DON BAILEY
AUDITOR GENERAL

Commonwealth of Pennsylvania
Office of the Auditor General
Harrisburg 17120

May 21, 1985

Mr. Nunzio Palladino
Chairma
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Mr. Chairman:

I recently received a communication from Mr. Jack Barry, International Vice President, International Brotherhood of Electrical Workers, who is aware of my experience in the United States Congress as a member of the Military Procurement and Nuclear Systems Subcommittee of the Armed Services Committee and my work on the Trade Subcommittee of the Ways and Means Committee, concerning the restart of TMI Unit 1.

While I realize that this has been a controversial issue, I fully understand that the immediate concerns of the commission have to be the protection of public health and safety. I also understand that national policy, in all its broad ramifications, particularly where fission reactions are concerned, is impacted by a decision to restart Unit 1.

However, as a member of the Armed Services Committee, I had access to virtually all information available to anyone in our country concerning all aspects of nuclear power including our weapons program. As a member of the Ways and Means Trade Subcommittee, the aspects of nuclear technology transfer abroad, and problems associated with financing the development of power in this country, were constantly laid at my doorstep.

In addition, I represented a congressional district in Western Pennsylvania which was the center of a great deal of research for the nuclear industry and also was a nuclear supply industry center. I also served on a TMI Congressional Task Force which attempted to resolve the funding impasse to cleanup Unit II.

Given the information available to the Commission, including the great degree of public awareness, the great amount of time that the public has invested in the appeal process, I very strongly recommend that the Commission conclude the six year debate and reach a decision.

I deeply share, and do not mean in any way to denigrate the vital and sincere concerns of the public, who have so consistently emphasized the need to assure that public health and safety will be protected when TMI-1 restarts. However, I sincerely believe that consumers, GPU Nuclear, union groups, employees, and government officials, without exception, understand the ultimate primacy of that issue (i.e., protection of public health and safety). Within the realm of every practical limitation, that protection has been given due and proper consideration by the commission, the public, and others.

It is time to begin the sale of power to consumers in the service area of TMI-1 to help with another aspect of public health and safety; that being the elimination of the unfair financial burden to the residential and industrial customers to purchase more expensive replacement power. Fifty eight million dollars would be the immediate savings, annualized at present dollar values, to consumers in Pennsylvania from the restart of TMI-1.

We need to constantly monitor the safe operation of nuclear power and I fully support every effort to ensure public participation in that process. However, I feel that there is a fundamental element of procedural fairness to taxpayers, consumers, and all those involved in the process. That fairness is to recognize that we have exhausted, to the greatest extent possible, every consideration surrounding protection of health and safety.

It is time now to move forward; it is time now to integrate the lessons learned from the TMI-2 failure into our technology, and it is time now to look at the six year public record and make a decision.

Sincerely,

Don Bailey

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

COMMISSIONERS:

Nunzio J. Palladino, Chairman
Thomas M. Roberts
James K. Asselstine
Frederick M. Bernthal
Lando W. Zech, Jr.

'85 MAY 16 P3:02

In the Matter of

METROPOLITAN EDISON COMPANY

(Three Mile Island Nuclear Station, Unit No. 1)

Docket No. 50-289
(Restart)

SERVED MAY 16 1985

MEMORANDUM AND ORDER

CLI-85-08

I. Background and Summary

On June 21, 1984, Marjorie and Norman Aamodt filed a motion with the Commission alleging that releases of airborne radioactive materials from the March 28, 1979 accident at TMI-2 were substantially greater than have been acknowledged and that these releases have lead to an unexpectedly high level of cancer in local residents. The Aamodts based their allegations on door-to-door interviews that Marjorie Aamodt and others conducted of residents of two areas near the TMI-2 facility. The Aamodts requested the Commission to investigate their allegations and to defer a decision on the restart of TMI-1 until the issues they raised had been studied further and fully resolved. On December 13, 1984 the Commission denied the Aamodts' motion to sponsor a new study of health-related issues arising from the TMI-2

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accident. The Commission stated that the "Aamodts had not presented sufficient reliable information to show that previous, more comprehensive and scientific surveys of TMI-2 accident radiation releases are erroneous." CLI-84-22, 20 NRC 1573.[1]

On January 15, 1985 the Aamodts filed a motion asking the Commission to reconsider the December 13 denial of their request. They also requested the Commission to reopen the record in the TMI-1 restart proceeding, asserting that the issues raised by their survey were relevant to "the management competence, emergency planning and health issues" litigated in the restart proceeding. On April 13, 1985, the Aamodts amended their request by submitting additional information.

For the reasons which follow, the motions to reopen the record and to defer a decision on TMI-1 restart are denied.[2]

II. Analysis of Motion to Reopen the Record

The Aamodts claim that the record of the restart proceeding should be reopened to examine health-related issues arising from the TMI-2 accident. The Aamodts allege that death certificates obtained from the Pennsylvania

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[1]Commissioners Asselstine and Bernthal dissented. They would have provided NRC funding to ongoing studies being conducted by the Commonwealth of Pennsylvania's Department of Health.

[2]Should the Commission in the future acquire information regarding the need for any furtner studies along the lines requested by the Aamodts, it will, of course, make its views known along with any appropriate recommendations. The NRC staff is currently evaluating this matter and will be providing recommendations to the Commission shortly. The Commission is also assessing whether the Commission's Advisory Panel for the Decontamination of TMI-2 could provide a useful forum for citizens to raise health-related concerns. These matters are not relevant to the restart proceeding because health effects resulting from the TMI-2 accident are not related to a determination whether TMI-1 can be safely operated today. See II.C, infra.

Department of Health establish that: (1) there is an elevated cancer mortality rate in certain areas surrounding TMI-2; (2) an increased rate of neonatal hypothyroidism in Lancaster County in 1979 resulted from the TMI-2 accident; (3) serious post-accident health effects within and beyond the ten-mile radius of TMI demonstrates the presently-approved emergency plans are inadequate; (4) residents near TMI are suffering adverse health effects from high levels of radiation currently in the environment; and (5) the 5100 degree Fahrenheit temperatures reached within the TMI-2 core during the accident produced elevated levels of fission products and transuranics which have escaped to the environment and could be harmful to the public.

The Aamodts also believe the record should be reopened on an issue relating to the integrity of licensee's management. The Aamodts allege that information developed in the restart proceeding on the Dieckamp mailgram issue demonstrates that licensee personnel lied to the Pennsylvania Bureau of Radiation Protection on the morning of March 28, 1979. The Aamodts maintain that after the Commonwealth had been warned of projected radiation releases of ten (10) rems per hour over Goldsboro, TMI personnel discounted this information by claiming, contrary to fact, that the surveillance teams had been dispatched and had verified that a significant release had not occurred.

Under established Commission practice three factors are considered in determining whether a motion to reopen should be granted: "(1) Is the motion timely; (2) does it address significant safety (or environmental) issues; and (3) might a different result have been reached had the newly preferred material been considered initially." In the Matter of Metropolitan Edison (Three Mile Island Nuclear Station, Unit No. 1), CLI-85-2, 21 NRC 282, 285, n.3 (1985).

The NRC staff opposed the request to reopen the record, arguing that the criteria for reopening the record had not been satisfied. The licensee also opposed reopening of the record on whether licensee personnel lied to Bureau of Radiation Protection, but did not take a position on whether the record should be reopened on the other issues raised by the Aamodts.

A. Timeliness

The central issue raised by the Aamodts relates to their allegation that there are elevated levels of cancer in the TMI area. Their request to reopen the record on that matter is untimely. The Aamodts first presented their concerns regarding cancer levels to the Commission in June of 1984, yet did not request reopening of the record until January of 1985. The Aamodts have not presented any justification for not requesting at that time a reopening of the record.[3]

B. Whether Claims Raise a Significant Safety or Environmental Issue

The Commission has reviewed the material presented by the Aamodts regarding alleged elevated cancer levels in the TMI area and continues to believe that the prior studies are correct in concluding that the number of health effects from radiation releases arising from the TMI-2 accident will be negligible. The Aamodts have not presented information which casts doubt on the previous studies. For example, the Aamodts have not reported when the cancers which form the basis for their allegations were diagnosed relative to

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[3]The Aamodts also have not established when the information they rely on in support of their other claims became available and whether the facts could have been presented to the Commission at an earlier date.

the TMI-2 accident and have not shown that the cancers resulted from the TMI-2 accident. When the cancers arose or were first diagnosed is particularly significant, in light of the obvious fact that cancers which arose prior to the TMI-2 accident cannot be attributed to the accident, and the fact that, even for those cancers arising since the accident, the undisputed scientific evidence is that there is generally a latency period for cancer development following exposure to radiation. Even if additional information, such as date of diagnosis of the cancers, type of cancer, health, occupational, and personal histories of the deceased were available, we believe it is unlikely that statistically and scientifically valid conclusions could be reached regarding the causes of the cancers in the small population groups associated with the Aamodts' informal survey. The epidemiological evidence presented by the Aamodts is fragmentary and anecdotal. As a technical and logical matter, it is not sufficient to support a reasonable doubt as to the adequacy and correctness of the several detailed scientifically conducted studies on which the Commission relied. Therefore, under the circumstances, the Aamodts have not raised a significant safety or environmental concern.

Their other claims similarly fail to raise significant issues. With respect to their allegations that there was a higher rate of neonatal hypothyroidism in Lancaster County in 1979 than there was in the 1981-1983 period, the Pennsylvania Department of Health has analyzed the seven cases of hypothyroidism that arose in 1979 and concluded that they could not be attributed to radiation, but should be attributed instead to factors such as incomplete maturation of thyroid glands and lack of enzymes to synthesize thyroxine. In fact one of the seven cases occurred prior to the accident and another within three months following the accident, a time period too short

for the hypothyroidism to have resulted from the TMI-2 accident. The Aamodts have not provided information that would lead us to question the Department of Health's conclusions.

The Aamodts' allegation that health effects reported by TMI area residents, such as nausea and severe vomiting, resulted from radiation released from the TMI-2 accident that was higher than reported is not supported by available information. The NRC staff estimates that the average radiation dose to an individual within ten miles of the TMI site resulting from the TMI-2 accident was approximately 8 millirems, and the average dose received by individuals within 50 miles was approximately 2 millirems. Based on accepted scientific principles governing the effects of exposure to varying levels of radiation, these dose levels are far too low to be the cause of the kind of adverse health effects cited by the Aamodts. In the absence of other evidence demonstrating a link between the cited health effects and the TMI-2 accident, the Commission must continue to support the findings reached in earlier assessments of radiation releases from the TMI-2 accident.

With respect to the Aamodts' claim that there are currently unacceptably high levels of radiation in the environment near TMI, the NRC staff, the Environmental Protection Agency and the Pennsylvania Department of Environmental Resources conducted an informal field survey with sophisticated radiation monitoring equipment of sites selected by the Aamodts. The agencies concluded that the radiation levels were within the normal range.

The Aamodts also speculate that the high temperatures (in excess of 5000 degrees Fahrenheit) reached within the TMI-2 reactor core during the accident created a "high probability" that transuranic materials were released into the atmosphere. Transuranic materials emit alpha radiation and could be

another possible source of adverse health effects. The NRC staff has examined these allegations and concluded that the likelihood of measurable quantities of transuranic material becoming airborne and subsequently being released into the environment is low. The staff further noted that no measurable quantity of transuranic material other than that associated with normal background levels has been identified in any of the air or soil samples taken around the TMI site during or after the accident. Accordingly, again the Aamodts concerns do not raise a significant issue.

Finally, the Aamodts' claim that the licensee deceived the Pennsylvania Bureau of Radiation Protection concerning radiation measurements on the day of the TMI-2 accident is based on a draft document which was prepared in the course of an NRC investigation conducted in 1980, but before pertinent individuals had been interviewed by the NRC. After the interviews, the staff determined that the facts contained in the working draft were erroneous and concluded that the licensee had not provided erroneous information relating to the Goldsboro dose-rate prediction. The Commission has concluded on the basis of its review of the allegations and the staff's and licensee's responses that the Aamodts' claim of deception is not supported and accordingly does not raise a significant safety issue.

C. Likelihood of Reaching a Different Result

The Commission does not believe that the information presented by the Aamodts in their motion would have led to a different result. With the possible exception of the claim that Metropolitan Edison Company officials deceived Commonwealth officials on TMI-2 accident radiation releases and the

neonatal hypothyroidism issue,[4] the Aamodts' concerns are not relevant to the restart proceeding because health effects resulting from the TMI-2 accident are not related to a determination whether TMI-1 can be safely operated today. As discussed above, the Commission finds that the Aamodts' claims of licensee deception to be without any foundation. With respect to the neonatal hypothyroidism, the information presented by the Aamodts does not form a basis for concluding that the Licensing Board erred in LBP-81-59, 14 NRC 1211, 1596 when it concluded that the alleged increased in neonatal hypothyroidism was not caused by the TMI-2 accident.

For these reasons the Aamodts' motion to reopen the record is denied, as well as its request that the Commission sponsor a health effects study prior to making a restart decision.

Commissioner Asselstine's separate views are attached.

It is so ORDERED.

For the Commission[5]

SAMUEL J. CHILK
Secretary of the Commission

Dated at Washington, D.C.
this 16th day of May 1985.

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[4]The Licensing Board addressed the hypothyroidism issue in the context of evaluating the protective action criteria used by the Commonwealth of Pennsylvania in emergency planning.

[5]Commissioner Roberts was not present for the affirmation of this item, if he had been present, he would have approved.

March 24, 1982

Inaccurate and Inadequate Data on Radioactive Releases and Population Dose Resulting from TMI-2 Accident of March 28, 1979 — Reasons for Concern by Karl Z. Morgan

1- Three of monitors of radioactive release were off-scale.

2- Other Monitors of release were erratic in operation.

3- The filters and activated Charcoal were saturated with water and some were deteriated due to faint fumes making them ineffective in holdup and removal of radioiodine fogas of iodine and noble gases.

4- The 20 TLD stations at time of accident were inadequate to estimate the population dose because:

a) Even if they had had 36 TLD stations (i.e. one at each degree of arc) at a distance of 12 miles (approximate location of nearest city) the stations would have been over 1000 feet apart and could have underestimated the dose at ground level by more than an

order of magnitude unless the height and dimension of the cloud were known with great accuracy at that distance on a minute-by-minute basis.

b) meters at the same station differed in recorded readings due to the passage of the radioactive cloud by as much as 100%. From this we conclude the TLD meters were very unreliable, the geometry and shielding of the stations in reference to the passing cloud were poorly arranged for close estimates and/or there were some variables they did not take into proper account

c) Of the 20 TLD monitoring stations only 2 were at any time anywhere near the "hot" passing cloud. One cannot judge properly the dose to thousands of persons from only two readings. This is especially true since the dose rate at ground level under the passing cloud was changing from minute-to-minute due to changes like geographical

position, height, composition and shape of cloud
d) The TLD's only measured the gamma dose. They did not respond to the beta dose which was three to five times the gamma dose.

5) In estimating the population dose from the TMI-2 accident the background dose (due to cosmic rays and terrestrial sources) was subtracted from the dose recorded by the TLD's as should always be done. However, the background dose varies with season of the year (e.g. with snow cover and early spring thaw) and with weather conditions (e.g. atmospheric inversions). In the official reports the assumed background dose was too large resulting in a considerable underestimation of the dose due to the accident. Also, unsubstantiated assumptions regarding dose due to weapons fallout from the Chinese tests resulted in an underestimation of the dose from the accident.

6) The source term (i.e. radioactivity of gases released during the accident) was much greater than some have assumed because there were several potential points of leakage to the environment and from items 1), 2) and 3) above the early holders

of gases was less than some have assumed. I base my dose estimates on the known inventory of noble gases and iodines in the reactor at 4:00 am when the accident actually began. At this time 81% of the noble gas activity was due to Xe-138 and less than 0.2% was due to Xe-133 (Note: the official reports assume essentially all the population dose was from Xe-133). Even at 1 hour (5:00 a.m.) 36% of the noble gas activity was from Xe-138 and only 0.96% was from Xe-133. Although most others base the population dose primarily on Xe-133, it contributed only 6.7% of the noble gas activity at 8 hours and it was not until 40 hours after the accident began that Xe-133 began to contribute more than 50% of this activity.

* There are similar voids and inconsistancies in the data collected on radioiodine during the TMI-2 accident. I expect all objective scientists are as much amazed as I am when they find that at every turn essential data one needs to estimate the dose either were never collected or are hidden from view of impartial scientists who seek the truth. It would have been so easy to collect this vital information in this early period of

someone interested in providing this information had been in charge of the data gathering during the first 12 hours of the accident. The NRC didn't make its first air measurements (with a helicopter) until 12 hours after the accident began. If there were early releases — and I believe there were — the major doses had already been delivered to the population. I believe it is extremely unfortunate for those of us who seek the truth about the Population dose that those responsible for the safe operation of TMI-2 (if there were such persons) had not taken a lesson from the Windscale accident (October 10, 1957) in which thousands of curies of radioiodine, noble gases and other radionuclides such as Sr-90, Sr-89, Cs-137 escaped into the environment. I was asked to go to England at this time as an observer-consultant and Drs Morley, McLain, Roberts, etc emphasized to me their regrets that there was some delay in getting their light planes airborne immediately after the accident. During the 29 years I was Director of the Health Physics Division of Oak Ridge

Natural Laboratory we found during our emergency drills we could get our light planes equipped with survey instruments aboard within ½ hour. If they had collected air samples on activated charcoal or in evacuated chambers during the first 3 hours of the accident in the air pattern around TMI-2 and had these samples been analyzed with a GeLi detector, the data would remove many of the question marks regarding the population dose. Certainly members of the public who may develop malignances during the next 50 years and who suspect their cancers were caused by this radiation dose cannot be at fault because proper measurements were never made and as a consequence the dose is and never can be known with absolute certainty within a factor of 100!

7. I believe the estimates of release of radioactive noble gases and radioiodine made by Dr Takeshi are more consistent with what one would expect from the

radionuclide inventory of the TMI-2 reactor and likely release through a damaged fuel rod-cap system than the official estimates of the NRC and its contractors.

8- The wind was blowing at about 2 MPH in the W-NW direction or toward the nearest large city of Harrisburgh, 12 miles away- during this early critical period, what valuable information was not being collected. Thus thousands of unaccounted- for person rems probably were delivered in the early period.

9- As mentioned in 4(d) above, the TLD's at the 20 TMI-2 monitoring stations did not respond to beta dose. However, NRC contractors estimated the beta dose at Main Gate 2 only 75 mrad and assumed the dose was from Xe-133 beta with a mean energy of only 0.346 MeV. They should have considered the dose at lesser depths where much of the skin radiation is located and at greater depths from Xe-138 (E_β=2.4 MeV) with 1 cm range in tissue where both the beta

and lenses of the eyes were in the target area. Exposure of skin melanoma is of considerable concern because of the risk of causing Malignant melanoma which unlike other skin cancers (basal cell and squamous cell carcinoma) does not usually respond successfully to medical treatment.

10- The NRC brushes off the similarities of TMI-2 accident damage to the community, to farm animals, Etc. However, farmers in the TMI-2 area should not be held irresponsible for not having collected dose data the NRC and the TMI-2 operators failed to collect. Studies of I-131 uptake by cows living in the TMI-2 area will bear strongly against the NRC claims. In a study 111 out of 96 farmers reported respiratory damage to their live stock and crops as well damages have gone unnoticed in most cases.

11- As mentioned above there are voids and inconsistencies in the radiation data

during the early period that may be as serious a missing data relative to the noble gases. The short lived radioiodides (e.g. I-132, I-133 and I-135) could have made a large contribution to total body dose both from external and internal exposure (i.e. internal exposure from the short lived radioiodines is only to the total body and not the thyroid). The Kemeny Report underscores the inadequacy of the stack and radioactive emission flow monitors and the Rogovin Report is even more critical of this deficiency, pointing out that the stack monitor HP-219 which monitored the charcoal filter system for radioiodine and noble gas went off scale about 7:45 and, even worse, there were six early time periods in which the charcoal sample cartridges were lost (Note: mabe "lost" was not the proper word) or not analyzed soon enough to detect the short lived radionuclides. Also, there were filter by passes which opened sporadically in the early peri-

12- Conclusion

I have the general observations regarding the TMI-2 accident:

1) The probability of such an accident is at least as large as presently indicated by the TMI-2 accident in 1979, i.e. 3×10^{-3} or 3 chances per 1000 reactor years of operation. This means that with 80 nuclear power plants operating in the US we can expect on the average one such accident every 4 years in the US.

2) I consider Sea Takeshi's estimate of 45 billion curies of noble gas release to be much on the low side. The estimate of NRC was only 12 billion curies.

3) I believe Sea Takeshi's estimate of 64,000 Ci of radioiodine release may be on the low side if the charcoal hold up when wet was as poor as I suspect it was (NRC estimates only 16.7 Ci of iodine release)

4) Because of poor instrumentation one cannot make very meaningful estimates of the total body population dose. I strongly suspect Sea Takeshi's estimate of 16,200 person-rem* is on the low side (the NRC estimate was 1600 to 5800 rem)

5) I suspect the thyroid population dose was at least 100 times the NRC estimate of 1060 rem.

6) I estimate the total radiation induced lethal cancers (excluding thyroid carcinomas) will be at least 15 (the NRC estimate was 0.10 to 2.4) and the total cancers well over 100.

7) I expect the final cost will be about $10 billion.

* Dr. Whiting showed that correction of background dose due to higher Rn-220 values during spring thaw would increase Takeshi's to 35,000 person-rems

(Letter from Centers for Desease Control
to Dr. Bruce Molholt,(see page 2), provided
under Aamodt FOIA request)

January 7, 1985

[redacted]

In reply to your December 17 letter, I have no control over the Nuclear Regulatory Commission's statements about our review of the Aamodt study. Upon reviewing my letter (copy enclosed), I agree it expresses reservations about the data collection, the analysis, and the interpretation presented in the Aamodt report. I still have those reservations.

With regard to your first point, I have no information about reconfirmation of cancer deaths after completion of the study. Those data were not in the report. The question remains: how were the cancer deaths reconfirmed? Were medical records reviewed to ascertain if the cancers were proven by tissue examination and diagnosed after the Three Mile Island (TMI) Accident? The TMI Accident cannot be blamed as the cause of a cancer if the cancer was diagnosed before the TMI Accident, even though the death may have occurred afterwards. Even if some of the cancer cases were diagnosed after the accident, the relatively brief latent period between the accident and date of diagnosis (less than 6 years) is inconsistent with most current theories of human cancer development that assume a longer average latent period.

Even though [redacted] has reviewed 12 of 20 death certificates (60%) the important data item is when the patient was diagnosed with cancer, not when the patient died. Also, 8 (40%) of the 20 cancer deaths have not had, according to your letter, even a review of their death certificates.

I do agree that if all the deaths were confirmed by medical records, then this would be a statistically significant increase.

We have continued to collaborate with the Pennsylvania State Department of Health to follow-up the most likely exposed populations (within 5 miles) around the TMI site. We collaborated on a census of this population inquiring about evacuation, time spent in the area, past medical and reproductive history. The State Department of Health has continued this follow-up.

Finally, suspicions of an increased frequency of disease should be reported to the State Department of Health for their evaluation since by law they are responsible. CDC will help the State investigate such suspicions when the State requests it.

Sincerely yours,

Glyn G. Caldwell, M.D.
Assistant Director for Epidemiology
Chronic Diseases Division
Center for Environmental Health

Enclosure

cc:
Dr. Zack
Dr. Tokukata
Dr. Mills

CDC:CEH:CDD:GCaldwell:dk:1/2/85:Doc. 6080D