

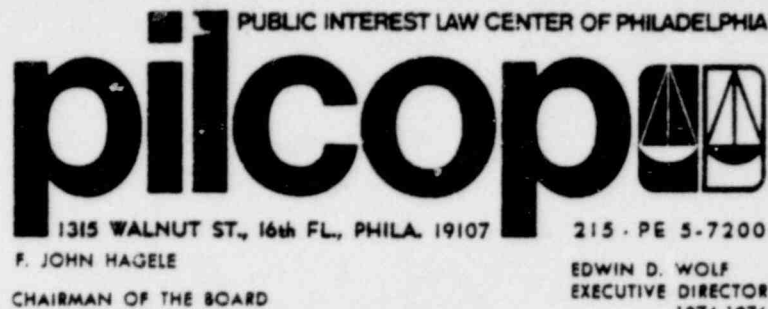
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14 April 1980

Dr. Richard H. Vollmer
Director, Three Mile Island Support
NRR, U.S. Nuclear Regulatory Commission
1717 H Street, N.W.
Washington, D. C. 20555

Re: COMMENT TO ENVIRONMENTAL ASSESSMENT
FOR THE DECONTAMINATION OF THE THREE
MILE ISLAND UNIT 2 REACTOR BUILDING
ATMOSPHERE.

Dear Dr. Vollmer,

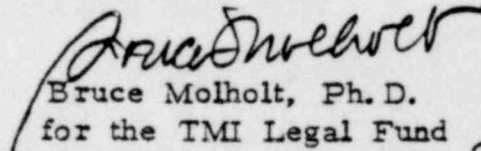
Enclosed you will please find two copies of our comments on the Nuclear Regulatory Commission's Environmental Assessment for the decontamination of the TMI-2 containment building atmosphere.

Under separate cover you will receive our comments to Addendum 2, concerning the proposed plan to accelerate venting from 60 to 5 days.

For your convenience, an outline (Table of Contents) is on the front cover of the comments. In addition to the comments per se we have included a complete set of references and appended sections which include affidavits concerning the adverse health effects of venting and seven appendices containing primarily newsclippings which deal with the material cited.

If you have any question concerning these comments, please do not hesitate to contact me.

Yours sincerely,


Bruce Molholt, Ph. D.
for the TMI Legal Fund

Enclosures

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COMMENT TO

NUREG-0662

THE NUCLEAR REGULATORY COMMISSION'S
ENVIRONMENTAL ASSESSMENT FOR THE DECONTAMINATION
OF THE THREE MILE ISLAND UNIT 2 REACTOR
BUILDING ATMOSPHERE

TMI LEGAL FUND

TALLE OF CONTENTS

PAGE

I.	Summary Statement	2
II.	Introduction	3
III.	Potential Health Effects of Proposed Venting	8
IV.	Insufficiency of the Environmental Assessment Data Base	28
V.	Meteorologic Criteria for Venting	34
VI.	Monitoring the Release of Krypton-85	38
VII.	Lack of Necessity of Venting	40
VIII.	Alternatives to Venting	43
IX.	References	49
X.	Affidavits	
XI.	Appendices	A - G

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TMI LEGAL FUND

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I. SUMMARY STATEMENT

The NRC Environmental Assessment proposes venting as an urgently needed, superior method for the removal of 57,000 curies of krypton-85 gas from the TMI-2 containment building atmosphere. The NRC proposal is replete with errors of both fact and judgement.

1) There is no emergency at hand. Data may be collected and containment facility equipment may be inspected and maintained without removal of the krypton-85 gas. There is adequate time to implement an alternative system for krypton-85 removal from the containment building atmosphere.

2) Venting of krypton-85 gas into the air which surrounds TMI-2 carries definite genetic and carcinogenic risks to the people of nearby communities. For a population which has already endured severe psychological stress, the proposed venting will only exacerbate this state of stress.

3) The proposed venting cannot be controlled due to meteorologic uncertainty. The monitoring as described by the NRC is incapable of providing sufficient information for the protection of people in communities surrounding TMI-2.

We urge that data collection be initiated, that the containment building equipment be inspected and maintenance begun at TMI-2, but that the krypton-85 gas be retained until an alternative system has been installed for its safe and efficient removal.

II. INTRODUCTION

The Nuclear Regulatory Commission's Environmental Assessment for Decontamination of the Three Mile Island Unit 2 Reactor Building Atmosphere is grounded upon the premise that immediate, less restricted access to the containment facility is necessary. Once that premise is accepted, it follows that krypton-85 in the atmosphere of the containment building must be vented, as the licensee proposes, because of the length of time needed to install equipment in order to remove the gas by alternative methods. This premise is false. We do not disagree that immediate access is at least highly desirable, if not necessary. Nor do we disagree that krypton-85 will have to be removed eventually from the containment building in order to proceed with the clean-up operation. We do not agree, however, that less restricted access is immediately necessary. Rather, now, without venting, the containment building can be entered for the purposes of inspection, maintenance and data gathering.

Unlike the general public, workers who enter the containment facility can be protectively clothed and equipped with self-contained breathing apparatus. Thus they will be protected from beta-particles emitted from krypton-85, which particles comprise 99.6 percent of the emitted irradiations and constitute the greater health hazard. In addition, these radiation workers will be carefully monitored for exposure to nuclear irradiation, an advantage not available to the general public.

While inspection, maintenance and data gathering proceed, proper equipment can be installed at the TMI-2 site for safe removal of the krypton-85 gas without adverse health effects to surrounding communities. By the time this gas has been removed, a comprehensive Environmental Impact Statement on the entire clean-up process should have been completed. At this time actual clean-up can begin, with the assurance that the public will not unduly suffer as a result of that clean-up.

The NRC's refusal to acknowledge the feasibility of entry into the containment facility without venting places the agency, and the public it is supposed to protect, in a classic Catch-22. The public is asked to choose between intentional release of krypton-85 gas into the air that they breathe and the potential for further uncontrolled releases. The public is further asked to believe that intentional releases are superior to uncontrolled releases.

No release of krypton-85 gas is acceptable, intentional or otherwise. No release is necessary, intentional or otherwise.

The Environmental Assessment contains nothing to support the conclusion that an intentional release can be controlled in such a way as to prevent human and other environmental exposure to krypton-85. We believe that there are no such data in the Environmental Assessment because *no such data exist*. To permit krypton-85 releases, which involve some health dangers, without necessity is inconsistent with the ALARA standards, which require that radiation releases be kept to the absolute minimum reasonable.

There is a lack of supporting data for many other statements put forth and conclusions drawn in the Environmental Assessment. (Specific instances will be addressed in *Section IV. Insufficiency of the Environmental Assessment Data Base.*) Without supporting data, the public cannot possibly evaluate the conclusions drawn by the NRC. Hence, the public right to comment is rendered meaningless.

It appears that the reason for the lack of supporting data lies in the fact that the NRC staff has relied largely, if not entirely, on information it has received from its licensee in assessing the request for venting, its necessity, and alternative methods for the removal of krypton-85 gas. As a result, throughout the document, the virtues of venting krypton-85 from the TMI-2 containment building atmosphere are extolled, while potential adverse health effects are either downplayed or blatantly ignored. Although four alternative methods are considered in the Assessment document, in these cases the potential adverse health effects are maximized, as are their costs and delays in implementation.

It must be obvious to all that the licensee has a particularly strong vested interest in skewing, at least subconsciously, the information it submits to the NRC in order that the least expensive alternative is rendered most tenable. For this reason it is imperative that the NRC seek independent assessment of the issues at stake in venting of krypton-85. It is time for the agency to take charge of the most severe commercial nuclear accident in the history of the United States,

and, in so doing, to make public health, safety and welfare top priorities of the Nuclear Regulatory Commission. The failure of the NRC to do so only hastens the demise of the nuclear industry.

Even though the NRC has conducted one psychological survey of its own, is aware of 14 other studies on the psychological stress induced during the accident at TMI-2 and in the year afterward, and has been confronted by hostility in public meetings concerning the proposed venting of krypton-85, it remains oblivious to these concerns in the Environmental Assessment. (These considerations will be expanded in *Section III.B. Psychological Effects of Venting*). Through continued display of this struthian attitude, the NRC only aids and abets public distrust and hysteria.

Finally, it should be made clear that the NRC is guilty of illegal segmentation of the TMI-2 clean-up process in the issuance of this Environmental Assessment. Nuclear Regulatory Commission regulations, N.E.P.A. and CEQ guidelines all require that the NRC prepare a programmatic Environmental Impact Statement *prior to any clean-up actions*, where such actions are major and will significantly affect the quality of the human environment. Through its isolation of the krypton-85 venting from the TMI-2 accident and the clean-up process itself, the NRC ignores the fact that the public and the environment have already been exposed to huge quantities of irradiation, and that future additional exposures are likely as the clean-up proceeds. At the time of the accident and the two weeks following, the public and the environment were exposed to at least 20 million curies of

released radionuclides, mostly fission products of uranium-235. Given these huge prior releases of irradiation, it is totally unacceptable for the NRC to rely as it does upon:

- the requirements of 10 CFR Part 20,
- the design objectives of Appendix I to 10 CFR Part 50,
- the limits of 10 CFR Part 100, and
- the applicable requirements of 40 CFR Part 190.10;

in determination of the nature of further planned releases of radionuclides which it will permit to be released. To do this is a misplaced attempt by the NRC to hide behind extant, irrelevant regulations and to ignore the realities of the accident at Three Mile Island. (See *Appendix E. NRC Advocacy.*)

Although krypton-85 emissions include gamma irradiation only 0.4 percent of the time, there is sufficient krypton-85 in the containment building atmosphere to provide about 0.8 rem/hour whole body gamma irradiation. Another 1.2 rem/hour whole body gamma irradiation comes from the containment walls and sump. Hence, venting the krypton-85 would decrease total gamma irradiation by only 40 percent, allowing workers 2.5 hours of access time instead of the 1.5 hours they have at present.

III.	POTENTIAL HEALTH EFFECTS OF PROPOSED VENTING	
		<u>Page</u>
A.	Adverse Health Effects of Krypton-85	8
B.	Adverse Health Effects of Low Levels of Irradiation..	12
C.	Psychological Effects of Venting	19
D.	Risk to Workers.....	20
E.	Increased Risk to People in Surrounding Communities..	23

"Despite widespread recognition of the hazards of radiation, there is no comprehensive program to protect the public from its hazards."

- E. B. Staats, Comptroller General
U.S. General Accounting Office (1)

A. Adverse Health Effects of Krypton-85

The major contaminating radionuclide of the containment building atmosphere at TMI-2 is krypton-85, a noble gas. In this sub-section, we discuss adverse health effects of krypton-85 and xenon-133, another radioactive, noble gas released by nuclear fission of uranium-235. We also briefly discuss other radioactive isotopes which may contaminate the containment building atmosphere as aerosols or particulates derived from the sump. Since krypton-85, if released into the environment, will interact with humans as a source of low level irradiation, these effects in general will be discussed in the following sub-section.

Common misconception has it that radioactive, noble gases are not dangerous because they neither travel through the food

chain nor are they metabolized by the human body. This is obviously not the attitude of the NRC as they propose to vent the containment facility of krypton-85 in order to render the building safer for data collection and equipment inspection and maintenance. Yet, if this 57,000 curies of krypton-85 is released, it will persist in the environment for long periods due to its slow rate of decay (half-life of 10.7 years) and its inertness (2).

Krypton-85 is dangerous any time it becomes juxtaposed with any portion of the human body. The gas decays to rubidium-85, a stable isotope, releasing an energetic (0.67 MeV) beta-particle in the process. Rarely, only 4 per 1,000 disintegrations, krypton-85 also releases a gamma ray as it decays. Like any other radionuclide, krypton-85 is especially dangerous in high concentrations, as in the containment facility atmosphere at present. As it is more than five times as dense as air, krypton-85 tends to seek out and accumulate in low-lying areas unless adequately dispersed by high convection and therefore may also be found in high concentrations in the environment if the proposed venting is initiated (See *Section V. Meteorologic Criteria for Venting*).

The major target organ at risk to high concentrations of atmospheric krypton-85 is the lung, which will be exposed to both beta-particles and gamma rays resulting from radioisotopic decay. Outside the lung, these beta-particles travel less than 6 feet in air and are blocked by clothing, so that exposed skin is the only organ affected if within a few feet of the isotope. The beta-particle travels less than 1/10th inch in human tissue (3).

The gamma rays, on the other hand, may travel for miles in air and are not blocked by protective clothing. The human body is transparent to gamma irradiation. Hence, to a protectively garbed worker or to a person more than six feet away from the plume, only the gamma irradiation of krypton-85 is important, whereas for an unprotected worker or a person enveloped in a krypton-85-containing plume, beta-particle emissions are more important.

Although krypton-85 is poorly soluble in water, it may be transported by the circulatory system to fatty parts of the body where it accumulates (4). This is due to the partition coefficient of krypton-85 of 0.5 air-to-fat (3). Krypton-85 retention by experimental subjects has been shown to be proportional to their percent body fat (5). Fat pads which become impregnated by krypton-85 for long periods include those of upper thighs and buttocks and those of the female breast (6). These areas are important because thighs and buttocks reside close to the gonads of both men and women, and irradiations arising there may give rise to birth defects due to irradiation of developing germ cells. The female breast is acutely sensitive to radiation-induced carcinogenesis (7). In the case of this organ, beta-particles, which produce much more damage per ion track than the gamma rays,* are emitted less than 1/10th of an inch from their target epithelial cells in the mammary ducts or glands (8).

*Ionizations (free radicals) per ion track are measured in terms of linear energy transfer (LET), which determine the radiobiological effectiveness (RBE) of radiation.

Although krypton-85 is not employed for radiospirometry, another krypton isotope, krypton-81, is currently being adopted with some success (9, 10). More epidemiologic evidence is available from studies with another radioactive, noble gas, xenon-133, which has been used for the past six years in radiospirometry (11). Initial results show substantial retention of xenon-133 by lung (12) and bladder (13) and a correlation with specific organ site carcinogenicity (14). Another radioactive, noble gas, radon-222, has been well-studied and is highly carcinogenic, especially for the lungs. As radon-222, unlike krypton-85, is transuranic, we shall not discuss its carcinogenic properties further here.*

In conclusion, individuals who have breathed krypton-85 are at an increased risk to cancer of the lung and of organ sites with high fat content. They also are at increased risk to bear children with birth defects due to genetic mutations introduced into the germ line by irradiation of gonadal tissue.

No mention was made in the Environmental Assessment of other potential atmospheric contaminants in the containment building, such as strontium-90, cesium-137 or any of the transuranics, such as plutonium-244, which are present in the sump due to both normal contamination of coolant water by fission products and wide-spread disintegration of fuel-rod cladding.** These reactive radioisotopes may contaminate the TMI-2 containment atmosphere as aerosols or particulates maintained by the 75°F, 90 percent humid condition.

*Although releasing an alpha-particle, its RBE is not too much greater than that of the 0.67 MeV beta of krypton-85.

**Resnikoff (15) has estimated this to be 75% on the basis of krypton-85 levels rather than the 31% estimate of NUREG-0557.

The Environmental Assessment is incomplete without a description of the atmospheric concentration of these isotopes and to what degree they will be removed by filtration prior to the proposed venting.

B. Adverse Health Effects of Low Levels of Irradiation*

"Exposure to ionizing radiation, in any dose except zero, results in a transfer of energy in discrete quanta, which may be responsible for DNA strand breakage and possible ultimate carcinogenesis." (16)

Although there has been a great deal of controversy surrounding the adverse health effects of low levels of human irradiation, it has become increasingly clear the NO LEVEL OF RADIATION IS SAFE (17-20). Ionizing radiation interacts with human tissue by creating a track of free radicals within the aqueous environment of cells. From less than a hundred to several tens of thousands of free radicals may be created per ion track as the particle or ray transcends human tissue. The number of free radicals produced per ion track depends upon the energy of the particle or ray -- its mass, speed and charge if it is particulate (alpha or beta); or its frequency if it is a photon (gamma or x-irradiation). It is rare that the particle or ray itself intercepts DNA, the chemical blueprint which passes along genetic information as cells divide and individuals produce progeny. More often, genetic damage is induced by radiation when one of

*See appended affidavit by Karl Z. Morgan, Ph.D.

the highly reactive free radicals produced along the ionization track diffuses a short distance and interacts with a base in DNA to alter it functionally. Altered bases in DNA are unable to pair with complementary bases in the opposite strand of the DNA duplex and are often repaired by excision and replacement utilizing the opposite DNA strand as template. Following the excision of a damaged DNA base, it is occasionally replaced at random with any of the four possibilities--adenine, guanine, cytosine or thymine.* This random replacement of a DNA base which has been damaged by interaction with an irradiation-produced free radical forms the functional basis of radiation-induced genotoxic effects, including mutagenesis, carcinogenesis and teratogenesis. (For a detailed analysis of the ideas summarized in this paragraph, please consult references 21-24.)

The above mechanism is described in detail in order to demonstrate how beta-particles or gamma rays emitted from krypton-85 are able to induce long-term adverse health effects in human populations, even at low levels of contamination by the radioactive gas. There is no threshold below which krypton-85 or radiation from any other source is not dangerous. This lack of a threshold for carcinogenesis has been difficult to prove experimentally due to the large number of test animals which must be employed to show statistically significant effects at low doses. As the major mechanisms of radiation-induced carcinogenesis are equivalent to

*Error-prone repair of base damage in DNA appears to be correlated with sensitive stages in the cellular replication cycle when the DNA is not accessible to normal repair enzymes (25).

those of chemical carcinogenesis, i.e., transmission of the radiation-induced insult by chemical free radicals, we may gain significant factual insight into the lack of a carcinogenic threshold from the recent "ED₀₁ study"* performed with 24,000 mice and the chemical carcinogen 2-acetylaminofluorene (2-AAF). In this study, the lowest dose of 2-AAF utilized, 30 ppm, was so weakly carcinogenic that 5,000 mice were employed for this concentration alone. The results of this massive study, costing over \$1 million, conclusively prove that there is no threshold below which chemical carcinogens fail to induce cancer, provided one employs a large enough population to see the effect (26). The ED₀₁ study helps to define why low doses of radiation, which produce low concentrations of free radicals, have lower, but demonstrable, adverse health effects proportional to those seen at higher doses.

There are several human epidemiologic studies with ionizing radiation which confirm the adverse health effects deriving from low level exposures. From their evaluation of the benefits vs. the carcinogenic risks of mammography in 280,000 women involved in the Breast Cancer Detection Demonstration Project (BCDDP), the American Cancer Society and the National Cancer Institute jointly concluded that the risks outweighed the benefits for women under 50 who were asymptomatic and without family history of breast cancer (27). Despite the low doses of

*Effective dose which affects one percent of the experimental test population.

x-rays used in mammography (a few millirems whole body irradiation, or a fraction of the annual background irradiation), it was concluded that more cancers were being induced by the procedure than were being detected in younger, asymptomatic women. This lack of a threshold for mammography frequency vs. incidence of breast cancer in women may be seen in the following Figure (28).

Figure 1

BREAST CANCER INCIDENCE AS A FUNCTION OF
NUMBER OF MAMMOGRAPHIES (28)

520 W. H. M. Ellett and A. C. B. Richardson

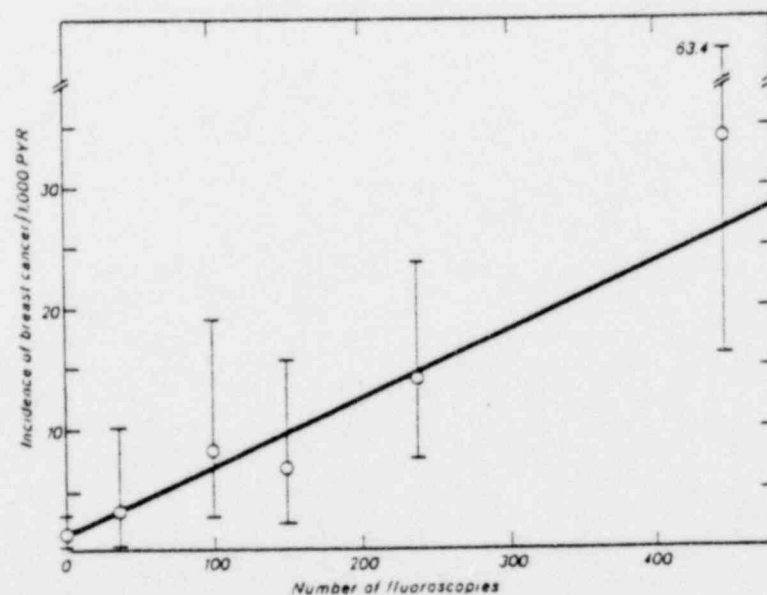


Figure 2

Incidence of breast cancer per 1000 persons per year at risk (PYR). The error bars represent 90% confidence intervals, and the line is the best-fitting, weighted, least-squares regression line.

Recently, similar restrictions have been suggested for other radiological diagnostic procedures by the American Cancer Society (29). These radiological diagnostic procedures, such as annual chest and dental examinations by x-ray, also expose people to fractions of the radiation dosages received from natural background sources. Yet they are deemed carcinogenic hazards by the ACS and may be inducing more long-term adverse health effects than they discover, if over-utilized. It has long been observed that radiologists, even with modern shielding, are at an increased risk to develop cancer (30).

The comprehensive report by the U.S. National Academy of Sciences on the biological effects of ionizing radiation (BEIR) concluded that low level irradiation from all sources combined would eventually be responsible for the induction of 220,000 cancers in our present population (31). Background irradiation is a fact of life, but is by no means innocuous. Background irradiation fluctuations have been associated with human cancers (32), congenital malformations (33) and birth defects (34). *The human genetic legacy is a fragile thread which accumulates rather than casts out genetic aberrations. We cannot tolerate any further insult to our pool of DNA, this core of our genetic legacy.*

A continuing source of contamination with low level irradiation derives from fission products associated with atomic testing programs and the production of power from nuclear plants. Sections of southwestern Utah suffered 2.5 fold increases in leukemia in the years following atomic testing at the Nevada test site some 100 miles to the west (35.)* Following a large

*See Appendix B. Atmospheric Testing.

series of atmospheric tests in the southern Enewetak atoll, children were born without thyroid glands (athyroidism) in the northern atoll (36). A similar iodine-131 release from TMI-2 for two weeks after the accident may have increased the number of hypothyroid births in Lancaster county to ten times the expected frequency (37). In four counties downwind from the reactor (Lehigh, Lebanon, Schuylkill and Berks), there were no cases of hypothyroidism before the TMI-2 accident and eight cases after (equivalent nine month periods, ref. 37). In 56 counties of Pennsylvania upwind from the reactor, the hypothyroidism frequency was eight in the nine months before and six in the nine months after the accident, in which it was admitted that 15 curies of iodine-131 were released* (38). (See *Appendix C. Fetal Hypothyroidism.*)

Similar increases in adverse long-term health effects have been seen in high cancer rates, especially leukemia, multiple myeloma and pancreatic cancer, among workers in Hanford and Portsmouth nuclear naval shipyards (39-43).

Perhaps the most compelling treatise on the "Biological Effects of (Low Levels of) Ionizing Radiation" may be found in the Heidelberg Report (44), which cites some 40 references in addition to those described above. The essential conclusion of this comprehensive treatise is as follows:

"Even small radiation doses (mrem range) are able to cause impairment of vital organs and manifest

*Takeshi (45) has independently calculated that over 5,000 curies of iodine-131 were released on the basis of xenon-133 levels.

and fatal disorders of the organism. Many results of radiobiological experiments and extensive statistics prove this. In particular, many irradiation experiments have been performed on animals in order to determine the risk to man of radiological testing and handling methods." (44)

C. Psychological Effects of Venting

Although their findings may have been premature,* the Kemeny Commission concluded that the only adverse health effect of the accident at TMI-2 was severe psychological stress (38). This severe psychological distress continues to exist today, exacerbated each time the citizens of communities proximate to TMI-2 learn of accidental or new or planned releases of radio-nuclides into their air or water supplies.

The Nuclear Regulatory Commission has sponsored a study of psychological stress as a result of the TMI accident (45). Yet no information from this study, or 14 other studies acknowledged in the Addendum 1, was included in either the Environmental Assessment or its addenda (see *Section IV. Insufficiency of the Environmental Assessment Data Base*). From recent hearings with the NRC, both in Washington, D.C., and in the communities proximate to TMI-2, it is safe to assume that a great measure of distrust exists and that severe psychological stress has continued and will increase in the eventuality that the proposed venting is initiated.

*The Report was issued seven months after the accident, two months short of normal human gestation and 5-30 years short of the latent period for cancer development.

The adverse health effects induced by severe psychological stress are difficult to measure, but they are capable of profoundly and irreparably changing peoples' lives. There is no doubt that the proposed release of krypton-85 gas into communities adjacent to TMI-2 will adversely affect the psychological health of people residing in these communities. For this reason alone, krypton-85 should not be removed from the TMI-2 containment building atmosphere by venting or purging into the outside air.

For further information relevant to this sub-section, please consult the attached affidavit by Robert W. Colman, Ph.D., a psychologist registered in the Commonwealth of Pennsylvania and Appendix A. Psychological Stress.

D. Risk to Workers

The following Table outlines the levels of radiation hazards to workers inside the TMI-2 containment building atmosphere before and after the proposed venting of krypton-85 gas.

Table 1

TMI-2 CONTAINMENT FACILITY ATMOSPHERIC IRRADIATIONS

<u>Protective Clothing</u>	<u>Venting</u>	<u>Kr-85 beta</u>	<u>Kr-85 gamma</u>	<u>Other gamma</u>
Without	Before	150 rad/hr*	0.8 rem/hr	1.2 rem/hr
	After	0 rad/hr	0.0 rem/hr	1.2 rem/hr
With	Before	0 rad/hr	0.8 rem/hr	1.2 rem/hr
	After	0 rad/hr	0.0 rem/hr	1.2 rem/hr

*Skin dose, equivalent to about 75 rad/hr lung dose (3)

It is readily seen from Table 1 that the dangers from exposure to krypton-85 beta-particles in the containment facility, which are by far the more hazardous to human health, may be reduced to zero either by the proposed venting or by protectively suiting the workers in decontamination suits equipped with self-contained breathing apparatus. The health risks to workers inside the containment facility from gamma irradiation are not diminished by protective clothing. As 60 percent of this gamma irradiation (1.2 rem/hr whole body dose) emanates from the containment facility walls and sump, the proposed venting of krypton-85 would reduce gamma exposure by 40 percent.*

If a worker were to receive his/her permissible quarterly quota of gamma irradiation (3 rem, assuming protective clothing and extrinsic air supply), it would be possible to remain in the containment building for 1.5 hours at present. Venting of the krypton-85 gas to the outside air would only increase this maximal exposure time to 2.5 hours.** Thus, by hiring more workers to do the data collection, maintenance and survey work, the licensee can avoid exposing the public unnecessarily to krypton-85, in line with the tenets of the ALARA concept, while at the same time not increasing the adverse health risks to each individual worker.

*The Haller Report (46) puts the krypton-85 contribution to gamma irradiation at 25 percent, which figure Commissioner Hendrie has judged too small (47). We derive 40 percent from the estimates of a spokesman for the re-entry team (48).

**The re-entry team spokesman's estimate was an increase from 1 to 1.5 - 1.75 hours (48).

Radiation worker access times of up to 90 minutes are long in terms of routine inspection, maintenance and repair activities associated with the nuclear industry (49). In some cases, such as the routine welding of thermal exchanger plates which lose their seals frequently due to stress induced by high temperature differentials on the two sides of the plates, these worker access times are as short as one minute (50). The gamma irradiation levels inside the containment facility at TMI-2 at present are not high in terms of the nuclear industry.

It should be made clear here that we are not arguing that it is safe for radiation workers to go into the containment facility for any period of time, as *any amount of radiation exposure is dangerous to human health*. We are merely arguing that, given that the licensee must gather data and both inspect and maintain extant equipment while preparing a comprehensive Environmental Impact Statement for the clean-up operation, these activities may proceed at present in the absence of venting the krypton-85 without further increasing the risk to workers.

The worker is at a distinct advantage when dealing with the health hazards of krypton-85 as compared to the citizen outside the containment facility. He can be protectively clothed in an air-tight suit completely impermeable to penetration by either atoms of krypton-85 gas or the beta-particles emitted in 99.6 percent of the disintegrations by the gas. He can be monitored for gamma irradiation arising from 0.4 percent of the krypton-85 disintegrations in order to limit whole body exposure. These advantages protect the worker from skin, lung and whole body

doses of irradiations associated with krypton-85 gas.

In addition, the worker has agreed by contract to enter the containment facility and take part in the data collection and equipment inspection and maintenance, activities for which he will be compensated by the licensee. No such informed consent exists for the public, however, who have neither approved of the proposed venting nor are guaranteed compensation should they suffer adverse health effects from the krypton-85 gas.

"We just don't expose people to radiation.

It has to be for a really good reason."

- A physicist employed by GPU,
parent utility of the licensee (51).

We agree totally with the spirit of this sentiment, not only for the workers inside the containment facility, but also for the public on the outside as well.

E. Increased Risk to People in Surrounding Communities

The accident at TMI-2 and the contamination of the environment by radionuclides therefrom will provide the first large prospective study of low-level radiation health effects on human populations. This is the conclusion of an article published in the British Medical Journal (52). The population mentioned are innocent people, potentially victimized by an accident in which they had no part, who are now asked once again to be used further as guinea pigs by the Environmental Assessment.

As was discussed in *Sub-section III.B.*, there is no known threshold below which radiation fails to induce cancer. This lack of a threshold is inherent in the "person-rem" concept, utilized

extensively throughout the NRC Environmental Assessment. The person-rem concept treats the product of population and radiation dose to which the population is exposed as a constant, regardless of population size or radiation dose. For example, *the total adverse health effects* of 1,000 person-rem will be the same whether 10 people are exposed to 100 rems each, or 10,000 people are exposed to 100 millirems. Of course the adverse health effects in the 10 people exposed to 100 rems each will be easier to find due to the small population size and a high proportion that will be adversely affected. Yet the same magnitude of total adverse health effects will be manifest in the 10,000 people receiving 100 millirems, albeit now a much smaller fraction of this larger populace will be affected. The reason the person-rem concept is valid is that the targets for radiation-induced carcinogenesis (or mutagenesis) are not people, but *cells*. The mechanisms by which radiation irreversibly transforms cells to the malignant state were discussed in *Sub-section III.B*.

Continuing our example above, if 1,000 person-rem irreversibly alter a total of ten human cells, these ten altered malignant precursor cells could be distributed one each to all 10 in the smaller group receiving 100 rems. In this case, each individual will potentially develop cancer, dependent upon such vagaries as the immunological health of the individuals during the subsequent 5 - 30 year latent period for cancer development. More than likely, because of random probabilities (determined by the Poisson equation), in our smaller group of 10, two will

develop two malignant precursor cells due to carcinogenic "hits" by radiation, six more in the group of 10 will develop one malignant precursor clone each, and two will escape unscathed. With the 10,000 population exposed to 100 millirems each, however, the ten malignant precursor cells will be distributed to ten different individuals. So, in essence, the number of potentially afflicted individuals increases slightly the *lower* the irradiation dose.*

Cells which are irreversibly altered in their DNA may either give rise to cancers, if they are somatic cells, or birth defects in subsequent generations, if they are spermatogenic or oögenic cells. A SINGLE ALTERED CELL FORMS THE BASIS OF BOTH CANCERS AND BIRTH DEFECTS. In addition, if a fetus is irradiated, a clone of cells arising from the irreversibly afflicted cell may be obliterated or severely altered, forming the functional basis of congenital malformations. It is well known that radiation is carcinogenic, mutagenic and teratogenic. The point here is that, as a single cell is the target of such radiation-induced effects, and, as there is no threshold below which radiation fails to induce carcinogenic, mutagenic or teratogenic damage, *the beta-particles and gamma rays emanating from krypton-85 in the environment carry a real and measurable health threat to all people in communities surrounding TMI-2 who come in contact with krypton-85.* There is a potential

*This is seen even more clearly if only one person receives the entire 1,000 person-rem, i.e. a dose of 1,000 rems. The total effect is now one death, since 500 rems is the lethal dose of radiation in humans.

health threat from even one atom of krypton-85, depending upon when it spontaneously disintegrates. At present there are approximately 3×10^{25} atoms of krypton-85 (50 moles) in the TMI-2 containment building atmosphere. Within the next 10.7 years, half of these atoms, 1.5×10^{25} (15 septillion), will disintegrate whether they are still in the containment facility, stored in a condensed state in a few gas bottles or scattered amongst the fat pads of people in adjacent communities following the proposed venting. The disintegration of just one krypton-85 atom releases a beta-particle which creates thousands of free radicals as it travels 2.5 mm in human tissue. If a single free radical so produced intercepts DNA and induces irreversible alteration, we now have a precursor cell for one of the adverse health effects we have considered above.

In the Environmental Assessment it is proposed that the 57,000 curies of krypton-85 be released into the environment in 60 days.* The person-rem concept outlined above belies the entire premise of the dilution of this radionuclide into the environment. Surely it will be difficult, if not impossible, to prove that any radiation-induced adverse health effects have arisen from krypton-85 released into the atmosphere around TMI-2. Yet more adverse effects may befall the community outside the containment facility than inside, were the krypton-85 to be retained, due to the 1,000 to 4 ratio of beta-particle to gamma ray emissions. For this

*In Addendum 2, the NRC proposes to lessen this release time to five days. Increased health hazards inherent in a lessened krypton-85 venting time will be dealt with in a separate comment.

reason alone, venting of krypton-85 into the air of the environment outside the TMI-2 containment facility should not be attempted. We find the apparent attitude of the licensee, a willingness to trade off slightly increased adverse health effects from gamma irradiation to its workers for potentially more detrimental health effects to the population at large, from beta irradiation, an irresponsible stance.

In the next two paragraphs we present dose estimates for maximal and average contaminations of the environment by the proposed krypton-85 release in order to assess potential adverse health effects.

In the case of maximal contamination by krypton-85, we assume venting of 1,000 curies within 6 hours into a steady wind of 10 knots, which plume intercepts a quiescent valley within a few miles of Three Mile Island. Since krypton-85 is heavier than air, it could easily settle into this valley, similar to fog which accumulates in low lying areas overnight. The 1,000 curies released represent 10,000 cubic feet of presently contaminated air or larger volumes once the "bleed and feed" cycles have been initiated. If we assume that 5,000 cubic feet of this contaminated air descend into a inhabited valley of one million cubic feet to a depth of 20 feet, then the habitable zone of this valley could become .5 percent contaminated by krypton-85-containing air from the reactor building. Krypton-85 easily seeps into cracks around doors and windows, or even more easily enters if either of these are open. The dose to each occupant could be 25-30 millirems whole body gamma irradiation and 6 rads skin dose (3 rads lung dose) of beta-particles in a single night.

Although the above scenario is quite possible for people residing near TMI-2, the population within a 50-mile radius around the reactor would receive on the average a much smaller dose of irradiation from krypton-85. In our calculations,* we assume the following: 1) that 2,000,000 people live within a 50-mile radius of TMI-2; 2) that the population everywhere encounters the diluted krypton-85 gas for at least one day out of the 60 days proposed venting; and 3) that on the days of krypton-85 exposure, the air from the containment building has been diluted one-million fold (to 10^{-6} $\mu\text{Ci/cc}$) prior to human contact. Using these parameters, we conclude that 10 cancer deaths could be induced by the venting of the 57,000 curies of krypton-85 from the TMI-2 containment building atmosphere.

*Calculations:

1) In a population of 2,000,000, 20 cancer deaths can be expected to be induced per 10 mrad dose per year (53).

2) The radiobiological effectiveness of both beta-particle and gamma ray emitted from krypton-85 is about 1, therefore for these irradiations
 $\text{mrad} = \text{mrem}$.

3) Hence, combining (1) and (2), for each 10 mrem dose, we can expect 20 eventual cancer deaths.

4) For krypton-85, 10^{-6} $\mu\text{Ci/cc/day} = 4.8$ mrem (54).

5) Hence, for one day's exposure to 10^{-6} $\mu\text{Ci/cc}$ of krypton-85 in the population considered we will have
 $20 \times 4.8/10 = 10$ cancer deaths.

IV. INSUFFICIENCY OF THE ENVIRONMENTAL ASSESSMENT DATA BASE

There is a paucity of data in the NRC Environmental Assessment. The public is once again being asked to "Take our word for it." In the face of the Rasmussen report's prediction that an accident such as the TMI-2 "occurrence" could happen only once every 20,000 reactor-years (55) and the underestimates of both time and resin efficiency needed for the EPICOR-II clean-up of water from the auxiliary building (56), plus repeated mis-statements, both during the course of the TMI accident itself and its aftermath, neither the NRC nor its licensee retain public credibility. (See *Appendix D. Leaks and Coverups.*)

Both the NRC's statutory mandate and its responsibilities to the public in this unprecedented situation bar any NRC authorization for release of krypton-85 without a full determination that such action is the safest and most practicable alternative available for removal of this gas from the TMI-2 containment building atmosphere. NRC has not adequately considered that variety of factors which bears upon the dangers to the environment and to public health by its proposed venting of krypton-85. In the following paragraphs, we address various sectors of the Environmental Assessment which omit data essential for the interpretation of feasibility and health risks to communities proximate to TMI-2. We strongly urge that such information be made available and fully evaluated before any decision is reached concerning the proposed venting of krypton-85 gas.

Although three types of containment building atmospheric samples have been taken weekly for the past year, the Environmental

Assessment presents minimal information from only two of these approximately 150 samples. This information, that the containment air contained 0.78 μCi of krypton-85 per cc in November 1979 and 1.0 $\mu\text{Ci}/\text{cc}$ presumably in March 1980, could be taken to mean that radionuclides are continuing to be produced inside the reactor core and are accumulating inside the containment building. If so, at what rate are radionuclides being synthesized and at what rate are they accumulating? How will this potential accumulation affect the containment building atmosphere in the months after the proposed venting of the 57,000 curies of krypton-85 gas? Will further venting be necessary after the presently contaminated atmosphere has been purged? In order to validly judge what is happening in the containment building atmosphere, the public should be informed of the exact radionuclide concentrations on a week-by-week basis, information readily available to the NRC and its licensee.

What is the precise radionuclide inventory of the TMI-2 containment building atmosphere? In particular, as there has been extensive fuel rod damage, how much plutonium and other trans-uranic isotopes contaminate the atmosphere as aerosols or particulates produced in the sump?

There is no estimate in the Environmental Assessment as to how long a protectively clothed worker could spend maintaining and inspecting equipment or collecting data, either at present or after the proposed venting of krypton-85. This information is vital in the consideration of the necessity for venting. Similarly, there is no information as to the present need for equipment

maintenance and inspection, although it is obvious that equipment will function both more efficiently and for a longer time under these conditions. The public, given the lack of urgency as defined by the Environmental Assessment, is hard put to believe that the present situation, which has existed for over one year, is an emergency. If there is such an emergency, given that a worker can spend up to 1.5 hours inside the containment facility before exhausting his or her quarterly quota of 3 rems, why isn't some data collection and equipment inspection and maintenance being conducted at present?

Although we are assured in the Environmental Assessment that "purging of Kr-85 to the atmosphere can be performed under well-controlled conditions," we are dubious that this is the case. Before controlled release is a credible concept, the following questions must be answered in a future Environmental Assessment:

1) What meteorologic criteria will be considered in determining whether to vent or not to vent?

- a) Wind speed?
- b) Wind direction?
- c) Variations in speed and direction?
- d) Relative humidity?
- e) Barometric pressure?
- f) Chance for an inversion?
- g) Chance for precipitation?

2) How long will the period of venting last on an "ideal" day?

3) At what time of day will venting be initiated?

Fearless forecasts notwithstanding, each of us knows the vagaries of the weather to be virtually unpredictable and certainly uncontrollable, more susceptible than any other aspect of our environment to the whims of Mother Nature. "Well-controlled conditions" are never defined in the Environmental Assessment. We suspect they do not exist. However, such conditions, if definable, must be clearly explicated in the Environmental Assessment for an adequate public assessment of potential adverse human health risks inherent in the venting of krypton-85 gas from the containment facility.

Presumably the function of monitoring is to shut off the venting process if too much radioactivity is detected off-site due to insufficient diffusion and dilution of krypton-85 into the outdoor air. Yet there are no monitoring criteria spelled out in the Environmental Assessment. How many monitors will be placed around the containment facility? At what distances will the monitors be placed? Will instantaneous monitors be available at 5 miles? Ten? Twenty? Fifty miles? Given that krypton-85 is over five times as dense as air, at what height will the monitors be placed? Will special monitors be placed in basements, wells and other low-lying areas? How many of the monitors will be manned? Will they be manned for the entire venting period, which may be up to 24 hours per day? How many electronic, remote-sensing monitors will be deployed? How many will be film-type, giving indications of excessive radiation doses only in retrospect? In order to be of use in controlling the proposed venting of krypton-85, these

monitors must provide instantaneous data relevant to radioactivity densities (fluxes) in all directions from the TMI-2 facility for distances up to 100 miles away (see *Section V. Meteorologic Criteria for Venting*). The Assessment provided by the NRC gives no assurance whatsoever that this will be the case. High school science teachers are to be trained as monitors. How many? For what periods of time will they monitor, during or after periods of venting, or both? When will these high school science teachers complete their training course? What funds are available for their training and employment as monitors of krypton-85 diffusion?

The data base of the Environmental Assessment is also woefully deficient in information concerning psychological stress to surrounding communities even though a plethora of such data is available. In Addendum 1 the NRC has outlined fifteen separate studies which analyze the psychological stresses induced by the TMI accident and by subsequent releases of radionuclides. One of these studies, that conducted by the Mountain West Research and Social Impact Research groups, was supported by the NRC itself (45). Yet none of the results of this or any of the other psychological studies has been made available in either the Environmental Assessment or its appendices.

The following questions must be answered concerning psychological health in order to assess the impact of krypton-85 venting on the well-being of populations in nearby communities:

- 1) What are the results of the fifteen psychological studies, especially as relevant to potentially severe stress which may be induced by the proposed

venting of krypton-85 gas from the TMI-2 containment facility atmosphere?

2) What will be the effects on any population for which monitoring has revealed excessive radiation exposures warranting immediate cessation of venting?

3) Is evacuation being considered for populations receiving excessive doses due to meteorologic uncertainties, e.g., a sudden inversion, and what would be the effect of such an order for evacuation on the psychological health of the so-ordered community?

4) What are the chances of civil disobedience if the proposed venting of krypton-85 gas is initiated?

V. METEOROLOGIC CRITERIA FOR VENTING

The least credible section of the Environmental Assessment deals with meteorologic criteria for venting of the krypton-85 gas from the containment building atmosphere at TMI-2. Constant assurances notwithstanding, there is no adequate way to control the weather. Furthermore, as extensively addressed in the previous section, there are no supporting data for the methodology of assessing which meteorologic criteria are beneficial for venting, how long and under which conditions venting would occur and how frequently venting would be accomplished under ideal conditions.

Krypton-85 is approximately five times denser than air and therefore settles into low-lying areas such as valleys and basements in the absence of adequate convection. The proposed venting will take place from a 160-foot stack. On a calm day, the krypton-85 will settle in a uniform pattern around the base of the stack and then spread outward by diffusion in all directions, seeking out and being retained by low-lying areas. Although windy days provide immunity from krypton-85 contamination upwind, downwind there may be a greater concentration of the radionuclide than there would be on calm days. Depending upon wind speed, fluctuations in wind speed, wind direction and fluctuations in direction, the krypton-85 may travel with the plume for miles downwind with relatively little dispersion until it is stalled by either a geographical or meteorological obstacle, at which point krypton-85 would tend to settle out of the plume. In gas warfare, advantage is taken of these properties of plumes to intercept and decimate enemy stations (see Figure 2, next page, ref. 57).

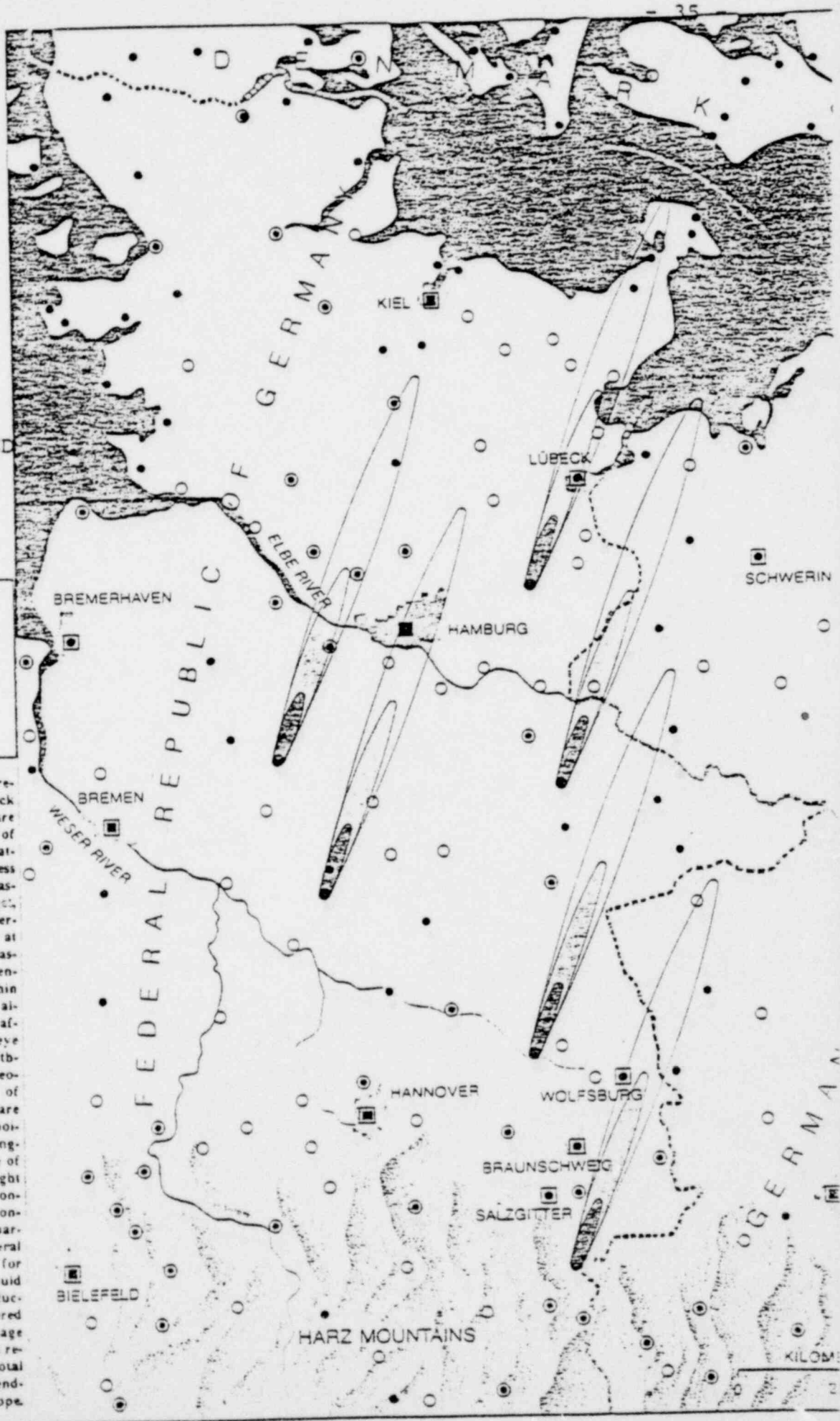
Figure 2

PLUME DISPERSION PATTERNS AS EXPLOITED IN GAS WARFARE

(ref. 57)

- 0-10,000
- 10,000-25,000
- ◐ 25,000-100,000
- ◑ 100,000-250,000
- ◒ 250,000-1,000,000
- ◓ MORE THAN 1,000,000

POTENTIAL CIVILIAN CASUALTIES resulting from a hypothetical chemical attack on a battlefield in north-central Europe are suggested by the equal-dosage contours of this map. The solid colored dots represent battalion-size targets (a square kilometer or less in area), each attacked with GB bombs releasing a total of six tons of nerve gas per target, a quantity intended to inflict about 20 percent casualties on troops carrying but not at first wearing gas masks. The weather is assumed to be cool, dry and overcast with a gentle southwesterly breeze. Most people within the light-color areas would be poisoned, although not fatally; their vision would be affected, and they would suffer protracted eye pain, headache and difficulty breathing. Within the medium-color areas unprotected people would be incapacitated for a period of days. The innermost, dark-color areas are those in which people would be severely poisoned: only young adults near the outer fringes of each area would have a good chance of surviving, and many of them would be brought to the brink of death, collapsed and in convulsions. Under more stable atmospheric conditions, for example at night with clear or partially clear skies, all the areas would be several times larger; under less stable conditions, for example in warm, sunny weather, they would be smaller. Normally there would be wind fluctuations over the 10-hour period considered here, altering the shape of the equal-dosage contours. The six attacks illustrated would release only a fraction of a percent of the total amount of nerve gas that could be expended in a large-scale chemical war in Europe.



Many of the nerve gases employed in such gas warfare have molecular weights below 100, i.e., they have analogous densities and dispersion patterns dependent upon meteorological conditions, as does krypton-85. In addition to these nondispersive plume effects, even in strong winds there is sufficient swirling and creation of low pressure vortices on the downwind side of the 160-foot stack to bring a considerable portion of the emitted krypton-85 cascading down to ground level at the point of emission (44).

The Environmental Assessment relates that "Kr-85 has the unique capability of infiltrating and diffusing through protective garments." This capability may not be as hazardous to workers within the containment facility atmosphere as to people on the outside, as workers can be outfitted with absolutely airtight suits such as those worn on the moon or during ~~deep-sea~~ diving (if need be). The infiltrating and diffusing capabilities of krypton-85, however, are much more insidious for farms and homes which may be intercepted downwind by the gas-containing plume. Closed doors and windows will provide little barrier against krypton-85.

It is not uncommon for noble gases such as krypton-85 and xenon-133 to be detected 100 miles or more from their source of emission. A few years ago, during an inversion in the Rhine Valley, krypton-85 was detected in Freiburg, 140 km (84 miles) from the closest nuclear power station, the Kernkraftwerk Süd plant at Karlsruhe (44). Following the accident at TMI-2, considerable xenon-133 was detected at Albany, NY, over 200 miles away from the reactor (58). These examples show that meteorologic dispersion patterns are often far from ideal, and may result in unanticipated contaminations of

radionuclides into urban areas 100 miles or more away. It bears repeating that some large urban areas are within 100 miles of TMI-2.

The NRC Assessment estimates that venting could be completed within a 60-day period. It is ambiguous from the Assessment itself as to whether this is 60 days' total elapsed time or 60 days of venting with interstitial non-venting days. From the comments of the second Addendum, however, it is possible to infer that the latter alternative appears more likely to be the interpretation intended by the NRC and its licensee. Initial venting would proceed, according to the Assessment, at 100 cubic feet per minute, increasing to 1,000 cubic feet per minute by the end of the purge. Mathematical calculations show that *continuous* venting according to this scheme would require 13.8 days. If the NRC and its licensee are proposing that venting be completed within a 60-day period, then venting must occur for an average of at least 6 hours per day. Although meteorologic criteria for venting were never defined in the Assessment, if we assume that these criteria are not met at least half the time, then the average venting period must be increased to 12 hours per day on the days permitting venting. Alternatively, the NRC and its licensee may anticipate that only one-fourth of the days will correspond to responsible meteorologic criteria, and that dumping of krypton-85 into the atmosphere on those days will be a 24 hour per day activity. Given the vagaries of the weather, this latter scenario seems especially dangerous. Hence, short pulses seem more sane, yet even 6 hour releases must

be accomplished every day to keep on schedule. We are left with the impression that whatever the meteorologic criteria implied by the Environmental Assessment, they cannot be very stringent.

VI. MONITORING THE RELEASE OF KRYPTON-85

Ideally monitoring should provide a mechanism whereby people are protected from the adverse health effects posed by krypton-85 gas. Obviously the best possible protection of the populace is that they be exposed to no krypton-85 gas. Yet the Environmental Assessment provides such a sketchy description of the monitoring system that one wonders if the NRC really cares at all, or just threw this section in to pacify an hysterical public.

Many of the data needed for public assessment of the Environmental Assessment are missing (these points have been extensively addressed in *Section IV*). We now address what the monitoring system *should be* as there is insufficient information available in order to judge what it *is*.

Monitoring must be contemporary with krypton-85 release, that is, points downwind for up to 100 miles should instantaneously feed back krypton-85 levels to the emission site. Maximal permissible levels of, for example, 1.5 mrad/hr beta-particles must be established. If maxima are exceeded at any monitoring station, automatic shutdown of the venting operation must proceed immediately. Emergency provisions for evacuation of finite areas should be made ready in the event that certain higher levels, for example, 15 mrad/hr,

are achieved at any monitoring station. Although it would be useful epidemiologically, it will do populations no good at all in terms of preventive medicine to utilize passive monitors which will yield information days or weeks after high level exposures have been realized.

In several places in the Environmental Assessment, the NRC, and presumably its licensee, display callous, if not fraudulent, attitudes toward the tolerated maximal acceptable radiation exposures to the public. Scenarios which expose people up to 1700 mrem beta skin dose at the boundary site are exonerated as but "a small fractions of the limits set forth in 10 CFR Part 100." Yet, the footnote to this section of the *Code of the Federal Register* reads as follows:

"The whole body dose of 25 rem referred to above corresponds numerically to the once in a lifetime accidental or emergency dose for radiation workers ... However, neither its use nor that of the 300 rem value for thyroid exposure as set forth in these site criteria guides are intended to imply that these numbers constitute acceptable limits for emergency doses to the public under accident conditions."

VII. LACK OF NECESSITY OF VENTING

" ... the staff believes that it is in the best interest of the public health and safety to purge the reactor building promptly prior to completion of the Programmatic Environmental Impact Statement."

"These potential pathways are sealed by seals which are presently inaccessible for maintenance because of high ambient radiation levels."

The above quotes are from the Environmental Assessment, pages 4-5 and 4-4, respectively. The entire Assessment is based upon the faulty premise that venting of the containment building atmosphere is vital to equipment maintenance and inspection and the collection of data. The public has been blackmailed into accepting this premise with the spectre of greater nuclear catastrophe hung over their heads, unless they accept and potentially breathe 57,000 curies of krypton-85 gas vented into their air. Yet venting is not vital to data collection or to equipment inspection and maintenance. These activities can be begun now by a protectively suited and masked worker. If, as the NRC and its licensee contend, equipment deterioration is imminent which may lead to core recriticality, why have workers not been performing these functions during the past year? Why are data collection and equipment inspection and maintenance not being conducted now? If indeed there is a state of emergency, why wait until we are all further imperiled, even during the 60 days of proposed venting?

Surely, as a part of the overall clean-up operation, krypton-85 must be removed from the containment building

atmosphere. Venting, however, is the least responsible means to achieve this end, a means to which the nuclear industry has become accustomed, as the average nuclear reactor releases about 1,300 curies of krypton-85 into the atmosphere each month. It is intolerable that our population is asked to accept this additional burden to its background irradiation load, let alone now to be subjected to 30 times as much, as is proposed in the Environmental Assessment. As Commissioner Gilinsky has pointed out, the 57,000-curie release of krypton-85 from the TMI-2 site would be greater than the sum produced by all operating reactors per year (59).

As there is no emergency and as workers can enter the containment building at present to initiate data collection and equipment inspection and maintenance, adequate time exists to implement responsible alternative methods for removal of krypton-85 from the atmosphere. These alternative methods are considered in the next section.

There is a consistent obfuscation of the issues in the justification section of the Environmental Assessment. "Less restricted access ... is necessary ..." is the phraseology frequently employed. Less restricted access to the containment facility is not *necessary*, it is merely economically *desirable* from the standpoint of the number of workers needed to complete a given job. That is, it is desirable because it is less expensive. The presently available 1.5 hours per worker access time would be only increased to 2.5 hours if all krypton-85 were vented. For every three hours of work inside the containment facility, the licensee must employ three workers now instead of two after venting.

Further obfuscation derives from the continual reference in the same section of the Environmental Assessment to not only "repair or replace nuclear instruments, to maintain the reactor building air cooling system," but also to "decontaminate the building, its equipment and piping," and even to "remove the fuel." These latter two references are clearly out of the purview of the Environmental Assessment and irrelevant to the issues described therein. It must be re-emphasized that submission of a complete Environmental Impact Statement must be accomplished before *any* issues of containment building or reactor core clean-up are addressed.

In summary, there is no necessity for venting the krypton-85 gas into the outdoor atmosphere in order to perform routine data collection and equipment inspection and maintenance within the containment facility. Protective clothing allows up to 1.5 hours work time for workers prior to receiving their quarterly quota. This is a much longer access time than available to workers involved in other routine inspection, maintenance and replacement functions associated with nuclear power plants (49, 50). There is adequate time to install alternative systems for krypton-85 removal from the TMI-2 containment facility atmosphere.

(See Appendix E. *Necessity of Venting.*)

VIII. ALTERNATIVES TO VENTING

The Environmental Assessment champions venting as immediately available and of short duration. In the absence of any emergency, this rationale means merely that venting is the least expensive alternative, since extant fans are able to blow krypton-85 gas out over filters and into the atmosphere outside. Four other advantages to venting are offered in the Environmental Assessment. These are listed below, along with our replies:

<u>Advantage to Venting (E.A.)</u>	<u>Reply</u>
1) Controlled releases can be maintained within applicable federal regulations;	1) Use of applicable federal regulations only evades public health responsibility;
2) Purge has a small general population accident dose impact when compared to other alternatives;	2) As admitted in the Assessment, purge has the largest mrad population exposure of all methods;
3) Purging to the atmosphere eliminates the need for long term surveillance of Kr-85;	3) The gas with a half-life of 10.7 years will contaminate a large area for a long time;
4) Purging of Kr-85 to the atmosphere can be performed under well-controlled conditions ...	4) Releases cannot be controlled due to meteorologic uncertainty and monitoring difficulties.

Of these "other advantages," numbers (1) and (3) are answered in more detail below in order to introduce our discussion of alternatives to venting. We have dealt extensively with numbers (2) and (4) in previous sections of this comment.

The "applicable federal regulations" cited in the first "other advantage" above are the "design objectives of 10 CFR Part

50, Appendix I, and the applicable requirements of 40 CFR Part 190.10," which regulations are not to be exceeded. Currently these regulations allow for discharges which cause the ambient air to be no more than 10^{-5} $\mu\text{Ci}/\text{cc}$ of total radionuclides or to inundate a bystander with 25 mrem whole body irradiation or 75 mrem to the thyroid gland. It will be recalled that in *Section III* we created a scenario in which people were exposed to 25-30 mrem as a reasonably achievable high dose and that, if the population at large were exposed for a single day out of the 60 days of proposed venting to 10^{-6} $\mu\text{Ci}/\text{cc}$ krypton-85, an order of magnitude under the regulatory limitation, eventually 10 cancer deaths could arise within a 50-mile radius of Three Mile Island. There are no data in the Environmental Assessment which convince us that these estimates are exaggerated. In the latter of the two federal regulations cited, 40 CFR 190.10, the key word is "applicable." Not until January 1, 1983, will emission of krypton-85 be limited to 50,000 curies per gigawatt-year. But the regulation should be used at present as a guideline by the NRC, a clear signal to this *regulatory body* that these radiation releases should be kept to an absolute minimum whenever possible. Interestingly, in the past year, TMI-2 has produced only 2.4 megawatts from the residual heat in the reactor core, and, hence, by this rule would be limited to only 120 curies of krypton-85 emission, if this portion of the regulation were in effect at present. Even in the normal operating year, the proposed 57,000 curies would be twice too large to release over a one-year period, let alone 60 days. It is clear that the licensee hopes to evade its responsibilities

to the public in every way and to trade off as much public danger for reduced expense at TMI-2 as possible.

Similarly, the Environmental Assessment has been myopic in its insistence upon the "bleed and feed" method of purging gases from the containment facility. This method of air removal is clearly only beneficial for the venting alternative, since the subsequent purge cycles will be progressively more dilute with respect to krypton-85 concentrations. There are three alternatives to air removal by the "bleed and feed" method:

- 1) displacement,
- 2) internal removal of krypton-85, and
- 3) either of the above plus venting the krypton-85 residuum.

These alternatives for the removal of the atmosphere of the containment facility are discussed along with selective adsorption and cryogenic methodologies for krypton-85 capture in more detail below.

Displacement of the containment building atmosphere has the advantage of allowing the majority of the krypton-85 gas to be removed without dilution by outside air. This makes the total volume of air dealt with 2 million cubic feet instead of 23 million cubic feet by the "bleed and feed" technology in the Assessment, rendering concentration methods and eventual storage problems an order of magnitude easier. Displacement of the containment building atmosphere could be accomplished in a number of ways, and this should be considered a viable alternative to the "bleed and feed" method proposed in the Environmental Assessment.

A second alternative method for removal of krypton-85 from the containment building atmosphere without dilution by outside air is to place either a selective adsorption column or cryogenic device within the containment building itself and continuously cycle the atmosphere through either of these devices. Should construction of either device be cumbersome within the containment facility, alternatively, either selective adsorption or cryogenic devices could be placed within the auxiliary building and fed with extant gas lines from the containment building, returning the decontaminated air to the containment via extant return lines.

Should either of these alternatives to dilution by outside air be feasible, it is possible that they could afford ≥ 95 percent krypton-85 removal in much shorter times than those predicted in the Environmental Assessment. With ≤ 5 percent of the krypton-85 remaining, it would be possible to reconsider a venting program for the remaining $\leq 2,350$ curies over a 60-day period, or 40 curies/day. These releases, although still posing a finite health danger to the surrounding communities, would constitute less hazard than the exorbitant 1,000 curies/day of the Assessment.

We support as the method of choice for krypton-85 condensation the selective adsorption process. Liquid fluorocarbons have the advantage over other potential krypton-85 adsorbents, such as ammonium or benzene clathrates, in adsorbing krypton at lower pressures and concentrations of the gas. If allowed sufficient interaction with the Freon 12, up to 99.9 percent of the krypton-85 may be removed in a single passage over the column and

the final, relatively pure krypton-85 tapped off and stored within a few 1.54 cubic foot gas cylinders. In practical reality, the final volume of krypton-85 storage would be most logically related to the temperature of the gas at various concentrations due to thermal emissions accompanying radioactive decay. Larger volumes of gas would facilitate less need for refrigeration, and vice versa. We recommend that these gas bottles be stored within the containment building, perhaps within a small concrete shed there constructed. Maintenance and monitoring for escaped radioactivity would be facilitated by extant equipment, and should some leakage occur, the public would be no worse off than at present with a containment building full of krypton-85 gas.

Should there be some unforeseen problems with the selective adsorption method, as a second alternative to venting, we support the cryogenic procedure, which employs liquid nitrogen to freeze krypton-85. This methodology is more elaborate than selective adsorption and, hence, more privy to pitfalls, such as contamination of the krypton-85 by oxygen and other gases. Also there may be more difficulty in storing the final, frozen product, should continued temperatures of -250°F be necessary. However, in our opinion, cryogenesis is definitely superior to venting, charcoal adsorption and gas compression as methods for krypton-85 removal.

The selective adsorption technology is available from the Nuclear Division of Union Carbide Company at Oak Ridge, TE, which is under contract to the Nuclear Regulatory Commission. Similarly, an extant cryogenic apparatus is available for purchase or leasing at the Limerick site, some 100 miles from Three Mile Island.

Finally, it must be re-emphasized that these alternative systems for atmospheric removal and krypton-85 condensation are not urgently needed at this time. There is no emergency at present. Either methodology for krypton-85 condensation, selective adsorption or cryogenesis, could be initiated and employed over the next 12-24 months without blocking data collection, equipment inspection and equipment maintenance within the TMI-2 containment facility.

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AFFIDAVITS
OF
KARL Z. MORGAN
ROBERT W. COLMAN

Statement of Karl Z. Morgan Regarding Release of Kr-85 Into the
Environment of Three Mile Island

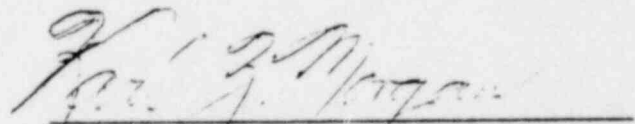
Fortunately most of the noble gases available in the Three Mile Island Reactor Number Two and related facilities have decayed to insignificant levels since the accident. The Xe-131m (12 day half life) and Xe-133 (5.3 day half life) are at such a low level that they would be difficult to measure. Most of the Kr-85 (10.7 year half life) that was trapped in the system, however, is still there and is likely to be released to the environment in future recovery or decommissioning operations unless special precautions are taken. It is fortunate that the amount of Kr-85 present is very low because of the long half life and the short period of operations of this reactor before the accident.

In spite of the low population exposure from the release of the Kr-85, I believe measures should be taken to prevent this release. The reasons may be summarized as follows:

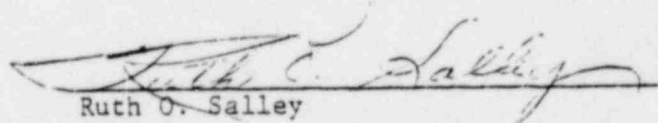
1. There is strong evidence that low level radiation exposure is far more harmful than was generally believed a decade ago and that the risk of radiation induced cancer increases with the accumulated radiation dose. Even a few cancers is not a good thing.
2. The ALARA philosophy would suggest that since it is reasonable to remove the Kr-85, we should take measures to do so in these operations.
3. Techniques for removal of Kr-85 are well developed but must be tested on a large scale before they are applied to nuclear reprocessing operations. This application at Three Mile Island could be considered a useful pilot study for future operations.

4. Because of the long half life and the inert property of a noble gas, the hazard from release of Kr-85 is one to the entire world. The risk probably drops off as the 2nd or 3rd power of distance from the release site but Kr-85 dose to the world population will be very significant after year 2000 if the nuclear industry continues to expand and if commercial fuel reprocessing is done on a large scale.

Thus, I believe this is an opportunity for the NRC in good faith to show support for ALARA and to conduct a valuable experiment that must be undertaken if nuclear energy is to have a long range future.



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Ruth O. Salley
Notary

Notary Public, Georgia, State At Large
My Commission Expires Oct. 3, 1980

Georgia Institute of Technology

BIOGRAPHICAL SKETCH

MORGAN, KARL Z. - Neely Professor

Education

A.B., University of North Carolina	1929
M.A., Physics, University of North Carolina	1930
Ph.D., Physics, Duke University	1934

Employment History

Lenoir Rhyne College, Chairman, Physics Department	1934-1943
University of Chicago, Metallurgical Laboratory	1943
Oak Ridge National Laboratory	
Director, Health Physics Division	1943-1972
Georgia Institute of Technology, Neely Professor	1972-Present

Experience Summary: During the period as Chairman of the Physics Department at Lenoir Rhyne College research in cooperation with Duke University in the field of cosmic ray showers, meson lifetime, etc., was carried out. While at the University of Chicago, Morgan was one of a group of six persons who developed and established the new science and profession of health physics. At Oak Ridge National Laboratory he was Director, Health Physics Division from its inception. He directed over 200 persons engaged in research, engineering, and applied activities. At Georgia Tech Morgan teaches courses in health physics, works with M.S. and Ph.D. students on their thesis programs, and is in charge of developing an undergraduate health physics curriculum.

Current Fields of Interest

Health Physics, radiation protection, diagnostic x-ray exposure, internal dose from radionuclides, environmental exposure, radiation protection standards, nonionizing radiation, safe operation of the nuclear energy industry.

Major Reports and Publications

Over 300 papers and publications have been written. Those of major importance over the past few years are as follows:

1. "Common Sources of Human Exposure to Ionizing Radiation in the United States," American Engineer, July 1968.
2. "Ionizing Radiation: Benefits Versus Risks," Annual Meeting of the Health Physics Society, June 16-20, 1968, Denver, Colorado; and published in Health Physics, Vol. 17, No. 4.
3. "Assumptions Made by the Internal Dose Committee of the International Commission on Radiological Protection," Sixth Annual Meeting of the Gesellschaft fur Nuclearmedizin, Wiesbaden, Germany, September 26-28, 1968; published in Proceedings, 1969.

Major Reports and Publications (continued)

4. "Redirecting Health Physics Studies to Areas of Greatest Interest," First European Congress of the International Radiation Protection Association, Menton, France, October 9-11, 1968; Published in Proceedings, 1968.
5. "Development of Health Physics as a Profession," Proceedings of First International Congress of Radiation Protection, Rome, Italy, Vol. 1, 3, Pergamon Press, 1968.
6. "The Need for Standardization Procedures in the Application of Ionizing Radiation to Medical and Dental Patients," Seminar sponsored by the National Center for Radiological Health, Rockville, Maryland, November 15, 1968, Seminar Paper 003.
7. "The Proper Working Level of Radon and Its Daughter Products in the Uranium Mines of the United States," Hearing on Radiation Standards for Mines, Washington, D.C., November 20, 1968; Congressional Record, 1968.
8. "Supplemental Statement on the Proper Working Level of Radon and Its Daughter Products in the Uranium Mines of the USA," Supplement to Testimony presented on November 20, 1968, Washington, D.C.; Congressional Record, 1968.
9. "Future Opportunities in Health Physics," Health Physics Society Midyear Topical Symposium, Los Angeles, California, January 29-31, 1969.
10. "Risks from Diagnostic X-Rays," Yale Scientific, Vol. XLII, No. 5, February 1969; Reprinted from Yale Scientific in the Journal of the American Radiography Technologists, Vol. XIV, No. 4, Winter 1969.
11. "Radiation Standards for Reactor Siting," Testimony presented before the Joint Committee on Atomic Energy at its Hearings on Environmental Effects of Producing Electrical Power, Phase 2, January 1970; Congressional Record.
12. "Energy Pollution of the Environment," Midyear Symposium of the Health Physics Society, Louisville, Kentucky, January 28, 1970; Proceedings published in USPHS-BRH Series, BRH/DEP-70-26, Oct., 1970.
13. "A Time of Challenge to the Health Physicist," Presidential Address presented before the Second International Congress on Radiation Protection, May 8, 1970, Brighton, England; Health Physics, Vol. 20, May, 1971, pp. 491-498.
14. "My Opinion--You Can Drastically Cut X-Ray Exposure Below Today's Levels," Consultant, March/April, 1970.
15. "History of the Health Physics Society," published as part of the RSNA Symposium on the Critical History of American Radiology (Nov. 1970)
16. "Standard Man-Standard Patient," Medical Radioisotopes: Radiation Dose and Effects, AEC Series 20, p. 87, June 1970.
17. "History of the International Radiation Protection Association," published in Proceedings of the RSNA Symposium on the Critical History American Radiology, November 1970.
18. "Criteria for the Control of Radioactive Effluents," IAEA Symposium on Environmental Aspects of Nuclear Power Stations, UN Building, New York, August 1970, Proceedings published, this paper is IAEA-SM-146/10; synopsis published also in Environmental Studies, 1971.

Major Reports and Publications (continued)

19. "Maximum Permissible Levels of Exposure to Ionizing Radiation," International Summer School on Radiation Protection, Boris Kidric Institute of Nuclear Sciences, Cavtat, Yugoslavia, September 20-30, 1970; Proceedings published in 1971 under title of "Radiation Dosimetry."
20. "President's Report on the General Assembly of IRPA," Brighton, England, May 1970, Health Physics, Vol. 20, No. 5, 1971.
21. "History of Radiation Protection," Symposium Commemorating the 75th Anniversary of the Discovery of X-Rays, Milwaukee, November 13-14, 1970; Materials Evaluation, Vol. XXIX, No. 3, March 1971.
22. "Why the 1968 Act for Radiation Control for Health and Safety Is Required," Radiology, Vol. 99, No. 3, pp. 569-588, June 1971.
23. "Excessive Medical Diagnostic Exposure," Third Annual National Conf. on Radiation Control, Scottsdale, Arizona, May 3, 1971; published in Proceedings.
24. "Health Physics and the Environment," International Symposium on Rapid Methods for Measurement of Radioactivity in the Environment, Neuherberg, Federal Republic of Germany, IAEA-STI/PUB/289, Vienna, 1971.
25. "Adequacy of Present Radiation Standards," presented at the Environmental and Ecological Forum, Silver Spring, Maryland, January 20, 1971; Proceedings of Forum published in 1972, USAEC-TIC-25857.
26. "Proper Use of Information on Organ and Body Burdens of Radioactive Material," presented at the IAEA/WHO Symposium on the Assessment of Radioactive Organ and Body Burdens, Stockholm, Sweden, November 22-26, 1971, IAEA/SM/150-50; Proceedings of Symposium published by IAEA.
27. "Health Physics Measures to Implement New USAEC Regulations Relating to Radiation Exposure of the General Public," Budapest, May 1971; Proceedings published by Akademiai Kiado, Budapest, Hungary.
28. "The Need to Reduce Medical Exposure in the United States," outline of testimony presented before the Health and Welfare Subcommittee of the Senate Committee on Labor and Public Welfare on Senate Bill S.3327, May 15, 1972, Washington, D.C.; published in Congressional Record, 1972.
29. "Comparison of Radiation Exposure of the Population from Medical Diagnosis and the Nuclear Energy Industry," Transactions ANS, 15:1, 64 (June 1972).
30. "Environmental Impact of Natural and Man-Made Ionizing and Non-Ionizing Radiations," Second International Summer School on Radiation Protection, Herceg Novi, Yugoslavia, Aug. 1973; Proceedings, 1973.
31. "The Need for Radiation Protection," Radiologic Technology, 44, 6, p. 385 (1973).
32. "Exposure in the United States," and "Mogliche Folgen einer Uebermassigen Medizinischen Strahlenbelastung in der Vereinigten Staaten von Amerika," Rontgen-Blatter, 27, 127 (March 1974).
33. "Reducing Medical Exposure to Ionizing Radiation," American Industrial Hygiene Journal (May 1975).

Major Reports and Publications (continued)

34. Two chapters in text, Environmental Problems in Medicine titled "Exposure to Non-Ionizing Radiation" and "Ionizing Radiation Exposure," W. D. McKee, Editor; Chas. C. Thomas Publisher, 1974.
35. "Types of Environmental Health Physics Data That Should be Collected and Evaluated in a Nuclear Power Program," in Environmental Impact Statements for Nuclear Power Plants, 1975, Pergamon Press, Chapters by K. Z. Morgan in text, Environmental Impact of Nuclear Power Plants, by R. A. Karam and K. Z. Morgan, GEORGIA INSTITUTE OF TECHNOLOGY SERIES IN NUCLEAR ENGINEERING, Pergamon Press 1975.
36. "The Bases for Standards and Regulations," in Environmental Impact Statements for Nuclear Power Plants, 1975 Pergamon Press, Chapters by K. Z. Morgan in text, Environmental Impact of Nuclear Power Plants, by R. A. Karam and K. Z. Morgan, GEORGIA INSTITUTE OF TECHNOLOGY SERIES IN NUCLEAR ENGINEERING, Pergamon Press 1975.
37. "Release of Radioactive Materials from Reactors" and "Ways of Reducing Radiation Exposure in a Future Nuclear Power Economy," in Nuclear Power Safety, GEORGIA INSTITUTE OF TECHNOLOGY IN NUCLEAR ENERGY, Pergamon Press.
38. "Transportation of Radioactive Material by Passenger Aircraft," Report to Joint Committee of Congress on Atomic Energy, Report No. 1 - Sept. 17, 1974, U.S. Government Printing Office.
39. "Health Physics - Past, Present, and Future," presented at First Asian Regional Congress of the International Radiation Protection Assn. in Bombay, India, Dec. 1974; published in Proceedings.
40. "Suggested Reduction of Permissible Exposure to Plutonium and Other Transuranium Elements," J. Am. Ind. Hygiene 36, (8), 567 (Aug. 1975).
41. "Effects of Radiation on Man - Now and in the Future," in Energy and the Environment -- Cost-Benefit Analysis; Pergamon Press, 1976, Chapters by K. Z. Morgan in text, Energy and the Environment, Cost Benefit Analysis, by R. A. Karam and K. Z. Morgan, GEORGIA INSTITUTE OF TECHNOLOGY SERIES IN NUCLEAR ENGINEERING, Pergamon Press 1976.
42. "Programs Needed for Education and Training of Health Physicists," Proc. Am. Phys. Soc. Meeting, December 1974.
43. "Recent Developments in Fast Neutron Personnel Dosimetry Using Track Etch Methods," presented at Congress of the International Radiation Protection Assn., Holland, May 1975; published in Proceedings.
44. "Medical Radiation Protection," presented at Health Physics Meeting, Buffalo, New York, July 15, 1975.
45. "Ways of Reducing Exposure in a Future Nuclear Power Economy," presented at American Public Health Association Annual Meeting, Chicago, Illinois, November 18, 1975.
46. "A Course on Non-Ionizing Radiation Protection for State and Local Health Officers," Proceedings of Health Physics Society, Denver, Colorado, February, 1976.
47. "The Particle Problem," Third International Summer School on Radiation Protection, Herceg Novi, Yugoslavia, published in Boris Kidric Institute Series, August-September 1976.

Major Reports and Publications (continued)

48. "The Linear vs. The Threshold Hypothesis," Third International Summer School on Radiation Protection, Herceg Novi, Yugoslavia, published in Boris Kidric Institute Series, August-September, 1976.
49. "Current Problems and concepts of the Health Physicist," Third International Summer School on Radiation Protection, Herceg Novi, Yugoslavia, published in Boris Kidric Institute Series, August-September 1976.
50. "Use of Recycle Plutonium in Mixed Oxide Fuel in Light Water Cooled Reactors," testimony presented at public hearings on MOX fuel, Washington, D.C., Nov. 1976.
51. "Keeping Dose Commitments ALAP," Proc. ANS National Topical Meeting, 71, Tucson, Arizona, October 6-8, 1975.
52. "Radiation-Induced Health Effects," Science 195, 157, 344 (January 28, 1977).
53. "The Dilemma of Present Nuclear Power Programs," Proc. of Hearings Before the Energy Resources Conservation and Development Comm., Sacramento, Cal., February 1, 1977.
54. "Comments on Operation of the Kerr-McGee Cimarron Facility and the Karen Silkwood Case," before the Congressional Small Business Comm., April 26, 1976.
55. "Data Interpretation," Proceedings of Workshop on the Utilization and Interpretation of Environmental Radiation Data, Orlando, Fla., March 1-3, 1976.
56. "Rolf M. Sievert: The Pioneer in the Field of Radiation Protection," Health Phys. 31, 263-264 Sept. 1976.
57. "Health Hazards from Diagnostic and Therapeutic X-Ray," proceedings of Conference on Diagnostic Imaging, Chicago, Ill., Sept. 27, 1976.
58. "Yes is the Answer to Question of R. H. Thomas and D. D. Busick, 'Is It Really Necessary to Reduce Patient Exposure?'" J. Am. Ind. Hygiene 37, 665-667, Nov. 1976.
59. "The Linear Hypothesis of Radiation Damage Appears to Be Non-Conservative in Many Cases," Proceedings of Fourth International Congress of the International Radiation Protection Association, Paris, France, April 25-29, 1977.
60. "The Need to Reduce Medical Diagnostic Exposure," J. Am. Ind. Hygiene 38, 6, June 1977.

Professional Activities, Memberships, and Honors

Member:

Health Physics Society, First President in 1956

International Commission on Radiological Protection, Chairman for 20 years of committee publishing present and past Recommendations on Maximum Permissible Internal Dose of Radioisotopes

National Council on Radiation Protection, Chairman for 20 years of committee publishing present and past Recommendations on Maximum Permissible Dose for Internal Radiation

Professional Activities, Memberships, and Honors (continued)

American Association for the Advancement of Science
American Industrial Hygiene Association
Research Society of America
Radiation Research Society
American Association of Physics Teachers
International Radiation Protection Association, First President, 1968

Associate Fellow: American College of Radiology
Fellow: American Physical Society and American Nuclear Society

Awarded the first gold medal for meritorious work in the field of radiation protection by the Royal Academy of Science of Sweden in 1962 jointly with Walter Binks (England), 1962

Distinguished Alumni Award and Honorary Doctor of Science Degree from Lenoir Rhyne College, 1964 and 1967

Honorary membership in Sigma Pi Sigma, the physics honor society, from Berea College, 1957.

First Distinguished Service Award of the Western Chapter of the Health Physics Society, 1968

Distinguished Achievement Award, Health Physics Society, 1973

Honorary member of Fachverband fur Strahlenschutz, 1973

Editor-in-Chief, Journal HEALTH PHYSICS

Consultant on Radiation and Reactor Problems with a number of Government agencies including the Nuclear Regulatory Commission, Environmental Protection Agency, Bureau of Radiological Health, HEW, and the joint Committee on Atomic Energy of Congress of the United States and a member of President Carter's Panel on Energy Policy.

OBSERVATIONS OF PSYCHOLOGICAL EFFECTS
OF THREAT OF VENTING KRYPTON 85

Robert W. Colman

Since the accident at Three Mile Island (TMI) in late March of 1979, I have been in a position to observe the responses of people of the Middletown and Harrisburg area both to the accident and to later threats of radiation releases. During that time, I have been Coordinator of a Masters Program in Community Psychology at Pennsylvania State University's Capitol Campus in Middletown, have taught in college classrooms, and functioned as a psychologist doing organizational development work with various regional human service agencies. In addition, I have attended numerous public meetings about TMI, in Middletown and elsewhere in the area, conducted both by NRC officials and by local anti-nuclear groups. In these various capacities, I have conducted interviews with local residents about their reactions to the TMI accident and its aftermath. (See Attachment No. 1 for a curriculum vitae.)

Based on the above, I have been able to draw several conclusions:

1). As a result of the accident, people in the area have experienced a loss of control over their own lives. Many of them were driven to evacuation by fear of radiation at the time of the initial accident, and many fear being so driven again on the event of further radiation releases. In this sense, they have become sensitized to the threat of ionizing radiation. (See Attachment No. 2 for a letter to the editor outlining these matters published

in The Patriot, Harrisburg, October 30, 1979.)

2). Changes in public behavior of local people in meetings with NRC officials indicate increasing levels of frustration and anger. The tone of public comment has become more hostile, and anger appears to be closer to the surface. People repeatedly express the concern that their opposition to the venting of Krypton is either not being heard by the NRC, or, if heard, is not being attended to. These concerns were particularly evident in comments made by local residents at the meeting with NRC officials at the Liberty Fire Hall in Middletown on March 19, 1980. (For further documentation, see the NRC transcript of that meeting and of a later meeting of Ahearne, Bradford and Gilinski with Harrisburg area people, held in Washington on March 21, 1980.)

3). The resolve of local people to oppose venting of Krypton has grown firm. At the same time, the organizational development of the anti-nuclear movement in the area has been sufficient to support popular opposition to venting. News articles in national media on March 21 and 22, 1980 suggested the possibility of rioting in the streets in the event of venting. On the basis of my experience and observation, it seems that a much more likely outcome is a well-planned, well-organized campaign of civil disobedience. The local and national anti-nuclear movements can support such a campaign, and should it occur, the campaign would draw both large numbers of people and major international attention from the press. Such a development could conceivably force a new decision, not to vent.

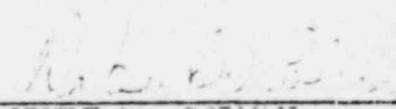
4). It is important that people in the area experience a sense of regaining control over their lives by affecting decisions made

about venting. Local people may achieve this goal by successful legal actions in the courts to halt venting.

5). This local need to regain control would be more directly met by an NRC decision not to vent in clear response to public concern.

COMMONWEALTH OF PENNSYLVANIA :
: ss
COUNTY OF DAUPHIN :

I, ROBERT W. COLMAN, A.B., M.A., Ph.D, do hereby depose and say that the facts contained in the foregoing paper titled "Observations of Psychological Effects of the Threat of Venting Kryton 85" are true and correct to the best of my knowledge and belief.



ROBERT W. COLMAN

Made this 23 day of April,
1980.



NOTARY PUBLIC

MY COMMISSION EXPIRES:
DORIS J. UBER, Notary Public
Harrisburg, Dauphin Co., Pa.
My Commission Expires Feb. 15, 1983

October 1979

CURRICULUM VITAE

Name: Colman, Robert Wheeler Address: The Pennsylvania State University
 Middletown, Pennsylvania 17057
 717-783-6036
Place of Birth: Butte, Montana
Date of Birth: 12 March 1940 P. O. Box 3328
 Harrisburg, Pennsylvania 17105
 717-238-4492

<u>Degrees:</u>	<u>Degree</u>	<u>Field</u>	<u>Date</u>	<u>Institution</u>
	A.B.	Social Relations	June, 1962	Harvard College
	M.A.	Psychology	June, 1966	University of North Carolina at Chapel Hill
	Ph.D.	Psychology	August, 1967	University of North Carolina at Chapel Hill

License Status: Licensed as a Psychologist, Pennsylvania
 Certificate No. PS-001632-L.

Work Experience:

1978-Present Coordinator, Community Psychology Program (MPsSc)

1970-Present Assistant Professor of Social Science and Psychology, The
 Pennsylvania State University. (On leave, 1974-1975).
 Teaching areas have included social psychology, social conflict,
 social movements, small groups, community organizing,
 and graduate and undergraduate internship supervision.

1967-1970 Assistant Professor of Psychology, New York University.
 Teaching areas included social psychology, attitude change,
 personality psychology, and research seminars (for the
 Psychology Department) and general social science seminars
 (for the Metropolitan Leadership Program).

1967 (June and July) Research Associate, Department of Psychiatry,
 University of North Carolina Medical School.

1966-1967 Graduate Research Assistant, under the direction of Stuart
 Valins.

1965-1966 Graduate Teaching Assistant.

- 1964-1965 Graduate Teaching and Research Assistant, under the direction of John Schopler and John Thibaut.
- 1964 (June to September) Psychologist I. Montana State Hospital, Warm Springs, Montana.
- 1962-1963 (June, 1962 to September, 1963) Psychological Assistant. Montana State Hospital, Warm Springs, Montana.

Grants and Awards:

- 1973 Russell Sage Foundation Contingency Fund Grant.
- 1971 Institutional Grant from the National Science Foundation.
- 1969 Institutional Grant from the National Institutes of Health, Bio-Medical Support Grant to New York University
- 1968-69 & 1967-68 New York University Arts and Science Research Fund Grant.
- 1965-66 & 1963-64 United States Public Health Service Fellowship in Social Psychology.
- 1958-60 Harvard College Scholarship.

Organizations:

- Member, Eastern Psychological Association.
- Member, Society for the Advancement of Social Psychology.

Research:

The Creative Process: A psychological approach. Unpublished Bachelor's thesis, Harvard College, 1962.

Bargaining and contract formation with an intrinsic power manipulation. J. Thibaut, R. Colman, J. Kahan and M. Miller. (Reported in Thibaut, J. The development of contractual norms in bargaining: Replication and variation. Journal of Conflict Resolution, 1968, XII, 102-112).

Comparisons of three creativity measures. Unpublished Masters thesis, University of North Carolina, 1966.

Commitment and attitude change as a function of rewards for a consonant act. Unpublished Doctor's thesis, University of North Carolina, 1967.

Onward and upward with the task. (Review of Bales, R. Personality and interpersonal behavior). Contemporary Psychology, 1970, 15 (12), 739-740.

Recipe for a jury. J. Schulman, P. Shaver, R. Colman, B. Emrich, and R. Christie. Psychology Today, 1973, 6, 37-44, 77-84.

Paper Presentation:

Problems in the measurement of human emotion. Second Annual Conference on Pennsylvania Statistics. Middletown, Pennsylvania, April, 1971.

Symposium Participation:

The training of "honest to God" community psychologists. Pennsylvania Psychological Association, Hershey, May, 1974.

Jury selection in political trials. American Psychological Association, Montreal, 1973.

Problems in making social psychological assessments of others: Selection of the jurors in the Harrisburg conspiracy case. New England Psychological Association, Boston, 1972.

Alternative institutions. Harrisburg Defense Committee, Harrisburg, March, 1972. (Chair).

Sociology and anti-war politics. (Ad hoc session). Eastern Sociological Society Convention, Boston, April, 1972.

Organizing for social change in a mental hospital. (Ad hoc session). Eastern Psychological Association Convention, Boston, April, 1972.

Invited Lectures:

Privacy and individual rights, 1976 Legislative Conference, Women's Legislative Exchange, Harrisburg.

Patients' rights. Gettysburg College, January, 1974.

The rights of mental patients. Harrisburg Area UN Association, December, 1972.

The rights of mental patients. Harrisburg ACLU, November, 1972.

Alternative education. Central Dauphin East High School, Harrisburg, Pennsylvania, March, 1972.

The psychology of institutionalization. Harrisburg State Hospital, February, 1972.

Consulting:

Consultant on survey methodology, Neighborhood Strategy Area, uptown Harrisburg, 1979.

Consultant on questionnaire design, Park Street Church, Harrisburg, 1977.

Social Psychological Consultant, Metropolitan School of Columbus (Ohio), 1973, 1974.

Consultant on jury selection, Camden 28 Defense, 1973.

Consultant on jury selection, Harrisburg 7 Conspiracy Defense, 1971-1972.

Research Consultant, Harrisburg State Hospital, 1971-1972.

Consultant on pre-trial prejudice, Legal Aid Society, New York, 1969.

Seminars Attended:

Fifth Vermont Conference on the Primary Prevention of Psychopathology, June, 1979.

"Deinstitutionalization and Dehumanization," Pennsylvania State University College of Medicine, 31 January, 1977.

Northeast Cities Conference, Hartford Institute and National Conference on Alternative State and Local Public Policies, Hartford, 10-12 December, 1978.

"Basic Issues of the Therapeutic State," Georgetown University Law Center, 9-10 October, 1975.

"Dissenting Life Styles," Dr. Leo Alting von Gesau; and "Social and Political Implications of Measurement," Dr. Ivan Illich; both at CIDOC, Cuernavaca, Mexico, Summer, 1971.

Community Involvement:

Workshop leader, (How to overcome apathy) Training and Orientation Session, Tri-County Commission for Community Action, Harrisburg, October, 1979.

Member, Pennsylvania Bar Association Special Committee on Legal Services for the Mentally Disabled, 1979.

Member, Planning Council, Three Mile Island Alert, Harrisburg, 1979.

Member of the Board, Women in Crisis, Hummelstown, PA, 1979.

Member, Planning and Prevention Committee, Dauphin County Mental Health/Mental Retardation, Harrisburg, 1979.

Member of the Board of Directors, First Pennsylvania Feminist Credit Union, 1977-1979.

Member of the Board, Women's Training and Support Program, Dauphin County Commission for Treatment and Program Development, 1977-1978.

Co-facilitator, Community Organizing Workshop, Harrisburg, 1975-1976.

Coordinator, Harrisburg ACLU Task Force on The Rights of Mental Patients, 1972-1973.

Member of the Executive Board, Harrisburg Center for Peace and Justice, 1972-1974.

Member of the Executive Board, Harrisburg Chapter, Harrisburg Defense Committee, 1971-1972.

Member of the Advisory Board, Harrisburg Hospital Mental Health/Mental Retardation Center, 1971-1972.

anti-Kennedy animus. I don't want any part of anything for or against him." Indeed, he took offense decades ago at reporters who tried to sensationalize the incident, and wanted to tell the Kennedy family he would testify in its behalf in any libel trial. But then Rose Kennedy called him "and really got on my butt" to shut up; now he's neutral.

After Kennedy pulled into his driveway, did he hide? The answer from Kennedy's press aide is unequivocal: "I spoke to the senator and he informs me he was not hiding."

THE COP'S recollection differs: "He had gotten down in the front seat of the car." Whitten told reporter Kamholz. This was not information freely volunteered; the reporter had asked if "the story about hiding in the back seat is true," and the former policeman reluctantly set the facts straight on exactly where in the car Kennedy had been hiding.

Did Kennedy receive special treatment in court? Magdelene Andrews Poff, The Daily Progress reporter at the time, recalls seeing no Kennedy name on the arrest blotter, but discovered five warrants with Kennedy's name in a court cash drawer. The judge, now dead, "threw me out of court."

If you want to believe the Kennedy version of all this, he was innocently driving along, perhaps a little fast, perhaps with his rear lights out, when he was put upon and convicted by a pack of vindictive Virginians.

But if you believe the cop and the local reporters, as I do, a pattern of character emerges: in 1951, faced with flunking a Spanish exam, he panicked and persuaded a ringer to substitute for him, and for that was expelled from Harvard; in 1958, with a sheriff on his tail, he panicked and tried to escape and was convicted; in 1969, when his companion drowned, he panicked and left the scene of the accident for nine hours until someone else discovered his car.

When in big trouble, Ted Kennedy's repeated history has been to run, to hide, to get caught, and to get away with it.

A Thought

"I don't know of anything better than a woman if you want to spend money where it will show." — Kin Hubbard.

this writing to show trucks to bring outside food in to perhaps four million starving people. It might, you see, just get into the bellies of the Pol Pot people.

ATTACHMENT NO. 2

Our Readers Write

TMI Is A Mental Health Hazard

EDITOR:

THE HARRISBURG AREA has changed since the Three Mile Island accident in late March. People in the region no longer see the man-made world around them as safe. People have a new sense of personal vulnerability.

Pro-nuclear sources are suggesting that the accident is an indication of the safety of nuclear power, not its dangers. They say that this is so because containment was not breached, a full meltdown did not occur, and because there is debate over physical health effects of the relatively low levels of radiation which were emitted.

This position ignores any psychological damage produced by the disaster and its aftermath. In fact, the damage done offsite seems largely to have been psychological. And it is the psychological effects which most interest people from outside the area. Understanding the nature of these effects is critical for understanding the meaning of TMI.

We can draw on disaster literature for help. (Disasters are sudden, unexpected events which damage property and people. By this standard definition, the TMI accident was clearly a disaster.) Psychological damage seems to come from two sources: immediate stress from the disaster's impact itself, and continuing sensitization to the possibility of future disaster.

The stress effects are usually short-lived, if painful. They include depression, irritability, agitation and anxiety. The stress can lead to disruption of work and relationships. The problems people experienced during evacuation fall into this category. (Interestingly, disasters tend to agitate and disrupt people, and not to drive them crazy: Anxiety is a more likely result than schizophrenia.)

In Harrisburg, the continuing sensitization effects are the most interesting. People still twitch a bit when they hear the term "radia-

ing our hands about how people said they "didn't know" what was going on.

This time, the whole world knew — and did nothing until now.

tion"; they respond quickly and negatively to threats of future radioactive releases from TMI. I hear that outside researchers are beginning to refer to a "Harrisburg hysteria." Why, they seem to ask, is there so strong a reaction here, if the accident was minimal in its immediate impact?

As it happens, the events at TMI could hardly have been better designed to produce long-term sensitization. Three characteristics of the events were particularly important. First, in coming so close to a meltdown, we were exposed to a near-miss situation, so that we could imagine all possible scary outcomes from an almost incredibly large threat. Second, we were all vulnerable, since radiation respects no high ground. Third, and now perhaps most important, it was a high technology accident, compounded by human error. Since the same people — Met-Ed and NRC — show every indication of planning to use the same high technology, we are exposed to a continued vulnerability. And outsiders wonder why local people act concerned?

One additional consideration. Direct stress effects, as I said, are usually short-lived. However, there is increasing evidence in the literature of latent traumatic neuroses from disasters. In other words, people can have anxiety symptoms which show themselves in behavior only under additional, later stress. It is for this reason, along with continuing sensitization to threat, that reopening TMI, Unit 1 or 2, would be a serious mental health hazard.

The best corrective for feelings of vulnerability is success in trying to regain control over one's life. Locally, the clearest way to do this is to work successfully to close TMI.

— Robert W. Colman, PhD
Harrisburg

(Editor's Note: Coordinator of the Community Psychology Program at Pennsylvania State University at Middletown.)

POOR ORIGINAL

The Patriot, Harrisburg
Oct 30, 1979 p. 22

3,000

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APPENDIX A

PSYCHOLOGICAL STRESS

Neighbors of TMI: 'Keep your krypton!'

Associated Press

MIDDLETOWN, Pa. — Hundreds of angry, shouting residents of the Three Mile Island area jammed a local fire hall last night to denounce plans to vent radioactive gas from the crippled nuclear plant.

"Keep your krypton!" chanted many of the 500 people in the hall. The hall has a capacity of 400, and police said that 100 to 200 people were outside, unable to get in, and that many of them pounded on glass windows and doors.

The U.S. Nuclear Regulatory

Commission (NRC) had called the meeting to explain and discuss its proposal to vent the radioactive krypton from the sealed containment building, as well as possible alternatives to venting, but the meeting turned into one of the most hostile among the scores held since the Three Mile Island (TMI) nuclear accident last March 28.

Officials trying to explain the venting plans were interrupted frequently by the audience. "This is going to be a long evening for all of us," said Richard Vollmer, director of the

NRC's technical support staff at TMI, and someone in the crowd yelled, "You earned it!" Others cheered lustily.

Metropolitan Edison Co., operator of the damaged nuclear power plant, wants to release 57,000 curies of krypton 85 so that it can start cleaning up the reactor containment building. It has been seriously contaminated since the accident, the most serious commercial nuclear breakdown in the nation's history.

John Collins, the NRC's chief of operations at the plant, said the maximum radiation dose anyone not actually on the plant site could receive from the venting would be about a fifth of a millirem. A chest X-ray involves a dose of about 35-millirems.

This month, the NRC staff recommended that plant operators be allowed to go ahead with the venting. The five NRC commissioners will have the final approval, and that cannot be given until next month, after the public has had 30 days to participate in discussions about the plan. Another meeting will be scheduled solely to hear public reaction to the report.

Metropolitan Edison Co., operator of the plant, wants to release 57,000 curies of krypton into the atmosphere from the containment building.

Krypton is byproduct of nuclear fission and has spread through 2 million cubic feet of air inside the huge containment building since a serious reactor overheating accident last March 28.

NRC told of a community living on the brink of fear

By Aaron Epstein
Inquirer Washington Bureau

WASHINGTON — Six neighbors of the Three Mile Island nuclear power plant yesterday gave the federal Nuclear Regulatory Commission (NRC) here a portrait of a community in crisis — people on the edge of mental breakdown and violence, families leaving their communities for good.

They told of animals dying of mysterious diseases, vegetation wilting and wildlife vanishing and of residents who fear the cumulative effects of radiation they cannot evaluate. They said that no one believes anything that a politician or an official says.

The encounter was similar to a meeting in Middletown, Pa., on Wednesday night, when angry citizens overflowed a local informational meeting called by the NRC staff. The citizens berated and denounced NRC officials and their plans to release radioactive gases. On Thursday night, a similar scenario was followed during the NRC hearing in nearby Elizabethtown.

The three meetings are the first at which citizens from the area have angrily confronted nuclear policymakers with their fury and frustration since the nuclear reactor at Three Mile Island (TMI) was crippled nearly a year ago.

Yesterday, for slightly more than an hour, the six residents — a nurse, a farmer, a hospital administrator, a psychology professor, a minister and a homemaker — described their fears and the fears of others in the community.

The meeting was held at the citizens' request, and the six said they were a representative cross-section selected after the NRC had responded to the request.

They were disturbed by the latest announcement of a planned release of the radioactive gas, krypton, from TMI, but they said their anxieties ran far deeper.



A resident protests at NRC meeting in Elizabethtown

"The people of the state of Pennsylvania feel we've been sold down the tubes by everyone," said the nurse, Nancy Prelesnik of Hershey. "We are crying out to you to really listen to us."

For the most part, the three of the five commissioners present did listen, attentively and with apparent sympathy, but they spoke little and did not commit themselves to any course of action.

Afterward, however, John F. Ahearne, a physicist recently appointed by President Carter as temporary chairman to give the NRC more direction, said he would speak to the two absent commissioners and set up another meeting to consider the citizens' complaints.

The Rev. William Vastine of New Cumberland told Ahearne that by now "your credibility is so shattered that you don't have a chance in a carload to convince us (that the TMI plant is safe). I would like very much to believe, but hundreds of thousands don't believe. . . ."

"The greatest contribution you can make, my friend, is to close those plants. . . . We have had it."

The core of the problem, said psychologist Robert Colman of Harrisburg, is the TMI neighbors' "absolute distrust" of their government at all levels.

As a result, according to Jane Lee, a farmer from Etters, "We're concerned about these people that are on the verge of cracking up mentally."

The commissioners heard stories of rowdy community meetings, including one at which an official was nearly attacked by a teacher who became "a raging wild man," and they heard of mothers who are afraid to leave their children alone in case of another nuclear emergency.

"I'm getting scared," Colman said, and another citizen added, "It's a very explosive situation."

Accusing the commissioners of remaining in their "ivory tower" in Washington, the citizens urged them to go to the TMI area themselves and face the frightened people.

Each time radioactive materials have been released from TMI, one of the citizens said, "it's just a little bit, but the key word is 'cumulative.'"

Yet the residents still have no way of knowing how much radiation has accumulated in their bodies, Ms. Prelesnik said.

"You certainly should have" figures giving that information, Ahearne agreed.

He wondered, though, if no one believes the NRC, as the citizens were saying, would anyone believe its figures? →

One resident replied that NRC figures would help but that "we have faith only in ourselves." A group of citizens not appointed by politicians should take on the job of getting the truth to the people, he said.

Among the six residents' other recommendations: health and environmental studies, federal money to clean up TMI and help the area's sagging economy and appointment of a health expert and an environmentalist as NRC commissioners. Most of the current commissioners have science backgrounds.

Ms. Lee distributed reports from area health surveyors and veterinarians indicating that animals, from cats to cows, within five miles of TMI have been suffering increasingly from bone and muscle ailments and breeding and respiratory problems since 1976.

She reported defoliation of trees, disappearance of wildlife and painful deaths of birds and other small animals.

"The entire system down there is being affected by something," she said. "It is eventually going to filter down to us."

Already, some residents are alarmed by the recent discovery that an abnormal number of children — four times for the amount expectable — were born with serious thyroid defects in three Pennsylvania counties during the last nine months of 1979.

One of the counties is adjacent to the Three Mile Island reactor, which has emitted radioactive iodine, a known cause of thyroid disease. Officials have said, though, that those defects almost certainly could not have been caused by radiation from the reaction.

'Venting' gas at TMI: Playing the cruelest game

The staff of the Nuclear Regulatory Commission has recommended that krypton gas trapped in the damaged reactor at the Three Mile Island nuclear plant be released into the atmosphere as soon as possible. There is a "strong possibility" that the five-member commission will soon approve the staff proposal, according to one commission member.

It is imperative that no radioactive gas be vented. The potential for harm to the residents of the area around Three Mile Island, and the health threat such a release poses to their offspring, is too great to permit that to happen. Despite claims by NRC officials that the levels of radiation to be vented are within federal safety limits, it is a scientific fact that all exposure to radiation poses potential harm to present and future generations.

The NRC and Metropolitan Edison Co., operators of the reactor, are playing out the cruelest of all psychological games with the people of Pennsylvania by asserting that the alternative to venting is a far more terrible risk, involving leaks of highly radioactive water also trapped in the reactor. In other words, get radiated now at low doses, or face the prospect of massive doses later. That is the option being given to individuals living near the reactor.

Officials have known since a few days after the accident last March 28 that the krypton gas had to be removed before clean-up could occur. From that time on, Metropolitan Edison has remained steadfast in its plan to vent the radioactivity into the atmosphere. It may be a futile exercise now to point out that if someone in authority had rejected that idea outright, and instead demanded that the company begin a search for equipment to remove the gas safely, that the equipment could be nearing readiness now.

There is technology to do so. Philadelphia Electric Co. has purchased cryogenic equipment — which liquefies gases through use of extremely low temperatures, facilitating their

containment and safe removal — for its Limerick reactors under construction in Montgomery County. After the accident, the company offered to make that equipment available to Metropolitan Edison officials, according to a PE spokesman. Adapting the cryogenic equipment to the enormous clean-up operation at Three Mile Island would take time and money, but technically it is possible, experts say.

NRC officials now admit operators are "flying blind" in their job of monitoring conditions inside the reactor because measuring equipment there no longer functions. They say that equipment must be repaired and repaired soon to assure that the reactor core doesn't overheat. Again, they raise a specter so terrible that, they hope, it reduces the hazards of venting to relatively small levels of risks to the public.

The NRC plans to solicit public comment on the staff proposal to vent the krypton gas. NRC Commissioner Victor Gilinsky has suggested that the commission itself go to Middletown — site of the reactor — to hear what the public has to say about the plan and to carefully explain it to area residents. His proposal is a good one. The people of central Pennsylvania have every right to believe that their safety and concerns are being completely ignored by those persons making decisions about TMI. Perhaps if the NRC members see and hear the fears many people have about the venting plan, they will not be so casual in shrugging off the potential health hazards of the proposal.

There is one question the residents near the reactor should most definitely ask the five commission members: Why has the NRC resumed licensing nuclear plants without requiring them to have equipment on hand, or at least readily available, to treat radioactive gases like krypton in the event of future accidents such as Three Mile Island? It is an answer the NRC owes to the people of central Pennsylvania and all Americans.

POOR ORIGINAL

TMI Anger Boils Over

Public Tells NRC Officials:

'We Are Sick, We Are Tired, We Are Angry'

POOR ORIGINAL

By John Drybred
Intelligencer Journal Staff

MIDDLETOWN — There was hooting and howling, chanting and crying, waving of signs, wearing of costumes, sipping of soda and potato chips, and strolling television players Wednesday night in Middletown, where members of the Nuclear Regulatory Commission and other experts tried to explain the proposed venting of krypton gas from the Three Mile Island facility.

NRC members came to the Liberty Fire Hall here to explain the venting proposals, plus alternatives, to the people of the area. "Is it more preferable to have a controlled release or an uncontrolled release?" John Collins, deputy director of of the NCR's TMI technical support staff, asked at one point.

The people of the area showed at every opportunity that they didn't believe anything the experts said, and they didn't want that krypton gas vented. "We are sick. We are tired. We are angry," said one woman in the audience.

Some spoke emotionally, and said they didn't believe the experts. Others spoke rationally, and said they didn't believe the experts.

If recommendations to vent the gas are accepted by the NRC, venting of krypton gas could start next month at TMI. Wednesday night's hostile crowd said they oppose that venting. Some held signs that said: "There will be no venting."

The large brick Liberty Fire Hall holds 400 people, according to an announcement made at 7:35 p.m. By 7:15 p.m., the hall was packed. All the chairs were filled. All the standing room was taken.

People stood outside and beat on the doors to get in. A fire company spokesman announced that the doors

would be locked, and that anyone who opened a door would be "removed from the building," even if police had to do it.

A man, standing in one corner of the room, voiced a prediction when the hooting and howling and yelling at the NRC officials began early in the meeting.

"Everytime one of those guys gets up to say something," the man said about the officials, "they're gonna give him a hard time. So, no one's gonna come out of here knowing anything at all."

The man who said that was being prophetic. Most of the time during Wednesday night's meeting, depending where you sat or stood in that fire hall, much of what was being said was unintelligible.

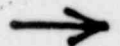
Those who spoke from the head table were constantly interrupted, insulted, shouted down. A middle-aged woman in the front row leaped to her feet every few minutes, ran up to the front table, shook her finger at one or another of the panelists seated there, and cursed at them.

Clouds of cigaret smoke drifted over the heads of speakers and spectators, choking some of them until finally somebody opened one of the doors to vent the smoke.

On one side of the room, a bay was opened, and women (presumably from the fire company) sold coffee, soda, chips and pretzels to a steady stream of customers.

Some of the television reporters and their camera-and-microphone-operating assistants stayed on the sides of the room. Others wandered through the aisles of angry people — sometimes attached to one another with communication cables — aiming the round eye and the mi-

More VENTING Page 2



POOR ORIGINAL

Venting Of Gas From TMI Triggers Anger Of Public

Continued From Page One

crophone gun at people with hostile comments.

One TV reporter thrust a copy of the "Environmental Assessment for Decontamination" report into the hands of a woman at the end of one aisle. "Here! Pretend you're reading this," the reporter said, motioning to his female camera operator to zoom into a tight shot of the opened report. "We don't want your face," the TV reporter told the obliging woman. "Just your hands, holding the report."

Two men, wearing plastic suits and oxygen masks, held a stuffed, homemade dummy, which had "N.R.C." printed on its hat. One of them led chants and cheers from others in the audience throughout the meeting.

Before the meeting started, the man, who asked for silence in the room, told everybody that the dummy was "Mr. N.R.C.," and that they should "make sure this guy (Mr. N.R.C.) doesn't get away easy."

He said that after the meeting was over, "We're gonna tar and feather this nice gentleman (the dummy) and send him out of town." There was loud applause at that, and a great waving of signs.

Some of the signs said things like: "Krypton Kills (below a skull and crossbones)," "Even Superman Can't Survive Krypton," "With Met-Ed We're Dead," and "Nuclear Bombs and TMI — Activate Either and You're Likely To Die."

Richard Vollmer, director of the NRC's TMI support staff, early in his remarks said: "This doesn't look like it's going to be a particularly good occasion for any of us."

That was another prophetic statement, followed a little later by one from a woman who said she came from Washington, D.C., to get an accurate transcript of what was said at the meeting. She asked for orderliness. She didn't get it.

When Collins stood up to show some slides and explain the various alternatives to venting the krypton gas at TMI, many in the audience yelled insults. When Collins got to the technical jargon of his presentation, one man yelled: "Talk English!" There was loud applause.

At one point, Vollmer said: "Ladies and gentlemen, if we can't hold the meeting, we can call it off." They held the meeting.

The people lined up to speak at two microphones placed in the center aisle. They were supposed to ask questions about what the NRC people were presenting.

They asked some questions. But they mostly made statements. The questions and the statements all got around to the same things: They didn't trust Met-Ed, the NRC, the government. And they didn't want that gas vented.

They stood in unison, at various intervals, waved their signs, and chanted things like, "Keep your krypton!"

People from Middletown said they'd been promised answers at previous meetings, and hadn't received them. "As of today, I haven't heard nothing from your office," one man said into the microphone.

One woman asked for audience applause as a vote meter as to who wants the gas vented and who doesn't. It was unanimous in favor of not venting the gas, except for one person who apparently misunderstood one of the questions. He applauded for only a split second when there was a call for applause from those who want the gas to be vented. This brought an angry cry from one man of "Where is that bastard!"

Women stood up and spoke in weeping voices about their concern for their children if they breathe the air filled with the vented gas. Men did the same, saying they were seriously considering leaving the area with their families if the gas is vented.

Officials continued to explain that the gas "won't go away by itself," and that some of the people in the area were expressing concern about "living with the TMI loaded cannon in their faces" if the venting of the gas isn't controlled.

A nuclear medicine expert tried to answer questions about possible harmful effects of radiation on humans by citing reports from experts and studies made around the world.

But the angry people kept bringing up the fact that experts disagree on these studies and reports, and that they believe no one really knows the actual harmful effects of radiation.

At one point, a man from Mechanicsburg asked Vollmer where his family would be during the venting, if it's done. Vollmer said: "I'll be happy to bring them up here."

This seemed to delight the man from Mechanicsburg, who then got from Vollmer the information that he had three children. The man said he won't be at his house when the gas is vented, but he offered it to Vollmer. "...102 Orchard St., Mechanicsburg," the man said. "Bring 'em (Vollmer's children. And your wife."

Venting

POOR ORIGINAL

Intelligencer Journal

March 21, 1980

page 1 of 3

Stirs Up A Storm At Elizabethtown



Intelligencer Journal photo by Larry Zacher

A gas-masked person, protesting plans to vent radioactive gas from Three Mile Island, holds up a dummy, he says represents the Nuclear Regulatory Commission. The dummy's sign reads: "Do you have something I can take for gas?"

By Tom Infield

Intelligencer Journal Staff

Thursday night in Elizabethtown officials of Metropolitan Edison Co. felt the after-shocks of the emotional quake that hit Middletown one night earlier at a public meeting.

The subject was the same: Met Ed's proposal to vent radioactive gas from the disabled reactor building at Three Mile Island.

Protestors — some shouting, some crying, some cursing — poured out their anger at the proposal, one yelling: "How in God's name do you people sleep at night?"

Others in a crowd of several hundred persons at Elizabethtown High School pleaded loudly with the protestors to "shut up and sit down," as one male voice put it.

The meeting was a public briefing by Met Ed about on-going cleanup work at the disabled reactor, sponsored by the state's Department of Environmental Resources.

At the earlier meeting in Middletown, anger focused on staff members of the Nuclear Regulatory Commission, who have recommended approval for the venting of 57,000 curies of krypton gas.

Afterward, the agency's chief regulator, Harold Denton, called the meeting "probably the most raucous assembly we've ever had."

Thursday night it was Met Ed's turn.

Fifteen minutes into an explanation of the how the nuclear plant works, utility senior vice president Robert Arnold was interrupted.

"Why don't you get on with what people want to hear?" an excited young man yelled, leaping to his feet.

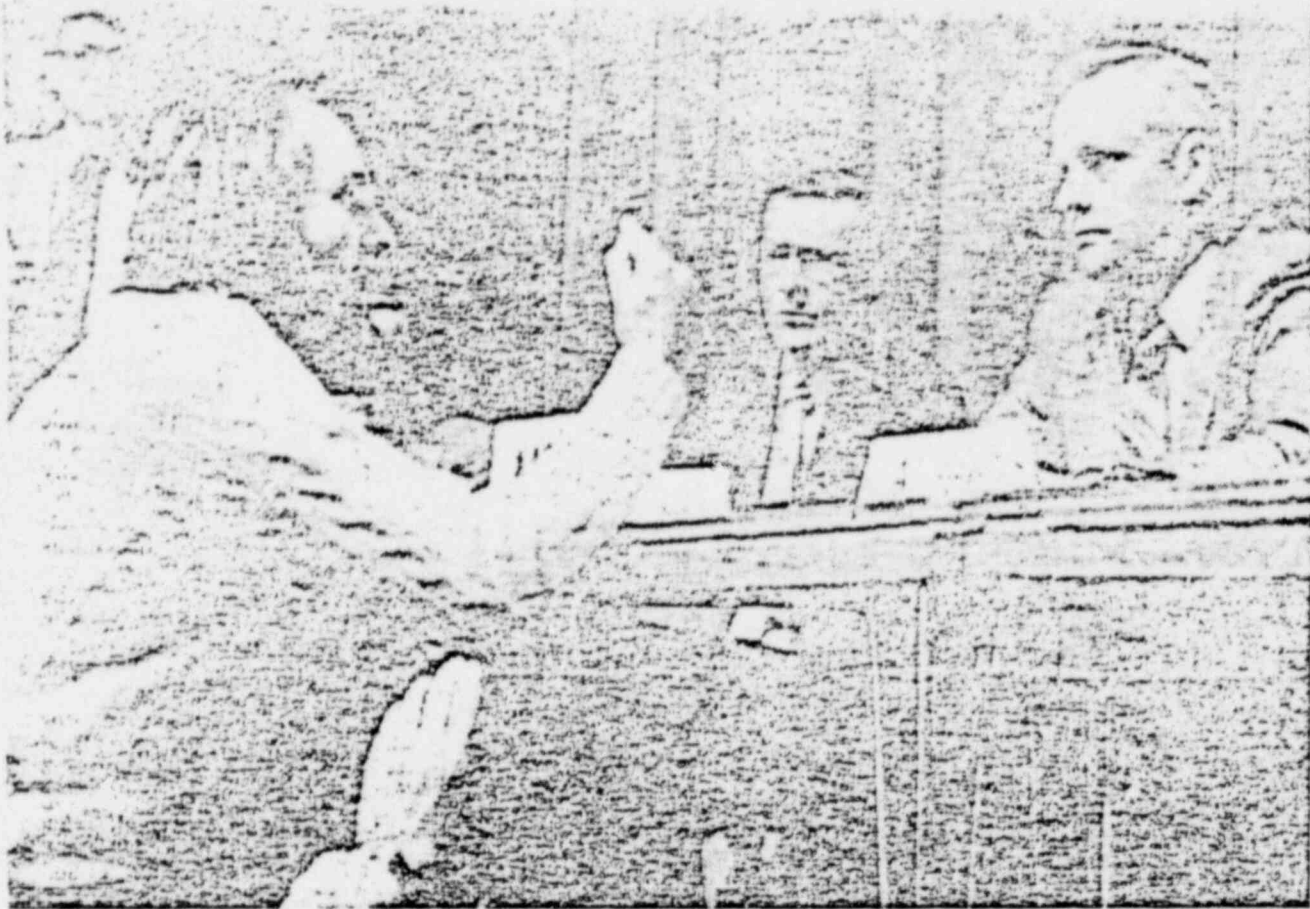
People applauded. A half dozen television crews turned their lights toward the young man, who kept up his outbursts.

"Show us on the chart where it leaked today," a woman shouted, referring to a minor radiation release.

"Let the man talk," yelled back a man who looked to be about 50.

Five minutes later, as Arnold began again:

"Tell us where the leak is today, and what you're going to do about it!" — woman's voice.



Associated Press Wirephoto

Tom Bainbridge, Lancaster, shakes his finger and protests a plan to vent radioactive gas from Three Mile Island. At right is Robert

Arnold of Metropolitan Edison Co. and, in the center, John Collins, an official of the Nuclear Regulatory Commission.

Met Ed Feels Heat At E-town Meeting

"Let us talk. We haven't been listened to since the accident" — another woman.

Somebody suggested a show of hands whether or not Arnold should continue his talk with charts and a pointer. Lots of hands went up on both sides, more on the side of letting the audience talk.

At the microphone on stage, a state official, Richard Boardman, admonished the crowd. He said the

meeting had been called for Met Ed to transmit information to the public. He urged that Arnold be given a chance.

"Sit down and keep quiet. You're paid with our tax dollars," said a woman in the second row.

"Do you want a riot on your hands? Let them (audience members) speak," she cried out.

Man to the woman: "I don't want to hear you either. Sit down."

Arnold, in turn, had a suggestion. Why not let members of his staff talk briefly about the krypton? "Then take an hour now for questions and then go back to the briefing."

Hostile voice — "You don't have any choice."

Met Ed officials strode to the microphone. Mike Morell talked about why he proposed the reactor building purge. Beverly Della Loggia talked about radiation monitoring in the plant. And Bill Riethie told about off-site monitoring for krypton gas.



"If you weren't going to let it go, you wouldn't need monitoring," yelled a man from the audience.

An elderly man was given the chance to ask the first question of the question period. No microphones had been placed in the aisles. He had to walk up on the stage. A line formed behind him.

The man's question turned out to be a reading of a newspaper editorial opposing the krypton venting. The editorial was from the Philadelphia Inquirer, which called it "the cruelest of all psychological games."

A form in audience — "Ask a question."

The man waved off the interruption and continued reading, to applause.

He wanted to know, why did Met Ed reject an alternative for the gas? Why did the utility reject cooling the gas into a liquid in a cryogenic process already built for a nuclear plant at Limerick?

"We did look at the cryogenic system at Limerick and we did not recommend it be used," Morrell answered for Met Ed.

The audience wanted more of an answer.

"Money, that's the reason," someone shouted.

"Money," came the echo.

Morrell tried again. "Three reasons," he said.

First, the system would "take an excessively long period of time to put into operation," up to 24 months. The utility has stated a belief that waiting for some such system to be installed could pose a greater risk to the public than venting the gas, because of leaks in the reactor system.

Second, the technology is "not proven."

Third, the cryogenic process "is not 100 percent effective in removing the krypton anyhow...only 70 to 99 percent."

Arnold said Met Ed had reached "what we thought was in the best interest of everyone concerned."

Voice — "Didn't your decision have anything to do with costs?"

Another voice — "At least admit it."

"I'm confident in my own mind that cost was not the essential factor in arriving at a decision," Arnold replied.

A man in line to ask a question volunteered another solution for getting rid of the gas.

"How about letting some of us 'anti's' — we'll chip in the cost — build a pipeline to all your houses?"

Many in the audience cheered. Met Ed officials were stone-faced.

"We're talking about people with hearts and souls who are being traumatized. What do you do with those psychological casualties?" asked Tom Bainbridge, who identified himself as a Derry Township school teacher from Lancaster.

He got a standing ovation.

"We recognize," Arnold said, "there's a great deal of psychological stress." He said the utility is trying to "minimize" that stress by removing its source — the gas.

He said ridding it in a "controlled manner" was better than the risk of it leaking in an uncontrolled manner.

He said the NRC may even want

Met Ed to vent the gas over a period of a "few days" for that reason, instead of the 60 days the utility proposed.

The public will get at least "10 days' notice," he promised.

Arnold, dressed in a gray suit, was calm. "I honestly believe an awful lot of worry is going on over things that do not necessarily warrant that worry," he told the audience.

"How do you sleep at night?" came the reply.

POOR ORIGINAL

Stress Of TMI Restart May Be Considered

By Tom Infield
Intelligencer Journal Staff

Pressure is mounting on the Nuclear Regulatory Commission to permit consideration of public mental stress in hearings on the restart of Three Mile Island Unit 1.

The undamaged reactor has remained idle since the nuclear accident a year ago at Three Mile Island Unit 2. Legal hearings on the restart may begin by late summer.

In a history-making recommendation, an Atomic Safety and Licensing Board said recently the commission may and should consider psychological stress and community fears.

Both the plant operator, Metropolitan Edison Co., and the NRC's own staff have argued that stress cannot be "quantified" and is not admissible by law in a licensing hearing.

The commissioners themselves said last August they were unsure if fears caused by the Unit 2 accident were legally "relevant" to Unit 1 hearings. They asked for arguments on both sides.

A number of studies have at psychiatrists from Hershey Medical Center, Drs. Joyce Kalen and Enos Martin, interviewed 200 persons and said the nuclear accident caused "massive collective stress."

For at least some people, the stress lingers. That was made plain at two large public meetings last week dealing with a proposal to release radioactive gas from the crippled plant.

At a meeting in Middletown, NRC officials were shouted down, insulted and called "you animals" by a crowd of 500 mostly-angry residents.

Staffers were admittedly shaken. Harold Denton, the agency's chief regulator, called it "probably the most raucous assembly we've ever had."

The following night in Elizabethtown, Met Ed officials got a dose of virtually the same thing, with protesters pleading: "How in God's name do you people sleep at night?"

Intervenors in the Unit 1 restart hearings said later they hoped the emotion would heap more pressure on the five NRC commissioners to admit mental stress as an issue.

"I would say they're probably going to admit it," predicted Jim Hurst, president of People Against Nuclear Energy (PANE), a citizens group in Middletown.

"I think people have been talking and talking and trying to get the story across they don't want that plant, and they're beginning to scream," Hurst said Sunday.

PANE intervened in the hearings on just the one issue of stress. Other anti-nuclear groups have taken a broader legal approach, among them the Newberry Township Three Mile Island Steering Committee.

"We are hoping they do hear the

psychological issue, because it's one of the main issues involving that plant," said Linda Dominoski, a member of the steering committee.

"I think when an industry's been disrupting our lives like they have ours in the last year, there's no way it cannot be allowed as an issue."

Both group leaders said the level of stress will rise even more if Met Ed is given permission to release krypton gas from the Unit 2 reactor building next month.

"I see violence erupting, and I also see a lot of people leaving the area. It's been pushed to that point ... It's a fight for survival down here now," Mrs. Dominoski said.

Removed from that emotion, the licensing board was able to consider only one question: Do the laws governing nuclear power plants permit stress to be weighed as a factor in determining the impact reopening would have.

The state of Pennsylvania and four legal intervenors filed briefs saying the commission could consider stress.

The board itself concluded that stress probably cannot be recognized under one law — the Atomic Energy Act — but is includable under another — the National Environmental Policy Act.

"We recommend that we be permitted to include such issues in this proceeding for the purpose of directly reducing the causes of psychological stress," the three-member board wrote.

However, the panel said it didn't see how stress could be put into a "full-scale cost-benefit balancing."

Met Ed and the NRC staff had argued that the public's stress isn't justified, but the board said it doesn't matter.

"We urge the commission to reject out-of-hand the arguments that the commission should ignore community fears of TMI-1 operation because of the assertion that those fears are irrational," the board wrote.

The board also said "precise numerical quantification" of stress isn't necessary.

POOR ORIGINAL

Stress Caused by Accident Is Studied

Concerned that people living near the crippled reactor at Three Mile Island may be suffering from exposure to chronic stress, a team of mental health professionals began interviewing them last November to assess the psychological fallout from the accident.

This Friday, on the anniversary of the event, researchers from the Western Psychiatric Institute and Clinic in Pittsburgh will begin the second phase of the \$375,000 study funded by the National Institute of Mental Health.

Evelyn Bromet, the principal investigator, said that she and her colleagues selected three groups likely to have suffered most: mothers of young children, clients receiving psychotherapy at social service agencies and employees of the nuclear plant.

"Our goal," Dr. Bromet said in a telephone interview, "is to examine the effects of living in a chronically stressful situation. We want to know what happens to people after-

wards, and what kinds of feelings the anniversary of the event may trigger."

Dr. Bromet explained that the study would compare these individuals with people living in Beaver County near the Beaver Valley and Shippingport Power Plant, twin nuclear reactors where no accident has occurred.

The results of the November interviews, which took one and a half hours and sought information about anxiety or other emotional upsets in the last year, are now being analyzed and will be published in May, she said.

The second series, pending approval from the Office of Management and Budget, will ask about the individuals' life history in terms of mental health.

Dr. Bromet has requested funding for a continuation of the present study, and an extension that would include a population living near a coal-fired plant.

POOR ORIGINAL

TMI's neighbors find a refuge in their faith

By Linda Loyd
Inquirer Staff Writer

MIDDLETOWN, Pa. — A year ago, members of Glad Tidings Assembly of God Church, near the stricken Three Mile Island nuclear plant, gathered to hear their minister solemnly say, "I believe we are living in the last days."

The frightened churchgoers prayed, sang, hugged one another and sometimes wept in the following days.

The end did not come.

Afterward, many believed that they had been spared only by "God's hand upon the situation," said Eileen Carlson, a housewife who lives near the reactor.

"We really faced death. I was afraid," she said. "The Lord gave me assurance. He took hold of my life."

In the year since the crisis, Mrs. Carlson has made a "stronger commitment" to God, her church and her family. She is not alone.

Several local clergymen say the deepening religious feeling that developed here during last spring's crisis has not worn off entirely. And while life goes on much as before, there has been a lasting effect on religious attitudes.

"There's been a definite revival of people I've never seen in church before," said Bill Moore, a young stock manager at a store, who attends the United Methodist Church in nearby Royalton.

People of all faiths have told their religious leaders that they have a new appreciation of the fragility of human life. Some said they thought more deeply about questions involving the meaning of life, the coming of death, the value of material things.

One who says the accident deepened her faith is gray-haired Margaret Posey. She recalled that, before the uncontrolled releases of radiation, "I worshiped my furniture, all three rooms of it." But since then, she said, "I put my furniture in perspective, where it belongs. I realized that all you really have is Jesus and your loved ones."

Housewife Barbara Burkett, who a year ago took her two young sons to stay with a relative in Delaware, said that after the family members were

reunited they spent more time together.

"It did bring our family closer to God," said her husband, Vaughn, a mechanic at Bethlehem Steel.

His wife added, "I saw a stronger love of the Lord because I knew he was watching over us. He had to. Otherwise, it would be all over."

"People have re-evaluated their lives and sort of shifted some of their values," said the Rev. W. Jackson Otto of Wesley United Methodist Church. "There has been a reassessment of things important; this includes a deepening of one's faith."

"It has not happened in earthshaking proportions. Rather, it has been a quiet accomplishment."

The religious revival has not swept the area in a dramatic fashion, clergymen say. Residents are not forgoing worldly possessions or everyday pleasures. Instead, a subtle spirituality is mixing with the unease and the resentment that followed the accident.

"It has touched people's lives in a great way," said the Rev. Richard A. Youtz of St. Peter's Church in nearby Steelton. "It was a great shock, like at the time President Kennedy was killed. Or like during a war. People begin to ask themselves what's most important."

"In a matter of days, almost everything these people had worked for — their homes, their farms, their material possessions — was almost gone," said the Rev. Stephen Sparks, pastor of Glad Tidings Assembly of God. "By Saturday night of the crisis, thousands of families had left the area. In leaving, they didn't know if they'd ever be able to come back."

Once people returned to Middletown, many returned to churches, as well. The surge in attendance has been gradual, though, and not all congregations report a "spiritual reawakening" among their members.

But more than half a dozen local churches do, including Seven Sorrows of the Blessed Virgin Mary, Middletown's only Catholic parish, where daily Mass attendance has doubled and Sunday attendance has improved more than 10 percent among the parish's 4,000 members, according to Msgr. George V. Lentocha.

"The levels seem to stay there," he said. "Once people got the taste of a good thing, they stayed with it."

At Glad Tidings, a Pentecostal church, attendance doubled to 200 in the months after the Three Mile Island accident. The growth has been "so tremendous" that the congregation plans to construct a new building to handle the overflow.

Across the Susquehanna River in tiny Newberrytown, attendance at St. Paul's United Methodist Church has risen 10 to 15 percent from a year ago.

"In light of possible disaster, people have been more aware of their faith and their need of God," said the Rev. Harold E. Millard.

At Valley Baptist Church in Middletown, where membership is up 21 percent, the Rev. Bill Reese said, "The crisis at TMI has brought about more of a unity in Middletown. You can walk down the street and get a genuine hello and a smile. There's a genuine concern for people, and it's overflowing in the church, but not centered in the church."

The Rev. Paul J. Griffith, vicar of St. Michael and All Angels Episcopal Church, said he had detected "a better interpersonal relationship between congregants, a little more warmth and compassion."

"In every church you find some friction and bitterness," he said, adding that "this accident seemed to mellow people's attitudes."

Pastors said the crisis had strengthened family ties.

"One particular couple was having marital difficulty when suddenly a year ago they found themselves out of the area in a wooded campsite with nothing but the husband, wife and child," recalled the Rev. Roland Prouse of First Church of the Nazarene in Harrisburg. "They suddenly realized what their real values were, and it made a strong marriage."

Minutes away from Three Mile Island, at St. Peter's Lutheran Church, pastor David Newhart has counseled congregants "who are not necessarily opposed to nuclear power, but are concerned about the safety and welfare of their families."

POOR ORIGINAL

"Some see the nuclear plant as a threat; others see it as a means of economic growth," he said. "But they all are very much in love with the area and have concerns about their town and want to protect it."

A year after the accident, an "unsettledness" still pervades the community, "and people are apprehensive," said the Rev. Abe Ediger of Calvary Orthodox Presbyterian Church.

"The economy has suffered. Real estate values have gone down. Opportunities for businesses coming in is negative," said another religious leader. "Whether or not they resume the nuclear reactor, concern is for the future and what's going to happen here."

POOR ORIGINAL

The fears over TMI cannot be smokescreened

"Why can't the state of Pennsylvania find a few thousand dollars," Sen. Gary Hart (D., Colo.) asked Nuclear Regulatory Commission Chairman John Ahearne Monday, "to find some local experts to assure the people there that you aren't going to gas them to death?"

During the hearings of the Subcommittee on Nuclear Regulation of the Senate Environment and Public Works Committee, which Sen. Hart chairs, he and his fellow senators heard in intense, and clearly frustrating, detail about the response of the people who live near the Three Mile Island nuclear reactor site to the prospect of venting radioactive krypton gas into the atmosphere.

Mr. Ahearne, in his testimony, reported on the meeting last week at Middletown, Pa. "There was anger," he said, "frustration, bitterness, fear, a complete mistrust of anyone who is in an official position." Then he and other officials of the NRC reiterated their position that the radioactive krypton gas which is trapped in the containment building of the TMI reactor must be disposed of before the clean-up of the reactor itself, with its deadly core material and highly radioactive cooling water, can begin. The NRC's position, and of course that of Metropolitan Edison Co., which operates the plant, is that venting the krypton into the atmosphere will not pose a health hazard to people in the area.

Sen. Hart's more detailed response was to ask: "Why can't the Pennsylvania legislature appropriate \$10,000 or \$50,000 or \$100,000 to hire nuclear experts... to look at this cubic yard of gas and tell people around there it's not going to hurt them?" The context of

that suggestion was Sen. Hart's contention that Pennsylvania officials had failed in calming the fears of the people of central Pennsylvania. "I would think the state of Pennsylvania would have some responsibility," he insisted. "This is just one instance of where state governments are not being responsible."

Sen. Hart's criticism of Pennsylvania officials is 180 degrees off-target. Gov. Thornburgh and his aides managed the most reliable and responsible performance of anyone in the TMI crisis. Still, the senator's frustration, perhaps, is understandable, if it is assumed that it is based on ignorance.

If he were to go to the area around TMI, if he had gone to the meeting Mr. Ahearne cited, if he will go to future ones promised by the NRC or, better yet, organize some of his own under his subcommittee's auspices, that ignorance could be erased.

He would perform an important national public service if he would do just that, and begin the process of educating Washington officialdom to a serious and growing social problem of the NRC's and the nuclear industry's — and their predecessors' — own making. Sen. Hart would do particularly well if in scheduling Senate hearings at the site he would insist that the commissioners of the NRC go along — and that everybody listen.

They would hear a great deal, and perhaps come to understand why there is profound — and fully justified — opposition to the venting of the gas.

They would hear from good, solid, skeptical, tax-paying citizens, with not an anti-nuke activist among them.

They would hear from people who have been lied to, by Met Ed, by their government — *their federal government* — whose officials bumbled and spun their wheels in impotence in the immediate aftermath of the March 28, 1979, accident — the worst in the American nuclear industry's history.

They would hear from people studious enough to know that the same protestations as are now being made about the krypton venting were made about radiation from nuclear weapons tests in Utah and Nevada in the 1950s, as both U.S. troops and civilians stood by — only years later to be shown to have inordinately high rates of certain cancers and other health damage.

If they heard that, and listened — to the social problem as well as to the still far from certain scientific estimates of potential health damage — they would demand that the gas be disposed of in a way other than spewing it into the atmosphere.

If they don't do that, long-latent cancer and genetic damage may not be inevitable. No responsible scientist is absolutely certain of that, either way. But one thing *will* be absolutely inevitable. That is that the fear, the frustration and the "complete mistrust" of the government will significantly, and dangerously, increase.

Ongoing Fallout: Fear

By Harvey Wasserman

NEWBERRY TOWNSHIP, Pa. — It's been a year since the accident at Three Mile Island but the air in the community surrounding the plant is thicker than ever with anger and fear. In fact, in seven years of working to stop atomic reactors in my own home town, Montague, Mass., and elsewhere, I've never encountered a community so close to the brink of an upheaval over the nuclear issue.

The reasons are many. For one thing, people in the farm country surrounding Three Mile Island now believe that the plant has been harming their animals since well before the accident. For four years now, Jane Lee, who lives on a farm in the village of Eters, has been collecting affidavits from area farmers on what they call "strange goings-on" with their animals. Their accounts include a frightening array of biological problems in animals ranging from cats to cows. The list includes spontaneous abortions, stillbirths, sterility, mutant offspring, blindness, defective bone structure and sudden death — all without clear causal explanation.

Dr. Robert Weber has also noticed problems. He is veterinarian in Mechanicsburg, 15 miles from the plant, who has practiced in the area for 32 years. Early this month, he testified before the Public Utilities Commission in Harrisburg that since 1976 he has been encountering widespread bone problems among cows in the area. After giving birth, he said, the cows "go down and can't get back up." Dr. Weber said further, in an interview, that in the summer and fall of 1979, "after the plant went bad," he began performing one caesarean-section operation a week on pigs that were unable to dilate properly despite sizeable hormone injections. He said that previously he had been called on to perform only one or two such operations a year. At the moment, he says, he is also performing two such operations a week on goats and sheep; one or two a year had been the normal

Private, both Jane Lee and Dr. Weber suspect that the problems are coming from the power plant, possibly from radiation, possibly from substances sent into the atmosphere through the cooling towers that may be altering the chemistry of the soil.

Charles Connolly, who lives in clear view of the four cooling towers, also has his suspicions. He says that when the reactors were operating, rainfall running off his roof would kill the grass around his house and would wash into his cisterns a milky white substance that would make animals who drank it "lie down and get sick." When the reactors stopped operating, the milky substance disappeared, he said. Mr. Connolly, who has lived on his farm since 1913, says that yields from his farm have dropped noticeably since the opening of the first reactor in 1974 and that since the accident at the second reactor, wild birds, game animals and snakes have greatly diminished in numbers.

In recent weeks, hot debate has developed over statistics indicating increased infant mortality and infant hypothyroidism in area hospitals. One York family has filed suit against Metropolitan Edison, operator of the reactor, over the post-accident stillbirth of their child. One Mechanicsburg couple wonders quietly if the birth of their daughter with the dreaded Down's Syndrome, a genetic defect, might have somehow been linked to the accident. One Hershey woman chose to have an abortion and then had herself sterilized rather than rear an infant where "it will never be clean."

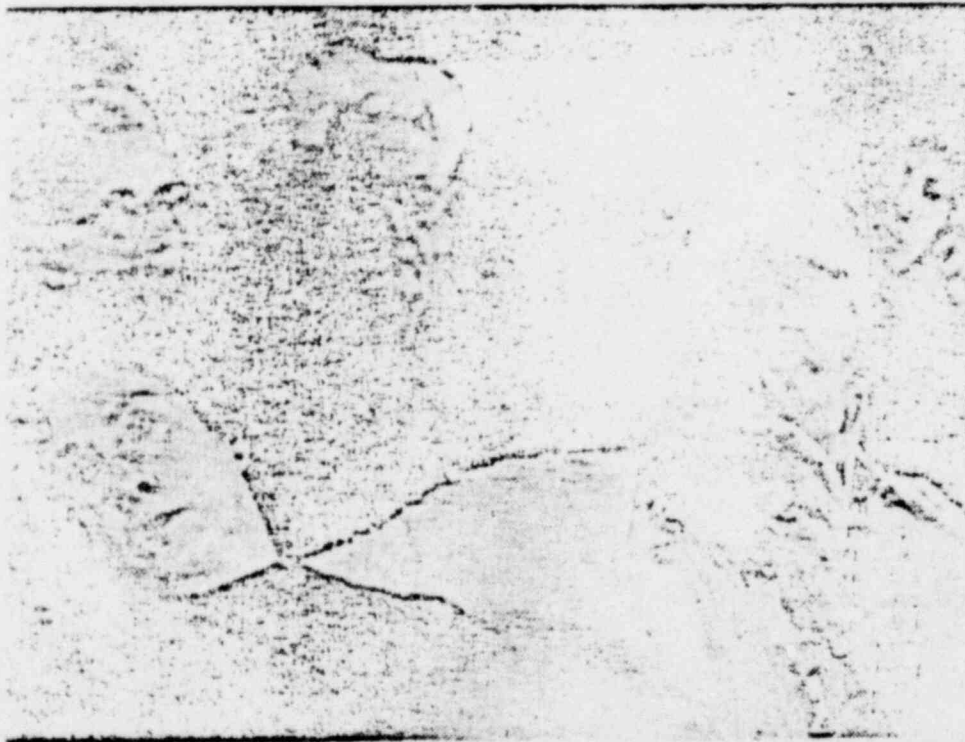
No one has definitive scientific proof of what health problems the emissions have or have not caused. But local residents are furious that no official study has been done on their animals, and many are nervous to the point of breakdown about what might be happening to them and their children. Some have begun a multi-million-dollar class-action suit for psychological damages stemming from the accident. Many say they would move "in a minute" if they could sell their farms or houses and find jobs elsewhere.

Indeed, there are hundreds here who once welcomed nuclear power into

their neighborhood but who now curse Metropolitan Edison, the Nuclear Regulatory Commission and the state. Many are starting to turn public meetings with utility, state and Nuclear Regulatory Commission officials into harsh confrontations. They don't want more krypton gas vented into the atmosphere. They don't want reactor No. 1 restarted. They do want reactor No. 2 dead and buried. Most of all, they want some clear answers about the health of their animals and families.

As a nation we have an obligation to make sure that those answers are forthcoming. There are 67 reactors licensed for commercial operation in this country, and 37 under construction. To my knowledge, none of them is immune to what happened at Three Mile Island and none of us is immune to the kinds of emotions its neighbors are feeling.

Harvey Wasserman, a long-time anti-nuclear activist, is author of "Energy War: Reports From the Front."



The New York Times/Teresa Zabala

Residents of Middletown, Pa., meeting about Three Mile Island.

At least 14 mental health studies have been conducted among affected Pennsylvanians.



POOR ORIGINAL

Researchers Finding Anxiety in the Air Near 3 Mile Island

The New York Times
March 27, 1980
Page 2 of 2

By BEN A. FRANKLIN

Special to The New York Times

MIDDLETOWN, Pa., March 26 — When ordinarily law-abiding, solid citizens — housewives, lawyers, mothers and fathers — stand up and shriek in public that they and their children are being driven to the edge of sanity, and that some of them may leave their families or become violent, psychiatrists take notice.

And they are, again, here this spring. As a new decontamination plan at the disabled nuclear plant at Three Mile Island poses still more potential hazards for the people in this area, many of whom are protesting angrily and fearfully, researchers are studying the thousands of Pennsylvanians driven from, or afraid to

leave their homes a year after the accident a year ago.

At least 14 separate studies have already generally concurred in finding, as one of the reports says, that "the major health effect of the accident appears to have been on the mental health of the people."

At the same time, while some of the mental health studies are scheduled to keep on monitoring for several years, both the main Federal and state studies on the accident have called the psychic effect "transient." The stress effects according to the major Federal study, "dissipated rapidly among most groups."

Now, however, some of the mental health experts here say that there are new and worrisome signs that the psychological remission that some reports found to have occurred in the months after the accident may be coming apart.

'A Lot of New Stress'

"There is new data", as one psychiatrist put it. "There is a lot of new stress. We're not sure it hasn't become chronic."

The stress is the announced plan of the Nuclear Regulatory Commission to purge the 200-foot-high, concrete Three Mile Island-2 containment structure of 24 million cubic feet of Krypton-85 by venting the radioactive gas into the June air of Dauphin County — and of the area downwind of the prevailing easterlies along the shores of the broad Susquehanna River.

On Friday, the first anniversary of the accident, the second phase of the largest mental health study — a \$373,000 research funded by the National Institute of Mental Health — is to begin, resuming and repeating the set of interviews conducted last year.

In May, Evelyn Bromet, director of psychiatric epidemiology at the Western Psychiatric Institute in Pittsburgh, and the project director, is to report on these re-interviews with the subjects of the study — women with young children who were advised to evacuate a 15-mile radius of the plant, the "at risk" clientele of local mental health clinics and workers at the reactor.

Discouraging Report Expected

On April 8, the state Department of Health's "T.M.I. Stress Study," headed by Peter Houls, a behavioral scientist at the nearby Hershey Medical Center, is to release a report on the accident's effect. Dr. Houls would not discuss the study today, but it is expected to say that data collected as recently as January show continuing, serious mental health problems in the area near the reactor.

Since it was announced a few weeks ago, the Krypton venting plan has stirred an outburst of protest that many here, including some top officials, believe might force officials to use alternative, much more costly and time-consuming methods.

At an unofficial two-hour "forum" taped Tuesday night for broadcast by a Harrisburg television station on Friday, witness after witness spoke in anguished and trembling voices to a panel of Federal, state and local officials.

'Scared to Death'

"I am scared to death," said Mary Entertine. "I have a 2-year-old son and every night when I pull his shade down at bedtime, and look out the window and see the cooling towers, I nearly cry. I am in a panic. I have never considered myself a violent person, but I am beginning to think I am going crazy — I do believe I am."

George Hickernell, a veteran local politician and civic leader, now a commissioner of Lower Swatara Township, a few miles from the reactor, said, "This is a very volatile situation and could be very dangerous. I visualize that we could have some serious incidents and riots."

Robert G. Reid, the high school teacher who is the Mayor of Middletown, joked sardonically at the televised forum that he wished local banks would replace the time and temperature information they now display on their flashing outside clocks with "the radiation count, so I'd know when to run."

The Mayor had just commented that regarding health-related radioactive releases from the reactor, "I'm quite sure they'll never tell us the truth."

Question From 11-Year-Old

John Lesniak, an 11-year-old who came with a tape recorder, asked, "What's going to be the future state of children my age, mentally and physically — mentally?"

"Well, the Kemeny Commission report says the mental effects are the most important," was the answer from Thomas M. Gerusky, the state director of radiation protection.

One young man, a college student, said, "We have Iran, and life goes on — we have Afghanistan, and life goes on. But with this crisis, I am beginning to think it is not going to go on and there is going to be an end to the world."

Obviously, not everyone agrees. In a half-day's stroll through Middletown, a visitor found only one person in a dozen who did not criticize such testimony as "hysterical" and "disgusting," though none had attended any of the recent meetings. These are people who say they accept or endorse the Krypton venting, however reluctantly, as "necessary to get on with the cleanup."

At the David Martin Store, a haberdashery, there is a brisk sale of \$4.50 T-shirts, most of them bearing pro-T.M.I. silk-screened slogans: "Hell No, I Don't Glow," "T.M.I. Staff — We Stayed Behind To Save Yours," and "A Little Nukey Never Hurt Anyone." The store has T-shirts saying "I Survived T.M.I.," one version with a tiny postscript that adds, "I Think."

In the Hy-Lo Discount Store on Main Street, the cashier, Marion Munz, a 56-year-old widow was repeating the comment of several others when she said "I'm worrying, but I'm the type who doesn't show my feelings."

A College Survey

"I think that is cognitive dissonance," said Donna Casperson. An instructor at the Harrisburg Area Community College, she had her social psychology class conduct a survey on the street two weeks ago. It yielded an unexpected result.

The tabulation showed markedly greater concern about the proposed Krypton release among respondents 11 to 40 miles away from the reactor than in Middletown, in sight of it.

In an interview, Miss Casperson theorized that "when there is a conflict between beliefs — say that the Krypton is dangerous, on the one hand — and the difficult behavior, on the other, of uprooting one's life and giving up a home and a job to move away from the danger, the theory of cognitive dissonance says that you have two ways to resolve the conflict.

"You can leave. Or you can stay and alter your beliefs — or your demonstration of them — to fit the suppressed anxiety. You can say 'I don't care'."

"Neither way is very good for your mental health", she said.

POOR ORIGINAL

Psychiatrists Fear Chronic TMI Stress

By Ben A. Franklin
New York Times News Service

MIDDLETOWN, Pa. — When ordinarily law-abiding, solid citizens — housewives, lawyers, mothers and fathers — stand up and shriek in public that they and their children are being driven to the edge of sanity, and that some of them may leave their families or become violent, psychiatrists take notice.

And they are, again, here this spring. As a new decontamination plan at the disabled nuclear plant at Three Mile Island poses still more potential hazards for the people in this area, many of whom are protesting angrily and fearfully, researchers are studying the thousands of Pennsylvanians driven from, or afraid to leave their homes a year after the accident a year ago.

At least 14 separate studies have already generally concurred in finding, as one of the reports says, that "the major health effect of the accident appears to have been on the mental health of the people."

At the same time, while some of the mental health studies are scheduled to keep on monitoring for several years, both the main federal and state studies on the accident have called the psychic effect "transient." The stress effects, according to the major federal study, "dissipated rapidly among most groups."

Now, however, some of the mental health experts here say that there are new and worrisome signs that the psychological remission that some reports found to have occurred in the months after the accident may be coming apart.

"There is new data," as one psychiatrist put it. "There is a lot of new stress. We're not sure it hasn't become chronic."

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Since it was announced a few weeks ago, the Krypton venting plan has stirred an outburst of protest that many here, including some top officials, believe might force officials to use alternative, much more costly and time-consuming methods.

But the new evidence of deep and continuing stress, shown in mere discussion of the issue at the required public hearings on the plan, has shocked and dismayed many mental health observers here.

At an unofficial two-hour "forum" taped Tuesday night for broadcast by a Harrisburg television station today, witness after witness spoke in anguished and trembling voices to a panel of federal, state and local officials.

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But the public forums and official hearings on the Krypton venting proposal, which are not over yet, have spread some distress.

More people than ever before have been reading about, or seeing and hearing on radio and television, frightened neighbors who stand and report "a metallic taste in my mouth" near the plant or "aborted and three-legged calves" on farms downwind.

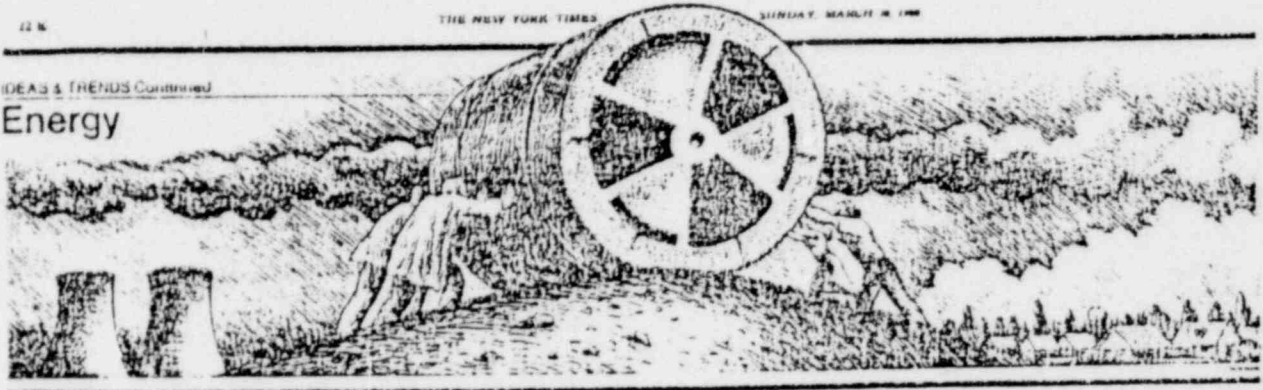
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IDEAS & TRENDS Continued

Energy



A Year Later, Three Mile Island Generates Anger

POOR ORIGINAL

A year ago last Friday — March 28, 1979 — things started to go wrong at a nuclear power plant operated by the General Public Utilities Corporation at Three Mile Island, in Middletown, Pa. Today, in the bowels of the plant, the reactor core is still inaccessible, surrounded by the containment vessel which houses 22 million cubic feet of air, contaminated by radioactive krypton 85.

In the aftermath of the accident, life has become very hard for General Public Utilities and for the nuclear industry in general. Last week the financially troubled utility sued the Babcock & Wilcox Company, which supplied the nuclear steam system for the plant, for \$500 million, charging negligence, while the Commonwealth Edison Company, the nation's biggest nuclear utility, was indicted for conspiracy and making false statements about breaches of security at one of its plants — the first such charges brought against a nuclear power company, according to the Justice Department.

If doubt now hangs over the future of

nuclear power in the United States, there is no doubt at all in the hearts and minds of many citizens in the Three Mile area and elsewhere. Over the weekend, antinuclear demonstrations were conducted at power plants nationwide, and scores were arrested in New Jersey, Missouri and elsewhere.

Antinuclear forces have recently been additionally provoked by the nuclear establishment's decision-making process as applied to the krypton bubble inside the plant. If the plant is ever to be cleaned up, engineers and regulators are certain, the krypton has to go. Otherwise, the space is too dangerous for workers.

But many local residents are adamantly determined that it must not be released the way most nuclear experts want to release it: into the open air.

On March 19, staff members of the Nuclear Regulatory Commission and several other agencies held public hearings in Middletown to describe and discuss an environmental assessment of the consequences of venting the krypton. The staff members were re-

peatedly shouted down by the crowd; and when the public got the microphones, they told the experts just how they felt. For example:

"I can't be rational in the sense of objectivity," one man told the hearing. "No one can live within 30 miles of here and be totally objective. . . . I want to believe you but I do not believe you." Another said: "Even the best minds that are trying to work with us, and I do believe they are sincere, as maybe some people don't but I do. I want to. For the sake of humanity I have to. But the thing is, there are no experts, let's face it." Others blamed the accident — and, by implication, the venting, should it take place — for sinusitis, hypothyroidism, bronchitis, unhatched goose eggs and blind puppies. "We are sick, we are tired, we are angry," one woman told the experts. "I went through a really nice Christian martyr trip trying to forgive you, but I can't any more. I want to say welcome to Nuremberg, because that's what this is going to turn into."

Cancer and other diseases aside, one questioner demanded, "Isn't it true that stress, anxiety and fear will also shorten our lives?" An N.R.C. staff member who replied that indeed such effects were being studied — as they are — was shouted down.

**Psychiatrists Study
Three-Mile Trauma**

The first anniversary of the Three Mile Island episode is now upon us (the accident officially began at 4 a.m. on 28 March 1979) and there is no end in sight to the postmortems. One of these is a study which is probably the first of its kind: a disaster survey of a nondisaster. Studies of the psychological aftereffects of natural disasters are common. But Three Mile Island is a case where no physical damage to the population or environs occurred; only psychologically does it rank as a trauma.

The President's commission on the accident reported, 6 months afterwards, that the incident had a demoralizing effect on large numbers of people. Now the National Institute of Mental Health is directing a survey to identify long-range psychological effects on those regarded as the most vulnerable members of the population. The study, headed by Evelyn Bromet of the Western Psychiatric Institute and Clinic in Pittsburgh, involves 1000 people living in the vicinity of Three Mile Island. They are divided into three groups: mothers of small children born within the year prior to the accident (most of whom followed the governor's advice to evacuate), unionized plant employees, and clients of the public mental health system who had been in treatment within 6 months prior to the accident.

Bromet's team of interviewers—all of them screened for antinuclear bias—have already completed phase one of the survey, in which respondents were asked general questions related to their emotional well-being and primary social relationships over the previous year.

Phase two, currently under way, involves reinterviewing all these people, with the idea of gaining a picture of their emotional well-being over the entire course of their lives. (Women who were pregnant at the time of the accident are not included in the survey because the state health department is conducting its own survey with them.)

Constance Holden

Monitoring Isn't Better

Before the accident at Three Mile Island, the state government had one air monitor around the state's nuclear power plants to measure radiation in case of a serious nuclear accident.

Although this insufficient monitoring was criticized later by a Presidential commission, it has not been upgraded at plants other than Three Mile Island. The state still has only one air monitor in place at the Beaver Valley and Peach Bottom nuclear plants in Beaver and York counties.

Before the accident at Three Mile Island, the Health Department had no library of information on health matters relating to nuclear power plant accidents.

Although a Presidential commission recommended Pennsylvania upgrade its research resources to handle nuclear emergencies, the Health Department still has no library.

In short, because of these and other apparent weaknesses in state policy, state government is not prepared to respond effectively to health concerns now — one year after Three Mile Island — were another nuclear accident to occur.

Why?

The state officials responsible for the radiation monitoring and the radiation health library suggest bureaucracy is holding up swift, efficient planning in the event of another nuclear accident.

"You can't do it overnight," said Thomas Gerusky, chief of the Bureau of Radiation Protection, who explained he ordered new monitoring equipment four months ago but the supply-purchasing Department of General Services hasn't delivered yet.

"We have the bookshelves, but not the books," said Health Secretary H. Arnold Muller when asked about the state's lack of a radiation health resource library.

The two apparent weaknesses in state nuclear accident planning were among 29 found in a review of state preparedness by United Press International. In all, 17 of the 29 weaknesses related to health plans.

Perhaps the most serious weakness was that a year after Three Mile Island, the Bureau of Radiation Protection still has only one nuclear engineer — although Gerusky and others feel the state should have five nuclear engineers for the 11 nuclear plants operating or under construction in the state.

The job is an important one because the nuclear engineer provides assessments of nuclear accidents to aid the governor in his decision on whether to order a precautionary evacuation of citizens.

The state apparently has not installed a radiation detector at the drinking water works in Midland, Beaver County, downstream from the Beaver Valley nuclear plant.

Despite the recommendation of President

**By George Lobsenz
and Scott MacLeod**

Carter's Commission on Three Mile Island for Pennsylvania to stock potassium iodide, a thyroid cancer-blocking agent, in case of another nuclear accident, the state possesses no potassium iodide.

Moreover, the state has established no means of medically treating the hundreds of people who could become severely injured by radiation in the event of a serious nuclear accident.

The state has not devised a plan to ensure that physicians who would be needed to treat victims in a nuclear accident do not themselves evacuate the area as many did during the Three Mile Island crisis.

The state has not yet started a formal program to educate physicians about the health problems associated with nuclear power, radiation sickness as well as psychological stress.

On stress, the state has yet to look into whether the mental anguish of nuclear power's hazards are so great, or are so potentially great, as to be a factor in a state's endorsement of nuclear energy generation within its borders.

The Health Department, which must provide key medical advice to the governor for his decision on precautionary evacuation of citizens, does not employ a radiologist and must rely on an outside consultant.

A dispute arose after the Three Mile Island accident over which should advise the governor on nuclear health matters, the Health Department or the Bureau of Radiation Protection in the Department of Environmental Resources. It was decided they both should.

The Health Department's policy of withholding tentative research data about the health effects of the Three Mile Island accident has created anxiety among citizens on two occasions. Both times, the information regarding potentially serious health effects was leaked to reporters by insiders who thought the public should know the findings.

A registry of cancer victims across the state is viewed as vital to research on the long-term health effects of the Three Mile Island accident, but funding for the project has been stalled in the General Assembly.

Finally, the state has not undertaken a review of a major debate among scientists over the health effects of low-level radiation such as that emitted from normally operating nuclear plants or the level of radiation released during the Three Mile Island nuclear accident. Some highly regarded scientists expect to find some "surprises."

Tomorrow: Is evacuation possible?

POOR ORIGINAL

APPENDIX B
ATMOSPHERIC TESTING
(U.S.)

One of the early witnesses Tuesday was Katherine Striemer former director of the CDFAs environmental assessment team, who since termination of the team nearly a year ago has worked in the state Water Resources Agency.

Ms. Striemer was highly critical of the CDFAs failure to adopt the team's findings or the 68 recommendations that it believed had to be made if the CDFAs were to come into compliance with the California Environmental Quality Act.

She said "unfortunately" there is very little evidence that any part of the team's report has been incorporated or ever considered in the proposed program of regulations.

"Apparently the department has decided to ignore the finding of its earlier report," Ms. Striemer said.

Ms. Striemer added, "The most striking shortcoming of the proposed program is the lack of defined administrative and scientific procedures that will carry out the mandate of CEQA to identify and avoid (environmental) impacts, to implement safer alternatives and to involve the public in the decision-making process."

The CDFAs and county agriculture commissioners have estimated it would have cost \$3.8 million a year to implement the environmental assessment team's administrative and enforcement regulations.

If Johnson does not certify the regulations—and most observers see no chance that he will unless major changes are made—then what will happen next is unclear.

Johnson said in an interview the matter should then go back to the CDFAs for modification.

CDFAs Director Rominger disagreed. He contended the matter would have to go to the Legislature for resolution if Johnson did not sign off on the new regulations.

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Concern grows

Radiation: A Deadly Fact of Everyday Life

BY GAYLORD SHAW
Times Staff Writer

POOR ORIGINAL

DENVER—Because her suburban home is midway between the Rocky Flats nuclear weapons plant and Colorado's largest uranium mine, Carol Watson wondered whether her family was being exposed to higher-than-normal levels of radiation.

Last spring she decided to take samples from her home's water taps to a private laboratory for testing. For \$18 per sample, she got some startling news: The water was so tainted by uranium that whoever drank it was receiving an annual radiation dose of 3,000 millirems, roughly 60 times the amount the average American receives from naturally occurring radioactivity in food and water.

Outraged, Mrs. Watson and some of her neighbors switched to bottled water or well water and, banding together in what became known as the "Housewives Mafia," sought to pinpoint the cause.

They quickly gained an ally in Polly Hearn, chairman of the North Table Mountain Water Board, who had been worried for months that the water supplied by the quasi-governmental agency to 7,500 customers in Denver's western suburbs might be unsafe. Mrs. Hearn helped arrange for government tests, which indicated the problem could be traced to Upper Long Lake, a reservoir fed by Ralston Creek, into which the Cotter Corp. dumps waste water pumped from deep shafts of the mine that produces uranium to fuel Commonwealth Edison Co.'s nuclear power plants near Chicago.

The "Housewives Mafia," by circulating petitions and bringing court action, succeeded in switching the water system at least temporarily to another nearby reservoir that had negligible radiation readings.

The issue is far from resolved and the health effects are undetermined, but the episode illustrates a growing public awareness and concern over how radiation is finding its way into everyday life.

Even before the accident at Pennsylvania's Three Mile Island nuclear plant riveted the nation's attention on the perplexing controversy, there were signs of increasing anxiety over exposure to low levels of radiation.

In Nevada and Utah, for instance, citizens committees were formed to seek compensation for individuals exposed to radioactive fallout from nuclear tests in the 1950s and 1960s.

In Florida and Pennsylvania residents voiced concern after discovering that radioactive material had been used in the foundations of their homes and businesses.

In Michigan and Louisiana public protests stymied proposals to locate nuclear-waste disposal facilities there.

In California and a number of other states there were demonstrations against new or existing nuclear power plants.

But even with the growing prominence of the controversy, radiation is an issue that confuses most Americans. One reason is the tongue-twisting scientific terminology—words like ionization and picocuries, roentgens and radiostrontium.

Another reason is that radiation comes in many forms. There are, for example, alpha particles given off by decaying uranium, beta rays given off by decaying thorium, gamma rays given off by all sorts of radioactive material.

Radiation sources are both natural, such as rock formations, and manmade, such as nuclear reactors or medical x rays.

And different forms of radiation have different effects on the human body.

Gamma radiation, which can penetrate concrete, is especially damaging to parts of the body that have cells that reproduce constantly, such as the bone marrow, where blood cells are manufactured.

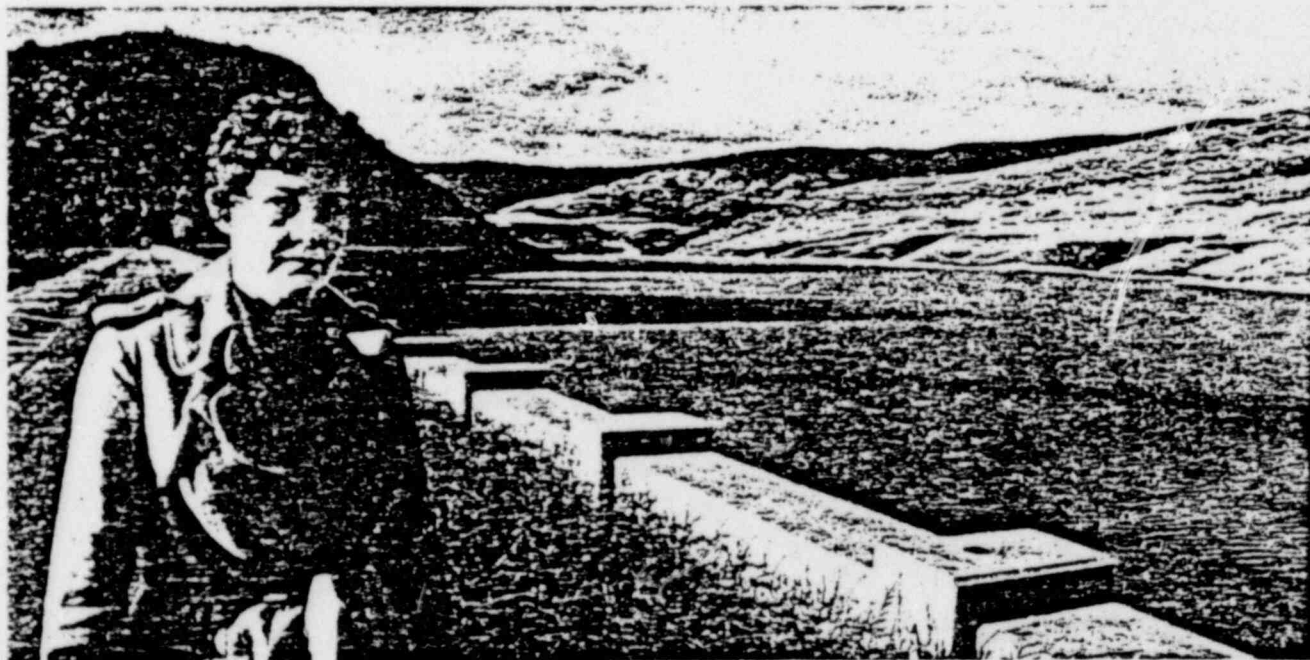
Alpha radiation does not penetrate like gamma radiation; it can be blocked by a single sheet of paper. But if inhaled or ingested, it can concentrate in the body's organs and "create chemical havoc in surrounding cells," said one health expert, who added:

"If cells are damaged by much of this material, the cells try to repair themselves. They may start acting abnormally and reproduce uncontrollably. In a short time a tremendous number of injured, out-of-control cells can proliferate, creating a tumor. When the tumor gets to a certain size, cells break off and circulate in the body and the cancer spreads."

There is a difference of opinion among experts over how much, if any, damage is caused by small amounts of radiation.

And there is debate over whether the social and economic benefits of the nuclear age—such as use of radioactive substances to treat cancer and other diseases, or the electricity generated by nuclear power plants—outweigh concerns over possible harm from low-level exposure.

It generally is agreed that the mean lethal dose of radiation, the level at which half of the people who are exposed will die, is about 500 rems (for roentgen equivalent man). For comparison, the average chest x ray involves an exposure to about 20 millirems (a millirem is a thousandth of a rem), and nuclear plant workers have an average exposure of 760 millirems a year.



WATER SOURCE—Polly Hearn, chairman of North Table Mountain Water Board, at reservoir.

Photo by James A. Cook

But the scientific community is sharply divided over the impact of low-level radiation on the general population. For example, when a National Academy of Sciences committee estimated last spring that low levels of radiation from all sources would lead to the development of 220,000 cases of cancer in the lifetime of today's population, five of the committee's 16 members disagreed, contending the projection was far too high.

In parts of the West even deep wells show high radiation levels.

To compound the confusion, at least 16 separate federal agencies and offices have regulatory authority in radiation exposure, and there are gaps in the patchwork of laws and regulations they enforce—sometimes resulting in Catch-22 situations.

For example, there presently are no federal rules limiting uranium-caused radiation in drinking water. Like most states Colorado has no rules, either. Thus the drinking water being piped into Carol Watson's home in suburban Denver, although laden with potentially dangerous radiation, violates no standards.

This summer officials of the Environmental Protection Agency in Washington urged Colorado to take "prompt control measures" to reduce radiation in that suburb's water supply. It recommended that uranium-caused radiation be limited to 10 picocuries per liter, a level far below the 80 picocuries of gross alpha radiation found in a liter of Mrs. Watson's water.

If that standard is applied elsewhere, water supplies in scores of communities in Western states could be considered undrinkable, according to Paul Smith, regional director for radiation programs in the EPA's Denver office. This is not only because of widespread uranium mining in the West, but also because undisturbed uranium deposits can cause higher radiation levels in surface streams and underground aquifers.

For instance, Montana officials found that an artesian spring used by 25 families in a rural area near Alhambra, south of Helena, had gross alpha radiation of up to 230 picocuries per liter. "It's all natural—the water is just coming up through uranium deposits," said Larry Lloyd of the state's Department of Health and Environmental Sciences.

The Montana families drilled wells to avoid the uranium contamination, but elsewhere in the West, even deep wells show high radiation levels.

In the tiny northwestern New Mexico settlement of Martinez Camp, complaints from residents that their livestock were becoming ill and losing their hair prompted tests of a water well, which disclosed gross alpha radiation of 300 picocuries per liter. This caused Indian Health Service officials to shut down the well, forcing residents to haul water from a trading post six miles away.

Tests also were under way on more than 100 other wells in the region stretching from Grants and Gallup in New Mexico to Many Farms and Round Rock in eastern Arizona.

This region has been the site of some of the nation's most extensive uranium mining since the late 1940s, and the fact that it has taken more than three decades for authorities to begin to systematically check its water supply for radioactivity illustrates the slowness of the official response to potential radiation dangers.

This tendency toward tardiness in recognizing potential dangers has been displayed before.

Radium is a prime example.

Just before the turn of the century, French scientist Marie Curie discovered that radium could be extracted from uranium ore. In Colorado local legend has it that Madame Curie used ore mined from the mountains west of Denver. Actually the ore came from Bohemia, but soon a booming industry developed here to produce radium from Colorado uranium.

In that era radium was touted worldwide as a miracle substance that "makes old age a joy and prolongs human life," and businesses in Denver and elsewhere hurried to meet demand for the substance. Among the widely sold products was a crock lined with radium salts. These were sold with instructions for the user to fill the crock with water each night, then drink heartily the next day to cure whatever ailed him.

Many locations in Denver had readings of up to 200 times normal.

Twenty-five years after discovering radium, however, Madame Curie was dead of cancer and scientists began concluding that rather than a magical elixir, radium was a dangerous carcinogen. Eventually strong restrictions were placed on its use.

Yet it was only this year, more than half a century after the radium boom fizzled, that officials discovered that a potentially dangerous legacy still lurked in Denver. And the discovery came almost by chance.

An EPA researcher who was looking through old bulletins of the U.S. Bureau of Mines came across references to the National Radium Institute, which was established in Denver in 1913 with the federal government's help. By checking old city directories, authorities found the institute's address—a site occupied in recent decades by a brick plant.

State inspectors went there and found abnormally high radiation levels. The search for contaminated sites broadened, and eventually it was determined that more than two dozen locations throughout the city—including several downtown office buildings, residential lots and even a restaurant parking lot—had radiation readings of up to 200 times normal.

It will cost up to \$25 million to decontaminate the sites, officials estimate, but little work has been done because of an unresolved dispute over whether the federal, state or local government—or the current landowners—will foot the bill.

Officials can only guess at the long-term health effects of exposure to the wastes from the radium processing operations. One problem is that they have been unable to locate anyone who worked in the radium plants 60 years ago, leading EPA's Paul Smith to suspect that the workers "never saw old bones."

Across the Continental Divide, residents of the southwestern Utah community of St. George can offer poignant testimony about the effects of radiation on health—they have watched their relatives, friends and neighbors die by the dozens of cancer.

They contend that the deaths were caused by radioactive fallout from the 80 atmospheric nuclear tests conducted by the Atomic Energy Commission at its Nevada testing ground during the 1950s and early 1960s—tests almost invariably timed so that the prevailing winds would carry the radioactive cloud away from Las Vegas and the population centers of California, but toward southwestern Utah.

Federal officials have argued that no scientific evidence can link the cancer deaths in St. George to the nuclear tests, but recently released government documents, some of them kept secret for more than a quarter of a century, disclose that AEC officials knew that as early as 1953 that the St. George region had been subjected to "the highest 24-hour average concentration of fallout ever measured in a populated area."

This spring expert witnesses at congressional hearings said the radiation filtering down on St. George was up to 500 times greater than the level resulting from the accident at Three Mile Island.

But back in the 1950s the residents of St. George knew none of this.

Parents would awaken their children before dawn on days of announced tests and take them to the top of the ridge outside town. "We listened for the rumble and saw flashes and our children were even given school assignments to watch," recalled Mrs. Glenna Orton, the mother of six. The test site was more than 100 miles to the west, so it would take a few hours for a "big, red cloud" to drift over the community.

No one thought much about it until many years later.

"No warnings of danger were really given to us," Mrs. Orton said. "They told us it wouldn't hurt us. We were quite naive and we believed what we were told."

"We are now paying dearly," said Mrs. Irma Thomas, who has lived in the same house on a quiet street in St. George for 45 years. "... Since that time I have counted the number of cancer victims just within a one-block radius of my house, and I have counted 29 victims. Eight of them have died."

Almost everyone in St. George, it seems, can offer similar accounts.

Elmer Pickett, owner of Elmer's Hardware on Main St., recites the cancer or leukemia deaths in his family. "My wife... a niece, 5 years old... a sister, a sister-in-law, a mother-in-law, an uncle, a grandmother and two great-uncles.

"We had nine cancer victims... all since the fallout," Pickett said. "I cannot find anywhere in our family records as far back as I can go any other cancer-related deaths. We have been a very healthy family; the majority of our family on both sides have lived to very ripe old ages... it has all happened since the fallout."

The litany of death, as related in interviews and congressional testimony, continues.

Ruby Mathieson's husband died of leukemia in 1976, the same year her father died of cancer. Her sister and brother-in-law also died of cancer.

Irene Allen lost two husbands to cancer—the first in 1956 and the second about 20 years later.

Darrell Nisson's 13-year-old son died of leukemia. "I finally took him home from the hospital, let him die at home. He didn't die in a hospital, he died in my arms..."

Kay Millett's 3-year-old daughter died of the same disease. "All the time I was growing up (near St. George) I never heard of one single case of leukemia," she said. "I never heard of it at all until just right before our little girl died, two or three others died, and all of a sudden everybody was being touched by the same thing, this rare disease.

"... It's the radiation. It is obvious. We ate it, we walked in it, we breathed it, we washed our clothes in it... and even the little children ate the snow. You know how little kids love snow. They went out and they would eat the snow. They didn't know it was going to kill them later on."

St. George is a close-knit community whose mostly Mormon residents tend to be quietly patriotic supporters of their government, its policies and actions. But the effect of the radioactive fallout has left a residue of distrust and bitterness.

"I don't think a million dollars could ever replace a loved one," Mrs. Millett told a congressional hearing. "I don't think we should even talk about money in this case. I think that the people who were responsible in the Atomic Energy Commission... should be brought to trial and prosecuted as murderers."

"That's just the way I feel about it," she added. "And until that's done, I don't think that any amount of money can ever repay anybody. I feel like that's the feeling of most people who have lost loved ones. They aren't interested in money."

Nonetheless more than 600 claims have been filed with the government by residents of Utah, Nevada and northern Arizona, claiming damages resulting from the radioactive fallout. Despite pressure from congressional committees and governors in the region, federal officials are hesitant to admit liability.

POOR ORIGINAL

Donald Gonya, a deputy assistant counsel for the Department of Health, Education and Welfare, told one Senate panel that it was impossible to distinguish between people who had developed cancer from radiation and those who were stricken with cancer from other sources.

"Each claimant may believe his or her cancer was caused by radiation exposure," he said, "yet it is statistically more probable in each case the illness was caused by something else."

Dr. Joseph Lyon, a University of Utah epidemiologist and codirector of the Utah Cancer Registry, published a study this year concluding that twice as many children who lived under the fallout died of leukemia than normally would have been expected.

Lyon's said his research did not establish that fallout caused the increased cancer rate or that it was responsible for any individual cancer case. But he added: "I think we can say without question there is an association between fallout exposure and the increased incidence of childhood leukemia deaths in Utah."

There also is little question that uranium miners suffer from a cancer rate far higher than the general population. Dr. Joseph Waggoner, a cancer specialist for the U.S. Labor Department, said studies as early as 1961 showed that lung cancer among uranium miners was more than four times greater than normal, but that a decade elapsed before permissible exposure standards were lowered.

Because of the slowness to act, Waggoner said, "we now clearly have a public health problem and an epidemic of monumental proportions on our hands."

Sometimes uranium mining and milling operations expose more than just miners or millworkers to high levels of radiation. Last July 16, for instance, the partial collapse of an earthen dam used to impound radioactive wastes at a uranium mill near Church Rock, N.M., dumped 1,100 tons of uranium tailings and 100 million gallons of radioactive water into a small stream known as the Rio Puerco.

The muddy mixture spread down the stream bed for 75 miles, into eastern Arizona, leaving such high levels of radiation that authorities ordered that signs be posted—in English, Spanish and Navajo—warning people not to go near the stream.

The mill operator, United Nuclear Corp., has begun scraping up the contaminated soil from the stream bed, and authorities say it may take the rest of the year to complete the task.

Federal officials termed the spill the worst of its kind in U.S. history because of the distance it covered, but the volume of radioactive material involved is dwarfed by the 52 billion pounds of uranium tailings piled haphazardly at 22 abandoned uranium mills in eight Western states.

These huge mounds of sand-like material, still containing 95% of the radioactivity of the uranium ore, were the waste products of the secret government push in the 1950s to produce a stockpile of nuclear weapons. Because government officials considered them harmless, they were left for years unprotected from rain and winds.

More recently, after studies indicated the tailings piles could cause more than 1,000 cases of cancer in the next 100 years, Congress voted funds to either move the piles to uninhabited desert locations or cover them with a thick layer of soil—an immense undertaking still in the planning stages.

One of the largest tailings piles is within four miles of downtown Salt Lake City, and Utah officials are pressing for its quick removal. Dr. Lyman Olson, the state's chief health officer, said levels of radon gas—a radioactive gas that results from the aging process of uranium—at the Salt Lake City site are 30 times higher than the upper limit prescribed by the U.S. surgeon general for remedial action. And Olson worries about what the future will bring.

"It is significant to us, and a continual worry, that each time new and better scientific information becomes available, as in the case of our new technique for measuring radon, the extent of the hazard is concluded to be worse than previously thought," he said.

POOR ORIGINAL

Veteran Exposed To Atomic Tests Is Given Benefits

Cancer Was Found Long After He Left the Army

Special to The New York Times

SAN FRANCISCO, Nov. 26 — A former United States Army sergeant who developed cancer years after exposure to radiation from atomic weapons tests today became the first known veteran to win Federal benefits in a case in which the cancer had been diagnosed after the victim left the military.

The ruling by the Board of Veterans Appeals in Washington drew no connection between the veteran's cancer and his exposure to radiation, but the fact that it decided to grant benefits constitutes its first acknowledgement that the two could be related.

The ruling in the case of Orville Kelly, who lives in Burlington, Iowa, was called "very significant" by Jonathan Steinberg, chief counsel for the Senate Veterans Affairs Committee.

Mr. Steinberg said in a telephone interview that the decision might indicate an increase in sympathy on the part of the Veterans Administration toward those who have filed claims asserting that their cancers were caused by exposure to radiation from atomic weapons tests in the Pacific and in Nevada. It is estimated that several hundred veterans have filed such claims.

Mr. Steinberg said that the ruling set no precedent in the judicial sense of the term. He said the Board of Veterans Appeals, the final arbiter in benefits claims, is neither bound by precedent nor subject to judicial review under Federal law. He said the board could be expected to consider similar claims on a case-by-case basis.

Only Eight Cases

But he said Mr. Kelly's case was significant because, to date, the Veterans Administration had granted benefits to cancer victims exposed to atomic weapons tests in only eight cases — all of which involved soldiers whose cancers were diagnosed when they were still serving in the military. Mr. Kelly's cancer, in his lymph system, was diagnosed 12 years after he left the Army.

Mr. Steinberg said the case had added significance because it marked the first decision by the Veterans Administration to award medical and survivors benefits in a case involving a claim of radiation-induced cancer since the Veterans Administration adopted new guidelines for decisions in these cases last summer. Under the guidelines, the board can give a veteran the benefit of the doubt where the veteran claims that his cancer is a result of radiation exposure.

Mr. Kelly, who is 49 years old, said in an interview here today that the ruling was the culmination of a six-year struggle with the Veterans Administration, which had denied his claim on three occasions.

Last year Mr. Kelly founded the National Association of Atomic Veterans, an organization that helps radiation-exposed veterans in filing and pursuing benefits claims with the Veterans Administration. He spoke today at a news conference of atomic test survivors that was sponsored by the University of California Nuclear Weapons Lab Conversion Project, an antinuclear group.

Watched 22 Explosions

Mr. Kelly said today that he witnessed 22 atomic explosions at the Enewetak Atoll test site from November 1957 to November 1958, while he was stationed on Japtan Island, seven miles away. He said his unit wore no protective clothing other than tinted aviators' goggles while watching detonations of weapons ranging up to nine megatons, about 450 times the size of the Hiroshima bomb.

Mr. Kelly said that after being diagnosed as having malignant lymphoma, in 1973, he applied for V.A. benefits in Des Moines, Iowa. His claim was denied the following year, he said, and two appeals last year to the Iowa regional Veterans Administration office were also denied.

POOR ORIGINAL

U.S. Panel Says Atom Tests May Have Caused Deaths

By A. O. SULZBERGER Jr.

Special to The New York Times

WASHINGTON, March 18 — The nation's nuclear weapons testing in the 1950's probably resulted in some deaths or disease, and the Government should accept responsibility for them, a high-level Government panel has told the White House.

Government officials believe that the report, dated Feb. 1, marks the first time that such an admission has been made in an official document.

"This exposure," the report said, "in all probability caused a small number of cases of death or disease, for which the Government should accept responsibility."

The report estimated that, of the 172,000 people living downwind from the nuclear test site, the number of persons who might have been expected to contract cancer from nuclear fallout would range from nine to 96. Of those, the number of fatal cancer cases would range from six to 32, the report said.

Panel Established Last July

Among the 172,000 people involved, about 20,000 could normally expect to die of cancer.

The panel was established last July by President Carter to study and recommend a fair and effective way of dealing with claims for compensation filed by victims of radiation-induced illness

caused by exposure to the above-ground testing that took place at the Nevada Test Site between 1950 and 1963.

The panel, called the Interagency Task Force on Compensation for Radiation-Related illnesses, recommended that an administrative program, rather than court litigation, be used to settle compensation claims. However, it left unresolved a number of administrative and policy questions that must be answered before specific legislative can be proposed.

Even as the report is being studied by White House officials, two other compensation proposals are being considered in Congress and some 965 claims for damages have been filed in Federal District Court in Salt Lake City by residents of Arizona, Nevada and Utah seeking a total of more than \$2 billion in damages.

Hearing to Be Held Thursday

A preliminary hearing in the court case is scheduled to be held Thursday. The suit contends that the tests caused either the plaintiffs or their relatives to contract cancer and that the Government failed to take adequate precautionary measures to protect the public.

The panel opposed litigation, which is the approach that will continue to be used to establish compensation if new laws are not passed, on the ground that it is enormously complex, expensive and time-consuming. They also said there was the risk of establishing judicial precedent,

which could be harmful in other litigation involving radiation and toxic substances.

"We don't agree with them that the courts are the wrong place" to establish compensation, said Stewart L. Udall, Secretary of the Interior in the Kennedy and Johnson Administrations and one of the lawyers handling the case for those filing claims for radiation-induced illness.

Two relatively similar bills have been introduced in Congress that would establish blanket Government liability for damages to a person residing near the nuclear test sites and who developed a specified illness.

Senate hearings are scheduled to be held April 22 on a bill sponsored by Senators Orrin G. Hatch, Republican of Utah, and Edward M. Kennedy, Democrat of Massachusetts. In addition, a House subcommittee hopes to hold hearings soon on another bill introduced by Representative Gunn McKay, Democrat of Utah.

"The result," the report says of these two bills, "is that the Government would be required to pay substantial money damages to all individuals who developed specified forms of cancer, notwithstanding the fact that very few of these could be attributed to radiation."

The administrative remedy that the report favors would look at the estimate on an individual's dose of radiation and the type of cancer he had, then work out the

chances that the cancer was caused by fallout in each case.

"Only persons meeting a legislatively established minimum probability would be eligible for compensation," the report said. "It would be more selective than other alternatives and would reduce further the tendency of a benefit program to be over-inclusive."

POOR ORIGINAL

Fallout Clams Get New Support

Military mistakes generally are paid for in battlefield casualties. Not necessarily so for the use of herbicides in Vietnam and nuclear weapons testing in Nevada in the 1950's. Higher-than-normal disease rates among persons exposed to them have produced numerous court battles for compensation. But the lawsuits have been hampered by a lack of evidence linking the events to disease incidence and by questions of who is to blame.

Last week, two separate documents seemed to admit that such links exist and fix Government responsibility.

A Presidential task force, established in July, reported that postwar nuclear weapons testing probably caused some deaths or disease. The Government, it said, should accept responsibility. The panel recommended avoiding expensive compensation litigation. Already, 965 claims for \$2 billion in damages have been filed in Federal court in Salt Lake City by Utah, Arizona and Nevada residents.

The panel suggested the following: Estimate a person's radiation dosage, compute the chances that fallout caused his particular cancer and award or refuse compensation accordingly. Such a procedure, the report indicated, might avoid litigation that would establish judicial precedence for Government responsibility in other incidents — the use of herbicides in Vietnam, for example, exposure to which, say veterans, has crippled or killed.

Vietnam veterans do not accuse the Government, but the chemical companies of negligence in selling Agent Orange and Agent Blue herbicides. Agent Orange contains dioxine, a poisonous chemical and known carcinogen, but one whose effects are known mainly from animal studies. Arsenic, the chemical base of Agent Blue, is a known carcinogen.

Last week two Congressmen released copies of what seemed to be a Veterans Administration memorandum — author and addressee unknown — saying that the chemical compounds can cause cancers among the men and birth defects among their children. The note seems to contradict agency testimony before Congress that the herbicides have not been proved a human health hazard. The agency's comment on the matter is expected tomorrow.

Daniel Lewis
and Caroline Rand Herron

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APPENDIX C

FETAL HYPOTHYROIDISM

Apparent Hike in Thyroid Disorders

Near TMI Probed

HARRISBURG (UPI) — State medical authorities are investigating an apparent increase in thyroid abnormalities in the vicinity of the Three Mile Island nuclear accident. Pennsylvania health officials announced Wednesday.

Dr. George Tokuhata, director of health research for the state Health Department, said epidemiologists will study a wide range of possible causes of the apparent increase, including low-level radiation from Three Mile Island.

Tokuhata said a routine state survey revealed last month there now was apparently a higher-than-normal rate of hypothyroidism in Lancaster County, which adjoins the nuclear plant,

and in five counties downwind. Hypothyroidism is a disorder which can lead to mental retardation. It can be caused by radioactive iodine, which federal officials said was released in small quantities during the March 28, 1979 nuclear accident.

Tokuhata said he did not believe the low-level radioactive emissions from the nuclear accident were the cause of the apparent increase in hypothyroidism.

But he said there was a remote possibility of a connection, since it could have been caused by being spread through the milk of cows that grazed on contaminated pastures.

State authorities discovered a radiation level of 41 picocuries per liter in milk

from a nearby farm a few days after the nuclear accident. The federal health limit is 1,000 picocuries per liter.

Tokuhata said other possible causes that would be investigated were genetic, other radiation sources in industrial and medical facilities and chemicals in foodstuffs.

"There is a remote possibility that radiation was the cause, and there are many other possible reasons. We don't have enough evidence to make any conclusions, except to say the rate (of hypothyroidism) is apparently higher than normal in this area," said Tokuhata.

Tokuhata said the likelihood of a reliable conclusion from the study was already thrown

into question. He said authorities lacked sufficient information on rates of hypothyroidism in previous years in Pennsylvania.

"We can't be confident that we'll be able to come to any definite conclusions," he said. Tokuhata said his study would take at least 2 years.

The routine 1979 state survey of hypothyroidism showed a total of six cases in Lancaster County, a rate of about 1 in 925, or more than five times greater than the expected rate of 1 in 5,000.

Dr. Thomas Foley of Children's Hospital in Pittsburgh, who monitors hypothyroidism as a consultant to the state, said he did not believe the latest occurrences were related to Three Mile Island.

He said some of the cases were differing types of hypothyroidism, indicating that a single environmental source such as nuclear radiation was not the cause.

Two other experts in the field agreed Three Mile Island was an unlikely cause. They were Dr. James Robbins, a thyroid specialist for the National Institute of Health in Bethesda, Md., and Dr. Hugh Pratt, of the Brookhaven National Laboratory in Upton, L.I., who directs studies into radioactive fallout from nuclear weapons tests.

POOR ORIGINAL

A Plant Involved in Probe of Thyroid Ills

The Washington Post
February 21, 1980

By Victor Cohn

Washington Post Staff Writer

A new controversy over the nuclear accident at Three Mile Island appears likely to arise from the discovery that an abnormal number of children were born with serious thyroid defects in three Pennsylvania counties in the latter part of last year.

The condition is known as hypothyroidism, which arises when the thyroid gland is either absent or doesn't produce normal hormone levels. It can lead to grave mental retardation and stunted growth unless it is quickly treated.

State health officials confirmed yesterday that during the last nine months of 1979, 13 hypothyroid babies were born in three counties that might ordinarily expect three such births during that length of time. They said they are about to start an epidemiological investigation that "of course" will have to consider low-level radiation from the accident at Three Mile Island—located adjacent to one of the counties—as one possible cause.

But they—as well as Dr. Thomas Foley of Pittsburgh Children's Hospital, an authority on hypothyroidism—all said that the conditions could have many possible causes.

They said they know of no cases of hypothyroidism ever caused by radiation at the low level emitted by the crippled reactor, though there is a well-established association between high doses of radioactive iodine—one chemical emitted by the disabled reactor—and thyroid disease. Radioactive iodine tends to concentrate in the thyroid gland, with destructive effects when the dose is high enough.

Radiation specialists from the President's Commission on Three Mile Island and the Nuclear Regulatory Commission said flatly yesterday that iodine emissions from the March accident were far too low to have had any such effect.

"There cannot be any connection: I can say that unequivocally," said Dr. Victor P. Bond, associate director of the Brookhaven National Laboratories for biomedical and environmental sciences, a member of the presidential commission task force on radiation health effects. "For thyroid effects the doses would have to have been thousands of times higher than they were."

Harold Peterson of the NRC's office of standards said a total of 15 curies

of Iodine 131 was released from the plant by the end of April, giving a maximum radiation dose of the thyroids of area residents of 8 to 20 millirems.

Background radiation provides 100 millirem per year. Tests of area residents revealed no iodine in their bodies, and none was detected in area animals or in cows' milk, Bond said. To affect fetuses born since the accident would have required a pickup of iodine.

"We would certainly not expect any effect on fetal thyroids from these levels," Peterson said.

A spokesman for General Public Utilities Inc., parent company of the utility that owns Three Mile Island, said no iodine measurements taken were ever high enough to cause fetal thyroid problems.

However, several local groups have challenged the official radiation readings, alleging that insufficient monitors were in place or operating at the time of the accident. Wind currents might have carried radioactive particles over nearby monitors and deposited them in faraway areas without the normal dispersal effect, these groups have said.

None of the hypothyroid cases were in areas that have been described as in the main "plume" or downwind direction of the Three Mile Island radiation.

Six cases occurred in Lancaster County, which is east of Dauphin County, the reactor site. Four were in Bucks County and three in Lehigh County.

Ordinarily one baby in 3,000 is born with hypothyroidism. In 1978 (the last year for which full birth statistics were available yesterday) Lancaster County had 5,500 live births, Bucks County, 6,493, and Lehigh, 3,208.

Unusual clusters, mere statistical aberrations, sometimes occur in many diseases, said Dr. Arnold Muller, secretary of health in Harrisburg.

Also, said both Dr. Foley and Dr. Evelyn Bodin, a Pennsylvania health department pediatrician, a more logical explanation than radiation has been found in three and possibly four of the Lancaster County cases, the group most closely studied so far.

One had a familial or inherited condition and two had a misplaced thy-

roid gland, a condition not likely to be caused by radiation, Bodin said. The three other Lancaster County cases are still under study, but one was a twin whose twin did not get the disease "so it's unlikely" though not impossible, she said, that the cause in this case was environmental, since both babies were subjected to the same environment.

Another health authority said that many populations, such as the Amish, in Pennsylvania have a high concentration of genetically related diseases.

"I don't think there's any cause and effect" connected to Three Mile Island, Bodin said. Dr. Foley agreed, but called the timing "peculiar and curious," and said "the fact that it did follow the accident raises an issue" that must be settled.

The cases' existence was disclosed in an interview yesterday by Dr. Gordon MacLeod, who was Pennsylvania health secretary at the time of the nuclear accident.

MacLeod became the state's chief health officer on March 15, only 12 days before the accident. Last Oct. 10, he said—after criticizing the state's handling of the problem—that he was asked by Gov. Richard Thornburgh to

resign. He returned to his job as a well-regarded professor of public health administration at the University of Pittsburgh.

MacLeod, too, agreed that "it is impossible" to assign any common cause to the thyroid defects. But he said he was shocked that the health department had made no public announcement and had not started an investigation of possible causes. The first of the affected Lancaster County babies was born last June. Two were born in July, and one each in August, October and November.

MacLeod also said it is "urgent" to look for any possibly undetected cases in babies born at home among the Amish and other Pennsylvanians who often choose home deliveries.

Thyroid problems turned up among Marshall Islanders who were exposed to radiation from the fallout of a U.S. hydrogen bomb test in the Pacific on March 1, 1954.

The first cases discovered nine years later were two children, under 5 at the time of exposure, whose thyroid glands had disappeared.

Staff writers Walter Pincus and Joanne Oming contributed to this report.

Birth defects raise a new TMI issue

By Victor Cohn
Washington Post Service

WASHINGTON — A new controversy seems likely to arise over the nuclear accident at Three Mile Island as a result of the discovery that an abnormal number of children were born last year with serious thyroid defects in three Pennsylvania counties — Bucks, Lehigh and Lancaster.

The condition is known as hypothyroidism, which arises when the thyroid gland is either absent or does not produce normal levels of hormones. It can lead to grave mental retardation and stunted growth unless it is quickly treated.

Yesterday, state health officials confirmed that, during the last nine months of 1979, 13 hypothyroid babies were born in the three counties, which might ordinarily expect three such births during that length of time.

The accident occurred in March 1979.

Six cases occurred in Lancaster County, which is east of Dauphin County, the site of the reactor. Four were in Bucks County and three in Lehigh County.

State officials said they were about to start an epidemiological investigation that would consider low-level radiation from the accident at Three Mile Island as one possible cause.

However, radiation specialists from the President's Commission on Three Mile Island and the Nuclear Regulatory Commission said flatly yesterday that iodine emissions from the March accident were far too low to have had any such effect.

Further, the state health officials and Dr. Thomas Foley of Pittsburgh Children's Hospital, an authority on hypothyroidism, said that there were many possible causes for the conditions.

They said they knew of no cases of hypothyroidism ever having been caused by radiation at the low level emitted by the crippled reactor, although there is a well-established association between high doses of radioactive iodine — one chemical emitted by the disabled reactor — and thyroid disease. Radioactive iodine tends to concentrate in the thyroid gland, with destructive effects when the dose is high enough.

The existence of the cases of hypothyroidism was disclosed in an interview yesterday with former Pennsylvania Health Secretary Gordon MacLeod, who said he said he was shocked that the Health Department had made no public announcement about the births and had not started an investigation of possible causes.

POOR ORIGINAL

Thyroid Illness In TMI Area Under Study

HARRISBURG (UPI) — Medical detectives are investigating the possibility — believed now to be remote — that an apparent growth in the rate of thyroid abnormalities was caused by the Three Mile Island nuclear accident.

The Pennsylvania Health Department said it had begun the investigation after a routine survey showed the incidence of hypothyroidism was five times greater in some areas near the nuclear plant.

Initial judgments by a variety of thyroid experts was that the Three Mile Island accident probably did not cause the occurrences because the radioactive emissions during the accident were too small to do such damage.

Other possible causes, such as heredity, industrial or medical radiation sources and chemicals in foodstuffs, were also under investigation by state epidemiologists, said Dr. George Tokunata, director of state health research.

"There is a remote possibility that radiation was the cause, and there are many other possible reasons. We don't have enough evidence to make any conclusions, except to say the rate (of hypothyroidism) is apparently higher than normal in this area," said Tokunata.

The remote possibility of a connection to Three Mile Island rested with cows that grazed on contaminated pastures. State authorities reported a radioactive iodine level of 41 picocuries per liter in milk from a nearby farm a few days after the nuclear accident. The federal health limit is 1,000 picocuries per liter.

Hypothyroidism is a disorder which can lead to mental retardation. It can be caused by radioactive iodine.

Dr. Thomas Foley of Children's Hospital in Pittsburgh, who monitors hypothyroidism as a consultant to the state, said he did not believe the latest occurrences were related to Three Mile Island.

He explained that some of the cases were differing types of hypothyroidism, indicating that a single environmental source such as nuclear radiation was not the cause.

The routine state survey revealed that the hypothyroidism rate in Lancaster County, adjoining the nuclear plant, was five times greater than normal. Five counties downwind from the nuclear plant also showed higher-than-normal rates.

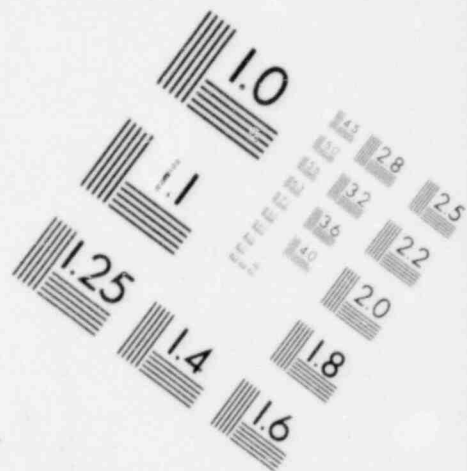
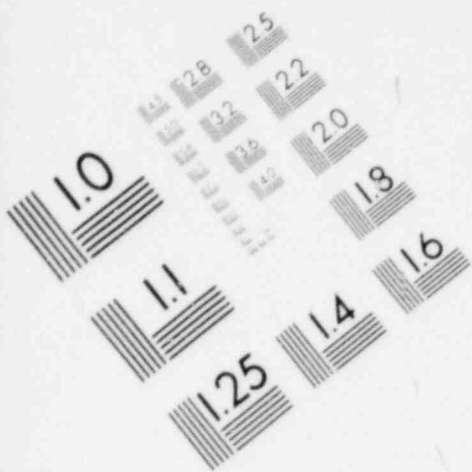
B-10 Pittsburgh Press, Thurs., Feb. 21, 1980



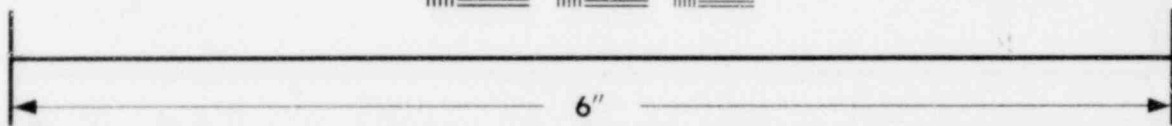
UPI Telephone

OUCH — Mary Anne Potami, a nurse at a Harrisburg hospital, draws blood from a baby to test for a thyroid abnormality following reports of increased thyroid problems in the area around Three Mile Island.

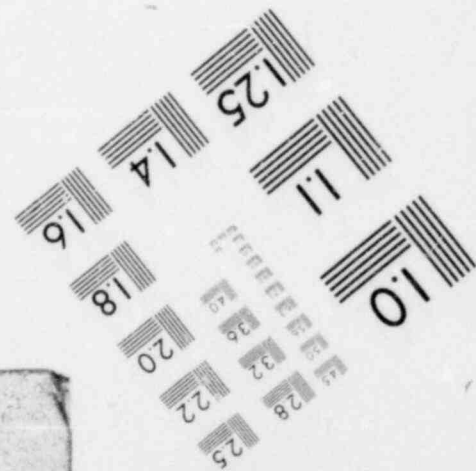
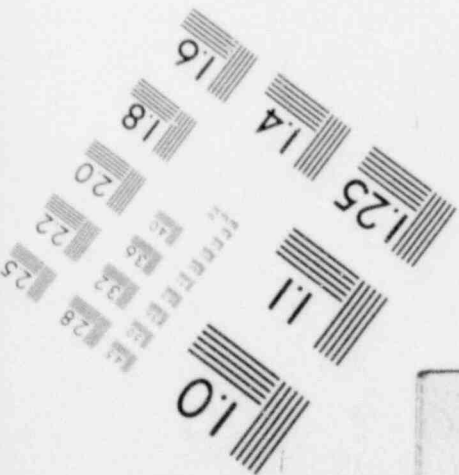
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**IMAGE EVALUATION
TEST TARGET (MT-3)**



MICROCOPY RESOLUTION TEST CHART



Don't Snub TMI-Thyroid Tie, Pitt's MacLeod Urges

By HENRY W. PIERCE

Post-Gazette Staff Writer

Former state Health Secretary Gordon MacLeod yesterday warned against a too-hasty dismissal of figures that may show an increase in thyroid defects among babies born near the Three Mile Island nuclear plant after the radiation leak March 28.

MacLeod, who said he reviewed the thyroid figures in detail for the first time yesterday, insisted that coincidence alone can't account for an apparent upsurge in cases in Lancaster, Lehigh, Berks and Bucks counties after March 28. All are relatively near the site of the Three Mile Island radiation leak.

MacLeod stopped short of asserting a definite link between the nuclear accident and the thyroid problems, however.

"There's always a possibility some other factor, such as industrial toxins or contamination of the water, could account for it," he conceded.

But he pointed to these figures:

- Eight cases were reported statewide before March 28, and 26 more were reported during the remaining months of 1979.

- Of the 26 cases, 15 were in counties not far from Three Mile Island. Lancaster reported 6 cases, and 3 each were reported in Lehigh, Berks and Bucks Counties.

- By contrast, Allegheny and Erie counties reported only 1 case each after March 28.

- During the last six months of 1978, only 9 cases were reported throughout the state.

But a state health official, Dr. Evelyn Boudin, called MacLeod's interpretation "illogical" and stated flatly:

"We do not have a data base which is sufficient to make the kinds of claims being made."

Dr. Boudin pointed to an absence of thyroid defects from Cumberland and York counties, which also are in the vicinity of Three Mile Island.

Another exception, she said, is Montgomery County, in which 3 cases were reported from June 28 to Dec. 28, 1978, but no cases in 1979.

Dr. Boudin said, however, that state health officials are reviewing the data "the way we would in any public health program."

"We are looking, first, at the individual

cases themselves, determining what conditions are associated with them," she said.

At least some cases appear to be a result of inheritance, she said.

It is a known fact that radioactive iodine 131, which was among the most feared of the substances released during the Three Mile Island incident, can cause thyroid abnormalities in babies.

What is not known is precisely how much of an increase it takes to cause damage. Studies have been carried out that suggest even a very small increase in the exposure levels will add slightly to the number of thyroid cases in a large population. But some authorities consider such figures inconclusive.

Dr. Donald Reid, deputy secretary of programs for the state Health Department, and Dr. George Tokuhata, Health Department epidemiologist, minimized any association between Three Mile Island and the thyroid defects last week.

Tokuhata said there was only a remote possibility the defects were related to the radiation leaks, adding that it would be almost impossible to link the increase definitely to the

Three Mile Island incident.

But MacLeod insisted yesterday:

"The situation has to be looked at. This is more than coincidence. I plotted the number of cases by counties this morning. The relationship is striking."

MacLeod resigned as health secretary Oct. 12 and returned to his job as professor of public health administration at the University of Pittsburgh. Since resigning he has been a strong critic of the state's handling of the health aspects of the Three Mile Island affair.

POOR ORIGINAL

Op-ed

Friday, Feb. 29, 1980

By Bruce Molholt

Several years ago there was a memorable cartoon by Gahan Wilson showing a professor admonishing his students in the laboratory. "Nonsense," he said, holding aloft a flask which fairly glowed with radioactivity. "A little radiation never hurt anyone!" What the students couldn't see, but the readers could, was the professor's other hand was only a skeleton!

A year after the accident at Three Mile Island we are still being told that only a little radiation was released and that this little bit was not dangerous.

It is nonsense to pretend that low levels of radiation and high levels of radiation are different species. This is tantamount to advising beginning drivers to test out their cars at 130 miles per hour. After all, driving your car that fast all the time will get you killed, but a little bit isn't dangerous!

Rather than fast cars, radiation might be better likened to microscopic bullets. These little bullets of radiation can be directed, as from an X-ray gun, or undirected, such as from the radioactive spills at TMI.

Radiation bullets are most dangerous when they strike that most intimate and precious member of our genetic heritage, our DNA. This miniature thread contains the blueprint by which all cellular processes are dictated. Radiation bullets break DNA. Although some of these breaks can be repaired, some cannot. Unrepaired DNA breaks may lead to cellular death, or even worse, to cellular mutation. These mutations are the initial events in carcinogenesis, showing how radiation can cause cancer in man.

Like soldiers condemned to a firing line, DNA is more likely to become shattered the more frequently radiation bullets emit their source. The frequency of radiation emission is measured in curies, named for the famous Polish-French discover of radiation, who herself succumbed to cancer after years of handling radium.

Each curie of radioactive material spews out precisely 37 billion radiation bullets every second (some Gatling gun!). Obviously, a curie of radio-

active material is very dangerous, so scientists normally speak of millicuries (37 million bullets per second) or even micro-curies (37,000 bullets per second).

Since the damage caused by emitted radiation bullets is a direct function of the number of curies involved, it is of interest to note just how many curies were lost at TMI between March 28 and April 7, 1979. The number is an astronomical 10 million curies! These are not millicuries, but million curies. In terms of radiation bullets per second this is 370,000,000,000,000,000 which went up the stacks at TMI. It is no wonder some local residents wanted to get out of the way!

Most of this radioactive cloud was composed of inert gases which un-

less breathed, will not interact much with human cells. Fourteen of these curies, however, were in the form of iodine known as I-131.

Iodine-131 is especially dangerous in humans because it is taken up and retained by the thyroid gland. It also emits a very energetic bullet of radiation which easily penetrates cells and destroys DNA. Since I-131 is retained for long periods of time, even a small amount of radioactivity is dangerous.

Ingestion of one milli-curie of I-131 means that the individual's DNA will be subject to 50 billion highly energetic bullets of radiation in three months. In order to make these types of calculations easier to understand, radiation biologists have employed the term rem, which encompasses number and energy of radiation bullets to compare this with an equivalent number of X rays.

As with curies, rems are normally communicated in terms of millirems (thousandths of a rem). Since normal background irradiation is about 130 millirems per year, the equivalent of four or five chest X rays, this sets a lower limit of our exposure (unless you happen to go about encased in a lead shield). In 1925, radiation exposures of 1,000 millirems per week were allowed. It is now 100 millirems per week and soon the federal standard will be 15 millirems per week.

Finally our radiation standards will reflect the experimental reality that there is no safe level of radiation exposure.

This brings us back to the question of TMI. What were the actual levels of radioactivity to which people were exposed? The official answer of the Kemeny Commission was about 250 millirems per person, or about twice the normal yearly background irradiation.

This figure, however, was derived by assuming that the 2 million people living within 50 miles of TMI were all irradiated evenly, which almost certainly they were not.

In the year since the radioactive cloud has dissipated, a new cloud has settled over the Pennsylvania medi-

cal community, a cloud of disturbing increases in birth defects. This cloud is the first tangible evidence of potential human damage from TMI, and although controversial, casts doubts on official estimates of radiation levels to which people were exposed. The conclusion of the Kemeny Commission that the most severe biologic effect of the accident at TMI was mental stress may have been premature.

It will be 30 years before we will know just how many cancers were induced by the accident at TMI and even then it may be difficult to pinpoint carcinogenesis to this one event.

A rise in the number of birth defects, on the other hand, is an immediate indication of genetic damage. In two independent studies, these increased numbers of birth defects were seen in the months following the accident at TMI, but not before. In one study, in the three-month period before TMI, a Harrisburg hospital recorded one birth defect, but the number of birth defects rose to seven in the three months following TMI. In a more recent study 13 babies with thyroid nodules were found in three Pennsylvania counties east of TMI. This is more than four times the expected frequency of this pre-malignant condition, a condition which is often associated with I-131 contamination. Could this be I-131 from TMI?

(Bruce Molholt is science director of the Environmental Cancer Prevention Center, Public Interest Law Center of Philadelphia.)

Just a little radiation? Don't believe it

POOR ORIGINAL

Nuclear beliefs

Facts behind the radiation story

To the Editor:

Science is said to differ from religion in basing its conclusions upon facts rather than beliefs. Unfortunately for the public, this distinction frequently fades as scientists pick and choose just which facts best fit their preconceptions. As in religion, there are many faiths in science.

Recently James T. Brennan of Radiation Management Corp. attacked my Op-ed article, "Just a little radiation? Don't believe it."

He didn't attack the fact that 10 million curies, the radioactive equivalent of 10 tons of radium, were spewed into the air during the week following the TMI accident. He didn't attack the noticeable increases in hypothyroid birth defects downwind after the accident.

Instead Dr. Brennan chose to attack the source of my information that 250 millirems might have been received by one person as a result of radiation released at TMI.

Dr. Brennan is right. The source of my information was not the Kemeny Report, but a report of the Nuclear Regulatory Commission, "Population Dose and Health Impact of the Accident at the Three Mile Island Nuclear Station." I quote from the Appendix of that document, pages A-3 and A-4:

"The maximum estimated exposure would be 200 plus 50 (mR) to an individual located about one mile north-northwest of the station continuously for the entire week following the TMI occurrence."

Hence it is the source of this information rather than the information itself which was in error, and I apologize for this oversight in citation. The NRC itself concluded that an individual could have received 250 millirems of radiation from the accident at TMI. Dr. Brennan said, "If he is not granted this exaggeration, Mr. Molholt's entire argument falls apart." Perhaps my argument is now back together again.

Small amounts of radiation have measurable adverse effects on human populations. Recently both the National Cancer Institute and American Cancer Society (ACS) recommended that mammography not be performed on women under 50 who have no symptoms of breast cancer.

Their reasoning was simple: More breast cancers could be induced by this procedure than could be detected after their experience with 180,000 women, despite the fact that mammography exposes women to just a few millirems. Recently the ACS further recommended additional

reduction in a wide variety of other radiation diagnostic procedures for the same reason.

We continue to be told by scientists with vested interests in the nuclear industry that no health effects could have arisen from the accident at TMI. In a six-month period following the accident, there were six babies born with defective thyroid glands among 2,500 live births in Lancaster County.

This is 12 times the expected frequency of hypothyroidism. "A statistical aberration," they will reply.

Downwind from the reactor there were 20 cases of hypothyroidism in the nine months after TMI, as compared to nine cases in the nine months before. On the upwind side in Pennsylvania, there were eight cases before TMI and seven cases after. More statistical aberrations?

And if the final cancer statistics show increasing leukemia incidence near nuclear reactor accidents, as they have near atomic testing sites in Nevada and Utah, there will again be more denials from those affiliated with the nuclear industry.

Who has the beliefs and who the facts on a little radiation?

BRUCE MOLHOLT
Public Interest Law Center
Philadelphia.

APPENDIX D

LEAKS AND COVER-UPS

Spillage is feared at 3 Mile

Reactor-line leak is filling tanks

By Tom Raum
Associated Press

WASHINGTON — A hard-to-repair leak at the Three Mile Island nuclear power plant is hindering cleanup operations and may cause a spillage of radioactive wastes, Senate investigators said yesterday.

The staff of the Nuclear Regulatory Commission (NRC) contended, however, that the radioactive water that is rapidly filling storage tanks at the crippled plant will not be allowed to overflow.

The leak, in a line that removes contaminated water from the reactor, is adding volume to nearly 1 million gallons of highly radioactive water already in storage at the plant, which is on the Susquehanna River 10 miles south of Harrisburg.

In a letter to NRC Chairman Joseph Hendrie, members of the Senate nuclear regulation subcommittee said they had obtained information that tanks used for storage of the radioactive water are fast reaching their capacities.

"Contaminated water from the damaged plant will exceed storage capacity within 40 days and be released into the environment unless steps are taken soon to clean it up and to find additional means to store it," the panel said. Most of the information gathered by the investigators came from interviews with NRC regulators and officials, the subcommittee said.

At a hastily called meeting yesterday afternoon, the NRC staff said the radioactive water could be shunted from the tanks at the Unit 2 reactor to tanks at the Unit 1 reactor. It was the Unit 2 reactor that was involved in the Three Mile Island accident last spring, the most serious in the 25-year history of commercial atomic power. The Unit 1 reactor, which was shut down at the time of the accident, also remains closed during the cleanup of Unit 2.

The NRC staff confirmed that radioactive water may fill the Unit 2 tanks to capacity in about a month, but it said that it would take as long a year to fill the now-uncontaminated tanks at the Unit by spreading the contamination to the unaffected plant.

In its letter, the Senate panel, which has been investigating the March 28 accident, asked Hendrie what the NRC planned to do about the leak and the accumulating radioactive water.

"Currently there are more than 1 million gallons of contaminated water stored at the site and the volume is increasing due to a leak in the letdown line drawing cooling water from the nuclear core of the reactor," the senators told Hendrie.

"We are advised that this leak cannot be repaired because of high radiation in the containment" building, where the reactor is located, their letter said.

Reactor operators hoped to keep the contaminated water inside the reactor containment until they determine how to dispose of it safely.

The subcommittee, whose chairman is Sen. Gary Hart (D., Colo.), called on the NRC to describe "what planning is being done by the commission to respond to any future contingency at Three Mile Island site related to management of these highly radioactive wastes."

The NRC's director of nuclear reac-

tor regulation, Harold Denton, was quoted by the senators as saying that as long as radioactive water remained in the reactor containment structure, it might find "sneak paths" to the outside.

The senators' letter was signed by members of the subcommittee as well as by Sens. Jennings Randolph (D., W. Va.), chairman of the Environment and Public Works Committee, and Howard Baker (R., Tenn.), minority leader.

The Three Mile Island accident occurred when the Unit Two reactor was inadvertently deprived of cooling water and badly overheated, causing major damage to the nuclear fuel and releasing radiation to the atmosphere.

Officials have indicated that it may be a year or longer before the concrete structure containing the reactor — the so-called "containment" structure — can be re-entered because of high levels of radioactivity within.

POOR ORIGINAL

3 MILE ISLAND AIDES SAID TO HAVE WAITED TO TELL OF HAZARDS

U.S. Investigators Disturbed by
Testimony Indicating Utility
Knew Data Showed Peril

By DAVID BURNHAM
Special to The New York Times

WASHINGTON, Oct. 20 — Federal investigators have obtained testimony indicating that some supervisors at the Three Mile Island nuclear power plant fully comprehended on the first day of the reactor accident there that the possible consequences were more serious than they were reporting to the Government.

The investigators are attempting to determine whether some officials at the reactor may have violated an ambiguous Federal requirement that they report dangerous conditions to the Government within 24 hours after they are noted. But, beyond the question of legal liability, most experts agree that public support for nuclear power rests in large part on the expectation that both the industry and Government regulators will be forthright and candid.

The testimony bearing on the understanding of officials at the Three Mile Island reactor on March 28, the first day of the accident, was recently obtained by the independent investigative group established by the Nuclear Regulatory Commission. The group, which is somewhat akin to a special prosecutor, is headed by Mitchell Rogovin, a Washington lawyer.

Accuracy of Instruments

Because of a combination of technical and human failures, the reactor core did not receive enough cooling water to keep the fuel rods from melting, allowing radioactivity to escape. The supervisors received many indications in the first few hours that the core had lost a significant amount of water, according to earlier accounts, which also reported that the officials did not believe the readings that some of their instruments provided.

The testimony obtained by Mr. Rogovin's staff, however, is the first suggestion that the officials believed their instruments and understood the significance of the indicators.

Robert Arnold, a senior vice president of the Metropolitan Edison Company, the operator of the reactor, said in response to inquiries that he believed officials had given the Government all significant information as soon as it was available. The incident at Three Mile Island is the worst accident that has occurred in the civilian use of nuclear power.

The special group is not scheduled to make its report public until the end of 1979. Another investigatory group, the President's Commission on the Accident at Three Mile Island, is holding its final

set of closed meetings this weekend before submitting its report to President Carter at the end of the month.

Barbara Jorgenson, public information director of the President's commission, said today that there would be no comment about the report yesterday in The New York Times that the commission had voted to recommend a moratorium on the construction of new reactors until its proposals for improving nuclear safety had been adopted.

The moratorium recommendation, which could be reversed in meetings today, Sunday and Monday, would be a considerable blow to the development of nuclear power in the United States even though the panel's recommendation are advisory. Such a recommendation would support the members of Congress seeking a moratorium law and further discourage Wall Street from investing in nuclear power plants.

The testimony about the first day of the accident was given by Brian Mehler, a

shift supervisor at the Three Mile Island reactor near Harrisburg, Pa. Mr. Mehler initially discussed what some officials knew about the seriousness of the accident in a conversation with a Federal investigator July 6.

Pumps Were Already Turned On

According to the notes of the investigator, which have been obtained by The Times, Mr. Mehler said that on Wednesday afternoon, the first day of the accident, he was ordered not to turn on a set of pumps that provide oil to the reactor coolant pumps. The order came after a small explosion of hydrogen in the reactor had been noted.

Mr. Mehler told the investigator that he told the supervisors that it was too late

because he had already turned them on. "Then someone said, 'Well, that means we don't have any more hydrogen in there,'" the notes show.

Nuclear experts said that Mr. Mehler's account, if accurate, showed that at least some of the Metropolitan Edison officials were worried that turning on the pumps might cause an explosion because of the presence of hydrogen in the reactor.

Virtually the only way this hydrogen could have been formed, the experts said, was if the uranium fuel rods had lost a significant amount of the water that is designed to keep the fuel from melting. The reaction in the core that created the hydrogen also created the radioactivity that escaped into the reactor building, some of which was vented into the air outside.

Mr. Mehler, asked earlier this week about the report of his July conversation, said that it was somewhat inaccurate, but he confirmed the company's concern about an explosion.

Declines to Answer Question

When asked whether his answer confirmed the understanding that hydrogen already existed in the reactor, Mr. Mehler said that he would not discuss the matter on the telephone because he had already been questioned about it by Mr. Rogovin's special investigative team.

It was not until more than 24 hours after the conversation described by Mr. Mehler — that is, late Thursday evening or early Friday morning — that Metropolitan Edison told the Nuclear Regula-

tory Commission that the company thought the core had been uncovered, according to the memory of both company and Government officials.

Mr. Arnold, the senior Metropolitan Edison official now in charge of cleanup operations at the crippled reactor, said he was sure that officials at Three Mile Island had not decided that the core had been uncovered until late Thursday and had immediately passed on their conclusion to the Government.

POOR ORIGINAL

Radioactive

The Philadelphia Inquirer
February 12, 1980

gas escapes in TMI spill

By Mark Bowden
Inquirer Staff Writer

Small amounts of radioactive krypton gas were released into the atmosphere around Three Mile Island yesterday afternoon when about 1,000 gallons of highly radioactive cooling water spilled inside the nuclear power plant's auxiliary building.

The water spillage was the largest recorded leak of radioactive material at the facility since the major accident there last March, and prompted the evacuation of 11 workers from the auxiliary building, which sits alongside the plant's troubled Unit 2 reactor.

Officials of Metropolitan Edison Co. (Met Ed), which operates the plant, told federal and state regulators last night about the release of the krypton gas from the water into the atmosphere.

However, testing devices monitored by the U.S. Environmental Protection Agency, the Nuclear Regulatory Commission (NRC) and Met Ed did not detect significantly higher levels of radiation downwind from the plant, which is 10 miles south of Harrisburg on the Susquehanna River.

Met Ed officials initially had denied reports that any radioactivity escaped into outside air. But a spokesman later said that a check of monitors atop the building "confirms there was a small release of some radioactive gases, probably krypton 85." In the second statement, Met Ed said that "nearby monitors verified that the gas had been diluted within a short distance of the auxiliary building."

The statement added: "There would be no adverse health effects to workers on the island from such a minute release."

The auxiliary building houses pumps, tanks, pipes and machinery that normally do not come in contact with highly radioactive materials. But during the accident last spring, hundreds of thousands of gallons of radioactive coolant water were pumped from the afflicted Unit 2 containment structure into storage tanks there.

Most of the largest radiation releases during the accident came from the
(See TMI on 14-A)

auxiliary building, which, unlike the thick concrete containment structure, is not built to house radioactive materials safely.

Robert Reid, mayor of Middletown, Pa., the nearest town to the Three Mile Island site, said a Met Ed official informed him of the accident yesterday, shortly after it happened.

"They told me there was a release of radioactivity inside the plant, but that none got out," Reid said. "That was exactly the same thing they told me last year, and I found out about 20 seconds later that radiation had been released. I guess I'll take their word for it until I hear otherwise."

Gov. Thornburgh dispatched a state radiological health expert to the plant to report on the incident. He also asked Thomas Gerusky, director of the State Bureau of Radiological Health, to monitor reports about the incident through the night.

"The governor is concerned about the situation and is receiving regular reports from all the monitoring agencies involved," said a spokesman on his staff.

Ever since the reactor vessel inside Unit 2 was uncovered and overheated during the accident 10 months ago, coolant water inside an enclosed network of pipes has flowed over the damaged core to keep it from melting down. Small amounts of highly radioactive water from inside this coolant system leak out inside the containment structure constantly, so "make-up" water pumps in the auxiliary building feed water into the cooling system regularly.

No one has entered the containment building since the accident last year. The building is intensely radioactive, and its atmosphere must be constantly regulated to prevent the escape of radioactivity. Work has been under way for many months, however, inside the auxiliary build-

ing, which is not as seriously contaminated.

When workers attempted yesterday to transfer the flow of "make-up" water from one pump to another inside the auxiliary building, they discovered that water pressure inside the pumping system was low. At about that time, according to an NRC account of the incident, alarms sounded inside the three-story auxiliary building and in the plant's control room. Eleven workers inside the auxiliary building were evacuated.

A two-man inspection team dispatched into the auxiliary building discovered that radioactive water was spilling from a pipe three-eighths of an inch in diameter. The water, which an NRC spokesman said was contaminated with about 60 microcuries (a measure of radiation intensity) per cubic centimeter, drained into the auxiliary building basement and was immediately

pumped by sump pumps into storage tanks designed to hold radioactive water.

Sixty microcuries is about one-fourth the level of radioactivity contaminating each cubic centimeter of the 500,000 gallons of water at the bottom of the containment structure. The coolant water that spilled yesterday is much more radioactive than the water that has been stored in large amounts inside the auxiliary building since the emergency last year.

There have been a number of on-site accidents at the plant since last year. The worst, according to NRC spokesman Abraham, occurred last summer when seven men on a clean-up crew received an overdose when they accidentally opened the wrong valve inside the auxiliary building. Abraham said yesterday's accident could not be considered "major," even though it involved a large amount of water.

POOR ORIGINAL

Radioactive Water Leaks 2 Hours At Three Mile Island Nuclear Plant

MIDDLETOWN, Pa., Feb. 11 (AP) — A cooling system leaked as much as 1,000 gallons of highly radioactive water inside the crippled Three Mile Island nuclear power plant today, the authorities reported. They said no radioactive material had escaped and there was no health threat.

"The leak has been isolated and stopped," said John Collins, head of operations at the Nuclear Regulatory Commission's office here. "The water has been contained inside the auxiliary building. There has been no indication of airborne activity off-site. There was no danger to any of the workers on the island or off the island."

However, the auxiliary building, which adjoins the one that houses the severely damaged reactor, was evacuated what plant officials called the "local emergency." Eleven workers, wearing protective clothing and breathing gear, were inside at the time.

"We don't have any indication at all that any of these workers received any radiation," said Sandy Polon, spokesman for the Metropolitan Edison Company, operator of the plant that was shut down after an accident last March. "We isolated the auxiliary building, evacuated it, so we could locate the leak and take care of it."

600 to 1,000 Gallons

Mr. Polon estimated the amount of the leak at 1,000 gallons. In Washington, Victor Stello Jr., the nuclear commission's director of inspection and enforcement, gave an estimate of 600 gallons.

Officials said water leaked at a maximum rate of nine gallons a minute from 12:55 P.M. to 2:40 P.M. A sump pump hauled the spilled water to a storage tank.

Plant officials said the leak occurred in routine maintenance of three pumps that add water to the primary cooling system. They said that when one pump was turned on, a leak developed in a pressure switch feeding a three-eighths-inch line.

The system where the leak occurred has been used since the March accident to keep the reactor cooling system supplied

with water. The water runs through the reactor's uranium core and contains radioactive isotopes.

Rate of Radiation

Dave Milne, spokesman for the state Department of Environmental Resources, said the water contained material radiating at a rate of 125 microcuries per cubic milliliter. "That's a significant figure," he said.

In Washington, Frank Ingram, a commission spokesman, said his agency's technical support team at the plant was investigating.

"Our people are checking into the question of releases outside the building. We have heard none reported so far, but that is very preliminary," he said.

Commission officials said the leak had not affected the natural circulation of water that cools the reactor core. When alarms signaled the leak, a backup system was placed in service. The backup system was built after the accident.

POOR ORIGINAL



A worker at Three Mile Island checks a radiation monitor outside the crippled power plant

State charges TMI officials tardy in alert on radioactive gas leak

State calls TMI tardy with alert

Delay charged in revealing leak

By Roger Cohn
Inquirer Staff Writer

Pennsylvania officials charged yesterday that the operators of the Three Mile Island nuclear power plant failed to properly notify state and local authorities about Monday's spill of highly radioactive water, which caused radioactive gas to be released into the atmosphere.

Oran K. Henderson, director of the Pennsylvania Emergency Management Agency, said that Metropolitan Edison (Met Ed), which operates the plant, had violated an agreement that requires the company to notify the state immediately of any spill or leakage of radioactive material. Henderson said that state authorities only learned of Monday's incident, in which radioactive krypton 85 gas escaped into the atmosphere, indirectly through an tip from a worker at the plant.

"It was inexcusable," Henderson said in an interview. "They (Met Ed) were bound to notify us and they didn't do it."

The release of small amounts of radioactive krypton gas occurred after about 840 gallons of highly radioactive cooling water spilled inside an auxiliary building next to the plant's damaged unit two reactor, the site of a major accident at the facility last March. The plant has been shut down since that accident.

A spokesman for the Nuclear Regulatory Commission (NRC) said that the amount of radioactive gas released, estimated by a Met Ed spokesman at 200 to 300 millicuries (a measure of radiation intensity), was not large enough to endanger the public (See TMI on 2-A)

TMI, from 1-A

or the 11 maintenance workers who were forced to leave the auxiliary building.

In a prepared statement, Gov. Thornburgh said he was "greatly concerned about the timeliness of the notification process and the fact that the state first learned of this incident from sources other than the company and the Nuclear Regulatory Commission."

"It is absolutely imperative that the appropriate state authorities be informed directly and immediately of any malfunctions at this or any other nuclear power plant in Pennsylvania," the governor added.

Henderson said that Met Ed officials had signed an agreement with the state to "notify us expeditiously" of any radioactive spill or leakage at the Three Mile Island plant. Under the agreement, he stated, Met Ed was to report any such incident immediately to his office, the State Radiation Protection Bureau, and emergency preparedness authorities in Dauphin County, where the plant is located.

Henderson said that the spill of cooling water at the facility was discovered at 12:58 p.m. on Monday, but that his office did not learn of it until 1:20 p.m., when Dauphin County authorities called to report that they had information indicating that a spill had occurred. The information was relayed to county authorities by a friend of a worker at the plant, he added.

Henderson said that state officials then contacted the plant's NRC representatives who confirmed that a spill had taken place. His office did not receive final confirmation of the incident until 1:40 p.m., Henderson said.

"As far as we're concerned, they (Met Ed) violated the agreement by failing to notify us," Henderson stated.

"I thought we had the system pretty well worked out and that we would get notification of this type of incident," he said. "But here it is, an incident happens, and we don't get any notification."

"We find out about it 25 minutes later through the back door, instead of five minutes later through the front door the way we're supposed to," Henderson added.

A Met Ed spokesman said yesterday that, under the plant's NRC-approved emergency plan, the company is not required to notify any state agency about the type of incident that oc-

(portion missing)

confined to a small area at the plant, he stated.

Met Ed spokesman David Kluscik said that the power company had gone "beyond what we were required to do" by notifying the Radiation Protection Bureau of the spill at 1:30 p.m.

However, Henderson said that call was not made until 1:40 p.m. and that, by that time, state officials had already contacted the NRC staff at the plant. The leak was stopped at 2:30 p.m., according to the company.

Henderson said that he met yesterday afternoon with Herman Dieckamp, acting president of Met Ed and president of General Public Utilities, of which Met Ed is a subsidiary. He agreed that state officials should have been informed of the spill, Henderson said, and he pledged to improve notification procedures at the plant.

In his statement, Thornburgh said that he intended to complain to the NRC about Met Ed's failure to notify the state immediately of the incident.

"The need for swift, accurate and direct communication was one of the most important lessons to come out of the events of last spring," said Thornburgh, citing the worst nuclear reactor accident in history. "I would hope that it hasn't been forgotten."

POOR ORIGINAL

Radiation leaks at TMI: Nothing has changed

Monday's accident at the Three Mile Island nuclear plant, in which water was spilled and small quantities of radiation released, demonstrates with frightening clarity that absolutely nothing has changed in the way nuclear plants are run or regulated in the United States, despite all the public assurances to the contrary.

Officials of Metropolitan Edison Co., operators of the reactor, at first denied that any release of radiation had occurred even though there was ample evidence that gas had been vented during the spill. They later changed their story. The utility failed to notify state officials — as they had previously agreed to do — that a portion of the plant had been evacuated. And it took operators 1 hour and 45 minutes to bring the situation under control.

The events of Monday are in many ways so similar to those that occurred last March 28 as to be uncanny.

When the President's Commission on the Accident at Three Mile Island last fall released its exhaustive study, members noted: "Metropolitan Edison did not have sufficient knowledge, expertise and personnel to operate the plant or maintain it safely."

Immediately after the accident, the best minds in the fields of nuclear engineering and safety rushed to the plant to assist. They have provided guidance ever since. Operators were subjected to rigorous retraining. All this took place under the watchful eyes of the Nuclear Regulatory Commission which assuaged critics in the Congress and the public by mounting a highly touted internal shake-up, well aware that its future as a regulatory agency hung in the balance.

"We are learning the necessary lessons from this accident and applying them so that we can even better protect the public," said the industry's top spokesman, Carl Walske of the Atomic Industrial Forum, Inc. last year.

Nothing could be further from the truth which emerged, naked, Monday. It is business as usual at TMI and, it would appear, at the NRC.

The NRC thus far has survived a variety of demands that it be restructured to provide more decisive leadership in emergencies as well as in long-range regulation. Yet only last month, it extended a crucial deadline for installation of safety equipment on operating reactors because 38 of the 68 affected plants had not complied.

In many other of its regulatory actions, the NRC has given every indication that it realizes the pressure is off, that public attention has been diverted elsewhere, and that the tough talk of last year can be modulated.

President Carter, whose commitment to nuclear power dates back to his Navy days, recently revised his position on the expansion of nuclear generating capacity in this country. Although the President used to describe nuclear power as a "last-resort" source of power, he has amended his position, saying that the U.S. must rely on new reactors until alternative forms of energy are available.

The accident at Three Mile Island on Monday was minor. The radiation that leaked out was diffused a short distance away from the reactor.

The significance of that small problem is tremendous, however, for the residents of Middletown, the people of Pennsylvania and all Americans.

The best technology available, the best minds available, and the ever-present knowledge that Three Mile Island serves as the proving ground for nuclear power all failed to produce a combination of effectiveness. It failed — Monday made it inescapably clear — to run even an almost closed-down plant properly. That leaves the obvious question unanswered: Can nuclear power be made safe at all?

2d radiation leak at TMI this week

By Roger Cohn
Inquirer Staff Writer

Another leak of radioactive krypton gas was discovered yesterday at the Three Mile Island nuclear power plant. It released 10 times as much radioactive gas into the atmosphere as escaped from a leak at the plant Monday, Nuclear Regulatory Commission (NRC) officials said last night.

However, the NRC officials said yesterday's leak, which occurred between 7:30 p.m. Tuesday and noon yesterday, did not threaten the

three curies (a measure of radioactive material based on the concentration of radioactivity). That amount is 10 times greater than the krypton gas that escaped on Monday after 840 gallons of highly radioactive water spilled inside the auxiliary building.

John Collins, chief of the NRC staff at Three Mile Island, said he did not regard yesterday's leak as "a serious incident."

Metropolitan Edison, which operates the plant, confirmed last night

health of plant workers or nearby residents. Monitoring devices just off the plant grounds failed to detect an increase in radiation, the officials stated.

Gary Sanborn, an NRC spokesman, said that the krypton 85 escaped through a leak in a gas-sampling system at the auxiliary building beside the damaged Unit 2 reactor, site of the worst commercial nuclear accident in the nation's history last March.

Sanborn said that the gas released over the 16-hour period measured

that krypton gas had started to leak Tuesday night from the gas-sampling system. In a prepared statement, the company said that the system had been shut down at 11:40 a.m. yesterday and that Met Ed workers were trying to find the cause of the leak.

The company said that it had reported the latest leakage to Gov. Thornburgh's office, to state environmental and emergency officials.

Met Ed has agreed to notify state and local authorities of all spills and leaks. Page 3-B.

POOR ORIGINAL

Met Ed agrees to notify state, local officials of leaks

By Roger Cohn
Inquirer Staff Writer

New emergency notification procedures were put in effect yesterday at the Three Mile Island nuclear power plant in an effort to assure that state and local authorities are notified immediately of any spills or leaks of radioactive material, a spokesman for Metropolitan Edison (Met Ed) said yesterday.

Met Ed, which operates the plant, was responding to state officials' complaints that they were not promptly notified about Monday's

spill of 840 gallons of highly radioactive cooling water at the plant.

The state officials said the 40-minute delay in formal notification violated an agreement requiring Met Ed to inform the state immediately of such incidents. Met Ed spokesman David Kluscik said that the company had not believed that the agreement was in effect on Monday.

Kluscik said that now the plant staff would alert the Pennsylvania Emergency Management Agency and emergency-preparedness officials in Dauphin County, where the plant is

located, of any radioactive spill or leak.

State officials insisted yesterday, though, that such notification should have been made for Monday's incident, in which small amounts of radioactive krypton 85 gas escaped into the atmosphere. Those officials said they believed Met Ed's handling of the incident would further damage public confidence in the company's operation of the plant, which has been shut down since the worst nuclear accident in the nation's history happened there in March.

"It just seems that Met Ed is prone to making errors," said Thomas Gerusky, director of the state Radiation Protection Bureau. "They should have called us . . . I think the damage has been done to Met Ed again. I don't know if they are ever going to come back to credibility."

John Collins, chief of the Nuclear Regulatory Commission (NRC) staff at Three Mile Island, said that the cooling water spilled inside the plant's auxiliary building had a maximum radioactivity concentration of 120 microcuries (a measure of

radiation intensity). Cooling water inside the primary system of a normally operating nuclear plant would have a concentration of one microcurie, Collins said.

Meanwhile, in Harrisburg yesterday at a Public Utility Commission (PUC) hearing on whether Met Ed should be permitted to remain in business, Citibank vice president Stewart Clifford said that banks would be reluctant to continue extending credit to General Public Utilities, Met Ed's parent company, unless they believed that the PUC wanted

Met Ed to continue operating. A group of banks, led by Citibank and Chemical Bank, have currently placed a ceiling of \$292 million on credit available to General Public Utilities.

In a related development, the NRC announced that small amounts of radioactive gas leaked into the atmosphere on Monday and Tuesday at a nuclear power plant in Lusby, Md. The leaks, which occurred at the Baltimore Gas & Electric Calvert Cliffs plant, were considered "negligible" and did not endanger public health, according to the NRC.

POOR ORIGINAL

TMI Leaks, But Source Not Found

Radiation levels rose mysteriously inside a Three Mile Island plant building and remained higher for several hours on Thursday before falling back to normal, officials said.

"They have not really found the source of the leak...but, whatever it was, it is not presenting a continuing problem to us," said John T. Collins, chief on-site official for the Nuclear Regulatory Commission.

Higher levels triggered an alarm in the Unit 2 auxiliary building about 1 a.m. No workers were inside the building at the time.

Radiation inside the auxiliary building tripled before coming down, Collins said.

Metropolitan Edison Co., the plant operator, said some radioactive krypton gas probably escaped from the Unit 2 auxiliary building. The amount was so small it could not be detected, even on the building's roof.

"We believe some of it was released, although we can't put a number on it," spokesman Sandy Polon reported.

The disabled plant gives off about two curies of krypton gas every day from a variety of small leaks.

"Instead of two curies being released (on Thursday), it may be three. It still is an awful small amount," said Thomas Gerusky, director of the state's Bureau of Radiation Protection.

On-site officials of the U.S. Environmental Resources also reported that no radiation could be detected off-site.

To be sure, the agency sent an air sample from a "krypton-sensitive"

TMI Leaks, But Source Not Found

Continued From Page One

monitor placed at the TMI Observation Center to laboratories in Las Vegas, Nev., for analysis.

"I don't expect to see anything," said Al Smith, the EPA's coordinator at the nuclear plant.

The incident was reported to Pennsylvania authorities about 7 a.m. as "an event of potential public interest."

Officials at first thought radioactive water may have leaked from the plant's cooling system onto the floor of the reactor building, giving off gas that escaped through the building's ventilation system.

Later a water leak was ruled out when workers in protective clothing entered the building, looked around and saw no water. The water level in the building's "sump" did not go up either, Polon said.

By Thursday night, plant officials were speculating the leak may have come as a result of maintenance and decontamination work performed a day earlier in a valve room that adjoins the auxiliary building.

"The assumption is being made that it was probably a particulate release," Collins said.

Gerusky called the incident was "just another indication of what's going to happen" until the disabled reactor is cleaned up.

POOR ORIGINAL

APPENDIX E

NRC ADVOCACY

Met Ed asking to release gas trapped at TMI

Associated Press

HARRISBURG — Metropolitan Edison Co. said yesterday that it wants to vent krypton 85, a radioactive gas, from the damaged Three Mile Island nuclear reactor.

If the Nuclear Regulatory Commission approves, the controlled release would occur during the first three months of 1980, Met Ed vice president Robert Arnold told a public hearing. The gas was created during the March 28 accident when water came into contact with the fuel assemblies, which had deteriorated in the intense heat.

Both commission and state officials at the hearing declined to comment on Met Ed's proposal.

There are approximately 2 million cubic feet of trapped gases — primarily krypton — in the containment building. The amount of radioactivity released during the venting, which is expected to take between 1½ to three months, would be far below federal radiation standards, Arnold said.

For a person standing continuously at the facility's boundary for the duration of the venting, radiation exposure for the skin would be 5 millirems, Arnold said. Whole-body exposure would be one-tenth of a millirem, he added.

Under federal standards, the maximum safe exposure over a year is 15 millirems.

Report on Nuclear Accident Holds Agency Is Unable to Insure Safety

It Urges Strong Chief for Regulatory Commission and Formation of a Consortium to Operate Reactors

WASHINGTON, Jan. 24 — A report to the Nuclear Regulatory Commission on the accident at the Three Mile Island reactor concluded today that the commission as currently organized was incapable of managing a nuclear safety program "adequate to ensure the public health and safety."

Calling for a reorganization, the report stressed the need for a "single chief executive" to direct the regulatory commission.

In addition to urging a reorganization of how the Government regulates nuclear power, the report recommended the formation of an industrywide consortium or a public corporation to take over the operation of reactors from those utilities unable to run them in a safe manner.

The report was prepared at the request of the regulatory commission by an independent investigative team headed by Mitchell Rogovin, a Washington lawyer. Today's report is entirely separate from the one completed in November by a Presidential advisory commission headed by John G. Kemeny, president of Dartmouth College.

"We have found that the Nuclear Regulatory Commission itself is not focused, organized or managed to meet today's needs," the Rogovin team said. "In our opinion the commission is incapable, in its present configuration, of managing a comprehensive national safety program for existing nuclear power plants and those scheduled to come on line in the next few years adequate to ensure public health and safety."

Need for Trained Personnel

The group added that, based on its study of the Three Mile Island accident and interviews with experts throughout the industry, "many nuclear plants are probably operated by management that has failed to make certain that enough adequately trained operators and qualified engineers are available on site in responsible position to diagnose and cope with a potentially serious accident."

The report further found that responsibility for safety was badly fragmented among different parties and that, at least until the start of the Three Mile Island accident near Harrisburg, Pa., last March 28 "an attitude of complacency pervaded both the industry and the N.R.C."

By DAVID BURNHAM
Special to The New York Times

John F. Ahearne, chairman of the regulatory commission, called the report "a reasoned and sound document." Two of his colleagues, however, Victor Gilinsky and Peter Bradford, raised a series of critical questions about the reasoning behind some of the report's recommendations. The comments came at a commission meeting in which Mr. Rogovin presented a summary of the \$2 million study.

Despite the sweeping criticisms, however, the final report by the Rogovin group did not include recommendations for either a temporary "moratorium" on the construction of new reactors or that serious consideration be given to closing down any reactor whose operator is unable to develop plans to evacuate every

person living with a 30-mile radius of the reactor. Those two recommendations were made in the original version of the report, a copy of which was obtained three weeks ago by The New York Times.

Peril of a Meltdown

The special report said the Three Mile Island incident had come close to being "the accident we had been told by many in industry could not happen: a core meltdown."

About two hours after the accident began, the report said, a shift foreman reported for work, noted a valve was leaking reactor coolant into the containment building and blocked off the stuck-open valve.

"If that valve had remained open, our projections show that within 30 to 60 minutes a substantial amount of reactor fuel would have begun to meltdown — requiring at least the precautionary evacuation of thousands of people living near the plant, and potentially serious public health and safety consequences for the immediate area," the report said.

The special team concluded that because of a variety of steps taken by the nuclear industry and the regulatory commission an accident identical to that at Three Mile Island would not happen again.

"However," the report added, "the work done by the Special Inquiry Group over the past seven months has led us to conclude that unless fundamental changes such as those outlined above are made in the way commercial nuclear reactors are built, operated and regulated in this country, similar accidents — perhaps with the potentially serious consequences to public health and safety that were only narrowly averted at Three Mile Island — are likely to recur."

Lack of Leadership Seen

The report charged that the regulatory commission had failed to provide either leadership or management for the nation's nuclear safety program.

"The central and overwhelming need is for legislative and executive reorganization to establish a single chief executive with the clear authority to supervise and direct the entire N.R.C. staff," the report contended. "An effective reactor safety program absolutely requires strong and effective management of this kind."

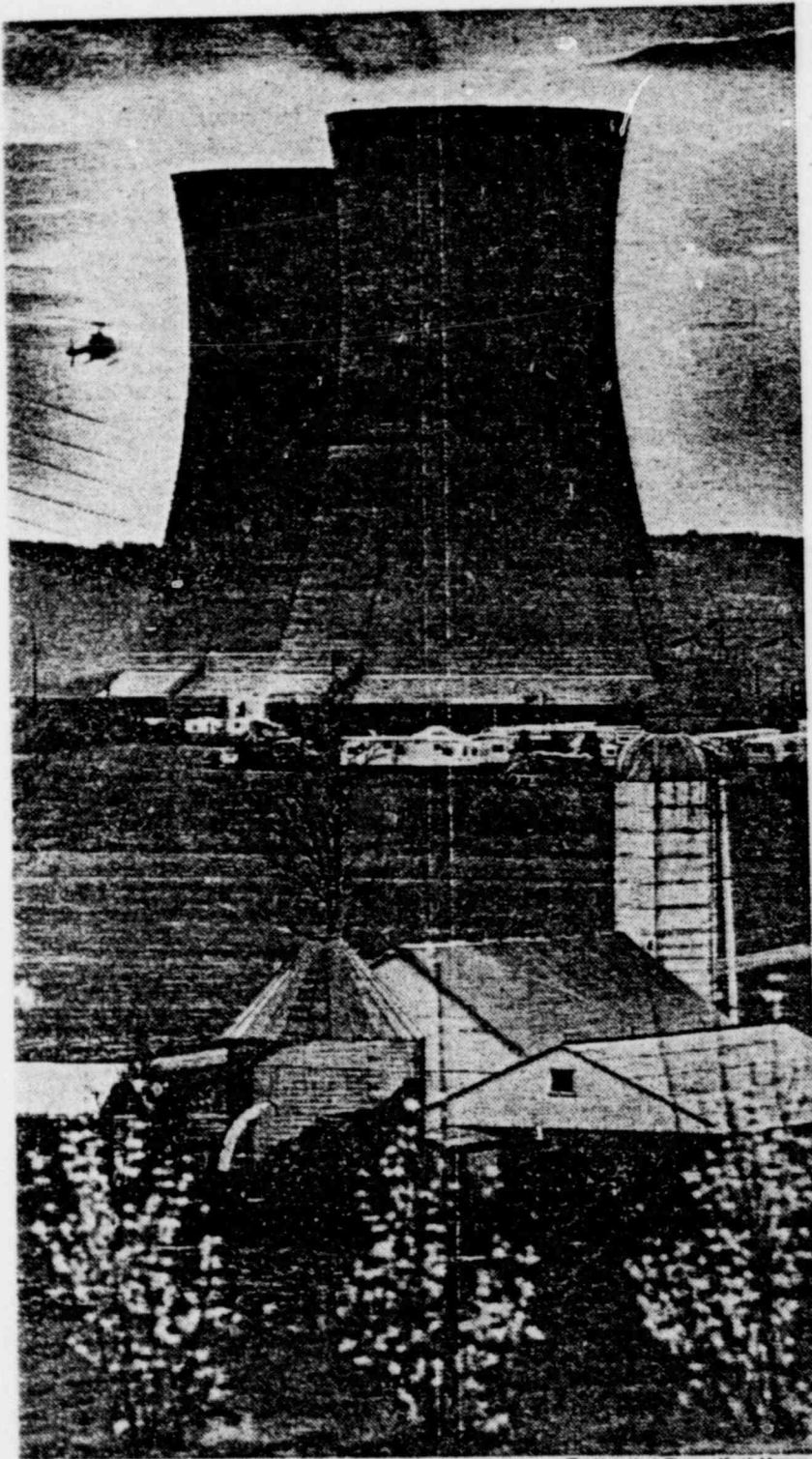
The Presidential advisory commission headed by Dr. Kemeny also recommended the abolition of the five-man board that heads the regulatory commission and its reorganization into an agency headed by a single administrator similar to the Food and Drug Administration, the Environmental Protection Agency or the Federal Aviation Administration.

Such a plan, however, is not popular in Congress and was not adopted by President Carter in his response to the recommendations of his advisory commission.

"We do not believe that the current Administration's proposal to 'strengthen' the N.R.C. chairman's executive author-



POOR ORIGINAL



The New York Times / Keith Meyers

A Nuclear Regulatory Commission helicopter flew past cooling towers of the Three Mile Island nuclear plant as its crew checked radiation levels.

ity goes far enough to reach the heart of the problem involved here," the Rogovin team report said.

Call for Consortium

The recommendation for the formation of a nationally chartered operating company or consortium to take over the operation of some reactors was based on a finding, the report said, "that there is a wide spectrum in the capability of the various nuclear utilities to operate existing plants in a safe way."

The report said that for those utilities found unable to manage a nuclear reactor "the company or consortium would either acquire the plants and sell electric power to the utilities for resale to customers" or would operate existing plants on a contract basis.

The report said that the investigation team had sought to determine whether

there was evidence of any willful failure on the part of utility personnel to cover up the seriousness of the accident.

The report said that there was no question that the information conveyed to the regulatory commission during the accident was incomplete, in some instances delayed and often colored by individual interpretations. But, it added, there was no evidence that the causes of this breakdown in information flow went beyond confusion and incompetence.

In a letter to the regulatory commission, however, Representative Morris K. Udall, chairman of the House Interior and Insular Affairs, called for further investigation of why on the first day of the accident Federal and state officials "were denied important information" about the status of the plant.

POOR ORIGINAL

Quick Decontamination At 3 Mile Island Sought

WASHINGTON, Feb. 16 (AP) — Federal regulators are looking for ways to speed the decontamination of the crippled Three Mile Island nuclear reactor after two minor leaks of radioactive gas this week.

Members of the Nuclear Regulatory Commission said the pace of the cleanup at the reactor, Three Mile Island Unit No. 1, near Harrisburg, Pa., should be re-examined and a report issued within two weeks.

The Unit 1 reactor has been inaccessible nearly a year. It contains nearly 1 million gallons of radioactive water, radioactive krypton 85 gas and a core believed heavily damaged and in a fragile state because of the accident March 28, when the reactor allowed cooling water to escape from its system.

The Federal commission and the utility that operates the plant have estimated that workers will not be able to reach the damaged core until early 1983 and not complete the cleanup until 1984. So far only about one-tenth of the radioactive water has been decontaminated.

Victor Stello, director of the commission's office of inspection and enforcement, told his colleagues there was reason to believe that the cleanup could proceed faster. He indicated that the commission itself might be partly to blame because of inaction.

Two other commission members expressed concern that in its present, sealed state, the reactor might pose a greater risk than if some controversial cleanup procedures were begun now. Those procedures would lead to releases of radioactive material, but below dangerous levels.

Venting of Radioactive Gas Urged

WASHINGTON, March 12 (AP) — The Nuclear Regulatory Commission's staff proposed yesterday that radioactive gas be vented as soon as possible from the crippled Three Mile Island nuclear power plant in Pennsylvania.

The commission agreed to reach a decision on the proposal ~~by April 3~~ after the ~~public is given 15 days to comment on the~~ ~~staff's environmental assessment~~ and the commission gives the matter further study.

Before any of the krypton-85 gas is released into the atmosphere, the commission's staff said, an effort would be made to reassure people living near the plant that the venting would pose no health threat.

Area residents have strongly opposed release of the potentially hazardous material that is now sealed in the nuclear plant's containment building, despite assurances by the commission that any releases would be well within Federal radiation safety limits.

The release of the gas would be the first

major step toward gaining access to the containment building, which has been sealed since a nuclear accident occurred at the plant nearly a year ago. Members of the commission have indicated in recent weeks that they favor speeding the cleanup process at the reactor near Harrisburg, Pa. The staff warned that if the gas remained in the containment structure, "it is likely that future accidental releases" would occur.

The cleanup operation also must deal with 600,000 gallons of contaminated water in the containment building. Both the gas and water must be removed before anyone can enter the building to examine instruments, pipes and gauges that may be rapidly deteriorating.

POOR ORIGINAL



Two TMI technicians, the first to enter Unit 2 airlock since the accident, remove masks after finding area free of radiation

NRC staff wants gas at TMI released soon

By Mark Bowden
Inquirer Staff Writer

The Nuclear Regulatory Commission (NRC) staff has recommended to its five commissioners that 57,000 curies of radioactive krypton gas trapped inside the Unit 2 containment building at Three Mile Island be vented into the outside air soon.

If the commission approves the recommendation next month, the venting will be the largest release of radioactivity from the stricken nuclear power plant since an estimated 15 million to 20 million curies escaped during the accident there last year.

NRC officials stressed Wednesday that venting the Krypton-85, an inert gas that will remain radioactive for nearly 100 years, would not threaten the health of area residents.

Metropolitan Edison Co., co-owner and operator of the plant, asked the NRC for permission to release the gas as a first step toward decontaminating Unit 2, a process that will take at least four years and cost an estimated \$400 million.

Although venting is strongly opposed by surrounding communities, it has now been endorsed by two separate NRC groups and by Gov. Thornburgh's TMI commission.

In approving the venting of the radioactivity, the NRC staff rejected more time-consuming and expensive methods of cleaning the atmosphere inside Unit 2. Alternatives such as absorbing the krypton gas in special filters or liquefying and bottling it were vetoed because further delays in cleaning up Unit 2 could result in more dangerous, accidental releases, the staff report said.

"I regret to report that the technology for cleaning up a mass concentration of krypton gas is not as advanced as I had once hoped," said Harold Denton, the NRC's director of nuclear regulation.

Mayor Robert Reid of Middletown, Pa., which is close to the plant, said, "I knew it was going to happen, but I don't like it. There are a lot of people upset with it. Venting is just the cheapest and easiest way."

Reid predicted that many residents would leave the area when venting occurs, despite assurances from fed-

eral and state officials that it will be harmless.

Met Ed officials are anxious for permission to vent the gas. After that has been done, workers will be able to spend enough time inside the contaminated reactor building to begin devising a method of cleaning out the reactor core, which is thought to have partially melted during the accident. No one has entered the Unit 2 containment building since the accident occurred on March 28, 1979.

Yesterday morning, two teams of Met Ed workers entered the Unit 2 airlock for the first time since the accident. Workers are tentatively scheduled to enter the containment building next month to take photographs and test the level of radioactivity.

POOR ORIGINAL

Officials Seem to Favor Venting Gas at 3 Mile Island

By RICHARD D. LYONS

Special to The New York Times

HARRISBURG, Pa., March 27 — The top Federal nuclear safety expert and Pennsylvania's Governor left little doubt today that they would support the controlled release of more radioactive gas from the Three Mile Island plant.

The venting, while small in amount, is likely to trigger the largest protest yet from people living nearby and serves to underscore the safety questions that remain one year after the nation's worst civilian nuclear accident.

Harold R. Denton, director of reactor safety for the Federal Government, said at a news conference here that he had

been cited as the primary causes of the accident, on March 28, 1979, in which a loss of coolant left the atomic fuel partly exposed.

The venting issue has left many normally undemonstrative residents near the plant, on the Susquehanna River, in bitter, even violent, moods.

They contend that the renewed plan for venting highlights their fears that their health and safety are being placed behind the cost of the cleanup of Three Mile Island, perhaps as high as \$1 billion.

Skepticism From Mayor

"I'm quite sure they'll never tell us the truth about the venting," Mayor Robert Reid of Middletown, the town closest to the plant, told a meeting of local residents two nights ago in summarizing the distrust felt by his constituents.

The Middletown Press and Journal made public today the results of a telephone spot check of area residents. It found that those questioned believed, by almost 2 to 1, that the Metropolitan Edison Company, the utility operating the plant, and the Nuclear Regulatory Commission had given them misleading information.

Earlier meetings, such as one at the Middletown fire house last week, have turned into heated exchanges and vandalism because of the depth of feeling on the venting issue, not only by people traditionally opposed to nuclear power but also by many apolitical residents who believe their safety is being subordinated to the cleanup cost.

It was Mr. Denton who bowed to what he termed "psychological stress" in banning the release of krypton gas into the atmosphere last summer.

Krypton Mixed With Air

Krypton 85 is a normal product of nuclear fission in an atomic power plant. It is highly radioactive and its half-life — the time it takes half the atoms to disintegrate or "cool off" — is almost 11 years.

As explained by Mr. Denton today, the Three Mile Island plant contains one to two cubic feet of krypton 85 mixed with 22 million cubic feet of air inside the containment vessel, which houses the reactor.

The krypton has about 57,000 curies of radioactivity, compared with the two million curies or so that were accidentally vented during the accident a year ago, mostly as xenon gas.

Although krypton 85 is a heavy, inert gas whose beta radiation normally cannot penetrate the skin, it can be inhaled.

Mr. Denton noted that the Nuclear Regulatory Commission and other groups had examined ways of disposing of the krypton and had come up with a few other possibilities.

Included was one to liquefy the air that holds the krypton. Yet Mr. Denton said this was extremely difficult to do, that there had been minor explosions in working with the necessary equipment and

General Public Utilities Corporation, owner of the Three Mile Island plant, is in severe financial trouble. Page D1.

recommended the venting of gases, mainly radioactive krypton 85, as the only logical means of speeding up efforts to decontaminate the plant of hazardous atomic waste.

"There would only be a very small, a tiny amount of radiation released," Mr. Denton said, "which would have inconsequential health effects."

'Has to Be Cleaned Up'

Mr. Denton, an official of the Nuclear Regulatory Commission, added that "we cannot walk away from the plant; it has to be cleaned up."

Gov. Dick Thornburg, who held the news session in his capital office, stopped short of endorsing the venting proposal, but he added that "the option to do nothing is simply not on the table; decontamination must go forward."

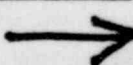
The news conference came on the eve of the one-year anniversary of the Three Mile Island accident. Equipment failure, human error and poor procedures have

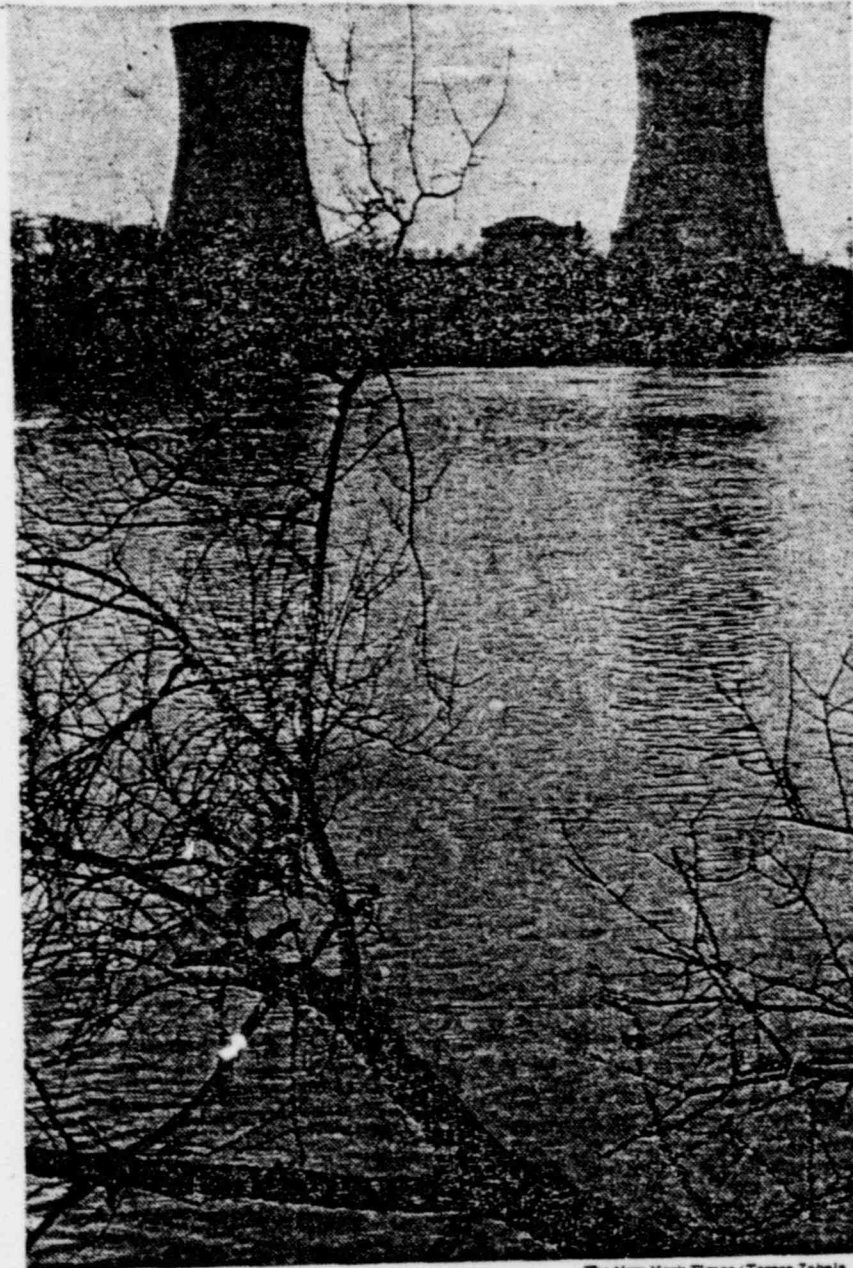


Associated Press

Harold R. Denton speaking yesterday about Three Mile Island.

POOR ORIGINAL





The New York Times / Teresa Zabala

The Three Mile Island nuclear plant one year after the accident

that such a project would take several years. Another possibility would be to absorb the krypton with activated charcoal, 34,000 tons of it. A third would be to store all the contaminated air in vacuum bottles.

After noting the options and calling attention to the drawbacks of each, Mr. Denton summed up by saying, "The technology is just not there to bring here and put into place."

The costs could range from about \$4 million to more than \$100 million.

Mr. Denton said that, although the health risks of venting were extremely small, there would be other risks if nothing were done, such as not knowing what was going on inside the reactor. He ex-

plained that the krypton gas must be disposed of to allow cleanup workers to enter the plant with greater safety.

After dealing with the radioactive gases, the workers then must clean up about 700,000 gallons of water inside the plant, contaminated mainly strontium 90 and cesium 137.

While far more toxic than krypton 85, these two materials can be handled more easily since they may be filtered out of the water and taken away in lead casks.

There still has been no decision about whether to restart the undamaged nuclear reactor at Three Mile Island. Known as T.M.I.-1, this was shut for refueling at the time of the accident to the second reactor, T.M.I.-2.

POOR ORIGINAL

APPENDIX F

NECESSITY OF VENTING

Somebody must decide the real TMI issue

Trapped inside the damaged reactor building at the Three Mile Island nuclear plant are gases containing 50,000 curies of radiation, along with many thousands of gallons of highly radioactive water. Whether that radioactive gas remains inside the plant or is intentionally vented into the atmosphere of central Pennsylvania is a question for which there is only one responsible answer: It must not be released.

A decision to spew the gas into the atmosphere and onto tens of thousands of people would represent the most indefensible form of expediency. It would be frightening, additional proof that the officials running the operations at TMI are like a bunch of boys playing mechanic in a back lot, trying to repair a derelict car by trying anything. When one thing doesn't work, they dream up another scheme.

In the TMI instance, mistakes can prove deadly for the people of Pennsylvania today and in the future.

Someone must decide whether the TMI plant is going to be returned to service or abandoned. The decision must not be made by the operating utility, which would profit from its reopening, or by the Nuclear Regulatory Commission, whose credibility to make such a decision is suspect. Perhaps that final decision must, by default, fall into the lap of Gov. Thornburgh who should have the best interests of the people uppermost in mind.

The decision will be difficult and controversial. But no one thus far has given any indication of considering it seriously. It would be an immense tragedy if sometime in the next year — after the residents near the plant have been exposed to radiation vented intentionally or unintentionally — the utility or the federal government decided simply to walk away from the plant because the clean-up process was

not working or had grown too costly.

The gas trapped in the reactor building is radioactive krypton. Despite all sorts of benign assurances that exposure to the gas would be no more dangerous than taking a long airplane ride, any exposure to radiation poses a potential risk to health.

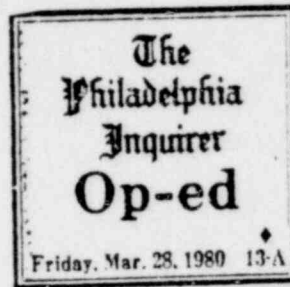
No one knows what the genetic legacy of TMI will be; only time will tell.

Officials at the crippled plant have warned repeatedly that unless they are permitted to vent the krypton under controlled circumstances the threat of uncontrolled releases increases. Considering the sloppy management and lax attitudes toward public safety already exhibited at the reactor, that possibility can't be ignored. But it cannot — and must not — be legitimized.

The Governor's Commission on Three Mile Island has done precisely that by tentatively endorsing the plant owner's plan to vent the gas, pending approval by the NRC. Not surprisingly, commission member Robert Reid, mayor of Middletown, TMI's nearest neighbor, dissented.

Venting the gas is a cheap way out of the dilemma — cheap for the utility. Equipment to filter out the radioactive particles isn't immediately available — telling testimony that the nuclear industry plans only for the routine and not for the unexpected. Technology does exist in other fields, however, to remove radioactivity from gas and it could be adapted — at great cost — to the TMI reactor.

The NRC will decide this spring whether the krypton gas can be vented by the utility. It must not be. Safety, public welfare and the genetic future of millions of Americans have been neglected far too long in the scramble for easy answers to the problems of nuclear power.



Public has reason for distrust . . .

By Rep. Peter H. Kostmayer

Two days after the accident at Three Mile Island, the chairman of the Nuclear Regulatory Commission bemoaned the conflicting and incomplete information he was receiving from the accident site, the breakdown in communications, and the mounting public hysteria. "We are operating almost totally in the blind, staggering around making decisions," he said.

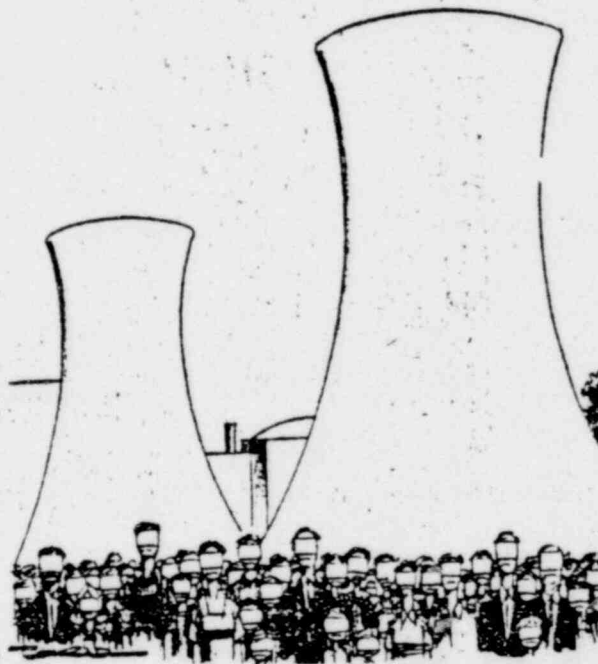
One year later, the situation is unchanged.

The owners of the crippled Three Mile Island reactor have embarked on a course fraught with danger and uncertainties, involving untested technologies and unpredictable consequences. It will involve the removal of radioactive krypton and almost one million gallons of contaminated water. Some 2,000 truckloads of radioactive material must be shipped 2,700 miles for disposal in Washington state. And the damaged core itself will be removed and stored in containers or shipped elsewhere.

The people of central Pennsylvania, facing the immediate prospect of venting of radioactive gas into the open atmosphere feel perhaps even less secure than they did a year ago.

A recent NRC staff report concludes that venting is preferable to any of the available alternatives which involve delay. How did we get into this current bind in which we must choose between dumping lethal gas into the atmosphere or risking unknown dangers by leaving it undisturbed?

In part, because we were all told by the industry and the regulators that the accident at Three Mile Island could never happen in the first place. Every investigation of the accident, from the President's special commission to the House Interior Committee task force on which I served, reached remarkably similar conclusions, namely, that an arrogant and danger-



ous complacency about nuclear safety issues and a near-religious faith in the virtues of nuclear power governed the activities of the industry and the government agency charged with regulating it.

This attitude still prevails today, and in many ways it is responsible for the situation in which we now find ourselves.

The NRC has simply reacted to industry proposals for the clean-up operation, rather than anticipating and confronting the problems that lie ahead.

What about alternative, and possi-

ble safer methods of ridding the reactor of the lethal gas? Metropolitan Edison, the plant operator, originally estimated it would take 20 to 30 months to implement a cryogenic processing system in which the gases would be contained rather than vented into the atmosphere.

The NRC staff said that 12 to 18 months for implementation of this system was more likely. Why the discrepancy? When I asked one of NRC's top technical staff, he replied that Met Ed was inclined to be pessimistic about alternatives because "Met Ed would really like to vent the

containment." From Met Ed's point of view, venting is the quickest and cheapest solution.

But what about the public's point of view, which should be the primary concern of the NRC? The public's point of view could have been determined by an environmental impact statement which would allow for public review and comment, and for assessment of technical alternatives. But one was not begun until eight months after the accident.

Why? One reason given by the then NRC chairman for the failure to order an environmental impact statement earlier was that the plant's owner had not presented its clean-up plan until then.

Who's running the show here? The real reason we are faced with limits and possibly dangerous alternatives is NRC's inaction and its failure to respond to public health and safety concerns.

The President's Council on Environmental Quality, the agency responsible for overseeing the environmental impact statement process, insists that a comprehensive environmental impact statement must be completed before any of the clean-up options, including venting, can proceed. All citizens and their elected representatives should demand that this view prevail.

In the meantime, the NRC's continuing intransigence indicates that despite the calls of the Kemeny Commission for a fundamental shift in the government's and in the industry's attitudes, the public's distrust and skepticism are justified and should continue.

(Peter H. Kostmayer of New Hope, represents Pennsylvania's 8th district in the U.S. House of Representatives. He is a member of the Subcommittee on Energy and the Environment which has jurisdiction over the Nuclear Regulatory Commission.)

POOR ORIGINAL

Venting krypton at TMI: Convenience, not necessity

Responsible appraisal of the facts makes it imperative that the Nuclear Regulatory Commission reject the request of Metropolitan Edison Co. operators of the Three Mile Island nuclear plant, to vent radioactive krypton gas into the atmosphere.

Venting the gas not only would subject people in the vicinity to potential health and genetic damages which cannot be confidently determined, it would unnecessarily exacerbate a growing social problem of public distrust of the federal government officials charged with regulating the nuclear industry.

Venting is a choice of convenience — not legitimate need.

Once more, Met Ed officials — with the tacit support of NRC staff members — have deceived the public as they have done time and again since the crisis began a year and two days ago.

For months, Met Ed officials have stressed the urgency of venting, claiming that vital equipment inside the reactor building is in jeopardy due to lack of maintenance since the accident. Experts have asserted that unless the gas is vented and repairs are made, the reactor itself may malfunction again and spew potentially deadly radiation over the central Pennsylvania countryside.

The staff of the NRC officially has supported the company's position, claiming that the release would pose no hazard to public health and noting that clean-up in the reactor cannot occur unless the 57,000 curies of radioactive gas trapped inside is removed.

A careful review of the facts, however, produces a fundamentally different conclusion:

- Workers can enter the containment building to perform maintenance chores regardless of whether the krypton has been released. The krypton represents only one-fourth of the amount of radiation in the massive containment building housing the reactor vessel, which is separately sealed and which contains even much more intense radioactive material. The

remaining 75 percent of the radioactivity in the containment area comes from contaminated water and radioactive particles clinging to the interior of the building.

- Without venting, workers can remain in the containment building for about one hour before exceeding the quarterly dose of annual radiation exposure set by the federal government. If the krypton were vented, that would extend the individual worker's time limit for maintenance by only 30 to 45 minutes, according to the company.

- Repair of a neutron detector which measures radioactivity inside the containment building would require "several hours of labor," according to an NRC staff report. (A company expert estimates that the time required would be much longer.) Although other repairs — of fans, pumps and valves — are believed necessary, the NRC report places the highest priority on repairing the neutron detector.

- Clean-up of the radioactive water lying deep in the containment building and the particles clinging like dust inside the building is a separate task. It will be a far more difficult and dangerous one because the level of radiation in those materials is much higher. But the removal of the krypton, significantly, would reduce only minimally that danger and difficulty. The larger containment clean-up will not be started for another year, according to Met Ed, and possibly two years, according to the NRC. The NRC estimates that equipment to remove the gas without venting could be installed at the plant within 18 months.

- In its special task force assessment of the clean-up operations at TMI, completed late last month, the NRC carefully analyzed the release of krypton. Although the staff ultimately recommended to the NRC commissioners that the release be approved, Norman M. Haller, who headed the task force,

later admitted that the data on the necessity of such a release could be argued either way, and the decision to favor venting represented "a pretty close call."

The health effects of any release of radiation are unknown. Many scientists argue that any exposure to radiation poses a threat to the health and genetic structure of present and future generations.

A physicist employed by General Public Utilities, Inc., parent company of Met Ed, said that the utility selected venting in order to reduce exposure to workers entering the containment and to facilitate their work inside. The protective clothing the workers must wear is cumbersome and renders their efforts only "50 percent effective," he said. Met Ed has set its own strict exposure standards for the repair crews — far below those set by the federal government. As a result, Met Ed officials estimate that without venting, repair crews could only work inside the containment for about 20 minutes before getting their maximum allowable exposure.

"We just don't expose people to radiation," said the physicist, referring to the clean-up workers and clearly unaware of the irony of his statement. "It has to be for a really good reason."

On that basis, the company has elected to vent the radiation over the countryside of central Pennsylvania, and possibly over hundreds of thousands of people — for a reason of no greater persuasiveness than convenience.

Thus far the NRC has supported that dismaying decision. For the NRC commissioners to authorize such a plan, when they meet to consider the matter next month, would prove to the people of Pennsylvania, and the nation, beyond a shadow of a doubt that it is the convenience of the nuclear industry, and not the health and safety of the public, which is served by the agency.

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