UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

Before Administrative Judges
Glenn O. Bright
Paul W. Purdom
James P. Gleason, Chairman

In the Matter of	
PENNSYLVANIA POWER & LIGHT COMPANY and ALLEGHENY ELECTRIC COOPERATIVE, INC.	Docket Nos. 50-387 OL 50-388 OL
Susquehanna Steam Electric Station, (Units 1 and 2)	November 2, 1981

MEMORANDUM AND ORDER ON SUMMARY DISPOSITION MOTIONS

This Order relates to those remaining motions for summary disposition previously adjudicated where the Board's reasons for its decisions have not been communicated to the parties.[1] As we indicated in our Order of October 12, 1981, wherein the Board's reasons were supplied for earlier adjudications of motions for summary disposition, there is no need to repeat here the law previously set forth applicable to motions to dismiss.

A. Contention 1 (Health effects of the uranium fuel cycle)

The Applicant, Staff and the sponsor of this Contention entered into a stipulation regarding that part which related to the quantities and health effects of radon and the Board approved the withdrawal of

[1] See Licensing Board Memorandum and Order, August 31, 1981. Board decisions were announced as follows: Lic. Bd. Order, September 23, 1981 (contention 1-magnitude of doses), (contention 2-magnitude of doses), (contention 2-magnitude of releases); Lic. Bd. Order, September 29, 1981 (contention 4c-conservation and 4d-solar energy), (contention 2-risks of low-level radiation); Lic. Bd. hearing, October 6, 1981, tr. p. 1019 (contention 14), (contention 1-health effects); and Lic. Bd. hearing, October 14, 1981, tr. p. 1723 (contention 4a and 4b), and tr. 1834 (contention 2-chlorine).

that portion of the Contention.[2] Two summary disposition motions were filed on other parts of the contention.

1. The Applicant filed a motion for summary disposition of that part of Contention 1 that questions the magnitude of the radioactive doses that will be imparted on the public by the release of all isotopes other than radon and technetium-99 during the fuel cycle. The motion was supported by an affidavit from Morton I. Goldman of the NUS Corporation and also by a response from the Staff on September 10, 1981 with an affidavit from Reginald L. Gotchy, a radiobiologist with the Nuclear Regulatory Commission. No response was received from any other party to the proceedings.

2. The Staff filed a motion for summary disposition, as a part of its supporting response above, for that portion of this Contention which relates to the health effects of all isotopes (other than radon-222 and technetium-99) that will be released during the fuel cycle of the Susquehanna plant. The Staff submitted an affidavit from Mr. Gotchy in support of this motion also and the Applicants filed a response on September 30, 1981, also in support of the motion, with an affidavit from Roger E. Linneman of the Radiation Management Corporation. No other party responded.

3. The pertinent portion of Contention 1 reads as follows:

> The radiological health effects of all isotopes other than radon-222 and technetium-99 which will be released during the fuel cycle required for the Susquehanna plant have been misrepresented and underestimated. In particular, the health effects of each long-lived isotope which will be released from the fuel cycle for Susquehanna should be reassessed. The appropriately determined effects must be factored into the cost-benefit balance for the operation of the plant.

We will treat each of the above motions, although they relate to different aspects of the Contentions representations, in this part of the Board's Order.

(a) Applicants motion.

1) The Applicants analysis is based on Nuclear

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[2] See ASLB Order of September 23, 1981.

Regulatory Commission reports and documents.[3] This analysis considers both a reprocessing mode and a once-through mode.[4] The calculations show upper limit risk-equivalent dose commitment values for long-lived radionuclides released from the back-end of the nuclear fuel cycle are:

	Total body dose man-rem/RRY	Total body dose 64 RRY man-rem
Reprocessing mode	660	42,240
Once-through mode	260	16,640

The information submitted by the Staff attests that the Applicant's dose estimates in Goldman's affidavit are comparable to those of the Staff and are reasonably conservative.[5] Citing the S-3 Hearing and the GESMO Hearing Records as covering the potential public health impacts, the Staff estimates 0.08 to 0.12 cancer deaths per RRY over 100 to 1000 years. And the Staff asserts that the 1980 BEIR III Report does not significantly change its risk estimates. The Staff concludes the health effects of fuel cycle releases of radionuclides to be inconsequential and incapable of significantly affecting the cost-benefit balance for operation of the plant.[6]

2) Findings of Fact. Based on our review, we find the following:

1. The dose estimates per referenced reactor year (RRY) cited by the Applicant are comparable to those developed by the Staff and submitted in the Final Environmental Statement.

2. The estimates provided by the Applicant are reasonably conservative.

3) Conclusion. We conclude that there is no genuine issue of a material fact concerning the magnitude of doses resulting from radioactive releases of isotopes other than radon-222

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[3] Goldman affidavit, p. 3.

[4] Ibid., pp. 3-5.

[5] Gotchy affidavit, p. 1.

[6] Ibid., p. 2.

and technetium-99 for the fuel cycle from the Susquehanna plant. Accordingly, we grant the Applicant's motion for summary disposition of this part of Contention 1.

(b) Staff's motion.

1) The Staff agrees that the dose estimates per reference reactor year from the fuel cycle submitted by the Applicant are comparable to those of the NRC Staff and that there are no data available which would substantially change those estimates, which it considers conservative. The Staff's estimates of the health effects of fuel cycle releases of radionuclides as previously indicated are summarized in the FES as 0.08 to 0.12 cancer deaths per RRY over periods of time ranging from 100 to 1000 years and that accordingly, this could not tip the cost-benefit balance for the facility. The Staff submitted other recent independent estimates of population doses and impacts from the nuclear fuel cycle which show that generating one RRY of electrical power for all radionuclides (excluding radon-222 and technetium-99) may result in less than one human health effect (cancer or genetic effects) per RRY over time spans up to 500 years into the future. And further, that all these independent reviews support the Staff assessments in the FES. As a result of the foregoing, as indicated in support of the previous motion, the Staff believes that the health effects of the fuel cycle releases in issue have been found to be inconsequential.[7]

In the Applicant's response supporting the Staff's motion, an affidavit by Roger E. Linnemann of the Radiation Management Corporation demonstrates similar estimates to that of the Staffs of 0.043 excess cancer deaths per year over a 100-year period as the health effects of radioactive releases attributable to the fuel cycle at Susquehanna.[8]

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[7] Ibid., pp. 2-3.

[8] Linnemann affidavit, pp. 2-3.

2) Findings of Fact. Based on our review of the foregoing, we find the following:

1. The potential health effects from radionuclides have been adequately assessed.

2. The potential health effects have been studied and found to be inconsequential.

3) Conclusion. We conclude that there is no genuine issue of a material fact concerning the potential health effects of radionuclides (excluding radon-222 and technetium-99) released during the fuel cycle and the Staff's motion for summary disposition granted.

B. Contention 2 (Health effects of low-level radiation and other discharges from the facility.)

The Applicants filed three separate motions on portions of Contention 2 and the Staff filed a motion for summary disposition on a fourth. Each of the Applicants motions is supported by an affidavit, as is the Staff's, and has received a supporting response with accompanying affidavits from each other. We refer to other response(s) below. In addition to the motions here, the Applicant filed a motion to dismiss the chlorine portion of this contention which the Board denied. That action is not discussed here since its effect is made moot by the Board's decision on a summary disposition motion of that part of the contention.[9]

Contention 2, as approved by the Board, reads as follows:

> The residual risks of low-level radiation which will result from the release from the facility of radionuclides, and particularly from the release of cesium-137 and cobalt-60, into the Susquehanna River, and the health effects of chlorine discharged into the river, have not been, but must be, adequately assessed and factored into the NEPA cost-benefit balance before the plant is allowed to go into operation.

1. The Applicant's filed a summary disposition motion on August 13, 1981 on that part of Contention 2 that deals with the magnitude of the releases from the facility of radionuclides (source

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[9] See Susquehanna hearing, Tr. p. 1724, October 14, 1981.

Term), particularly the amounts of cesium-137 and cobalt-60, that will be released into the Susquehanna River. An affidavit from John C. Dodds, Dose Assessment Group Leader, Bechtel Power Corporation was also submitted.

The Applicants attested that releases from the Susquehanna plant were calculated by using the GALE computer codes as described in NUREG-0016 (Rev. 0).[10] This code is continuously being revised to incorporate the most recent operating data but the results for the plant are reflected in Tables 3.5-7 amd 3.5-13 of the Applicants Environmental Report (ER). It is stated that the results would change if more recent versions of the code were used, but they would remain within the same order of magnitude and be minute.[11]

As calculated by Applicants in Tables 3.5-7 and 3.5-13, the expected amounts of radionuclides released from Susquehanna would be minute and would constitute small fractions of the maximum permissible concentrations under 10 C.F.R. Part 20. Applicants compute that the concentration of cesium-137 would be .025 Ci/yr, and that for cobalt-60 it would be .0096 Ci/yr. The corresponding concentrations in the river water at the Danville intake would be 3.9×10^{-3} pCi/l of cesium-137 and 1.5×10^{-3} pCi/l of cobalt-60.[12]

The cesium-137 value would be .029 Ci/yr if NUREG-0016 (Rev. 1) was used for computation and the cobalt-60 would be unchanged.

In response to the Applicant's motion, the NRC Staff concluded that the Applicants had clearly demonstrated the absence of any genuine issue of material fact with regard to the amount of cesium-137 and cobalt-60 to be released from the Susquehanna plant into the Susquehanna River. The supporting affidavit of Charles Lee Miller of the Effluent Treatment Systems Branch, U. S. Office of Nuclear Reactor Regulation, concluded that Applicant's calculations of the estimated releases of radionuclides from the Susquehanna plant had

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[10] Dodd's affidavit, p. 3.

[11] Ibid., pp. 4-5.

[12] Ibid., p. 5.

been substantially correct; the NRC Staff estimated that, on the average, 0.01 Ci/yr of cobalt-60 and 0.036 Ci/yr of cesium-137 would be released in the liquid effluent, which the Staff concluded to be of the same order of magnitude, though slightly higher than the values reported by the Applicant.[13]

Findings of Fact. Based on our review of the foregoing, we find the following:

1. The anticipated releases of radionuclides to the Susquehanna River and the atmosphere were computed utilizing the GALE code and adjustments were made in its mathematical models to account for plant specific data.

2. The GALE code provides conservatively high estimates of plant releases.

3. The expected amounts of radionuclides released from the plant constitute a small fraction of the maximum permissible concentrations under 10 C.F.R. Part 20.

4. The radionuclide release estimates in the ER including those for cesium-137 and cobalt-60 are conservatively high estimates of the actual releases that will occur when the plant goes into operation.

Conclusions. We conclude that there is no genuine issue of a material fact concerning the magnitude of the low-level radioactive releases from the Susquehanna facility including the amounts of cesium-137 and cobalt-60 that will be released into the Susquehanna River and the Applicant's motion for summary disposition of this part of Contention 2 is granted.

2. The Applicants filed a motion on August 25, 1981 for summary disposition of that part of Contention 2 which questions the magnitude of the doses resulting from radioactive releases from the Susquehanna plant. In support of their motion, the Applicants appended the affidavit of Frazier L. Bronson of the Radiation Management Corporation. The Applicants state that the radiation doses attributable to the releases from Susquehanna were estimated using

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[13] Miller affidavit, pp. 3-4.

the methods and assumptions in Regulatory Guide 1.109 (Rev. 0), March, 1976, which was published by the NRC Staff.[14] The Guide provides pathway and dosimetry models, in the form of computer codes, which permit the pre-operational prediction of the dispersion of radioactive effluents from nuclear power plants into the atmosphere and water bodies, their transport to man through various exposure pathways, and the resulting radiation doses. The Staff regards these models and codes as acceptable for calculating the radiological impact of plant operation on individuals and populations and for determining compliance with Appendix I to 10 C.F.R. Part 50.[15]

Applicants relied upon the GASPAR computer code to compute the annual radioactive doses to individuals at distances up to 50 miles from the Susquehanna site, and for the population throughout the continental United States, resulting from the release of radioactive gases and/or particulates.[16] These computations are summarized in Tables 5.2-25 and 5.2-26 of Applicant's ER, which are annexed to Applicant's motion papers.

Radiation doses from liquid pathways were calculated using the LADTAP computer code and these results were summarized in Tables 5.2-23, 5.2-24, 5.2-33, 5.2-34 of the Applicant's ER, which are annexed to Applicant's motion papers.[17]

As calculated by the Applicants, the total whole body doses attributable to all radioactive effluents from Susquehanna are 6.0 man-rem to the 50-mile radius population and 21 man-rem to the entire population of the 48 contiguous states. These calculations, like those in the aforementioned tables, are conservatively high estimates.[18]

The doses associated with cesium-137 and cobalt-60 releases to

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[14] Bronson affidavit, p. 2.

[15] Ibid., p. 3.

[16] Ibid., p. 3-4.

[17] Ibid., pp. 7-10.

[18] Ibid., p. 10.

the Susquehanna River and its use as a source of drinking water were computed using the LADTAP computer code. It was assumed that the 9000 residents of Danville, which use the Susquehanna as a source of drinking water, would each drink two liters of river water per day, and it was also assumed that the concentrations of cesium-137 and cobalt-60 in the water at the Danville intake structure would be identical to those computed as a basis for the Applicant's August 13, 1981 motion for partial summary disposition (i.e., 3.9×10^{-3} pCi liter of cesium-137 and 1.5×10^{-3} pCi liter for cobalt-60.[19]

Based upon these figures, the dose for cesium-137 was estimated to be 2.03×10^{-4} mrem/year, the dose for cobalt-60 was 2.07×10^{-4} mrem/year, and the total combined dose to a resident of Danville attributable to cesium-137 and cobalt-60 in his drinking water was calculated to be 4.1×10^{-4} mrem/year.

In reviewing the Applicant's motion and its supporting documentation the Staff agreed with the Applicants that the portion of Contention 2 dealing with the magnitude of doses should be dismissed as a matter of law. The Staff supported by an affidavit of Edward F. Branagan, Jr., a physicist with the Regulatory Commission, concluded that the individual dose estimates, both as calculated by the Applicants and as calculated by the Staff, are less than the annual dose design objectives in 10 C.F.R. Appendix I.[20] The Staff also agreed with the Applicants that the total body population dose within a 50-mile radius of the site from exposure to liquid radioactive releases from the Susquehanna plant equals less than 0.001 percent of the corresponding population doses from natural background radiation.[21]

Findings of Fact. Based on our review of the materials and information submitted, we find:

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[19] Ibid., pp. 11-12.

[20] Branagan affidavit, p. 2.

[21] Ibid., p.3.

1. The Applicants individual dose estimates due to radioactive releases from the plant are less than the annual dose design objectives contained in 10 C.F.R. 50 Appendix I.

2. The total body population dose in a 50 miles range is a small fraction of natural background radiation.

3. The doses associated with cesium-137 and cobalt-60 releases into the Susquehanna River were adequately computed and assessed.

Conclusion. We conclude that no genuine issue of a material fact exists with respect to the magnitude of the doses resulting from radioactive releases from the Susquehanna facility and accordingly, we grant the Applicant's motion for summary disposition of this part of Contention 2.

3. The Staff filed a motion for summary disposition on September 3, 1981, on that part of Contention 2 which relates to the potential risks to the public due to the release of radionuclides from the Susquehanna facility. The motion is supported by an affidavit from Edward F. Branagan, Jr., a physicist with the Nuclear Regulatory Commission. The Applicant forwarded a response in support with an accompanying affidavit from Roger E. Linnemann of the Radiation Management Corporation. The Citizens Against Nuclear Dangers (CAND) filed a paper on September 12, 1981 which contains, among other matters, an objection to a motion for summary disposition by the Applicants, which is not specific as to date or subject matter. In light of his concern on the health effects of low-level radiation which was expressed during the prehearing conference dealing with the approval of contentions, we believe his expressions may be directed to the motion before us. However, the intervenor must accept responsibility for not making its direction clear to the Board.

The Staff calculated the radioactive liquid discharges from Susquehanna as reported in Table 4.11, p. 4-20, of the FES and also the dispersion and hydrological transport thereof in Table 4.12, p. 4-20, of the FES. These data were used to estimate the doses to

an individual receiving maximum exposure and doses to the population within 80 km, as well as, the U. S. population. (Tables 4.8, p. 4-18, and 4.10, p. 4-19, FES).[22] The NRC Staff used recommendations from the BEIR I Report and NUREG-0002 to compute risks from these dose estimates. It is estimated that risks of premature death from maximum exposed individual are 7×10^{-7} for gaseous effluents and 4×10^{-7} for liquid effluents. Risks for the population within 80 km are less than one percent of the maximum exposed individual.[23] Risks to the U. S. population are estimated as 0.009 cancer deaths in the exposed population and 0.02 genetic disorders in all future generations of exposed population.[24] Transportation exposures were also computed along with other risks. The probability is less than one in 100 for one cancer death in the U. S. population due to exposure to effluents and transportation from normal annual operation. The similar probability from genetic disorders is less than one in 50.[25]

The Staff estimates also include exposure to cesium-137 and cobalt-60 (Table 4.11-FES).

The NRC Staff concludes that the risks to public health and safety, from normal operation of Susquehanna, Units 1 and 2, will not be significant nor will they be discernible.[26]

The Applicant's analysis confirms those of the Staff.[27]

In reviewing the statements of CAND, there seems to be some confusion in them relative to this contention which addresses low-level radiation and not 'atomic catastrophes.' However, whether the point of the statements submitted is to this part of the contention or others, we must observe that the Board can find no genuine issue raised by CAND's unsupported remarks.

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[22] Branagan affidavit, p. 2.

[23] Ibid., p. 3.

[24] Ibid., p. 4.

[25] Ibid., p. 5.

[26] Ibid., pp. 4-5.

[27] Linnemann affidavit, pp. 4 and Table I.

Findings of Fact. Based on the foregoing and our review, we find the following:

1. There has been an adequate assessment by the Staff of radioactive materials to be contained in the effluents from the Susquehanna facility.

2. The Staff has adequately calculated the risks to the public and individuals from doses from radioactive releases.

3. The risks from exposure to radionuclides, including cesium-137 and cobalt-60, as a result of effluent releases from the facility into the Susquehanna River are insignificant.

Conclusions. We conclude that there is no genuine issue of a material fact relating to risks of low-level radiation from the operation of the facility and therefore the Staff's motion for summary disposition of this part of Contention 2 is granted.

4. The Applicant filed a motion for summary disposition of that part of Contention 2 on September 9, 1981 which relates to the health effects of chlorine discharged into the Susquehanna River. The motion is supported by an affidavit of James Rios, of the Bechtal Power Corporation and also by a Staff response dated October 1, 1981 which is accompanied by an affidavit of John C. Lehr, an Environmental Engineer with the Nuclear Regulatory Commission.

This part of Contention 2 was subject to an earlier motion for summary disposition and was modified by virtue of the Board's decision granting in part and denying in part the Applicant's motion.[28] As modified, the chlorine portion of the contention reads as follows:

> "no assessment has been made of the health effects of a higher level of chlorination should a higher level become necessary because of the discharge of organic wastes into the river upstream from the plant. Nor have the quantities and health effects of trihalomethanes and halomethanes to be released been adequately assessed, at anticipated or higher-than-anticipated levels of chlorination."

Because of the lengthy and sometimes tortuous route traveled

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[28] Lic. Bd. Order, March 16, 1981.

by the chlorine part of Contention 2, we include here the relevant aspects of its development.

The original portion of Contention 2 on chlorine as admitted by the Board read as follows:

> ... the health effects of chlorine discharged into the river, have not been, but must be, adequately assessed and factored into the NEPA cost-benefit balance before the plant is allowed to go into operation.[29]

The Applicants filed a motion on November 6, 1980 for a summary disposition of this portion of Contention 2. Citizens Against Nuclear Danger (CAND) filed a response on November 24, 1980. The NRC Staff filed an answer in support of Applicant's motion on December 2, 1980. The Board invited CAND and other parties to file additional responses by January 5, 1981.[30] CAND did so on January 7, 1981 and in their response to discovery requests of the Staff stated that more chlorine than anticipated would be required because of acid mine drainage into the Susquehanna River and waste chemical spills from the Butler Mine Water Tunnel. Applicant's motion on summary disposition asserted that the purpose of chlorination was to control slime growth and to disinfect the water supply and sewage effluent and stated that the wastes referred to by CAND would not change the amount of chlorine required.

The Staff concurred in the Applicant's statements on the effects of acid mine drainage and stated that chlorine was not generally used as treatment for toxic chemicals. The Staff also addressed the health effects of chlorination stating that dechlorination would reduce chlorine below detectable levels, but conceded that some chlorides and trihalomethanes (THMs) would be released. The Staff was unable to predict accurately the level of THMs in the plant's discharge, but felt that they may be below EPA's drinking water maximum contaminant levels.

In CAND's response of November 24, 1980, a reference was made

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[29] Lic. Bd. Order, March 6, 1979.

[30] Lic. Bd. Order, December 9, 1979.

to an anticipated Council on Environmental Quality (CEQ) study alleged to link chlorinated drinking water with cancer. CAND claimed further that there were plans to build a large ethanol producing facility on the Susquehanna River-15 miles upstream from Berwick-which would discharge wastes to the river and would cause an increase in slime-producing organisms requiring an increase in chlorination at the Applicant's plant.

The Board in its Order of March 16, 1981, dismissed that portion of the chlorine question related to mine drainage and chemical spills, but agreed that CAND could be correct in stating that if an ethanol plant is constructed and discharges large amounts of organic wastes to the river it might necessitate an increase in the amount of chlorine used. The Board denied the Applicant's motion for summary disposition, and modified the contention as indicated herein.

The Staff on April 14, 1981 moved the Appeal Board for a directed certification of the Board's Order of March 16, 1981, claiming that the Board had accepted unsupported allegations as facts and had taken notice of material facts not in evidence. The Applicants supported the Staff position. Subsequently, the Appeal Board denied the Staff motion, but noted that the ASLB could be asked to reconsider. Such an appeal to the Board was filed by the Staff. The Board denied reconsideration but reopened the question by allowing discovery by all parties on questions raised by the Board's previous Order.

The Applicants served new discovery requests on CAND, August 6, 1981. After denial of a protective order sought by CAND, and ordered by the Board to respond to the new interrogatories, CAND replied by Mailgram on September 10, 1981, that it had tried to obtain the information requested but had been unable to do so. The Applicant's motion to dismiss Contention 2 (Chlorine) on August 21, 1981, and renewed on September 15, 1981, for a failure to respond was supported by the Staff, September 28, 1981, but was denied by the Board since CAND responded as indicated above. The Applicants

filed the present motion for summary disposition of the modified Contention 2 (Chlorine). The Applicant states that chlorination is used to arrest growth of slime-producing biolife on equipment surfaces, specifically to keep stainless steel condenser tubes free of slime films and that a supplemental system for mechanical cleaning is used to minimize the need for chlorine.[31] Chlorine is also used to disinfect the potable water supply and the sewage effluent, but of the 32,070 pounds of chlorine used per month, only 100 pounds is for the latter purposes. According to the Applicant, chlorine is added to condenser water for 20 minutes each 8 hours for each unit and the dose varies according to conditions.

EPA permits an average chlorine residual of 0.2 mg/L and a maximum of 0.2 mg/L in cooling tower blowdown discharges to surface waters.[32] Further, chlorine residuals are not permitted for more than 2 hours per day for any one cooling tower. Susquehanna will use sulfur dioxide dechlorination to meet EPA standards and there should be no detectable residual chlorine in cooling water blowdown at any time. Chlorine reacts with organic humic compounds to form THMs and halomethanes. To determine the effect of Susquehanna operations, a pilot plant study has been conducted. Samples of river water show an average concentration of THMs of 0.38 ug/L (or ppb). Chloroform was 0.13.[33] Other halomethanes were not detectable. The maximum THMs permitted by EPA's National Interim Drinking Water Standards is 100 ug/L. Criteria for river water quality are 1.9 ug/L of THMs. The simulation experiment resulted in concentrations of THMs in the discharge after chlorination, aeration, and dechlorination of 2.34 ug/L. Chloroform was 2.02 ug/L. Other halomethanes were 0.15 ug/L. After mixing with river water the concentrations were calculated to be: THMs 0.45 ug/L, chloroform 0.19 ug/L, and other halomethanes - not detectable.[34] The increase in concentration

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[31] Rios affidavit, pp. 3-4.

[32] Ibid., p. 5.

[33] Ibid., Table I.

[34] Ibid., p. 9 and Table I.

of THMs and other halomethanes in the river due to Susquehanna is estimated to be at or below the limit of detection at the Danville Water Treatment plant intake and, hence, negligible.[35]

An environmental study has been prepared by the Synfuel Energy Corporation (Synfuel) for a proposed ethanol production plant about 15 miles upstream from Susquehanna.[36] Synfuel would not discharge waste waters that can be contaminated with organic chemicals. Since Synfuel would not be discharging waste water containing organics which might act as nutrients for condenser-fouling organisms, there would be no need to increase chlorination should the proposed plant be constructed.[37]

The Staff's position based on Lehr's affidavit supports the conclusions of Applicants. The Applicant's pilot plant study produced results within the range of an ongoing NRC study.[38] Lehr points out that aeration reduces concentrations of chloroform and other THMs by 84 percent.[39] Lehr believes that Applicant's estimates of the concentrations of trihalomethanes likely to be produced at the plant are reasonable.[40]

In its order of March 16, 1981, the Board also noted CAND's reference to "the CEQ study" (CAND's letter of November 24, 1980 alleged CEQ would release a report that showed the relationships between cancer rates and chlorinated compounds in drinking water would be below safe levels established by EPA). The Board has taken notice of the report "Drinking Water and Cancer: Review of Recent Findings and Assessment of Risks" by K. S. Crump and H. A. Guess, prepared for CEQ, December 1980. That report summarizes animal tests for some substances found in drinking water and epidemiological studies to determine the prevalence of cancer in relation to drinking water chemical constituents. While the data provided some evidence to support a relationship, the information

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[35] Ibid., p. 12.

[36] Ibid., p. 13.

[37] Ibid., p. 13-14.

[38] Lehr affidavit, pp. 3-4.

[39] Ibid., p. 4.

[40] Ibid., p. 5.

was insufficient to document a causal relation. It was also determined that chlorine dose, or even THMs, may not be a reliable indicator of cancer potential, and that one has to consider all organic material present, as well as other contaminants. While past studies were inconclusive, it was pointed out that the cancer incidence to be observed in a well constructed study would be at or near the limits of detectability. The studies made included a number of organic chemicals besides chloroform and other THMs. The risk for lifetime consumption of 1ug/L of chloroform was 4.1×10^{-6} (95% confidence limit) (Table III .3, pp. 60-61). The Board notes that the levels in the Susquehanna River after discharge and mixing of all THMs, including chlorine, were calculated at 0.45 ug/L and chloroform at 0.19 ug/L.

Findings of Fact. Based on the foregoing information, we find the following:

1. The concentrations of trihalomethanes and halomethanes in the Susquehanna River as a result of the plant's operation have been adequately assessed by the Applicant.

2. The concentrations of THMs in the River due to chlorination and concentration in the plant will be altered to only a negligible extent that will not be detectable at Danville.

3. The proposed ethanol plant, if built, will not affect chlorination or wastewater discharges at the Susquehanna plant.

4. The operation of the plant at Susquehanna will not present any adverse health or environmental impacts from chlorine discharges

5. The study by Crump and Guess, prepared for the Council on Environmental Quality does not demonstrate a challenge to EPA drinking water standards.

Conclusions. We conclude therefore that there is no genuine issue of a material fact in the assessment of health effects of the levels of chlorination at the Susquehanna facility nor in the assessment of the quantities and health effects of trihalomethanes

and halomethanes to be released. Accordingly, the Applicant's motion for summary disposition has been granted. Further, the Board concludes that none of the activities of the Applicants, as challenged by the various parts of Contention 2, adversely affect the facility's cost-benefit balance.

C. Contention 4 (Need for Power)

1. The Staff filed their motion for summary disposition of Contention 4 on September 2, 1981. The Applicant, on September 23, 1981 filed an answer in support of the Staff's motion and both the Staff and Applicant submitted affidavits in their pleadings. The Citizens Against Nuclear Danger (CAND) and the Susquehanna Environmental Advocates (SEA) filed statements in opposition to the motion for summary disposition, neither of which were supported by affidavits.

Contention 4 reads as follows:

> The Susquehanna facility (or, at least, Unit 2 thereof) is not needed; and, as a result, the cost-benefit balance is tilted against authorization of operating licenses (or, at least, a license for Unit 2), for the following reasons:
> a. Information supplied in the Applicants' ER shows that, at the very low growth rate scenario, the entire output of both units will be available for sale outside the service area of the Applicants as the units come on line (ER, Table 1.1-15).
> b. The electric capacity of the lead Applicant in 1977 was 40% greater than customer needs and demands from existing facilities. Latest projections of energy use and requirements during the next 30 years for the Applicant's service area, the period equal to the projected plant's "useful life," show that the Applicants can meet the needs of their customers through existing facilities and sources.
> c. The National Energy Program contemplates that steps be followed in order to achieve a lowered growth rate in electrical demand of less than 2% annually. Yet there has been no demonstration that the effects of conservation efforts designed to achieve that goal have been factored into the analysis of need for this facility. The conservation programs suggested by the Applicants are not designed to encourage either meaningful energy conservation or efficient energy use. Instead, these programs are aimed at encouraging continued energy use, regardless of whether electricity is the most efficient form of energy for the job at hand or not. One such

example is the Applicant's encouragement of reliance on expensive electrically operated mechanical heating and cooling devices, like heat pumps, in the name of energy conservation. As another example, there has been no comparison of the cost of upgrading thermal insulation in existing residences and commercial buildings in the service area of the Applicants with the cost (environmental and economic) of operating the Susquehanna facilities. Furthermore, there has been no discussion, in connection with energy conservation, of end use efficiencies or what have become known as "second law efficiencies," or of the health benefits of energy conservation.

d. Solar energy in any of its various forms has not been considered as an alternative to Susquehanna. By ignoring this commonly used alternative energy source, the Applicants are hoping to prevent home use of solar heating and hot water applications and to encourage use of electricity.

2. The basic thrust of the first two parts of Contention 4 is similar in that it is alleged the facility is not needed because the Applicant's existing generating capacity can meet the needs of its customers and that the entire output of the Susquehanna units would be available for sale outside of Applicant's service area.

The Staff does not contest the intervenor's allegations or projections for load and capacity, but argues instead that benefits are not limited to satisfying growth requirements and enhancing reliability factors.

(a) In an affidavit submitted by Sidney F. Feld, an economist with NRC's Regulatory Staff, the argument is made that the Final Environmental Statement (FES-OL) reflects that the benefit to be derived from the Susquehanna Units is the substitution of a lower cost of supply of electrical energy through minimization of production costs with substantial economic savings.[41] If Susquehanna is not operated, replacement energy would be reliance on more expensive coal, oil, or gas sources.[42]

The Staff assumed a case where the load level was such that

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[41] Feld affidavit, p. 2. [42] Ibid., p. 5.

the Pennsylvania-New Jersey-Maryland Interconnection (PJM) could meet its requirements from existing capacity and retire 43 percent of its most expensive generating capacity. This was compared wit operation of the Susquehanna facilities at 60 percent capacity. The savings accruing from such a Susquehanna operation is estimated to be $64 million in the first year of operation.[43] The remaining portion of Contention 4 - 4C and 4D - is concerned with a reduction in demand from conservation of energy and substitution of solar energy as an alterrative. The Staff states that such reduction would not displace the need for Susquehanna as a substitute for less economical generating units and argues it would not be reasonable to deny an operating license solely on reduction in need for power or new developments in alternative energy sources unless a significant change or new discovery concerning public health and safety or environmental impacts had developed in connection with the operation of the Susquehanna facility. And no such information had been developed.[44]

(b) The motion by SEA opposing summary disposition of Contention 4 argues that the lead applicant has about 35 percent excess capacity without Susquehanna and that it sold less electricity last year than the year before. The intervenor organization claims there is no market for the excess electricity and that the Staff had not given sufficient weight to costs that could be recovered from sale of equipment and tax deductions if the plant were to be abandoned. Finally, SEA claims that even if Susquehanna will cost less to operate, that fact should not be considered apart from the effect its operation will have on electric rates.

(c) The CAND party intervenor in a letter, dated September 12, 1981, which covered several subjects, opposed the motion for summary disposition and claimed that the Environmental Impact Statement (presumably the FES) does not give consideration to a private generation of electricity by organizations and individuals through various means which the Applicants would then be

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[43]Ibid., p. 6.

[44]Ibid., pp. 3-4.

required to purchase. There was no quantification of the allegation.

(d) The Applicants filed its answer supported by affidavits of William F. Hecht, Grayson E. McNair, and a joint affidavit of Grayson E. McNair and Preston L. Roberts, all dated September 22, 1981, and with accompanying attachments dated September 15, 1981. The Applicants notified the Board and parties on September 28, 1981, of new short-term and long-term load forecasts for PP&L's service area that made their forecasts of October 1980 obsolete and withdrew supporting affidavits for Contention 4a and 4b. Subsequently, the Applicants filed, on October 2, 1981, a supplement to its prior answer. This supplement was supported by affidavits of Hecht and McNair, both dated October 1, 1981.

In the September 22, 1981 affidavit Mr. Hecht had shown the smallest net benefit as resulting from a low load growth and operation of the plant at 50 percent of capacity. In the new forecast, Mr. Hecht assumes a zero growth in sales and peak load for both the lead applicant and PJM. This is lower than would occur under the most pessimistic assumptions. Using a 50 percent capacity factor and zero growth, Hecht computes a benefit of 3.14 billion dollars in first ten years of operation with a present net worth of 1.31 billion dollars.[45]

The McNair affidavit of October 1 forecasts a new compound growth rate in sales of 2.2 versus 2.5 percent in the previous forecast and for peak load, 2.0 versus the 2.2 percent that was formerly provided. The reasons for the change are given as slower growth in the economy, fewer new dwelling units, and a lower average annual use of electricity in electrically heated homes. However, McNair considers it virtually impossible to experience as low as zero growth in energy sales and peak load over the next ten years and believes such as assumption will result in underestimating these factors.[46]

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[45]Hecht Supplemental Affidavit, p. 2 and Exhibit A.

[46]McNair Supplemental Affidavit, pp. 1 and 2.

The McNair affidavit of September 22 describes a number of programs of the lead applicant to conserve energy use and reduce peak loads in residential, industrial and commercial locations. McNair claims these programs have achieved 166.3 MW demand reduction and 377 million kwh annualized energy savings.[47]

The McNair and Roberts affidavits of September 22 describe the lead applicant's programs of research and demonstration in solar energy applications, particularly active and passive solar and wind energy systems. Costs are currently the principal deterrent to widespread development of solar technologies.[48] Only passive, flat plate collectors, and wind energy systems have developed commercially to a point where wide application is a possibility.[49] Projected savings by 1995 are 42 MW in demand and 78,000 MWH/year in energy savings, and these projections have been factored into load forecasts.[50] They conclude that solar energy cannot replace the need for Susquehanna.

Findings of Fact. Based on a review of the material submitted, we find the following facts:

1. The Board finds no material fact at issue between the parties with respect to the effect of projected growth rates and load factors on the cost-benefit balance.

2. The operation of the Susquehanna facility will allow its electricity production to be substituted for production using more costly fuels. The statements and calculations of both the Staff and Applicant in support of this fact are based on conservative assumptions and have not been refuted by the intervenors.

3. The operation of the facilities at Susquehanna as it affects the rate base is a matter within the jurisdiction of the Commonwealth of Pennsylvania. Rates of ratepayers are determined by state agencies, not the Nuclear Regulatory Commission.

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[47] McNair affidavit, pp. 17-18.

[48] McNair and Roberts affidavit, p. 22.

[49] Ibid., p. 23.

[50] Ibid., pp. 25-26.

4. Although the Board has difficulty in understanding how the Applicant could recover sufficient savings to challenge the favorable cost-balance benefit of the facility through any possible combination of tax depreciation or losses, no information has been submitted by the Staff or the Applicant as to its impact if the plant should not receive an operating license. Nor has any comments been received of the effect, if any, that such events would have on the growth forecasts. These questions deserve clarification and resolution in a hearing proceeding.

5. The affidavits submitted by the Applicants demonstrate that effective energy conservation programs are being undertaken. The new demand projections have reduced peak load and growth estimates to 2% annually which is the value objective stated in that part of Contention 4. The Applicants have apparently encouraged solar energy developments and have factored anticipated savings from both sources into its growth estimates. No evidence has been submitted on the possibility of private generation of power.

6. The Board agrees with the Staff that the only feasible alternative at this stage is to not operate the Susquehanna facility.

Conclusions. We conclude that there is no genuine issue of a material fact with respect to those parts of the foregoing findings that relate to conservation and the use of solar energy. The Board has granted therefore the Staff's motion for summary disposition of that part of Contention 4 designated as 4c and 4d. However, the Board denied the motion as it requests summary disposition of that part designated as 4a and 4b for the reasons stated herein.

D. Contention 14 (Capacity Factors)

1. The Staff filed their motion for summary disposition of Contention 14 on September 10, 1981. The Applicant filed an answer in support of the motion on September 29, 1981 but no other party responded.

Contention 14, as submitted by the Board, reads as follows:

14. The facility's cost-benefit balance as set forth by the Applicants overstates the benefits of the facility since it utilizes over-optimistic capacity factors. The facility will not be capable of producing the amount of electricity predicted by the Applicants, so that its benefits will be less than predicted and the cost-benefit balance adversely affected.

The Staff moved for summary disposition of this contention on the basis that there was no genuine issue as to any material fact to be heard with respect to it and therefore that the motion should be granted as a matter of law in accordance with 10 C.F.R. 2.749.

2. In support of their motion, the Staff supplied the affidavit of Raghaw Prasad, an economist with the Environmental Impact Studies Division of the Argonne National Laboratory, Argonne, Illinois (hereinafter Prasad affidavit). Mr. Prasad attests that the Applicant's cost-benefit analysis assumed a capactiy factor of 70% for the units at Susquehanna, whereas studies performed by and for the U. S. Nuclear Regulatory Commission have indicated that the historical capacity factors of all nuclear plants in the United States averages 61.8% and for a 1100 MW Boiling Water Reactor, similar to the Applicant's units, as 65%.[51] This would indicate that the Applicant, while not necessarily wrong, could be somewhat optimistic in a choice of a capacity factor.

On the basis of a 70% capacity factor, the Applicants program calls for units 1 and 2 at Susquehanna producing 11.6 billion Kwh of electricity per year over the life of the plant. The cost savings gained by the use of Susquehanna rather than the Applicant's other generating units or purchase of power from a power pool is estimated to be $40 million per year for each unit.[52] If, instead, an historically conservative figure of 60% is used, the Applicant estimates the electricity produced would be 10 billion Kwh with a cost savings of $34 million per year for each unit.[53] As a consequence, whether the conservative or optimistic factor is used, the

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[51] Prasad affidavit, p.2.

[52] Ibid., p. 3.

[53] Ibid., pp. 3-4.

overall cost-benefit balance still supports operation of the facility.[54]

In commenting on the higher estimate of savings from operation of the Susquehanna units computed by the Staff in their Final Environmental Statement (FES), Mr. Prasad indicates the differences result from increases in replacement energy due to price increases in fuel oil which occurred subsequent to the Applicant's preparation of their Environmental Report (ER-OL). At a capacity factor of 60%, the benefit of the Susquehanna units would result in a savings approximately 320% higher than was reported by the Applicant in the ER-OL.[55]

In support of the Staff's motion for summary disposition, the Applicant submitted the affidavit of Robert H. Koppe, Manager of Reliability and Safety Projects, S. M. Stoller Corporation. Mr. Koppe supplied an analysis of boiling water reactors similar in design to the Susquehanna units and concluded that the Staff's use of a capacity factor of 60% was too conservative. Based on his studies, he estimates that except for a two-year period, in the second and third year of operation, the capacity factors that can be used are 65% or better.[56]

3. Findings of Fact. Based on a review of the foregoing, we make the following findings:

1. Although the Applicant's use of a 70% capacity factor may be too optimistic, the use of a more conservative figure of 60% does not significantly change the cost-benefit balance.

2. The rise in oil prices since the preparation of the Applicant's ER-OL produces a substantial increase in savings and therefore an improvement in the cost-benefit than what was projected by the Applicant.

3. That even though a 60% capacity factor may be a prudent figure to use for planning purposes, the likelihood is that this represents an underestimate of operating performance

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[54] Ibid., pp. 4-5.

[55] Ibid., p. 5.

[56] Koppe affidavit, p. 33.

and accordingly the cost-benefit balance is improved over that projected.

4. Conclusions. We conclude that there is no genuine issue of material fact pertaining to the foregoing findings; that insofar as the capacity factors are concerned, the cost-benefit balance has not been adversely affected by the factors used; and the Staff's motion for summary disposition of Contention 14 was therefore granted.

ORDERED:

For the Administrative and Licensing Board

Bethesda, Maryland
November 2, 1981

James P. Gleason
ADMINISTRATIVE JUDGE