the plant.

If I didn't know better I would say that the draft's authors were consultants hired by the Applicant to shed the best possible light on the situation.

I firmly believe that this draft is so inadequate that it cannot serve as a final draft. As unpopular as it may be with the new wave coming from the Administration and the Hill, I urge the NRC to prepare a real draft, one that treats the problem and the economics properly. Then ask again for public comment and then proceed to the FES. I realize this is not a pleasant prospect; neither was reading this draft a pleasant experience.

The role of the NRC is to resist pressures from the Applicants, the opponents and the government officials in order to ensure the most thorough review of the problems associated with this plant. Do not let yourself be bullied into accepting a half-hearted job.

Sincerely,

Jim Perkins

Jim Perkins

Copies: Allen Ertel
David Mann
Morris Udall
Richard Ottinger

Comments on Supplement to Draft Environmental Statement related to the Operation of Susquehanna Steam Electric Station, Units 1 and 2 Dockets 50-387, 388

Selected comments below result from a general reading of the text. Comments on the economic assessment rely, in addition, on information obtained by asking from PP&L. This information should surely have been available to the preparer of this document.

p. 6-4, section 6.1.1.3

The numbers cited from the BEIR III report were criticised by the committee head as being unduly generous, i.e. non-conservative. A recent article in Science indicates that the information relied upon by the BEIR committee overestimated the influence of neutrons in Hiroshima; hence, the conservative figure should probably be revised upward by the factor of 2 or 3 indicated by Dr. Radford. Furthermore, Karl Morgan and Alice Stewart, among others, are beginning to question the conservativeness of the linear hypothesis. As a responsible agency, not an adjudicative board of scientific studies, the NRC should assume the work of these reputable scientists defines the conservative "line". That's what being conservative means, not that one accepts the average. JP(1)

p. 6-5, section 6.1.2

Where the draft says, "None is known to have caused any radiation injury or fatality to any member of the public," could equally have been written, None is known not to have caused any radiation injury or fatality to any member of the public. It is clearly the case that no study has been done which would indicate that the draft's claim is true. I would suggest that such comments, which are unnecessary to the NRC's case, although perhaps not to the Applicant's, be eliminated. JP(2)

Regarding the estimates of releases from TMI-2, has there been any published estimates of the releases had TMI-2 not had the extra-thick containment? JP(3)

"It has been estimated that the maximum cumulative offsite radiation dose to an individual was less than 100 millirem." The Staff has failed to note that there have been far higher estimates presented to it, to which it has failed to respond. In particular, in Docket #50-272 with regard to the intervention by Lower Alloways Creek Township, Intervenor submitted a report in response to a Board Question on the accident at Three Mile Island. Utilizing the methodology provided in the TMI-2 Final Safety Analysis Report the report's author calculated that the release of Xenon-133 from the accident at TMI would have provided a 280 rem dose for a 2 hour exposure at the exclusion boundary and a 45 rem dose for a thirty day exposure at the low population zone boundary. These figures have been in the hands of the NRC since August, 1979. JP(4)

In the continuing aftermath of the accident at TMI radioisotopes of several different types than iodine and xenon have been found outside the plant, in water samples. JP(4)

p. 6-8, section 6.1.3.2

I wonder how the residents of the Borough of Berwick, 6 miles to the south of the plant site, will feel to learn they are not a population center. JP(5)

p. 6-14, section 6.1.4.4

The draft neglects the costs associated with the physical and psychological health effects of an accident. With substantial awards being made by courts to individuals or families of individuals for the loss of one life, the costs associated with the loss of tens or hundreds or thousands should not be shrugged off. JP(6)

p. 6-19, section 6.1.4.6

This section regarding the chance of an accident whose decontamination cost is $1 billion is ludicrous. This I believe makes a mockery of the whole effort. "if the probability of an accident serious enough to require extensive cleanup and decont-mination is taken as . . . 2.4 chances in 100,000 per year, and if the average decontamination cost . ; . is assumed to be one billion dollars, then the estimated risk would be about $24,000 per year." I won't quibble with this because it is merely a mathematical statement. If, however, the draft's authors mean to suggest that the hypothesis of the statement is reasonable, then I will argue. On the very next page, as the authors try to explain their reliance on the Reactor Safety Study, they write, "The accident at Three Mile Island occurred in March 1979 at a time when the accumulated experience record was about 400 reactor years. It is of interest to note that this was within the range of frequencies estimated by the RSS for an accident of this severity."

The authors cannot have the best of each world. The TMI accident will cost at least $1 billion to decontaminate. Hence it fits in with the average accident cited by the authors. It occurred within the range of frequencies suggested by the RSS. Hence 2.4 in 100,000 per year is not a reasonable estimate. Rather clearly 1 in 400 per year is the reaonable assumption if we are not allowing for the impact of "lessons learned", as the draft's authors have claimed. So, let's use the methodology of the sentence quoted above: JP(7)

$$\frac{1}{400} \times \$1{,}000{,}000{,}000 = \$2{,}500{,}000$$ per year as the estimated economic risk.

The draft errs by a factor of 100.

Further, I would suggest that $1 billion may not be a reasonable estimate. Where did it come from?

Continuing on section 6.1.4.6

The cost of the TMI accident decontamination is now estimated at $1.3 billion. The cost of replacement power for ratepayers is estimated at $1.2 billion through 1985 alone. The proposed industry insurance scheme for replacement power, sponsored by the Nuclear Electric Insurance Limited of Bermuda, would have provided a maximum of $156 million for the GPU ratepayers had it been in place. So we can reduce costs to GPU ratepayers to $1.05 billion through 1985, and add on for the following years some figure. Since TMI-2 couldn't possibly be put back into service until 1990, it seems conservative to add another $1 billion for the years 1985 to 1990. Making the generous assumption that decontamination doesn't cost more than $1.3 billion, we are thus faced with a cost of at least $3.35 billion. Hence, the annual estimated economic risk is now $8,375,000.

Furthermore, if the RSS was reasonably accurate we can expect another TMI-type accident before 1985.

JP(8)

Missing from the draft was any mention of control rod failures of the sort that occurred at Brown's Ferry 3 in June of 1980. Also missing, though understandably, was any comment on the new concern about boiling water reactors' scram systems reported on by the NRC's Office for Analysis and Evaluation of Operational Data. These gaps should be filled.

Page 6-19, Section6.1.4.6

Comments on the worst case suggested by the draft's authors and on the proposed case to be studied.

Worst case: One unit lost in first year. The draft doesn't suggest the result on the other in this scenario, so I will take their three year estimate for a delay in restart.

Carrying charges for the lost plant are estimated by the company at 18% per year of final cost. Assuming a $3.5 billion final cost and an even distribution of the costs between the two units, the carrying charges on the undamaged facility would total $945 million. The lost carrying charges on the damaged facility would total $9.128 billion dollars. (Levelized 16.3% per year for 32 years) JP(9)
Net replacement power at 40 mills per kwh at the company's expected 68.9% capacity would total $456 million per year. In addition, the company would lose out on its sales to the PJM by some predicted 5 to 6 billion kwh per year. At a split savings profit of 16 mills per kwh, the loss of each unit would cost ratepayers at least $40 million per year.
We will assume a $1 billion cost to decontaminate and five years. Then we will assume that the company still has sufficient wherewithall to build a replacement for the damaged unit. That will take ten years and will be paid for in inflated dollars, not in 1980 dollars.

Thus the final cost of the accident, neglecting the costs of offsite damages and settlements, can be calculated.

	damaged unit	undamaged unit	(millions $)
carrying charges	9,128	$945	
ruined fuel	50	-	
replacement power	3,420*	684	
lost sales to grid	600*	120	
cost of cleanup	+ 1,000	+ -	
	$14,198	$1,749	

Plus a plant constructed and paid for in year 1998 dollars will have a substantially higher cost to ratepayers. For the moment we'll neglect that.

The bill, neglecting rather a lot, is $15,947,000,000 for a $1 billion accident.

Now utilizing the techniques of the draft's preceeding paragraph and the Rasmussean probability of 1 in 400 per year we get an annual estimated economic risk of $39,867,500.

* assuming fifteen years until capacity replaced.

the proposed case: one unit fails after 8 years of operation and the second is down for 3 years until restart

Carrying charges for the lost plant would equal a levelized 12.2% per year. Assuming a $3.5 billion final cost and an even distribution of the costs between the facilities, the carrying charges for the lost plant would total $5.119 billion. Lost carrying charges of the undamaged facility would total $885 million. (These figures are in mixed dollars.) Net replacement power at 40 mills (1980 mills) per kwh at the company's expected capacity of 70% would total $696 million for the undamaged facility and $3.48 billion for the fifteen years until the capacity is replaced. Again the company would lose out on its sales to the PJM grid of $40 million (1980 dollars) per year.

Assuming a $1 billion cleanup (in 1980 dollars, for consistency) and the construction of replacement capacity in mixed dollars which will be capitalized in 2006, we can compile the following chart.

	damaged unit	undamaged unit	($million)
carrying charges	$5,119	$885	
ruined fuel	50	-	
replacement power	3,480	696	JP(9)
lost sales to grid	600	120	
cost of cleanup	+ 1,000	+ -	
	$10,249	$1,701	

carrying charges are in mixed dollars, 1991 to 2014 for the damaged unit and 1991 to 1993 for the undamaged. All others are in 1980 dollars. To get the 1991 figure we can assume a conservative 10% annual inflation rate for fuel, replacement power, lost sales, and cost. From 1983 to 1991 a compounded 10% amounts to a 114% increase.

	damaged unit	undamaged unit	($ m)
carrying charges	$5,119	$885	
fuel	107	-	
replacement power	7,447	1,489	
lost sales to grid	1,284	257	JP(9)
cost of cleanup	+ 2,140	+ -	
	$16,097	$2,631	

So, in comparison with the figure on the preceeding page representing the "worst" case, we have an annual economic risk of $46,820,000. mostly in 1991 dollars.

Because the analysis above included some mixed dollars for carrying charges, I decided to take the worst case once more, this time calculating the effects in 1983 dollars. For every year of the company's proposed carrying charge schedule, I have used a factor based on a 10% inflation rate to adjust the figure back to a 1983 dollar cost. The draft's staff used 40 mills as a net replacement cost, a figure probably conservative* for 1983. I have used a 16 mill per kwh rate of earnings from the grid for 1983, based upon some analysis of the past record of the company. $1 billion is the draft's estimate of cost. Assume a $3.5 billion final cost and an even distribution between the two units. The company assumes an average capacity of 68.9% for each unit.

Reduced as described, the carrying charges foregone for the damaged facility would total $2,959,000,000 in 1983 dollars. The three years of carrying charges for the undamaged plnt would total $861,000,000.

JP(9)

	damaged unit	undamaged unit
carrying charges	$2,959	$861
damaged fuel	50	-
replacement power	3,420	684
lost sales to grid	600	120
cost of cleanup	+ 1,000	+ -
	$ 8,029	$1,665

So, in constant 1983 dollars the cost of a hypothetical $1 billion accident which destroyed one unit and rendered the other out of service for three years would be $9,694,000,000. This neglects entirely offsite damages and injuries and that a utility trying to handle a $9 billion loss and major cleanup would have a hard time entering the capital market for construction funds.

JP(7)

At the RSS figure quoted by the draft's authors of 1 in 400 per year for a billion dollar accident, this figure translates to an estimated $24.2 million economic risk for the first year of Susquehanna's operation. This figure is more that 100 times as high as the draft's.

* conservative, used here, means low

-JP(1)

The staff agrees that the BEIR III values may be affected by the reevaluation of the Hiroshima and Nagasaki doses to survivors and that preliminary estimates indicate the BEIR III risk estimates could increase by factors of 2 or 3. However, it is far too early to revise estimates of risk based on such unconfirmed estimates. When all the work has been completed and reviewed by the scientific community, and the BEIR III Committee has reevaluated its recommendations and provided new guidance for Federal agencies, the NRC will move quickly to implement any recommended changes. In the interim, an increase of a factor or 2 or 3 in the recommended BEIR III risk estimators would still be within the range of 10 to 500 deaths per million person-rem provided by the present BEIR III report. Finally, it is worth nothing that while the BEIR III Chairman criticized the BEIR III committee for being non-conservative, three other members criticized it for being overly-conservative.

-JP(2)

Staff agrees it cannot be demonstrated whether injury has or has not been caused, and only pointed out the <u>fact</u> that no one knows.

-JP(3)

Thickness of the containment did not play any role in the amount of radioactivity release from the TMI-2 accident.

-JP(4)

There is no obvious relationship between hypothetical calculated radiation doses resulting from assumed worst case releases and meteorology, and the real measured doses resulting from the TMI-2 accident.

Iodine and xenon (as well as several krypton radionuclides and some radioactive particulate progency) were detected in gaseous effluents from TMI-2. In addition, tritium and traces of Cs-137 have been found in on-site test borings taken near the Unit-1 borated water storage tank due to a leaking valve to the tank. However, the leak occurred prior to the Unit-2 accident, and no radioactivity has been identified off-site as a result of liquid releases from TMI-2 since the accident.

-JP(5)

The NRC's siting regulation, 10 CFR Part 100, defines the term nearest population center to be the nearest "densely populated center containing more than about 25,000 residents". Since the Borough of Berwick had a 1980 estimated population of 11,781 (1970 population of 12,274), it was not identified as the nearest population center, according to the above definition.

-JP(6)

While the only identifiable health effects resulting from the TMI-2 accident were psychological in nature, the Commission has concluded such impacts are outside the scope of NEPA.

The commentor computes an annual economic risk for the Susquehanna nuclear units under three different scenarios and arrives at figures of approximately $40 million, $47 million and $24 million, respectively, for the three scenarios compared to the staff's calculated total annual economic risk of $142 thousand spread over several years. The commentor's calculation is thus about 150 to 350 times that of the staff. We believe that the commentor has erred in three principal ways for each of the three scenarios:

(1) an improper probability factor,

(2) improper application of fixed charges, and

(3) double counting of certain costs

The principle difference lies in the probability factor used. Staff used a probability factor of 2.4×10^{-5} (2.4 chances in 100,000) whereas the commentor used a factor of 2.5×10^{-3} (2.5 chances in 1,000); a difference of more than 100 times. The commentor's probability factor was derived based on the TMI accident happening after about 400 years of reactor operation. A single event cannot be used to determine a probability factor. The best way to describe this for one not versed in statistical methods is to note that the probability of throwing snake eyes cannot be determined by a single throw of the dice. The commentor supports his factor in part by noting that the one chance in 400 is within the range of frequencies estimated by the RSS (1975 Reactor Safety Study) for an accident of this severity. The range estimated by the RSS varied from 1 in 300 to 1 in 30,000 reactor years of operation. Thus, the 1 in 400 value is at the very upper end of the range in frequencies. Conversely, the 2.4×10^{-5} probability factor used in the

Supplement to Draft Environmental Statement is lower than the lower range of frequencies given in the 1975 RSS. However, as noted in Appendix H-1 of the DES, the RSS has been re-baselined since 1975 to reflect use of advanced modeling of the processes involved.

Other than the probability factor, another major difference between the commentor's calculations and those of the staff is in the computation of carrying charges. Carrying charges include interest charges and return on investment, depreciation or recovery of the capital, interim replacements, taxes and insurance. Carrying charges must be paid if the plant is operating or not operating. These do not, therefore, represent additional costs while the facilities are shut down. While the generating units are not operating and until the damaged unit is replaced or decommissioned, the loss in benefits of not being able to operate the units is fully reflected by the replacement power costs. To charge for both the costs, and the benefits not realized, would be double counting.

After the damaged unit is replaced, the only carrying charges applicable for the replaced unit are those associated with interest charges and recovery of capital. Interim replacements, taxes and insurance are no longer applicable to the damaged unit after it is replaced or decommissioned.

Susan M. Shanaman, Chairman of the Pennsylvania Public Utility Commission, appeared before the Subcommittee on Oversight and Investigations of the House Committee on Energy and Commerce. On March 30, 1981, Ms. Shanaman gave the following costs for Three Mile Island in prepared testimony:

Decontamination	$1,000 Million
Reconstruction Cost	600 Million
Less Insurance	(300)
Net Investment Cost	$1,300 Million

The above costs compares to staff estimates in the Supplement No. 2 of the Susquehanna DES of $1,000 Million for decontamination plus return and capital recovery costs of $60 million for 22 years for reconstruction. The $60 million for 22 years is equivalent to a present worth lump sum of $491 million at an 11% discount rate. Although the Three Mile Island costs are not necessarily appropriate for Susquehanna, these estimates indicate that the staff's estimates are of a proper order of magnitude.

The commentor calculates additional carrying charges of $10,073 million, $6,004 million and $3,820 million, respectively, for the three scenarios that were developed. Staff believes that the only appropriate additional carrying charges due to the accident at Three Mile Island are those reflected by the $600 million reconstruction cost in Ms. Shanaman's testimony.

The commentor also estimates an additional charge for damaged fuel of $50 million. This would already be included in the $600 million reconstruction cost.

The commentor's calculations also include charges for lost sales to the grid. Staff believes that these costs are already reflected in the replacement power costs. It is double counting to charge for costs of buying power (or generating power) and also for not selling power.

-JP(8)

Regarding the comment that the DES did not address the Browns Ferry, Unit 3 scram system malfunctions in June 1980, it is not clear to the staff that this reflects any gap or new NRC concern. The matter of ATWS initiated core damage accidents has been a generic safety issue in NRC for some time now for which analyses have been completed and rule making is presently underway independent of the DES (See NUREG-0460). Furthermore, the risk analysis presented in the DES for the BWR design contains sequences that involve total failure to shutdown the reactor (including failure to insert all control rods). This particular sequence was in fact found to dominate the overall risks as these are presented in the DES (i.e. sequences designated as TC).