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NUCLEAR REGULATORY COMMISSION

(69)

Docket No. PR-50 (44 FR 75167)

UNION OF CONCERNED SCIENTISTS
COMMENTS ON PROPOSED RULEMAKING
ON EMERGENCY PLANNING

NRC has invited public comment on proposed amendments to 10 CFR Part 50 which would change NRC rules on emergency planning and require compliance with the new regulations as a prerequisite to issuance of operating licenses and to continuing operation of existing plants. UCS previously filed comments in response to the NRC's advance notice of proposed rulemaking on this subject. (44 Fed. Reg. 41483, July 17, 1979) A copy is attached.

As a general matter, UCS strongly supports the concept of a direct link between licensing and emergency planning. However, we find serious shortcomings in both alternatives proposed by NRC.

A 10-Mile Emergency Planning Zone
for Plume Exposure is Clearly Insufficient

The proposed change to §50.33 accepts without technical justification a 10 mile EPZ for plume exposure. The Commission has adopted this position without scrutiny of the validity of its underlying bases, nor indeed without disclosure of its underlying technical bases. A major reactor accident such as the most serious analyzed in WASH-1400, the Reactor Safety Study, could cause death and illness significantly beyond ten miles from the reactor site; there is little dispute over this.

L-4-1, pt. 50

Acknowledgment card 2/20

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Attached is a statement presented to the New York City Council on June 11, 1979, by Dr. Jan Beyea of Princeton University. Using the "PWR-2" failure sequence from WASH-1400 and typical meterological conditions, Dr. Beyea calculated the major health effects from an accident at Indian Point at 35 miles from release. (See pages 9-10 and table VIB) If the wind is blowing towards Manhattan, between 1800 and 18,000 people could die from cancer. Virtually all children and most adults exposed would develop thyroid nodules, a large fraction of which would require surgical treatment and lifetime medication thereafter. This analysis demonstrates that evacuation may well be required far beyond a 10 mile radius and that, for purposes of emergency planning, a 10 mile EPZ for plume exposure is clearly inadequate.

NRC must answer certain fundamental questions before it can determine an appropriate "generic" plume exposure planning zone for planning purposes:

1). What is the appropriate design basis accident for emergency planning?

2). What would the consequences be of this accident in terms of short and long-term health effects and property damage?

Based upon the answers to the above, NRC can proceed to determine appropriate zones for mitigating measures, including evacuation, sheltering and administration of potassium iodide. As yet, however, NRC has never permitted these basic questions

to be publicly ventilated in an open forum. Although a 10-mile EPZ for plume exposure is an improvement over the previous NRC position, it is still essentially arbitrary and does not represent anything approaching a worst case.

With Respect to §§50.47 and 50.54, Alternative "B" is Preferable to Alternative "A", But Both Lack Sufficiently Specific Standards for Exemptions

In UCS's view, Alternative A is totally unacceptable. While establishing theoretical deadlines for NRC concurrence in emergency plans, it would require the Commission to make additional findings in order to enforce its provisions, after the deadline had passed, with regard to the "significance" of the deficiencies, the presence of compensating measures, or the presence of other, wholly unspecified "compelling reasons" which would justify operation. Thus, the deadline is toothless, particularly considering the amount of time which it would certainly take the Commission to make the post-deadline findings.

In addition, the provision permitting plants to continue operating on the basis of some "compelling reasons" is completely open-ended and without definition. Utilities would certainly argue that economic factors, such as the cost of replacement power, constitute compelling reasons. In UCS's view, such considerations are outside the scope of the Atomic Energy Act. The Commission is not authorized to permit plants to operate which fail to meet minimum requirements necessary for the protection of public safety on the grounds that replacement power is expensive. To permit exemptions to be granted on these grounds is to emasculate the rule at the outset, since some economic cost

is always associated with shut-downs.

The utilities have known for many months that they would be required to bring emergency plans around reactor sites up to current standards. The time for temporizing is past.

Alternative "B" is an improvement over Alternative "A," at least to the extent that the deadlines would operate automatically to require shutdown of non-complying plants in the absence of an exemption. However, the grounds for such an exemption are precisely the same as those for Alternative "B". UCS believes that the grounds for exemption should be very narrowly drawn. Only if the plan's deficiencies are de minimus (i.e. insignificant) AND compensating measures have been taken AND appropriate protection actions, including evacuation, can be taken for persons within the plume EPZ should exemptions be permitted both for operating licenses and presently operating plants.

Appendix E Does Not Clarify the Relationship Between Emergency Planning and Site Evaluaction

The proposed amendments to Appendix E do not clarify the relationship between emergency planning and site evaluation, although the two are closely connected. The assumption implicit in the emergency planning rules is that all sites can comply. This results at least partially from the lack of an objective performance standard by which to judge the feasibility of protective measures, particularly evacuation.

Thus, although "it is expected" that all persons within the EPZ shall be "alerted" of the need for protective action

within 15 minutes of notification by the licensee of state and local officials, no standards are provided for the overall time for evacuation, which is the most critical parameter of all. Under the proposed rule, emergency plans could presumably be approved for a site even if the plume EPZ could not be evacuated for 20 hours or more, while other sites would require substantially less time. The underlying philosophy of the rule would appear to be that it is acceptable to make the best of a bad site. This would not only permit plants to continue to operate in areas of very high population density (such as Indian Point and Zion), but it would allow new plants to be sited in locations which are, as a practical matter, not evacuable within a reasonable period of time.

In order to provide genuine assurance that meaningful protective measures could be taken in the event of a serious accident, NRC must establish some objective criterion for the maximum permissible time to accomplish evacuation of the plume EPZ. In the absence of such a criterion, the evacuation planning regulations exalt form over substance.

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The Impact on New York City of Reactor Accidents at Indian Point

Statement to the

New York City Council
June 11, 1979

(Corrected June 20, 1979)

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Because there is so much uncertainty about safety aspects of nuclear power, and because such passion exists over nuclear policy, technical opinions about the dangers of Indian Point vary enormously. In such a confusing situation it helps to know the background and temperament of who is speaking. Therefore, I will begin my statement with some remarks about my experience in the nuclear safety field.

I am a nuclear physicist who has been working for the last three years as a research staff member at Princeton University's Center for Energy and Environmental Studies. (I have attached a list of the studies I have been asked to make about the consequences of accidents at nuclear facilities around the world.)

Of particular relevance to today's proceedings are 1) the detailed study of accidents at the Barseback reactor which I carried out for the Swedish Energy Commission, 2) the dose-prediction computer code, which I wrote for the N.J. Department of Environmental Protection to aid in their planning for reactor accidents, 3) the analysis I made of the proposed Jamesport reactor site in connection with a case before the N.Y. State Siting Board, and 4) the study of potential accidents involving spent-fuel rods carried out for the state of Lower Saxony in West Germany.

By temperament, I tend to be sceptical about the ability of scientists and engineers to guarantee anything about systems which have not been tested in operation. This predilliction has led me in the past to strongly criticize the optimism of government reports such as WASH-1400 (the Rasmussen report) and to view nuclear power as a potentially dangerous technology. Long before Three Mile Island, I stated that the probability of accidents might be significant and called, as a result, for accident mitigatory measures in my European studies (similar to those which my colleague Frank von Hippel and his coauthors in the

American Physical Society Study Group on Light Water Reactor Safety first proposed for the U.S.[1]). For instance, in my Swedish study I suggested that serious emergency planning be carried out for cities such as Malmo (which lies within 10 miles of the Barseback reactor) and Copenhagen (15 miles away) -- something which seemed radical to nuclear proponents, and engendered much criticism, before Three Mile Island.

This critical public posture has not endeared me to the nuclear establishment. On the other hand, the fact that I refuse to call for the shutdown of any particular reactor, without knowing the particular substitute which will replace it, has not endeared me to the anti-nuclear movement either.

Having located myself for you within the nuclear debate, let me turn to my technical studies of accidents at Indian Point. I will discuss 1) the probability of serious accidents at Indian Point, 2) the consequences of such accidents for residents of New York City, and 3) actions that the City and State might take to reduce the consequences of such accidents. I have two major recommendations to make. First, that a task force be convened to outline the elements of an emergency plan suitable for the City. Second, that a study of alternatives to Indian Point be funded.

Accident Probabilities

It is now clear that the nuclear industry has failed to produce a system with a low probability of catastrophic failure. The Brown's Ferry Fire, in which a workman's test candle almost caused a disaster, and the Three Mile Island accident, in which only the containment barrier retained its integrity, indicate that unsuspected failure modes have raised the probability of bad accidents perhaps a thousand times higher than assumed at the start of the

nuclear program.[2] The assurances given to the public over the years by technical people were based on incomplete analysis and optimism.[3]

The fact that unsuspected failure modes are important at the early stages of a technology is nothing new. Trial and error is the key to being scientific. One learns from one's mistakes and corrects the design accordingly. I have no doubt that after five meltdowns we will have much safer reactors. The question is whether we can afford to learn by trial and error in the case of nuclear technology, and whether we want to experiment with reactors close to population centers such as at Indian Point.

I am aware that many people find it difficult to believe that scientists and engineers can make disastrous technological mistakes, perhaps because they see the fruits of successful technology all around them and do not see the scores of failures which preceded the successes. Surprisingly, avid defenders of nuclear technology can accept the existence of human error on the part of operators, but seemingly cannot accept human error on the part of designers. In fact, however, failure to properly anticipate operator error is in itself a design fault.

Even though past subjective assessments of reactor accident probabilities can no longer be believed, it is possible to rely on another form of statistical estimation, namely estimating the frequency of future events based on their frequency in the past. Virtually everyone admits that the Brown's Ferry fire and the Three Mile Island incident were in the class of "serious accidents". Most objective people, I believe, would agree that this class of accident should trigger emergency plans -- at least to the extent of notifying authorities and mobilizing emergency personnel and supplies.

These two incidents can be used as indicators of the frequency at which emergency plans will be called upon in the future: The fact that two accidents of this class have occurred in 400 cumulative reactor-years of operation gives us an estimate of the frequency of such events in the future of one in every 200 reactor-years.[4] Assuming that the past is a guide to the future, we can extrapolate these results to two reactors at Indian Point, and predict a 30% chance of triggering emergency responses once in the next 30 years. However, this approach can be criticized on the grounds that it does not take into account the experience gained from Brown's Ferry and from Three Mile Island. Although I am sceptical that the failure modes revealed by those accidents will be completely eliminated by N.R.C. recommendations, I will assume that it will happen in order that my analysis not be vulnerable on this point. I will assume that half of the unsuspected failure modes have been found already in these previous accidents and will be eliminated soon, and that only two more remain to be found. Then my prediction drops by half to 15%.

A 15% chance of triggering an area wide emergency plan is not trivial. It demonstrates to me that New York City needs a detailed contingency plan, if for no other reason than to help prevent panic in case of a prolonged scare such as occurred at Three Mile Island. Such a plan is not yet required by Federal law. It is up to the City Council, the Mayor, the State Legislature, and the Governor to act now if a plan is to be developed in the near future.

So far I have discussed accidents in which a large release does not occur. A statistical base is not available to indicate the chances that an event in the "serious class" would lead to a significant release of radioactivity. However, the fact that a substantial fraction of the iodine and cesium in the

Three Mile Island case escaped into the containment, the last barrier to the environment, does not engender confidence in the ability of present designs to prevent releases to the atmosphere. If forced to guess, I would predict that one in ten of these serious accidents would lead to a large release. This means, incidentially, that I expect a large release of radioactivity to occur somewhere in the U.S. in the next 30 years. This release could occur as a result of the next Brown's Ferry or Three Mile Island event, however, as easily as during the tenth. In order to be prudent, therefore, we should develop our contingency plans on the presumption that there is a significant chance of a large release at Indian Point in the next thirty years.

Now the wind does not always blow towards the City. If the radioactivity were released in a short burst, there would be about a 1 in 5 chance of the City being caught downwind. (See Table I.) If the release took days, as might happen in an accident less severe than a meltdown, then the probability of city residents receiving some exposure would be considerably higher due to wind wander -- although the expected doses would be considerably reduced.

I have summarized these probability estimates in Table II. The "bottom line", even from a pessimistic viewpoint, is that New York City will probably never be disastrously affected by Indian Point. Nevertheless, there is a non-negligible chance of a major release which could affect the City. What would be the consequences of such an accident?

Consequences of an Accident at Indian Point

Note that for a major release of radioactivity to the atmosphere to occur, the reactor containment building must fail to isolate, be broken by an explosion, or fail due to gas overpressure. (None of these events happened at Three Mile Island so there was no large release.)

Figure I shows a side view of the radioactive plume leaving the reactor. Figure II shows a top view, indicating that the bulk of the effects are contained in a wedge with its apex at the reactor spreading out in the downwind direction.

People caught downwind in the plume would receive radiation doses immediately from the cloud overhead and a continuing dose from radioactivity inhaled during plume passage. Buildings offer some shielding from cloud shine, but not from inhalation unless the air is filtered or managed in some other way.[5] After the plume passed by, radiation would still be present in the area due to radioactive fallout stuck to ground and building surfaces.

The ground radioactivity decreases naturally due to radioactive decay, but residual cesium and strontium, with half lives around 30 years, would cause cancer deaths for periods of time measured in decades. It is the cesium and strontium which are ordinarily considered to be the principal long-term land contaminants. Table III indicates in more detail the time frame of received doses.

All effects from radiation doses do not occur at the time the doses are received. The time frame can be divided into two periods, "immediate" and "long-term". (See Table IV.) Sickness and death within two months from radiation illness would be a risk for people caught in very high dose regions (more than

100 rem to the whole body). The chances of such high doses occurring in New York City are low and would require unusual meteorological conditions. Even if there were an accident, and even if the wind were blowing towards the City, there would only be about a 1-in-10 chance of early death.[6,7]

The long-term effects associated with lower radiation doses include increased rates of cancer (both fatal and non-fatal), and both developmental and genetic birth defects. The cancers and genetic defects would appear in the exposed population during a period of decades after the accident.

Since moderate and low doses can produce these effects, although at a rate which is ordinarily assumed to decline in proportion to the dose, some long-term effects would inevitably occur in the city should the wind be blowing this way.

The magnitude of doses received would depend upon meteorological conditions and the quantities of radioactivity released. I shall show only doses calculated for typical meteorological conditions and shall consider two accidents. The first accident assumes a 5% release of iodine (and, of less significance, a 60% release of the noble gasses), similar to what might have happened at Three Mile Island had the containment building failed to isolate.

The second accident assumes a release corresponding to a meltdown with failure of the containment. I have assumed a release of radioactivity and meteorological assumptions consistent with the Nuclear Regulatory Commission's Reactor Safety Study.[8]

Moderate Release Case:

To show the areas affected by the accident, I have prepared Figure III which shows contours for one wind direction indicating the areas in which thyroid doses would equal or exceed certain values. For simplicity I will focus on doses 35

miles downwind from the accident (the distance from Indian Point to Central Part). Table Va shows the doses calculated for typical meteorological conditions.

Unless there were many days warning, I doubt there would be much chance of evacuating people before the plume passed by. This means that the inhalation and "cloud shine" doses would be unavoidable. (If thyroid-blocking pills were available, the thyroid dose could be reduced significantly.) Table Vb shows some of the expected health consequences from the unavoidable doses. Although the exact number of people exposed in the City would depend on the wind direction, a reasonable number to use in the calculations of health effects would be one million expose people. In such a case 20,000 to 100,000 cases of thyroid nodules would be expected

After passage of the plume, a decision would have to be made about evacuating remaining persons in order to prevent the continuing smaller, but cumulative, doses which would be received from subsequent exposure to contaminated areas. For this accident, the first two months would constitute the important time period. Table Va indicates that an additional 1 rem dose would be accumulated in the time period beginning one week after the accident and ending two months later. The individual risk from staying would be small - corresponding to the expected dose during ten years exposure to natural sources of radiation - and the economic cost of relocating people and halting business activity would be enormous. Consequently, I doubt that the decision would be made to evacuate. It must be noted however, that my ground dose prediction is very uncertain and could easily be a factor of 5 too high or low. For a wind direction exposing one million New York City residents, Table Vb indicates that 1400 to 8000 cancers would eventually develop, with 200 to 1600 of them being fatal.

PWR2 Accident

Let us now turn to the catastrophic failure case, a "PWR2" accident in the terminology of the Rasmussen Report. It is not the worst possible accident in that study, but close to it. Table VIa shows doses at 35 miles under typical meteorological conditions. Once again it is assumed that the wind is blowing towards New York City. If not, some other community would be exposed. Figures IV, V, and VI show area contours for various doses.

Table VIb shows the major health consequences from the inhalation and cloud shine doses plus one day's exposure to contaminated ground. Most of the exposed population would develop thyroid nodules which would require surgical treatment. Table VIa indicates that evacuation would likely be instituted even after plume passage because the doses received from even a 7 day residence time would be in excess of 28 rem. (An optimistic evacuation time of one day was assumed in Table VIa in order not to overstate the health consequences. Even then, 600 to 6000 cancer deaths are predicted to result for a wind direction exposing one million New Yorkers.) In some areas, the land would be so highly contaminated that residents could not go back for decades in the absence of highly effective decontamination procedures. Figure VII shows the long-term land contamination areas. (I have used a threshold for land contamination corresponding to a few tenths of a percent risk of cancer death resulting from thirty years residence on the land.[9])

It is very difficult to predict what action would be taken after the accident, what levels of contamination would be accepted and how much effort would be made to decontaminate.[10] Decontamination would be difficult enough, however, so that the inner contour on Figure VII indicates a potential "no-man's land" -- a region in which people would not be allowed to live or work except for limited periods of time for a 100 years.

Over the years, some of the radiation would spread out still further due to wind blowing around particles which had been eroded and resuspended. This spreading, although representing a relatively small amount of the released radioactivity, would be a source of continual worry for residents of other areas.

Alternatives to Indian Point

Ideally, before making decisions, political leaders should be informed about the side effects of each energy option. My purpose here today is to help in that process. I have been concentrating today on certain side effects of nuclear power, but I do not want to leave the impression that there are no problems with other energy options. One should not lose sight of the fact that fossil fuel electricity sources (which might be increased if Indian Point were shut down) have equally as shocking health effects associated with them. It is not generally known, but still true, that air pollution from oil- and coal-burning plants kills people. Estimates range from one to 100 deaths to the public per average 1000 megawatt plant per year.[11] That means 30 to 3000 deaths over 30 years from an average plant. There is probably no "safe" level of sulphur emissions, just as there is no safe level of radioisotope emissions.

Thus, one must not leap to the conclusion that all alternatives to Indian Point are preferable. Reactivating oil or coal plants in New York City could be construed as condemning 100's of older residents each year to premature deaths.

The decision about which option is preferable is a political decision involving values, not a technical decision. Rational people may prefer to tolerate a certain number of air pollution deaths each year to prevent the chance of a single catastrophy which would paralyze and shock society. On the other hand, other rational people could decide that the risk of catastrophy was preferable to actual deaths occurring each year.

In any case, there are alternatives to Indian Point which do not involve dramatic increases in air pollution, and it is to those alternative we should

turn. For instance, the burning of natural gas does not appear to produce significant amounts of lethal air pollution. Nor would air pollution be increased by a strategy which reduced electricity consumption to such an extent that Indian Point was no longer needed. (Such a strategy might involve substituting more efficient appliances and motors for our present wasteful stock.)

However, each alternative has a price, both economic and social. Without detailed study it is not possible to predict just how desirable each alternative (or mix of alternatives) might be in this specific region.

Consequently, I recommend that technical studies be made to investigate alternatives to Indian Point. Two studies should be carried out, one by the utilities and one by independent, technically competent people who are critical or skeptical of nuclear power. This second study would be independent of, but work with, government agencies. An independent group, biased away from nuclear power, would be most motivated to find acceptable alternatives. Several consulting firms with suitable biases exist around the country (I know of at least one in New York State), one of which could be hired by the State or the City to make the case for alternatives.

The utility study should lay out the case against the alternatives. When completed, the two reports can be debated and the public given a rational framework for choosing between the various options.

I have, myself, been involved in such parallel competitive studies (about nuclear risks), once in Sweden and once in West Germany, and recommend this approach.

Obviously, such studies costs money. I estimate $100,000 would be necessary for the non-utility study. Perhaps there is some way that the utilities could be

assessed the fee; perhaps they would volunteer it to demonstrate their good faith. If not, I think that the City or State should give serious attention to securing the necessary funding.

partial evacuation might still be necessary after the passage of the plume. The faster that people could be removed from contaminated ground, the smaller would be the number of accumulated cancers and other health effects. But where would such people go? Where would they be housed and how would they be fed? How would looting be controlled? These questions should be considered now when there is time to think matters through.

An emergency plan for New York City should not be limited to planning for evacuations. It should include distribution of thyroid-blocking medicine and information about sheltering. Local radio stations could be used to relay the instructions which might be needed.

It is not easy to design an emergency plan that, remaining unused for years, would work on command. The only method in which I place any confidence is that used in Waterford, Conn, for the immediate surroundings of the Millstone Complex. Due to the initiative of the local Fire Marshall, Douglass Peabody, a plan has been developed in which each detail has been thought through in military detail. A key element in the plan is the constant notification of the police of even minor accidents at the plant -- even broken legs. In this way, communication procedures are constantly checked. Such communication procedures could be established between Indian Point and both the New York City police and the Bureau of Radiation Protection.

I recommend that the City Council and the Mayor set up a task force to develop the outlines of a New York City emergency plan for reactor accidents.

Because of the general lack of knowledge about these accidents, the task force would have to include experts from outside city government to work with the relevant governmental agencies.

3. Iodine Blocking

Potassium iodide pills taken before breathing radioactive iodine in the plume would reduce thyroid doses by ten to one hundred-times, due to the blocking of radioactive iodine uptake by the already saturated thyroid. Obviously, the pills could not in practice be delivered to everyone, even with a carefully planned distribution system. Also, the pills do not block radiation doses to other organs. Therefore, iodide blocking is not a panacea for reactor accidents. Nevertheless, potassium iodide is cheap (it is the form of iodine added to iodized salt), and could significantly reduce the number of people affected by an accident. (As can be seen from Tables Va and VIa, thyroid nodule cases are likely to be the most prevalent health after-effect in the absence of thyroid blocking.)

Potassium iodide was approved for this purpose by the FDA in December of 1978. Let me quote from the notice in the Federal Register (complete copy attached).

> "The Commissioner concludes that potassium iodide is safe and effective for use as a thyroid-blocking agent in a radiation emergency under certain specified conditions of use because it has been widely used for many years, in large doses, and on a long-term basis with an incidence of side effects and toxicities, in general, proportional directly to dose and duration of therapy. The risks from short-term use of relatively low doses of potassium iodide in a radiation emergency are outweighed by the risks involved from exposure to radioiodine.
>
> Almost complete (greater than 90 percent) blocking of peak radioactive iodine uptake by the thyroid gland can be obtained by the oral administration of 100 milligrams (mg) of iodide (130 mg of potassium iodide) just before or at the time of exposure. A smaller dose (65 mg of potassium iodide) can be used in infants under 1 year of age. A daily dose is required to maintain the blocked state. The use of a blocking agent is not expected to exceed about 10 days."

At the time of the Three Mile Island accident, potassium iodide was not yet available for mass distribution in the proper dosages. The FDA therefore ordered large-scale production on an emergency basis and within a few days had flown enough into Harrisburg for more than a half a million people. But this would have been too late if the containment building at Three Mile Island had failed early in the course of the accident.

It makes sense to stockpile the medicine directly in the city -- perhaps at every police station. Stockpiling of potassium iodide is particularly important in crowded urban environments where rapid evacuation is not a realistic alternative. Note that, in California, the Nuclear Power Plant Emergency Response Panel established by Governor Brown after the Three Mile Island incident has already recommended procurement and deployment of this medicine to local emergency response agencies.[13]

I hope that New York City and New York State will take the initiative in this matter in the East.

Conclusions

The city government has the opportunity to significantly improve safety for its residents. Commissioning a study on Indian Point alternatives, creating a task force on emergency planning, and investigating the stockpiling of iodide pills, would provide the kind of leadership in the nuclear safety area that is sorely needed.

Footnotes and References

1. Reviews of Modern Physics, 47, S1 (1975).

2. The design goal for the probability of complete failure of reactor safety system was less than one-in-a-million per reactor year of operation. This goal was assumed to have been achieved until 1974 when the authors of the U.S. Reactor Safety Study (WASH-1400, the so-called Rasmussen Report) estimated a meltdown probability some 50 times higher (one-in-20,000 reactor years) based on a detailed analysis of certain accident modes.

   The Three Mile Island accident indicated that even the Reactor Safety Study (RSS) was optimistic:- by at least a factor of 10. The least serious accident considered in the RSS (PWR9), with a lower release into the containment than actually happened at Three Mile Island, was assigned a probability on one-in-4000 reactor years. Yet, the Three Mile Island accident occurred after a total experience of only about 400 reactor years (cumulative total).

3. Reasons why people would tend to underestimate failure probabilities of complex systems such as nuclear reactors were discussed in the psychological literature before Brown's Ferry and Three Mile Island. See A. Tversky and D. Kahneman, Science 185, p. 1129 (1974).

4. One reactor-year is taken here to mean one year's operation of a 1000 Mw(e) plant. 400 Reactor-years is equivalent to 80 large reactors operating for 5 years, 40 reactors operating for 10 years, etc.

5. It is true that the amount of radioactivity which seeps into buildings is reduced. However, the material which does get in is trapped and stays inside for a time longer than the plume passage time. The longer breathing time inside compensates for the reduced penetration.

6. To obtain sufficiently high doses one of the following events must occur: 1) heavy rain or 2) release on a clear night with low wind speed and high fallout rate, or 3) sudden drop in wind speed or increase in turbulance while the plume passed over the city.

   I have discussed some of these possibilities in previous testimony given before the New York City Board of Health. (Ref. 6).

   Based on my experience with other sites I would estimate a one-in-ten chance that one of these events would occur at the time of the accident.

7. Jan Beyea, "Consequences of a Catastrophic Reactor Accident", Statement to the New York City Board of Health, August 12, 1976.

8. This reference accident differs somewhat from that chosen in the secret Brookhaven report (WASH-740 update) often referred to by anti-nuclear activists. The Brookhaven report assumed a 50% release of <u>everything</u> in the core, whereas WASH-1400, based on later experimental data, assumed a higher fraction for the most volatile isotopes, but a much lower fraction for non-volatiles. This leads to a 2½ times lower short-term dose and somewhat shorter distance range of early lethalities for the accident considered here. There should not be much difference in the long-term dose.

Nevertheless, the Brookhaven report projected, in the worst case, a land contamination figure five times higher than I would project. I do not know yet whether this is due to the different release fractions assumed or due to different land contamination criteria.

9. A 10 rem in 30 year threshold level has been used. This is equivalent to the criteria used in WASH-1400 for rural land, but not the 25 rem in 30 year threshold assumed for urban land. However, 25 rem in 30 years appears to be higher than that recommended by the International Commission on Radiation Protection, (See WASH-1400 App. VI, Ch 11.)

   A 10 rem dose implies a fatal cancer risk of a few tenths of a percent, assuming four hundred cancer deaths per million person-rem figure. This dose coefficient is equivalent to assuming a "relative risk" model rather than an "absolute risk" model which was in favor in the past. Note that the majority statement in the draft report of the new National Academy of Science report on ionizing radiation makes use of the relative risk model.

10. The micron-sized aerosol particles would attach themselves strongly to surfaces. To decontaminate, it might be possible to replace window glass, and sandblast outside building surfaces. Inside surfaces would be less heavily contaminated, but possibly more difficult to scrape clean.

11. These estimates are made by correlating death rates with pollutant levels. The results are higher than would be expected from known effects of sulphur compounds, suggesting synergistic effects with other pollutants. See,

Trace Contaminants from Coal, S. Torrey, Editor, Noyes Data Corporation, Park Ridge, New Jersey, 1978.

Note that there are long-term problems associated with burning fossil fuels, just as there are long-term problems with nuclear wastes. Increased CO_2 in the atmosphere may well lead to dangerous overheating of the earth in the next 50 years.

12. "Post-Accident Filtration as a means of Improving Containment Effectiveness", B. Gossett et al, Los Angeles, University of California UCLA-ENG-7775 (1977).

13. Memorandum to Governor Brown from Russell Schweickart, Assistant for Science and Technology, May 25, 1979.

14. Considerable controversy exists about the effects of low level radiation. At the present time, I see no alternative to stating a range of health effects which includes most predictions, i.e., based on a coefficient range of 50 to 500 cancers per million person-rem to the whole body.

For comparison, note that the range given in the majority statement of the new National Academy of Science BEIR II (draft) report is 70 to 353 excess fatal cancers per million persons exposed per rem for single exposure, and 68 to 293 per million per rem for continuous exposure. These numbers, however, are stated to be uncertain, depending upon the age mix of the exposed population, as well as other factors.

Table I

Distribution of Weather Conditions
and Wind Direction

(taken from the Preliminary Safety Analysis Report for Indian Point 3.)

Frequency of Weather Classes

Inversions (E & F)	41%
Neutral (D)	31%
Unstable (A, B, C)	28%

Wind Rose Data (for the 300 ft. tower)
suggest the following relevent percentages:

	Percentage of time that wind direction lies in the 45^{0} sector including New York City	Percentage of time that wind direction lies in the 90^{0} sector containing the New York metropolitan area
with Inversion Conditions (F & E)	6%	11%
with Neutral Conditions (D)	10%	20%
with Unstable Conditions (A, B, C)	6%	9%
Total	22%	34%

TABLE II

PROBABILITY ESTIMATES FOR ACCIDENTS AT INDIAN POINT OVER 30 YEAR LIFETIME

TYPE OF ACCIDENT	PROBABILITY
1) ONE WHICH SHOULD TRIGGER EMERGENCY PREPARATIONS IN NEW YORK CITY, BUT WITHOUT A LARGE RELEASE OF RADIOACTIVITY ACTUALLY OCCURRING	15% A)
2) ONE WHICH LEADS TO A LARGE RELEASE OF RADIOACTIVITY WITH THE WIND NOT BLOWING TOWARDS THE CITY	1.5% (SUBJECTIVE ESTIMATE
3) ONE WHICH LEADS TO A LARGE RELEASE OF RADIOACTIVITY WITH THE WIND BLOWING TOWARDS THE CITY CAUSING CANCER AND OTHER HEALTH EFFECTS C)	.3% (SUBJECTIVE ESTIMATE
4) ONE WHICH CAUSES EARLY DEATHS IN THE CITY D)	.03% (SUBJECTIVE ESTIMATE

A) HALF THE FREQUENCY WHICH WOULD BE OBTAINED FROM THE OCCURANCE OF THE BROWN'S FERRY FIRE AND THE THREE MILE ISLAND ACCIDENT. (SEE TEXT).

B) ASSUMING THAT 1-IN-10 ACCIDENTS LIKE THE BROWN'S FERRY FIRE AND THREE MILE ISLAND LEADS TO A LARGE RELEASE.

C) BASED ON A 1-IN-5 CHANCE OF THE WIND BLOWING IN SUCH A WAY THAT A SIGNIFICANT FRACTION OF THE PLUME PASSES OVER CITY TERRITORY.

D) SEE FOOTNOTE 6.

TABLE III

TIME FRAME OF RECEIVED DOSES

IMMEDIATE	DELAYED
1) FROM PASSING CLOUD.	1) FROM INHALED RADIOACTIVITY STORED IN THE BODY.
2) WHILE REMAINING IN CONTAMINATED GROUND BEFORE EVACUATION.	2) FROM GROUND CONTAMINATED TO LEVELS TOO LOW TO JUSTIFY EVACUATION.

TABLE IV

TIME FRAME OF HEALTH EFFECTS

IMMEDIATE	DELAYED
SICKNESS AND DEATH FROM DOSES OF THE ORDER OF 100'S OF REMS.	CANCER, DISEASES, DEVELOPMENTAL AND GENETIC BIRTH DEFECTS OCCURRING WITH DECREASING BUT NONVANISHING PROBABILITIES WITH DECREASING DOSES.

TABLE VA

APPROXIMATE DOSES IN REM RECEIVED 35 MILES AWAY FROM INDIAN POINT FOLLOWING A "MODERATE" ACCIDENT[A)]

	Dose to Whole Body	Doses to Thyroid Gland	
		Adults	Children under 10
From inhalation and cloudshine[B)]	.2 rem	60 rem	300 rem
Plus 1 day's ground exposure[C)]	.5 rem		
Plus 7 day's ground exposure[C)]	.9 rem		
Plus 2 month's ground exposure[C)]	1.6 rem		

A) 5% Iodine, 60% xenon and krypton. "D" weather stability, 10 mph wind, .01 m/sec deposition velocity, 25 meter plume rise, WASH-1400 dispersion coefficients, Gaussian plume model.

B) Cloud shielding factor = 0.6.

C) Ground shielding factor due to buildings = 0.2. These doses are uncertain to at least a factor of five up or down due to uncertainties in the "stickiness" of the aerosol particles carrying the radioactivity.

TABLE VB

MAJOR HEALTH EFFECTS AT 35 MILES FOLLOWING A MODERATE ACCIDENT

(No Iodide blocking assumed)

	PER MILLION POPULATION EXPOSED[A]
DELAYED CANCER DEATHS[B]	
FROM .2 REM INHALATION AND CLOUD SHINE	10 TO 100
FROM 1.4 REM GROUND DOSE	70 TO 700
CASES OF THYROID NODULES[C,D]	
FROM 300 REM TO CHILDREN	12,000 TO 60,000
FROM 60 REM TO ADULTS	8,000 TO 40,000
NON-FATAL THYROID CANCERS[C,E]	
CHILD	600 TO 3000
ADULT	800 TO 5,000
FATAL THYROID CANCERS[C,F]	
CHILD	22 TO 120
ADULT	100 TO 700

A) IF THE WIND WERE BLOWING TOWARDS MANHATTAN, THE EXPOSED POPULATION IN NEW YORK CITY MIGHT NUMBER 3 MILLION, WHEREAS IF THE WIND WERE BLOWING TOWARDS STATEN ISLAND, A MUCH SMALLER NUMBER OF CITY RESIDENTS WOULD BE INVOLVED.

B) BASED ON 50 TO 500 DEATHS PER MILLION PERSON-REM. SEE FOOTNOTE 14.

C) THYROID DOSE/EFFECT COEFFICIENTS TAKEN FROM Rev Mod Physics, 47, S1 (1975).

D) BASED ON A COEFFICIENT OF 275-1300 CASES PER MILLION THYROID REM AND THE ASSUMPTION THAT 15 PERCENT OF THE POPULATION ARE CHILDREN LESS THAN 10 YEARS OF AGE. INCIDENCE OF NODULES FOR ADULTS TAKEN AS 1/2 THAT OF CHILDREN, REM FOR REM, BASED ON 1978 MARSHALLESE DATA.

E) BASED ON A COEFFICIENT OF 12-75 CANCERS PER MILLION THYROID-REM.

F) BASED ON AN ASSUMED 4% MORTALITY FOR CHILDREN, 15% FOR ADULTS.

TABLE VIA

APPROXIMATE DOSES IN REM RECEIVED AT 35 MILES FROM INDIAN POINT FOLLOWING A PWR2 ACCIDENT.[A]

	DOSE TO WHOLE BODY	DOSE TO THYROID GLAND	
		ADULTS	CHILDREN UNDER 10
FROM INHALATION AND CLOUD SHINE[B]	4 REM	1000	5000
PLUS 1 DAY'S GROUND EXPOSURE[C]	12		
PLUS 7 DAY'S EXPOSURE[C]	32		
PLUS 8 WEEK'S EXPOSURE[C]	66		

A) "PWR2" ACCIDENT RELEASE FRACTIONS TAKEN FROM WASH-1400. 10 MPH WIND, D STABILITY, .01 M/SEC DEPOSITION VELOCITY, 150 METER EFFECTIVE RELEASE HEIGHT, WASH-1400 DISPERSION COEFFICIENTS, GAUSSIAN PLUME MODEL.

B) CLOUD SHIELDING FACTOR = 0.6.

C) GROUND SHIELDING FACTOR = 0.2. (THESE DOSES ARE UNCERTAIN TO AT LEAST A FACTOR OF 5 DUE TO UNCERTAINTIES IN THE "STICKINESS" OF THE AEROSOL PARTICLES CARRYING RADIOACTIVITY.)

TABLE VIB

MAJOR HEALTH EFFECTS FROM INHALATION, CLOUD SHINE, AND 1 DAY'S EXPOSURE TO CONTAMINATED GROUND AT 35 MILES FOLLOWING A PWR2 ACCIDENT.[A)]

(No iodide blocking assumed)

1800 ~ 18,000 IF LIFT

DELAYED CANCER DEATHS[B)]	600 TO 6000 PER MILLION PEOPLE EXPOSED[C)]
THYROID EFFECTS[D)]	VIRTUALLY ALL EXPOSED CHILDREN'S AND A LARGE FRACTION OF ADULTS' THYROIDS WOULD DEVELOP NODULES. A LARGE FRACTION OF THYROID NODULES WOULD REQUIRE SURGICAL TREATMENT AND LIFETIME MEDICATION THEREAFTI
DEVELOPMENTAL DEFECTS MICROCEPHALY (SMALL HEADS)[B)]	10% OF EXPOSED FOETUSES[E)]
GENETIC DEFECTS PERSONS WITH IDENTIFIABLE DOMINENT GENETIC DEFECTS OVER AN AVERAGE OF FIVE GENERATIONS[B)]	300 TO 3000 PER MILLION PEOPLE EXPOSED[C,F)]

A) SEE TABLE VB FOR DOSE COEFFICIENTS USED. THE ONE DAY GROUND EXPOSURE REPRESEN AN OPTIMISTIC ESTIMATE FOR AVERAGE EVACUATION TIME.

B) FROM 12 REM EXPOSURE.

C) IF THE WIND WERE BLOWING TOWARDS MANHATTAN, THE EXPOSED POPULATION MIGHT NUMBE 3 MILLION, WHEREAS IF THE WIND WERE BLOWING TOWARDS STATEN ISLAND A MUCH SMALL NUMBER OF PEOPLE WOULD BE INVOLVED.

D) 1000 REM TO ADULT, 5000 TO CHILDREN UNDER 10. NOTE THAT BECAUSE OF THE LARGE NUMBER OF THYROIDS WHICH WOULD HAVE TO BE REMOVED SURGICALLY, THE INCIDENCE OF CANCER WOULD NOT BE THAT HIGH.

E) WASH-1400, TABLE VI F-9.

F) BASED ON TABLE XXXVIII OF REVS MOD PHYSICS, 47, S1 (1975).

TABLE VIA

APPROXIMATE DOSES IN REM RECEIVED AT 35 MILES FROM INDIAN POINT FOLLOWING A PWR2 ACCIDENT.[A]

	DOSE TO WHOLE BODY	DOSE TO THYROID GLAND	
		ADULTS	CHILDREN UNDER 10
FROM INHALATION AND CLOUD SHINE[B]	4 REM	1000	5000
PLUS 1 DAY'S GROUND EXPOSURE[C]	12		
PLUS 7 DAY'S EXPOSURE[C]	32		
PLUS 8 WEEK'S EXPOSURE[C]	66		

A) "PWR2" ACCIDENT RELEASE FRACTIONS TAKEN FROM WASH-1400. 10 MPH WIND, D STABILITY, .01 M/SEC DEPOSITION VELOCITY, 150 METER EFFECTIVE RELEASE HEIGHT, WASH-1400 DISPERSION COEFFICIENTS, GAUSSIAN PLUME MODEL.

B) CLOUD SHIELDING FACTOR = 0.6.

C) GROUND SHIELDING FACTOR = 0.2. (THESE DOSES ARE UNCERTAIN TO AT LEAST A FACTOR OF 5 DUE TO UNCERTAINTIES IN THE "STICKINESS" OF THE AEROSOL PARTICLES CARRYING RADIOACTIVITY.)

TABLE VIB

MAJOR HEALTH EFFECTS FROM INHALATION, CLOUD SHINE, AND 1 DAY'S EXPOSURE TO CONTAMINATED GROUND AT 35 MILES FOLLOWING A PWR2 ACCIDENT.[A]

(No iodide blocking assumed)

DELAYED CANCER DEATHS[B]	600 TO 6000 PER MILLION PEOPLE EXPOSED[C]
THYROID EFFECTS[D]	VIRTUALLY ALL EXPOSED CHILDREN'S AND A LARGE FRACTION OF ADULTS' THYROIDS WOULD DEVELOP NODULES. A LARGE FRACTION OF THYROID NODULES WOULD REQUIRE SURGICAL TREATMENT AND LIFETIME MEDICATION THEREAFTER
DEVELOPMENTAL DEFECTS	
MICROCEPHALY (SMALL HEADS)[B]	10% OF EXPOSED FOETUSES[E]
GENETIC DEFECTS	
PERSONS WITH IDENTIFIABLE DOMINENT GENETIC DEFECTS OVER AN AVERAGE OF FIVE GENERATIONS[B]	300 TO 3000 PER MILLION PEOPLE EXPOSED[C,F]

A) SEE TABLE VB FOR DOSE COEFFICIENTS USED. THE ONE DAY GROUND EXPOSURE REPRESENTS AN OPTIMISTIC ESTIMATE FOR AVERAGE EVACUATION TIME.

B) FROM 12 REM EXPOSURE.

C) IF THE WIND WERE BLOWING TOWARDS MANHATTAN, THE EXPOSED POPULATION MIGHT NUMBER 3 MILLION, WHEREAS IF THE WIND WERE BLOWING TOWARDS STATEN ISLAND A MUCH SMALLER NUMBER OF PEOPLE WOULD BE INVOLVED.

D) 1000 REM TO ADULT, 5000 TO CHILDREN UNDER 10. NOTE THAT BECAUSE OF THE LARGE NUMBER OF THYROIDS WHICH WOULD HAVE TO BE REMOVED SURGICALLY, THE INCIDENCE OF CANCER WOULD NOT BE THAT HIGH.

E) WASH-1400, TABLE VI F-9.

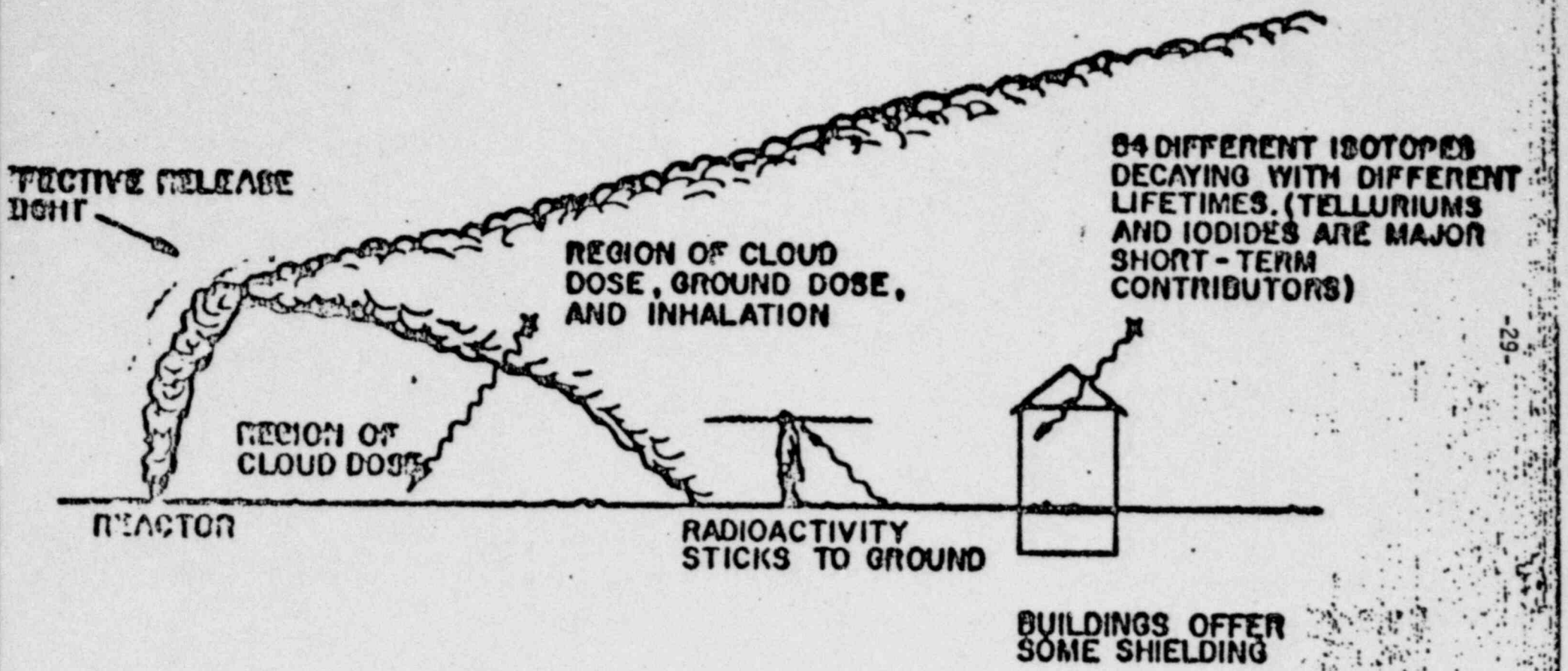
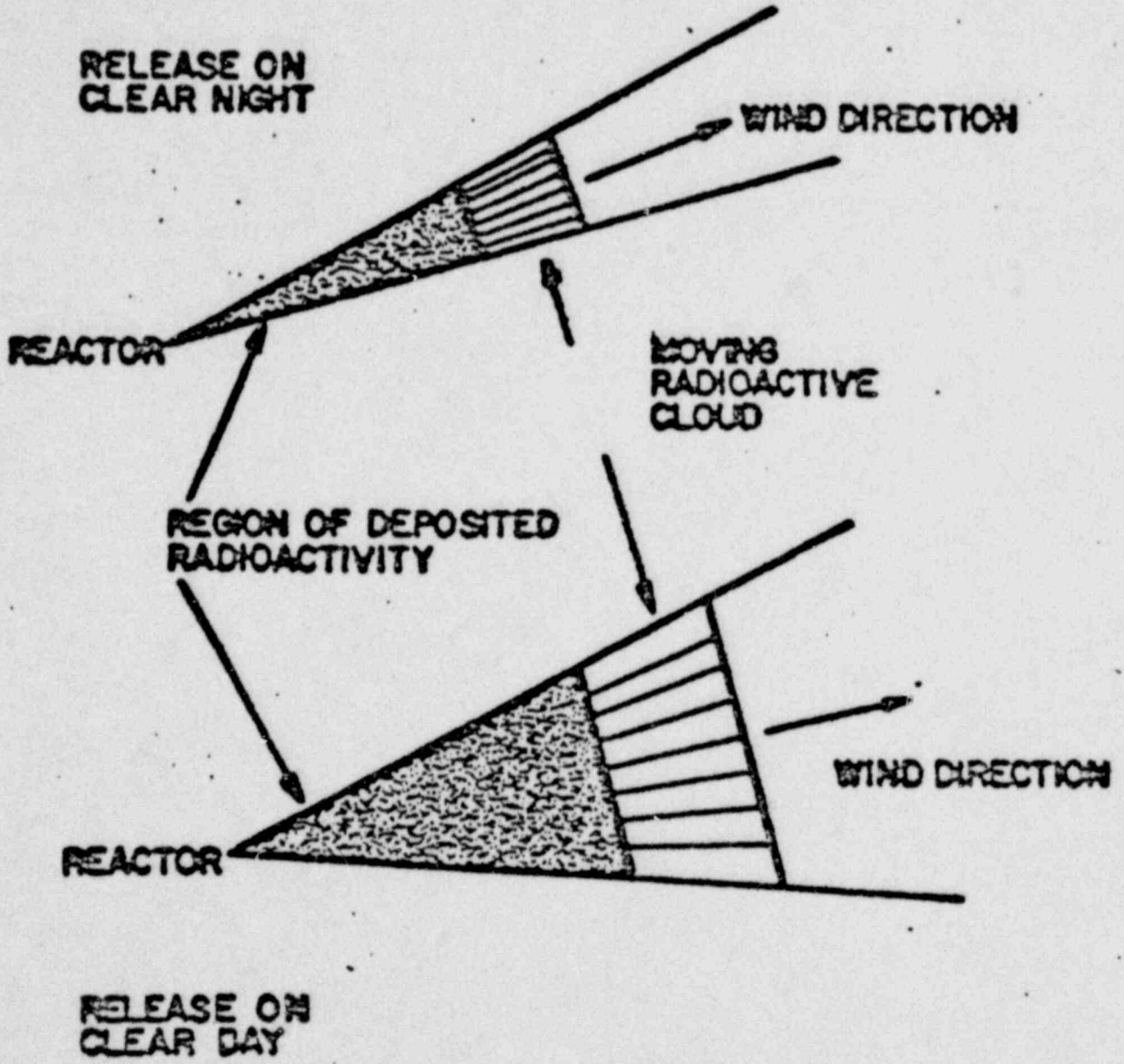


Fig I – SIDE VIEW OF RADIOACTIVE PLUME

Fig II – TOP VIEW OF PLUME



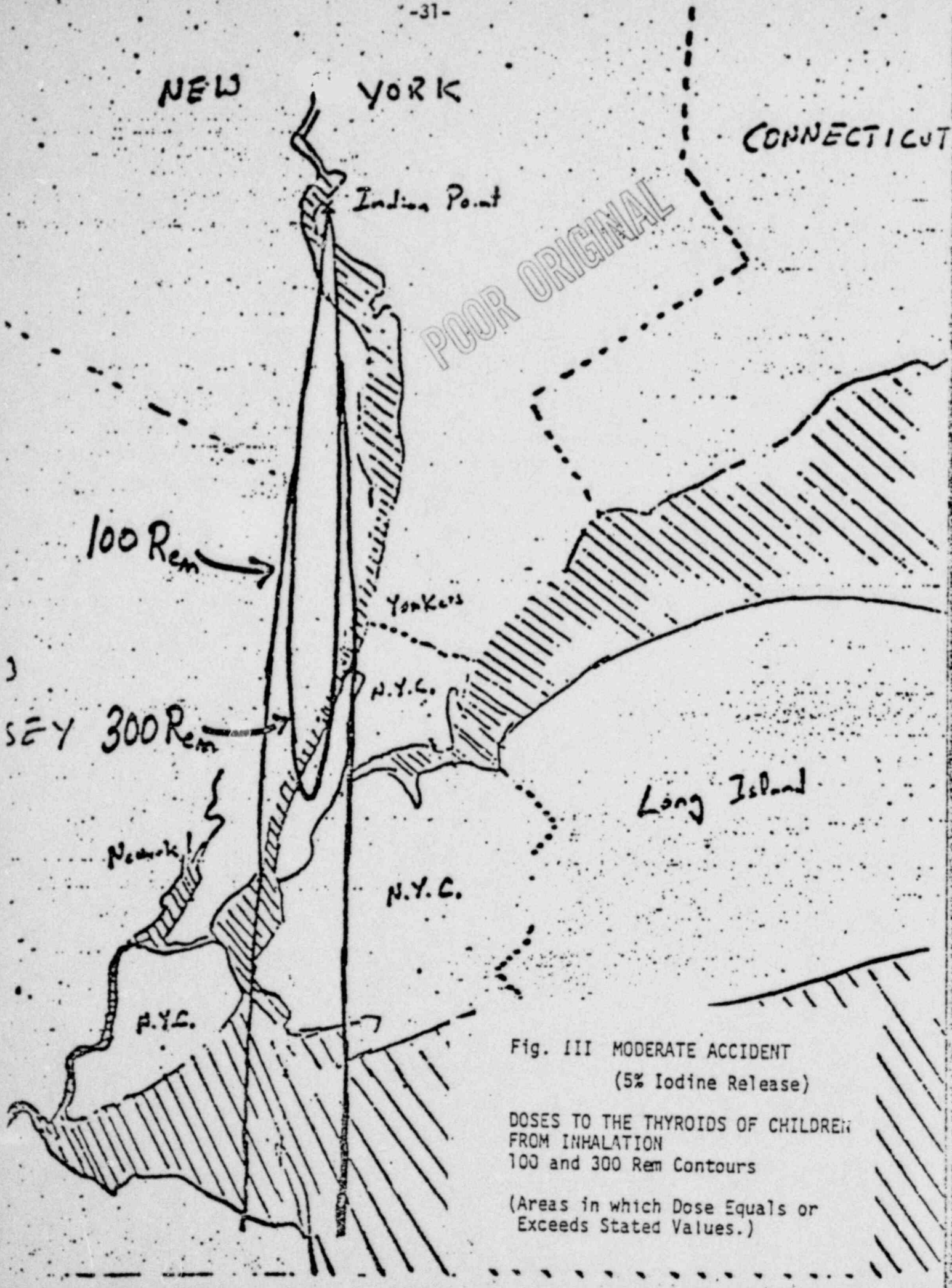


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Fig. III MODERATE ACCIDENT
(5% Iodine Release)

DOSES TO THE THYROIDS OF CHILDREN
FROM INHALATION
100 and 300 Rem Contours

(Areas in which Dose Equals or
Exceeds Stated Values.)

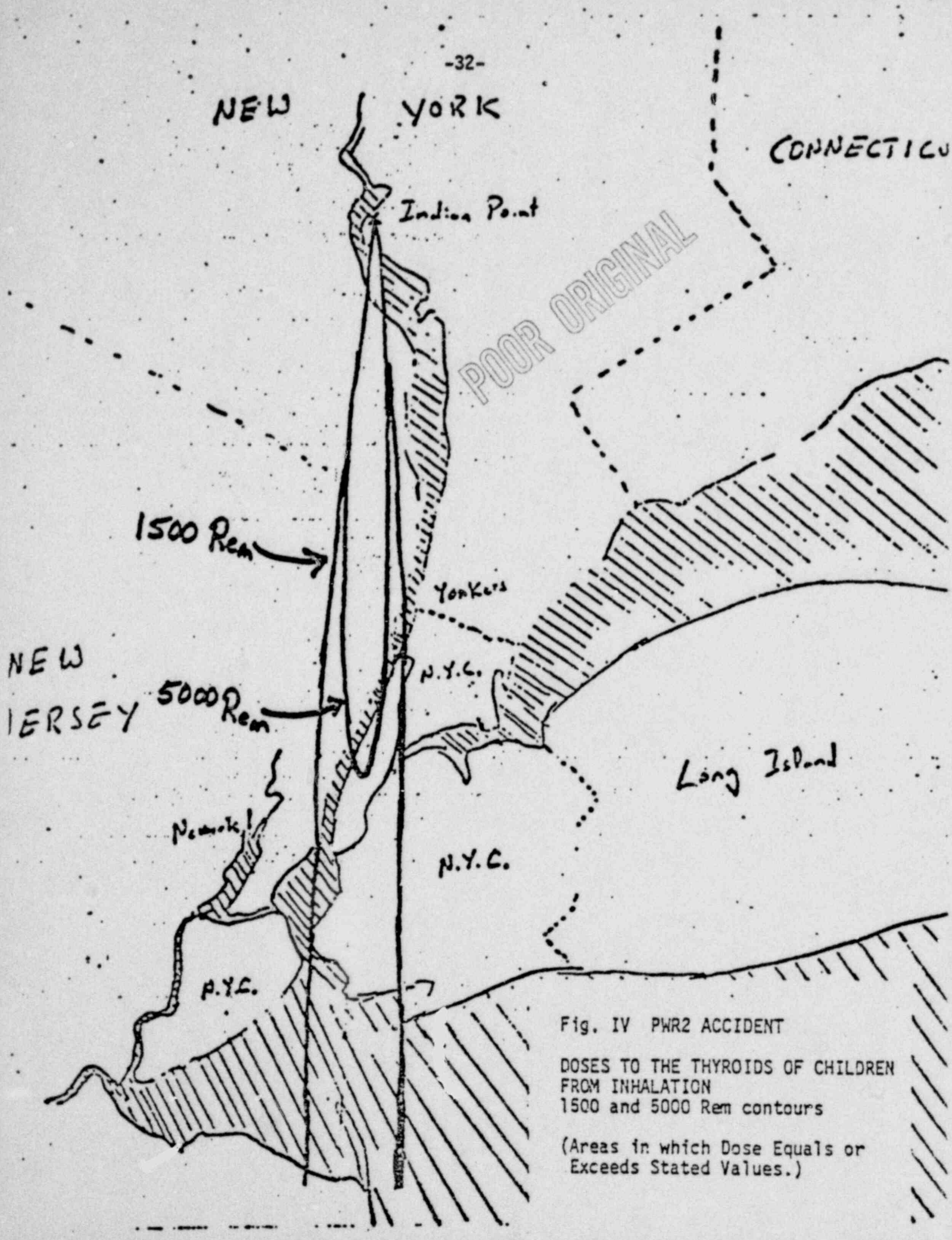

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Fig. IV PWR2 ACCIDENT

DOSES TO THE THYROIDS OF CHILDREN FROM INHALATION
1500 and 5000 Rem contours

(Areas in which Dose Equals or Exceeds Stated Values.)

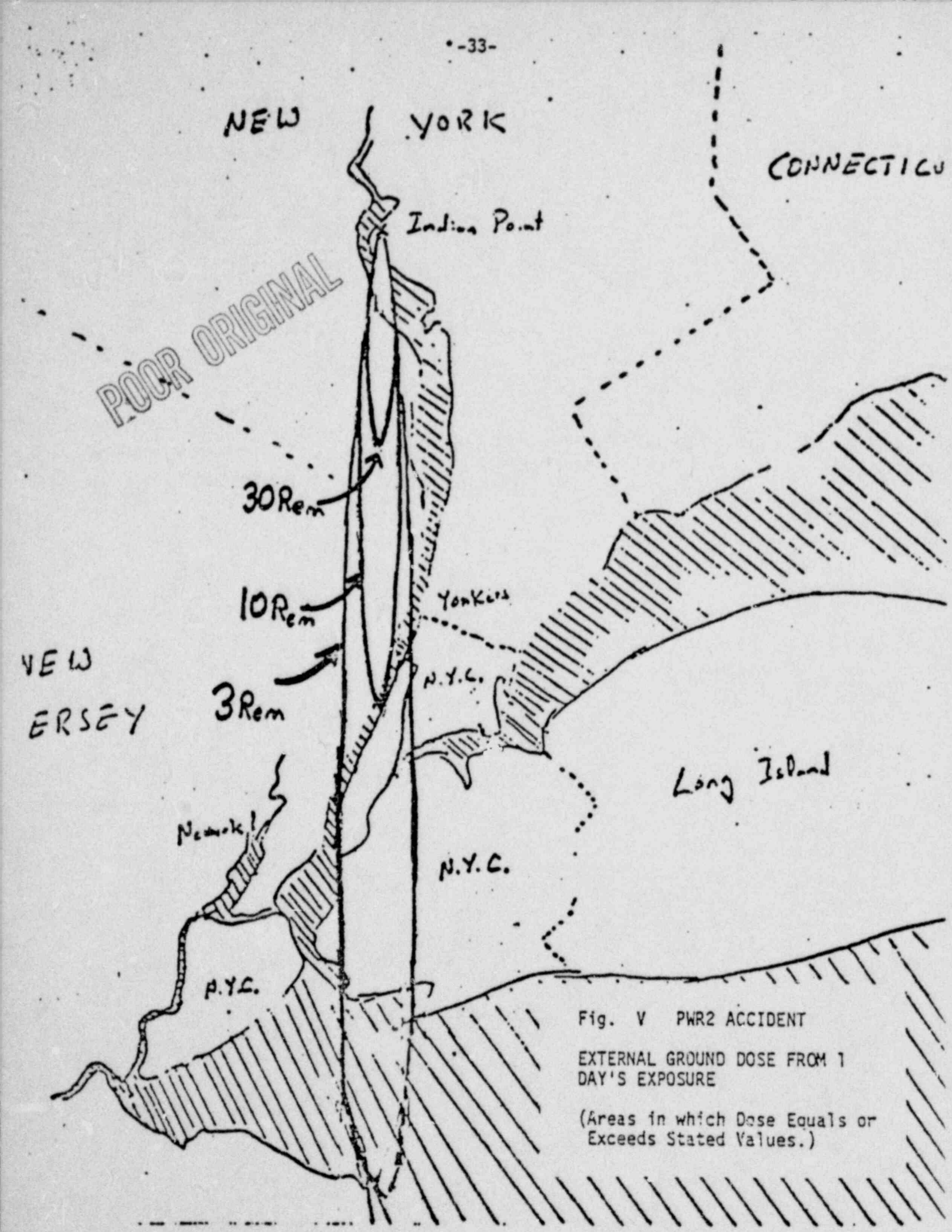

Fig. V PWR2 ACCIDENT

EXTERNAL GROUND DOSE FROM 1 DAY'S EXPOSURE

(Areas in which Dose Equals or Exceeds Stated Values.)

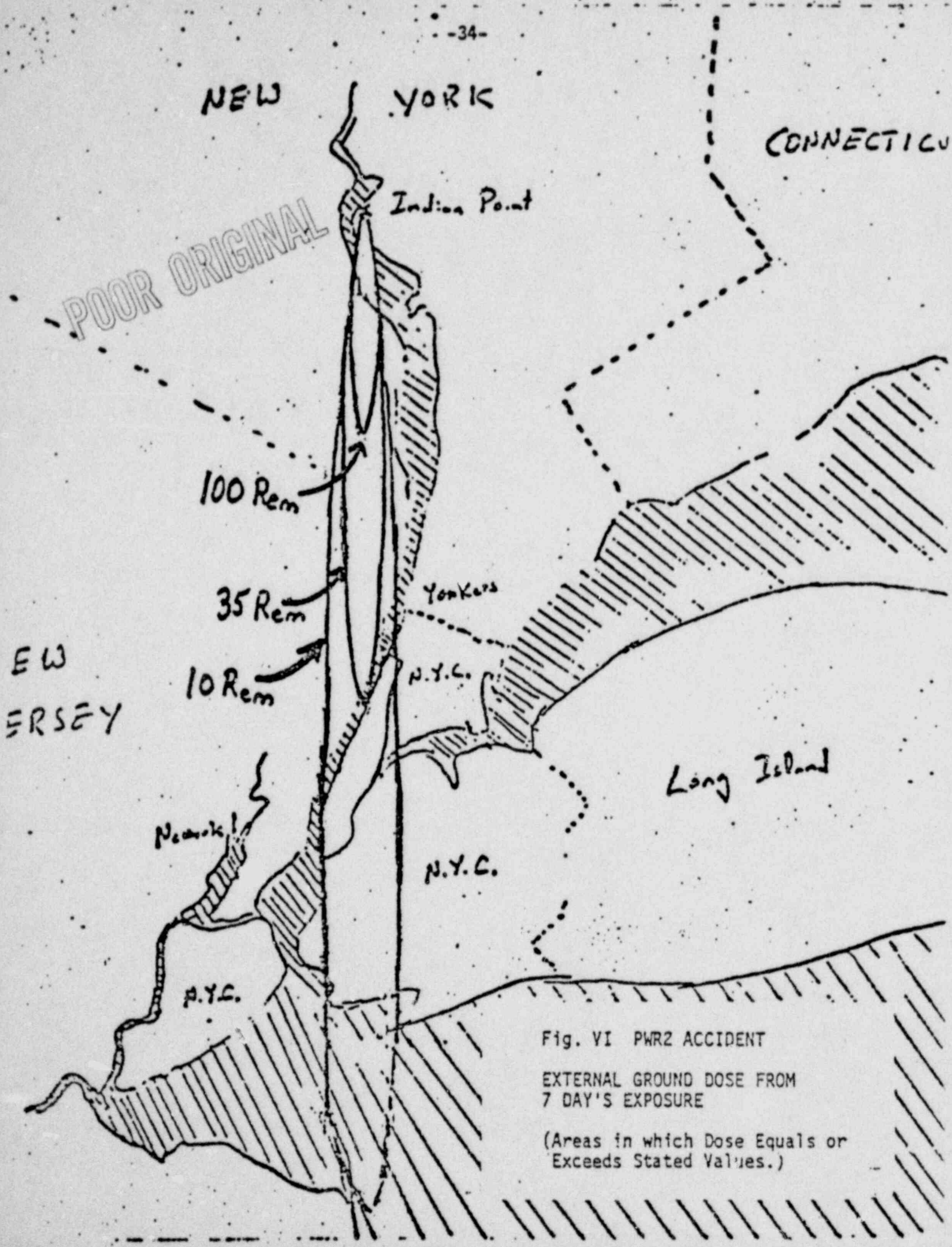

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Fig. VI PWR2 ACCIDENT

EXTERNAL GROUND DOSE FROM
7 DAY'S EXPOSURE

(Areas in which Dose Equals or
Exceeds Stated Values.)

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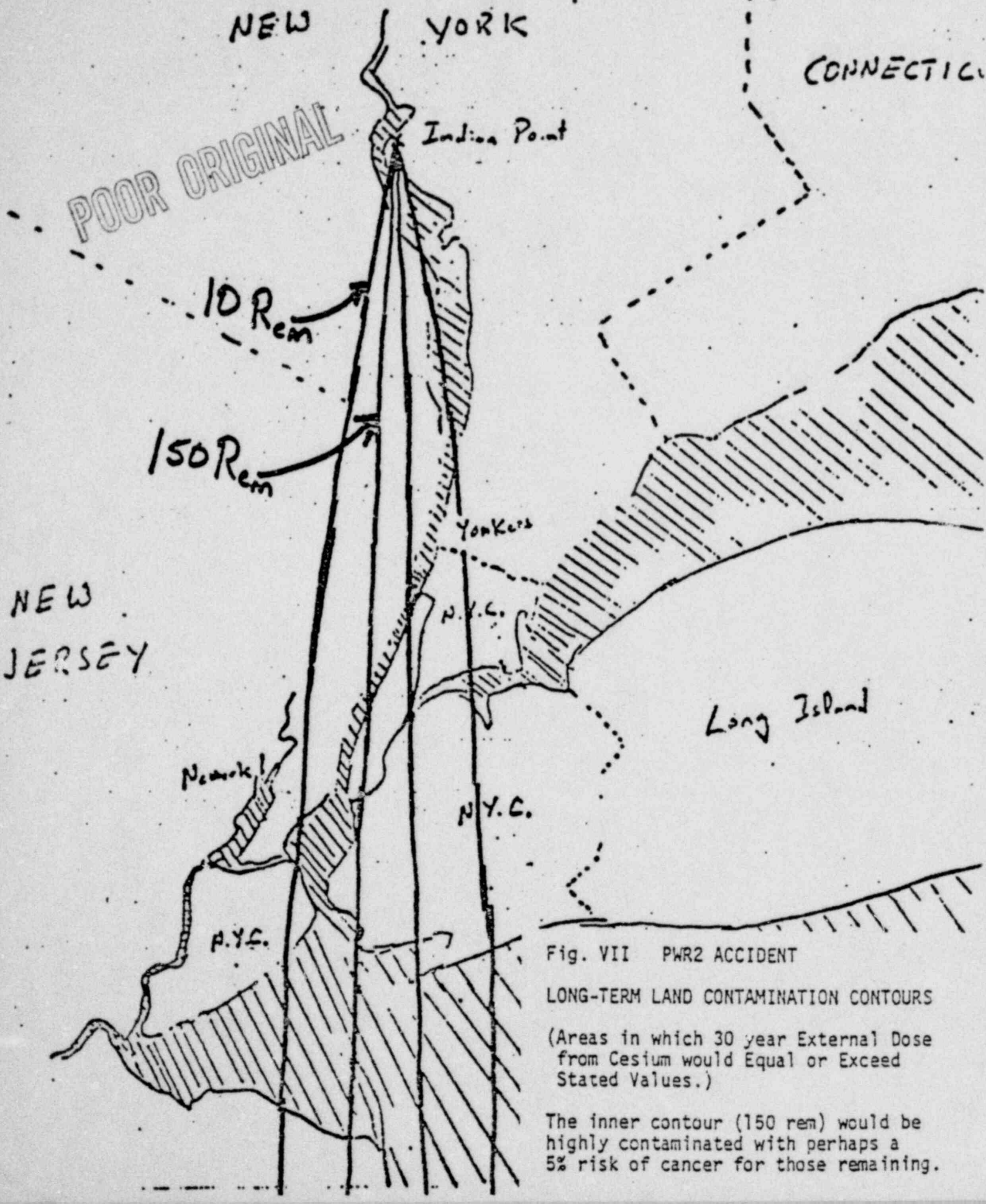

Fig. VII PWR2 ACCIDENT

LONG-TERM LAND CONTAMINATION CONTOURS

(Areas in which 30 year External Dose from Cesium would Equal or Exceed Stated Values.)

The inner contour (150 rem) would be highly contaminated with perhaps a 5% risk of cancer for those remaining.

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[4110-03-M]

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Food and Drug Administration

[Docket No. 78D-0343]

POTASSIUM IODIDE AS A THYROID-BLOCKING AGENT IN A RADIATION EMERGENCY

Request for Submissions of New Drug Applications and Notice of Availability of Labeling Guidelines

AGENCY: Food and Drug Administration.

ACTION: Notice.

SUMMARY: The Food and Drug Administration (FDA) requests submissions of new drug applications (NDA's) for potassium iodide in oral dosage forms for use as a thyroid-blocking agent in a radiation emergency. The approval of oral dosage forms of potassium iodide as a thyroid-blocking agent for use in a radiation emergency would be one step in meeting the responsibilities of the Department of Health, Education, and Welfare (DHEW) to State and local governments for radiological emergency response planning. The agency encourages interested persons to submit NDA's in the interest of the public safety. The agency is also announcing the availability of labeling guidelines for potassium iodide for such use.

ADDRESS: Submit new drug applications to the Food and Drug Administration, Division of Metabolism and Endocrine Drug Products (HFD-130), Rm. 14B04, 5600 Fishers Lane, Rockville, MD 20857. Comments concerning the labeling guideline and requests for copies of the guideline should be sent to the Hearing Clerk (HFA-305), Food and Drug Administration, Rm. 4-65, 5600 Fishers Lane, Rockville, MD 20857.

FOR FURTHER INFORMATION CONTACT:

Edwin V. Dutra, Jr., Bureau of Drugs (HFD-30), Food and Drug Administration, Department of Health, Education, and Welfare, 5600 Fishers Lane, Rockville, MD 20857, 301-443-6490.

SUPPLEMENTARY INFORMATION: By FEDERAL REGISTER notice of December 24, 1975 (40 FR 59494), the General Services Administration (GSA) outlined the responsibilities of several Federal agencies concerning certain emergency response planning guidance that the agencies should provide to State and local authorities. The Department of Health, Education, and Welfare (DHEW) is responsible for assisting State and local authorities in developing plans for preventing adverse effects from exposure to radiation in the event that radioactivity is released into the environment. These plans are to include the prophylactic use of drugs that would reduce the radiation dose to specific organs due to the sudden release into the environment of large quantities of radioactivity that might include several radioactive isotopes of iodine.

BACKGROUND

The GSA notice of December 24, 1975, concluded that there is an exceedingly low probability that incidents will occur involving either the use of radioactive materials in fixed nuclear facilities or the transportation of those materials. Because of the possible increase in number of nuclear power plants, however, several Federal agencies are identifying those possibilities, however remote, that could adversely affect the public, should an incident occur. One possibility is the sudden release of large quantities of radionuclides, which might include a number of isotopes of radioiodine, into the environment. When radioiodines are inhaled or ingested, they rapidly accumulate in the thyroid gland and are metabolized into organic iodine compounds. These compounds could reside in the thyroid gland long enough to allow for local radiation damage, resulting in thyroiditis, hypothyroidism, or thyroid neoplasia with either benign or malignant characteristics. Therefore, it is considered in the public interest that State and local authorities be prepared to take effective measures to prevent or curtail markedly the accumulation of radioiodines by the thyroid gland, should such an incident occur. These measures may include the use of a thyroid-blocking agent.

An ad hoc committee to the National Council on Radiation Protection and Measurements (NCRP), which included FDA representatives as consultants, studied the feasibility of using certain drug products as thyroid-blocking agents to reduce radiation dose to the thyroid gland. The NCRP, located in Bethesda, Maryland, is a nonprofit corporation chartered by Congress in 1964 to collect, analyze, develop, and disseminate information and recommendations about radiation protection. The NCRP is made up of 56 scientific committees, composed of experts having detailed knowledge and competence in the particular area of the committee's interest. An NCRP report published August 1, 1977 (NCRP Report No. 55, "Protection of the Thyroid Gland in the Event of Release of Radioiodine") discusses the safety and efficacy of thyroid-blocking agents and recommends that potassium iodide be considered for thyroid-blocking purposes under certain emergency conditions.

The report discusses stockpiling thyroid-blocking agents at appropriate outlets for ease of distribution in the event their use is necessary in a radiation emergency. The report concludes, however, that the details of stockpiling, if this method is to be used, and of distribution would be determined best at the State and local levels.

ANALYSIS

The Commissioner of Food and Drugs has analyzed the NCRP report and the available scientific literature about the possible prophylactic use of drugs to reduce the radiation dose to the thyroid gland in a radiation emergency. Although a variety of chemical substances can block the accumulation of radioiodine in the thyroid gland, iodide in the form of potassium iodide appears to be most suitable for this purpose. A number of factors were considered in choosing iodide (and specifically potassium iodide) over other blocking agents such as propylthiouracil, methimazole, perchlorate, thiocyanate, or iodate. These factors included the degree of the blocking achieved, the rapidity on onset of the blocking effect, the duration of the blocking effect, and the safety of the blocking agent. Although iodide acts on the thyroid gland in several ways, its use in this instance is primarily predicated on its ability to saturate the iodide transport system, and thus effectively abolish entry of radioiodine except for small amounts that might enter the gland by diffusion. Almost complete (greater than 90 percent) blocking of peak radioactive iodine uptake by the thyroid gland can be obtained by the oral administration of 100 milligrams (mg) of iodide (130 mg of potassium iodide) just before or at the time of exposure. A smaller dose (65 mg of potassium iodide) can be used in infants under 1 year of age. A daily dose is required to maintain the blocked state. The use of a blocking agent is not expected to exceed about 10 days.

Experiments designed to study the rapidity of onset of blocking have shown that at a 100-mg dose of iodide, the onset of blocking is readily demonstrated 30 minutes after oral administration. The decay of the blocking effect after cessation of iodide administration is relatively slow, so that a daily dose of 100 mg of iodide (130 mg of potassium iodide) appears to maintain effective blocking. To have the greatest effect in decreasing the accumulation of radioiodine in the thyroid gland, the thyroid-blocking agent should be administered immediately before or after initial exposure. A substantial benefit (e.g., a block of 50 per-

) is attainable, however, when the king agent is first given within 3 hours after acute exposure. If a on is exposed to radioiodine when umstances do not permit the im- iate administration of potassium de, the initial administration will f some limited benefit even as long 2 hours after exposure.

though most of the radioiodine is not taken up by the thyroid d is excreted in the urine within ours, the radioiodine that is taken by, and accumulated in, the thy- gland may be "leaked" back into general circulation system as a equence of intrathyroidal metabo- . Thus, there is a possibility that ulating and recirculating radioio- may be taken up by the thyroid d (from the circulatory system) though there are no radioiodines aining in the environment. To pre- or curtail the accumulation of ra- dine by the thyroid gland from source, including chronic expo- , a daily dose of a thyroid-blocking t is necessary for a period of time exposure. The duration of time a blocking agent would be re- ed is not expected to exceed about ays. A minimum of 3 to 7 days of administration is anticipated d on the biological events de- ed above and the effective half- of 'L.

tassium iodide has been used ly for many years in the treat- t of bronchial asthma and other monary disorders. Daily oral doses otassium iodide ranging from 300 00 mg have been given to asthma- over long periods of time. Daily doses of potassium iodide of 100 or greater have been administered ough preparations to children. Al- igh a variety of adverse reactions been reported in connection with use of potassium iodide, these re- ons are considered, in general, to directly proportional to the dose duration of therapy, and most city has been related to chronic inistration (see pp. 38357-38358 of findings of the Advisory Review el on Over-the-Counter (OTC) , Cough, Allergy, Bronchodilator Antiasthmatic Drug Products, lished in the FEDERAL REGISTER of ember 9, 1976 (41 FR 38312)). In tion to its use in pulmonary disor- . potassium iodide is used in daily s ranging from 250 to 300 mg in nts for up to 3 weeks in connec- with the diagnostic use of radio- rmaceutical drug products to block uptake of radioiodine by the thy- gland. The Commissioner is un- e of reports of significant toxicity this use of potassium iodide.

CONCLUSIONS

The Commissioner concludes that potassium iodide is safe and effective for use as a thyroid-blocking agent in a radiation emergency under certain specified conditions of use because it has been widely used for many years, in large doses, and on a long-term basis with an incidence of side effects and toxicities, in general, proportional directly to dose and duration of therapy. The risks from the short-term use of relatively low doses of potassium iodide in a radiation emergency are outweighed by the risks involved from exposure to radioiodine. However, the Commissioner does not believe that potassium iodide has been used to such an extent or for a period of time under these specified conditions to permit the conclusion that the drug is generally recognized as safe and effective. Accordingly, it is regarded as a new drug requiring an approved new drug application as a condition of marketing. Thus, the Commissioner will accept new drug applications meeting the requirements of § 314.1 (21 CFR 314.1). Because of the publicly available safety and efficacy data documenting the drug's use, the safety and efficacy requirements of § 314.1 may be met by citing the published literature in the List of Material Consulted (below) documenting its use. The Commissioner advises that it is unnecessary to submit (1) copies and reprints of the data cited in the List of Material Consulted in this document, and (2) copies and reprints contained in the journals listed in § 310.9 (21 CFR 310.9). Both the safety and efficacy data upon which the Commissioner bases the above conclusions and NCRP Report No. 55, "Protection of the Thyroid Gland in the Event of Release of Radioiodine," are on file for public inspection in the office of the Hearing Clerk, Food and Drug Administration. The Commissioner invites applicants to submit any other pertinent studies and literature of which they are aware.

The Commissioner also believes for this specific use of potassium iodide, and at the dosages intended, that the prescription-dispensing requirements of section 503(b)(1) (21 U.S.C. 353(b)(1)) of the Federal Food, Drug, and Cosmetic Act are unnecessary. Only the chronic administration of daily doses of potassium iodide far in excess of those necessary for thyroid-blocking in a radiation emergency have resulted in significant side effects and toxicities. These problems should not occur from the short-term use of a relatively low daily dose of potassium iodide. However, the Commissioner advises that the conclusion that a potassium iodide drug product manufactured for use as a thyroid-blocking agent in a radiation emergency is suitable for OTC sale does not affect the present status as a prescription drug of a potassium iodide drug product manufactured for other uses or at higher dosages.

The importance to the public of ready and convenient access to this product and the unlikelihood that it will be needed reinforce the Commissioner's belief that potassium iodide as a thyroid-blocking agent in a radiation emergency should be considered suitable for OTC use. The Commissioner also believes that special labeling directed to the patient must accompany the immediate container of these OTC preparations to ensure they are used safely and effectively. A labeling guideline that describes the kind of information to be included on the container label, if space permits, and if the accompanying labeling is on file with the Hearing Clerk, FDA. The guideline sets forth specific language that would be acceptable to the agency.

The guideline is entitled "Guideline Labeling for Potassium Iodide for Use as a Thyroid-Blocking Agent in a Radiation Emergency."

The person responsible for maintaining the guideline labeling is JoAnne C. Marrone, Food and Drug Administration, Division of Metabolism and Endocrine Drug Products (HFD-130), Room 14B04, 5600 Fishers Lane, Rockville, MD 20857, 301-443-3520. Copies of the guideline are available from the Hearing Clerk (address above).

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14. Radiation-Associated Thyroid Carcinoma, Edited by L. J. DeGroot with L. A. Frohman, E. L. Kaplan, and S. Refetoff; Grune and Stratton, Inc. publishers, 1977.

15. Langemann, F. W. and J. C. Thompson, Jr., "Prophylactic and Therapeutic Measures for Radioiodine Contamination," *Health Physics*, 9:1191-1197, 1963.

16. Pochin, E. E. and C. F. Barnaby, "The Effect of Pharmacological Doses of Non-Radioactive Iodide on the Course of Radioiodine Uptake by the Thyroid," *Health Physics*, 7:125-126, 1962.

17. Conard, R. A. et al., "A Twenty Year Review of Medical Findings in a Marshallese Population Accidentally Exposed to Radioactive Fallout," Report BNL-50424, Brookhaven National Laboratory, Upton, NY, 1975.

18. Goodman, L. S. and A. Gilman, *The Pharmacological Basis of Therapeutics*, 5th Ed., MacMillan Publishing Co., Inc., New York, pp. 801, 802, 1975.

The agency encouraged interested persons to submit written comments (preferably four copies, specifying Hearing Clerk docket no. 78D-0343) on the guideline labeling to the Hearing Clerk (HFA-305), Food and Drug Administration, Rm. 4-65, 5600 Fishers Lane, Rockville, MD. 20857. If, as a result of comments received on the guideline labeling, the Commissioner determines that the labeling should be revised, a notice will be published in the FEDERAL REGISTER announcing that such changes have been made.

The Commissioner has determined that this document does not contain an agency action covered by § 25.1(b) (21 CFR 25.1(b)) and, therefore, consideration by the agency of the need for preparing an environmental impact statement is not required.

Dated: December 8, 1978.

DONALD KENNEDY,
Commissioner of Food and Drugs.

[FR Doc. 78-34843 Filed 12-14-78; 8:45 am]

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Studies of Nuclear Accidents by Jan Beyea

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

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

A Study of Some of the Consequences of Hypothetical Reactor Accidents at Barsebäck, report to the Swedish Energy Commission, DS I 1978:5, Industridepartmentet Energikommissionen, Stockholm, 1978. (Also printed as Princeton University Center for Environmental Studies Report #61.)

Program BADAC, Short-term Doses Following a Hypothetical Core Melt-down; computer code written for the New Jersey Department of Environmental Protection, 1978.

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

Emergency Planning for a Catastrophic Reactor Accident, Invited testimony before the California Energy Resources and Development Commission, Emergency Response and Evacuation Plans Hearings, November 4, 1976, p. 171.

Short-term Effects of Catastrophic Accidents on Communities Surrounding the Sundesert Nuclear Installation. Invited testimony before the California Energy Resources and Development Commission, and cross-examination on same, December 3rd, 1976. The Sundesert hearings were the first held under the new California siting law.

Consequences of a Catastrophic Reactor Accident, Statement to the New York City Board of Health concerning consequences of an accident at Indian Point, August 12, 1976, (with Frank von Hippel):

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

Upper Limit Calculations of Deaths From Nuclear Reactors, J. Beyea, Bull. Am. Phys. Soc. 21, 111 (1976).

DOCKET NUMBER
PROPOSED RULE PR-50 (44 FR 41483)

COMMENTS OF THE UNION OF CONCERNED SCIENTISTS ON EMERGENCY PLANNING AROUND NUCLEAR FACILITIES

On July 17, 1979, the NRC published an advance notice of proposed rulemaking on the adequacy and acceptance of emergency planning around nuclear facilities. 44 Fed. Reg. 41483. The notice informed the public that NRC is considering adopting regulations which will establish as a condition of licensing that applicants demonstrate a higher level of preparedness to take action to protect the public in the event of a serious reactor accident.

Before addressing ourselves to the specific questions posed in the notice, UCS will offer some general observations. The AEC and then NRC's failure to adopt serious requirements for evacuation planning and other protective measures or to tie these requirements to licensing, stems directly and inexorsbly from the agency's refusal to face forthrightly the possibility of a major reactor accident which would result in radiation doses offsite. It has been a historical hallmark of U.S. nuclear regulatory philosophy to deny the credibility of a so-called Class 9 event. The consequences of a major accident are systematically excluded from impact statements prepared pursuant to the National Environmental Policy Act. In like fashion, Class 9 accidents are not considered as "design basis events" and no measures are required to mitigate their effect. The NRC's ambivalent attitude toward emergency planning - requiring lip-service

commitments but no genuine review - is thus squarely in the tradition of avoiding the issues which arise from the possibility of a serious accident such as a core meltdown.

We say this not simply to chide the Commission for past negligence but to point out that it must acknowledge that the crucial lesson of TMI is that serious accidents can happen. It is a simple proposition, but its acceptance by the NRC would begin to work a revolution in regulatory philosophy. In fact, this proposed rulemaking represents acknowledgement that such accidents can happen. So too, albeit in an equally tacit fashion, does the staff's policy on rejecting sites with population densities out to 40 miles above certain "trip levels." After all, such populations are only at risk if one assumes the occurrence of a serious (Class 9) accident.

However, the Commission needs to affirmatively wipe out the vestiges of a fatally flawed regulatory policy and require the consideration of serious accidents in all aspects of licensing. The discredited "proposed" Annex to 10 CFR Part 50, excluding Class 9 consequences from NEPA review should be immediately withdrawn. The present system is logically and philosophically inconsistent as well rationally insupportable.

Finally, emergency planning issues are tied closely to siting policy. There are presently some operating reactor sites where the number and concentration of surrounding population make it a practical impossibility to take protective

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measures. No one yet knows how many such sites exist, but certainly Indian Point, near New York City and Zion, near Chicago, present essentially intractable problems. All operating reactors should be reviewed on a priority basis to determine for how many the environs are unevacuable as a practical matter. These should not be permitted to operate. In addition, future siting should be restricted to areas truly remote from population. This would be a major step forward in learning the TMI lessons.

The remainder of UCS's comments will address the specific questions posed in the published notice.

QUESTION:

(1) What should be the basic objectives of emergency planning?

(a) To reduce public radiation exposure?

(b) To prevent public radiation exposure?

(c) To be able to evacuate the public?

To what extent should these objectives be quantified?

ANSWER:

Prevention of radiation exposure to the public should be the basic objective. This is tied directly to evacuability. It would be irresponsible to qualify or compromise on this objective. Furthermore, any qualification of this

objective would totally undermine public confidence in the safety of the population living near reactors.

Feasible implementation of emergency plans must be a prerequisite for siting approval for new reactors in order to insure public safety. Where existing reactors cannot meet feasible implementable emergency plans to provide for public safety in event of a core meltdown, licenses should be revoked until such time as an implementable emergency plan has been demonstrated.

QUESTION:

(2) What constitutes an effective emergency response plan for State and local agencies? For licensees? What are the essential elements that must be included in an effective plan? Do existing NRC requirements for licensees (10 CFR Part 50, Appendix E) and guidance for States (NUREG-75/111) lack any of these essential elements?

ANSWER:

An effective emergency response plan must be tested and proven implementable as judged by a number of responsible local, regional, state and federal officials. Perhaps the keynote of feasibility is that there must be persons with both technical information and expertise in combination with decision-making authority in a position to judge whether a danger to public health exists and to implement protective action. This was, of course, sadly lacking in the TMI case.

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The Governor, who had the authority, did not have access to accurate information, at least within the critical time periods.

- State governments should either employ or contract appropriate local resident specialists in nuclear physics, nuclear engineering, chemistry and biology giving them responsibility for regular inspection and crisis intervention which charges them with making declaration of a pending public safety emergency simultaneously to the licensee, chief elected official or local and regional governments within a 50 mile radius and the press.

- The U.S. HEW process for emergency medical care coupled with the official health planning agencies for states and their sub-state regions should bear the responsibility for assessing the plan's feasibility of meeting emergency response from a health perspective.

- The transportation systems must have adequate capacity to accomodate the number of people evacuating because of a public health safety hazard in the affected area within a set period of time (6 hrs). Judgment on this aspect of an emergency response plan can best be made through the process U.S. DOT uses to approve transportation development projects. Significant federal planning resources already enable each of the nation's "MPO's" (metropolitan planning organizations of chief elected local and state officials) to know their capacity limitations for road vehicles, rail vehicles,

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airplanes and ships.

Present NRC practice is totally inadequate, although this is probably due as much to a lack of zeal for assuming responsibility for the entire subject - and imposing it on licensees - as to deficiencies in the regulations in Appendix E to 10 CFR Part 50. There are, however, certain obvious holes in Appendix E. The most important are:

1) it does not require any detailed implementation plans at either the construction permit or operating license stages,

2) it does not require any testing or actual field verification. Essentially, it requires only paper, and vague paper at that,

3) it contains no performance criteria whatever against which this paper can be judged,

4) this is compounded by the fact that there is no guidance offered to the agencies charged with the responsibility to take protective action on what the health and safety consequences could be of the range of potential accidents. Thus, the Governor of Pennsylvania had to ask the Commissioners in the middle of the TMI accident what the consequences of exposure could be and was told by the Chairman that there is no good information on the subject! Meanwhile, of course, the plume had already passed,

5) it does not specify that the "design basis" for emergency planning should be a Class 9 accident, or provide parameters for evaluating the range of potential releases. Therefore, the areas covered are far too small.

QUESTION:

(3) Should NRC concurrence in the associated State and local emergency response plans be a requirement for continued operation of any nuclear power plant with an existing opera-

ting license? If so, when should this general requirement become effective?

ANSWER:

Yes. Prior NRC concurrence, concurrence of the governor(s), the chief elected local officials within 50 miles of the site, and the concurrence of elected legislature officials (local, state and federal) for the same geographic area should be required on emergency plans for public safety and evacuation. This concurrence must be a matter of public record and official sign off should take place subsequent to a month long period of local distribution of public education materials coupled with a drill on said emergency plan.

The requirement should be immediately effective for existing plants in an area where population within a 50 mile radius exceds 1,000,000 people. Other plants in sparsely populated areas should have a deadline of 6 months to operate prior to plan approval.

NRC must find, as to each operating plant, that the affected public can be protected in the event of a Class 9 accident. There are a number of operating reactors for which this is clearly not the case. Indian Point and Zion are two obvious ones. These plants are a real threat to public safety.

QUESTION:

(4) Should prior NRC concurrence in the associated State and local emergency response plans be a requirement

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for the issuance of any new operating license for a nuclear power plant? If so, when should this general requirement become effective?

ANSWER:

Yes - immediately. And a much more detailed showing of the suitability of the site for evacuation and/or appropriate protective action in the event of a Class 9 accident should be a prerequisite for a construction permit. No more Seabrooks should be permitted, with the NRC officially blinding itself to the existence of thousands of people just outside the LPZ on the beach several miles from the plant. If TMI had happended at Seabrook in July, the evacuation even of women and children within 5 miles would have produced utter chaos.

QUESTION:

(5) Should financial assistance be provided to State and local governments for radiological emergency response planning and preparedness? If so, to what extent and by what means? What should be the source for the funds?

ANSWER:

Absolutely. The level of funding required should be derived fr national standards to be met set by NRC together with HEW and DOT. The licensee should be obligated to pay the municipality, any affected regional government, and the state (each in separate transactions) 50% of this funding annually from the filing of an application for a

license until said plant has been decommissioned long enough to present no further potential public health and safety risk. The local, regional or state government should annually appropriate the other 50%. Should any of these governments in any year fail to appropriate their share the licensee should be obligated to shut down until such appropriation is made.

QUESTION:

(6) Should radiological emergency response drills be a requirement? If so, under whose authority: Federal, State or local government? To what extent should Federal, State, and local governments, and licensees be required to participate?

ANSWER:

Yes. GAO concluded in its recent report to Congress on this subject,[1/] after site visits to eleven nuclear facilities and analysis of questionnaires to all states, that untested plans "would probably be ineffective in an emergency situation."[2/] Thus, an untested plan is worse than nothing at all; it provides a false sense of security and lulls people into complacency.

1/ "Sites Around Nuclear Facilities Should Be Better Prepared For Radiological Emergencies," EMD-78-110, March 30, 1979.

2/ Id. p. 11.

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State and local civil defense agencies should assume the lead with proper training from the NRC as closely monitored by the state's committee of technical experts described in the answer to question (2) above. At least one drill should be held before the public and their officials sign off approval on implementability of the plan.

QUESTION:

(7) How and to what extent should the public informed, prior to any emergency, concerning emergency actions it might be called upon to take?

ANSWER:

The GAO investigation cited above found that the only efforts at informing the public about possible emergency action were public meetings called by utilities during the licensing process - years before actual operation.[3/] No further actions were taken to inform the public. UCS believes this failure to be little short of scandalous. GAO stated:

> Facility operators did not appear concerned about the lack of information made available to the public. This reflects the attitude of most operators, namely, that there is little danger to the public from their facilities. This attitude was summarized by one operator who said that he did not expect serious accidents requiring large-scale public involvement to occur and that prompt

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3/ Id. at 28-31.

notification and normal local offsite emergency response actions would receive total public cooperation if a nuclear emergency did occur..

In most cases, the operator's confidence in public cooperation has not been put to the test, even on a limited scale, to determine its validity.

There can be little question that the public needs to know what to do in the event of an emergency. This requires, the distribution of information, by mail, updated annually, to all persons living within 50 miles of a plant, of procedures for evacuation, the location of evacuee centers, the location of medical facilities, etc. In addition, the utility should be responsible for arranging widely-advertised public meetings in each affected city or town to bring together the responsible officials and the public, to review the emergency plans.

QUESTION:

(8) What actions should be taken in response to the recommendations of the joint NRC/EPA Task Force Report (NUREG-0396/EPA 520/1-78-016)?

ANSWER:

The Joint Task Force Report represents a significant step forward in bring this issue into the light of day but does not go far enough. There is insufficient justification for limiting the Emergency Planning Zones for plume exposure to 10 miles. As indicated above, we support the use of a Class 9 accident as a planning basis for emergency action. The Task Force fudges badly on this, apparently

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compromising on a "less severe Class 9 accident." There is no excuse for this temporizing. The recommendations of the Joint Task Force, with this important change, might usefully serve as the focus of the rulemaking proceeding. However, that should not be permitted to serve as a wedge for prolonging Commission inaction. It should act immediately to require licensees to have NRC concurrence to at least the present requirements.

QU[illegible]

(9) How and to what extent should the concerns of State and local governments be incorporated into Federal radiological emergency response planning?

ANSWER:

It is irresponsible not to heed state and local concerns as, in the last analysis, they are the people who are most impacted by the accident -- living with it, and recovering from it. They are in a position to turn any theoretical emergency response planning into a workable reality. In addition to all the comments in other responses to these questions concerning their role, it is critical that on an ongoing basis state, regional and local officials have better access to training, data and other information heretofore only housed with federal officials as well as data and other information heretofore considered proprietary.

As a practical matter, the involvement of numerous levels of government in this situation tends to create confusion, diffuse responsibility, and weakened accountabi-

lity. The only effective way to knit together the whole is for one organization to assume supervision, and the only effective wedge is the interest of the licensee in continued operation of his plant. Therefore, the supervision has to be in NRC, which can enforce it.

Under NRC's review, licensees should at least annually contact each responsible state and local official, make sure that he/she understands and concurs in his/her role in the event of an emergency and solicit comments on the need, if any, for changes.

By the Union of Concerned Scientists

Ellyn R. Weiss
General Counsel

Carla B. Johnston
Deputy Director
Union of Concerned Scientists
Cambridge, Massachusetts

DATED: August 31, 1979

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PROPOSED RULE FR-50 (44 FR 41483)

JAMES B. COULTER
SECRETARY

STATE OF MARYLAND

LOUIS H. PHIPPS, JR.
DEPUTY SECRETARY

DEPARTMENT OF NATURAL RESOURCES
ENERGY & COASTAL ZONE ADMINISTRATION
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August 29, 1979

Secretary of the Commission
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

SEP 6 1979

RE: Advance Notice of Proposed Rulemaking "Adequacy and Acceptance of Emergency Planning Around Nuclear Facilities" (FR 44, 138, Tuesday, July 17, 1979)

Dear Mr. Chilk:

It appears from the superficial nature of the questions in the subject Federal Register notice that the NRC is not yet familiar with the real world problems inherent in public planning for emergencies at nuclear power plants. Unfortunately, most state and local civil defense coordinators, who are very familiar with their local situations, are not yet familiar with the detailed consequences of the reactor accidents for which they must plan. Until the NRC can educate the civil defense planners as to realistic values and interrelationships of parameters such as the warning time before release, the duration of release, types of material released, the time of plume passage, the extent of ground contamination, the dose-reduction effects of sheltering in buildings of various types, etc., the planners cannot effectively optimize mitigative measures for the specific plant sites within their jurisdictions. Until this gap is bridged, substantive improvement in public protection from a nuclear accident cannot be expected. Until the NRC becomes familiar with what can and what cannot be accomplished by informed and intelligent local emergency planning, additional NRC regulation is likely to be off-base and NRC "concurrence" would be meaningless.

Prior to the incident at Three Mile Island Unit 2, the need for a better basis for local emergency planning was recognized by EPA and NRC. Their joint document draft (NUREG-0396/EPA 520/1-78-016) issued in December 1978 was a reasonable beginning for improvement. Similarly, GAO's Report to Congress in 30 March 1979 recognized the need for better preparation in areas around nuclear power plants. It is ironic that the incident at TMI, during which the maximum doses were an order of magnitude lower than the EPA's guideline values for taking even voluntary protective action, now threatens to negate t a beginning by forcing quick rather than substantive actions.

Acknowledged by card 9-6-79

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Rather than attempt to directly answer the questions in the Federal Register notice, we offer several points for your consideration:

A. The planning for emergencies at nuclear power plants is intensely site-specific. It should be considered in a realistic manner during site selection and approval. For this purpose, 10CFR100 is presently inadequate, as are current NRC Regulatory Guides on population density.

B. Given the variety of sites currently approved for nuclear power plants by NRC, standarized national guidelines for emergency planning are not likely to significantly improve the emergency plans. Population density, physical barriers to evacuation, types of shelter available and other demographic factors differ to a degree which defies a generalized planning concept. Something general enough to be applicable everywhere is unlikley to be specific enough to ensure realistic planning anywhere.

C. The NRC should provide much more specific detail about the kind of situations for which the planners must prepare. Scenarios similar to the release categories of the consequences modal in the Reactor Safety Study would be a much better basis for developing plans than is currently provided in the "plume zones" and "ingestion zones" of NUREG 0396. The NRC should exercise its judgement in defining these scenarios so as to exclude those potential high-consequence accidents which are of sufficiently low probability to pose acceptable risk levels without planning beyond that level already required by the more probable accidents. It should also consider the uncertainties which were apparent during the TMI incident, and help provide a rational basis for action during a period when existing conditions do not require action but future detrioration of the situations may occur.

D. The NRC should make available to the local planners the technical information regarding effectiveness of various types of mitigative measures against the various dose pathways expected under accident conditions. For instance, for plume shine, inhalation and surface contamination doses, dose reduction factors due to sheltering in buildings of various construction types should be made available.

E. The NRC should provide both technical and planning assistance to the state and local civil defense personnel. If the NRC adopts regulations requiring adequate emergency plans to be implemented by a specific date, then NRC should be prepared to supply sufficient consulting personnel to help all affected state and local planners to prepare their plans within the time allowed. The NRC should be prepared to provide an example of an acceptable plan for any plant site where it feels that local officials have not planned adequately. Without this level of commitment on the part of the NRC, it is probable that the NRC personnel reviewing the plans will, in many cases,

end up making impossible or unrealistic demands, either from their own ignorance or due to political pressure. If the NRC originally approved a site for a nuclear power plant, it should be able to show by specific example that an acceptable emergency plan can be made for it.

F. If the NRC concurrence is required for emergency plans within a 50 mile radius of a reactor site, it must have a plan for dealing with state borders and uncooperative or unresponsive neighbors. In the east, few power plants have 50 mile radii contained wholly within a single state. Especially if a time constraint is imposed, each state can be expected to place priority on plans for sites within its borders, and may, if necessary, neglect planning in their portions of 50 mile rings of distance plants. With rivers serving as borders for states, service territories and even interconnected utility groups, power plants at many riverine sites could have little importance to the jurisdiction directly across the river. The threat of shutdown may be ineffectual in producing adequate speed in such cases. If speed is desired, then the NRC may well have to provide it through adequate assistance, not coercion.

G. During emergencies, plant personnel should be expected to retain control. A cadre NRC personnel cannot be expected to become familiar with the design of one hundred different reactors and control rooms to the degree that they would be preferable to a well trained group of the utility's employees. The NRC could improve the current situation by developing regulations and guidelines for emergency situation training programs which utility companies would develop for senior operators at each of their reactors. A cadre of NRC personnel should be developed to focus expertise on emergency situation instrumentation, simulation and training. This group could also be made available as consultants during an actual emergency, should time permit.

In summary, we urge that emergency planning for nuclear reactors be substantially improved, but we caution against haste. The emphasis on timing, rather than substance in the Federal Register notice is ill advised, although understandable in the face of public opinion.

Sincerely,

Steven M. Long, Ph.D.
Acting Director
Power Plant Siting Program

SML:pe

cc: Paul Massicot, Acting Director
Energy Administration

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