



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

April 30, 1985

Mr. Peter Meyer
Environmental Science Department
Massachusetts Audubon Society
Lincoln, Massachusetts 01773

Dear Mr. Meyer:

This replies to your April 24 postcard. Mr. and Mrs. Aamodt have provided this agency with a copy of their report; however, there are not extra copies available for distribution to members of the public. I suggest you contact the Aamodts directly to obtain a copy. Their mailing address is 200 North Church Street, Parkesburg, Pennsylvania 19365.

Sincerely,

A handwritten signature in dark ink, appearing to read "Frank Ingram", is written over the typed name.

Frank Ingram
Assistant to the Director
Office of Public Affairs

Testimony of Steven Forry, Deputy Emergency Management Director
AT THE SUFFOLK County Legislature, New York for Newbury Township
MARCH 27, 1985 78

1 people who was in our survey area who lost her husband could
2 tell you what this meant to her, and her own experience.

3 MR. BLASS: So we are going to Steve now?

4 MRS. AAMODT: Steve Forry.

5 MR. BLASS: If he could trade places with you,
6 please.

7 Would you remain standing and raise your right
8 hand.

9 (Whereupon, Mr. Steve Forry was sworn by Mr.
10 Blass.)

11 Please be seated and state your name and address
12 and occupation, and begin your statement.

13 MR. FORRY: My name is Steven Forry. I am a full
14 time staff paramedic at York Hospital in York. I am also
15 the Deputy Emergency Management Director for Newbury
16 Township in York County, Pennsylvania, which is directly
17 across from Three Mile Island.

18 First of all, I would like to thank you gentlemen
19 that invited us up here today to share our concerns with
20 you all.

21 To give you a little personal background -- I am
22 going to make this as brief as I possibly can. When the
23 Three Mile Island nuclear power station was going around
24 and having the interviews, and just letting you know what
25 they were planning on doing, I wasn't the least bit concerned

1 about nuclear power. It was a new technology. The
2 Government had assured us that it was safe. There were so
3 many safeguards built into these plants that they would be
4 able to detect an accident before any harm could come, and
5 the bottom line was that it was most economical. That
6 our electric bills would be cut in half.

7 And unfortunately -- Murphy's Law says anything
8 that can happen will, and it did. We have seen double
9 in our electric bills back home, and we have seen an
10 accident at Three Mile Island that nobody has ever seen
11 before.

12 At that particular point in time I had ten years
13 involvement in the Newbury Town fire company as many
14 different officers, and when the accident occurred we
15 discovered that we did not have a workable plan for
16 evacuation at the time of the accident.

17 There was a quick couple of meetings put together
18 where some ideas were put down on paper so that when they
19 did call for a general emergency that we could be able to
20 evacuate, and I quote, as many people as quickly as possible.

21 So, once the plan was as best formulated as could
22 be, the next couple of days were pretty hectic. A lot of
23 things were going on that we were scared about. We had a
24 mass exodus out of our community of about at that time ten
25

1 to eleven thousand people. We had people that left their
2 homes and took as many of their belongings with them as they
3 could. Actually left their homes unlocked, and it was up
4 to the people that were left behind to patrol these areas
5 and see if there is anything possible we can do to at least
6 keep down on the looting. There were some national guard
7 called out to close some of the roads down. We don't have
8 to worry about that.

9 And we learned from that experience very greatly
10 that we were not prepared at all, in any way, shape, or
11 form to evacuate any of the people except those who were
12 able to get in their automobiles and get out of there before
13 the mad rush.

14 As Margie touched on the health study, what got
15 me involved in this even more deeper than the emergency
16 planning is the fact that within a mile radius of my home
17 we had thirteen to fifteen people die of cancer within a
18 two to two and a half -- two to three year period after the
19 TMI incident, and only because I have run ambulance for the
20 last ten years, and now for the last fifteen, I took notice
21 of the enormous amount of people that we were transporting
22 for different treatment for their cancer.

23 I started to see husband and wives dying of cancer
24 in the same household, all within this same two to three year
25 period.

1 And that is why I started being really involved
2 in better planning for our township.

3 In September of 1980, I took the position of
4 Emergency Management Director with Fred Sanders as my
5 deputy, and we changed places every once in a while because
6 of time and our college that we are both working on. At
7 the present time I am the Deputy, and Fred is the Director.

8 May I say to you gentlemen that I was appalled
9 on the way up here yesterday, being from a little community
10 that I am from, of the traffic which you folks have to bear
11 every day, and my heart goes out to you.

12 I got to the hotel and the first thing I said to
13 the person was: Is there a convention someplace up yonder
14 here? And she said: No. I said: Where are all these
15 people going? And she said: Oh, this is just normal
16 traffic. Don't go out there in about two hours, you won't
17 go anywhere.

18 And when I looked out my window I just could not
19 believe it. I am not used to it, so this of course is like
20 a mountain to me.

21 And I thought of the fact of having to evacuate,
22 and it just scared the pants right off of me. I am serious.
23 I knew what it was back in the little metropolis of Newbury
24 Town, and we are talking thirteen thousand people where I
25 live now, with all the people that we have to have from

1 Goldsboro, from -- that have to come into our township to
2 hit the main arteries to get out, and I think of now three
3 million some odd people coming down 495. It just really
4 scares me to think think if there would have to be a mass
5 exodus of the problems that you folks are all entailed to
6 accomplish that goal.

7 The naivety of me believing in our Government -- and
8 I still do -- there are problems, of course, in any part
9 of Government, any part of personal life, but I found that
10 maybe I was a little too naive, in that I started looking
11 at a plan that we had a little more prospectively. And I
12 found that our plan calls for eleven school buses to be
13 used to transport the people that don't have transportation.
14 These might be bedridden people, these might be people that
15 cannot walk, people that just don't have any friends, or
16 people to take them.

17 So, it is all in our plan that we had eleven buses
18 guaranteed, set aside for use during an evacuation of
19 Three Mile Island.

20 And I asked a very simple question one day at
21 a meeting, and the question was this: In addition to the
22 buses, do we have any drivers for these buses?

23 And the answer was, no.

24 We have two hospitals in the 20 mile radius of
25 Three Mile Island in our area that we would be responsible

1 for, and it has on there that we have an additional 25
2 ambulances coming in to transport people.

3 I asked again: Do we have drivers for these
4 vehicles?

5 And the answer again was, no.

6 And I want to ask you gentlemen, as prudent human
7 beings, if you got a call from anybody, me, and said look,
8 we have a mass problem here. We are evacuating our area
9 due to an immediate danger at Three Mile Island. All of
10 our people are leaving. Would you drive some buses up into
11 our area and pick up some of our people?

12 That is what it boils down to. I testified before
13 the Nuclear Regulatory Commission about two or three years
14 ago, and the gentlemen started off by asking one question.
15 He said: Mr. Forry, in the case of an all out evacuation,
16 what would be your first priority?

17 And as I stated in the beginning, this is a
18 volunteer position in our township, and it is no excuse for
19 not doing your job right. I am just saying that if that
20 should happen, my first priority in my life is my wife and
21 my two children and my family. And that would be my first
22 priority, to get them out of that area, immediate danger,
23 and then if there be anything possible to do, that I would
24 try to do that.

25 But seeing as though Route 83, the main artery that

1 we are to take is only two lanes south and two lanes north,
2 all the traffic flows are supposed to be diverted south.
3 Okay, both north and southbound lanes.

4 The potassium iodide that we are supposed to get
5 for protection has to come up that route, with all the
6 people heading towards them. It would not be able to get
7 to us unless they flew it in.

8 We are supposed to have X amount of State Police
9 that takes care of major traffic points. In talking with
10 the police, and this I did on my own -- I just went to those
11 people that we have on our list that makes this plan look
12 so well -- and I said: I want to ask you. If you are on
13 duty, or not on duty, and you get a call and say they are
14 evacuating the area, there is an immediate danger, would
15 you come?

16 Their answer was, no.

17 And I cannot hate them for being honest with me
18 in saying that if there is an all out danger that you
19 folks have to get out of there, who is going to come and
20 take our places in that danger zone? And it would be just
21 about each for himself, okay?

22 The main thing I want to get across to you is that
23 of your plan. I have not had a chance to look over your
24 plan. I am not saying that I am a professional at it.
25 All I am saying is that in my six years of continuing to

1 work with this plan, and trying to make it better, we
2 realize more and more that there would be lives lost and
3 there would be more chaos in evacuation itself than we would
4 be able to handle. The little eight people on our Committee
5 would not be able to control thirteen thousand people coming
6 at us, and in no way, shape or form be able to direct them
7 in the right area.

8 The main thing is -- I have two children. One
9 goes to middle school up in New Cumberland, which is north.
10 My other child goes to Newbury. We are supposed to head
11 south. If anybody in their right mind thinks I am going to
12 let my little girl behind, they are crazy. And that is
13 what everybody -- every adult that I have interviewed in
14 our township states that they have their priorities, and
15 that is to get their family together and get out of there
16 as quickly as possible.

17 So, I am asking you gentlemen, in all of your
18 consideration, in all your honesty as public citizens, as
19 public protectors, to look at your plan.

20 MR. PROSPECT: We have already concluded that it
21 can't be done.

22 MR. FORRY: That is what I am saying. And that
23 is what my basis is, that it is almost next to impossible
24 to evacuate this many people in such a short time.

25 During the accident at Three Mile Island, I was

1 appalled to see people fist fighting over gas pumps,
2 because some of the gas stations closed. And there was no
3 all-out evacuation.

4 It was folks, if you would feel more comfortable
5 leaving the area a while, if you have some place to go,
6 throw a couple of belongings in a vehicle and go.

7 And I mean to tell you, it was just utter chaos.
8 We had to pull the ambulance into one place and just break
9 up fights because people were fighting over gas pumps.
10 To get gas to get out of there. And these are the kind of
11 things that we have to realize. That people and their
12 personal feelings, how they react to situations. It is
13 going to be just barbaric.

14 One other final thing. We have tow trucks and
15 bulldozers in our plan to help disobstruct traffic. I
16 went to the tow truck operators and I asked them the same
17 question. Guess what their tow truck is going to do?

18 Their tow truck is going to be sitting right
19 underneath them, and they are going to be pushing cars out
20 of the way to get out of here.

21 And that is being honest. I am telling you, this
22 stuff all looks nice on paper, but it is really scary to
23 think if they would have to get these people out of here.

24 Thank you for your time and your patience.

25 (Applause.)

1 MR. BLASS: Thank you very much. Mrs. Aamodt,
2 did you want to say something?

3 MRS. AAMODT: Steve stayed. His wife stayed.
4 She fed the emergency workers. His wife is not well from
5 having done that.

6 The people in the area will not take any reassurances
7 that everything is all right again. They have looked around.
8 They have counted seven, ten, eleven people have died of
9 cancer, from their window. They can see this. And they
10 have come to the conclusion that they are not going to stay
11 again, no matter what the recommendations are. I think that
12 is pretty much -- they don't believe any recommendations.
13 They will just know there is a problem, and they will go.

14 MR. BLASS: Thank you. We have time maybe for
15 two more speakers, and then we lose our reservation for
16 this facility, so I will leave it to you -- I know Mary
17 Osborn --

18 MRS. AAMODT: Mary has a very important presentation.
19 Jackie was one of our people in our study. I think if she
20 just took a minute and just stayed directly to that rather
21 than reading from the statement that she had. Jackie is
22 right here.

23 MR. BLASS: Ma'am, would you please remain standing
24 and raise your right hand?
25

1 (Whereupon, Mrs. Brockman was sworn by Mr.
2 Blass.)

3 Please be seated, and state your name and your
4 address and your occupation, and you may begin your
5 statement.

6 MRS. BROCKMAN: My name is Jackie Brockman. I
7 live right outside Newbury Town. And I am a homemaker
8 and secretary. And I am here not as an expert witness,
9 but just as representative of your average person who went
10 through this experience and can tell you briefly how that
11 experience impacted our family.

12 I have it written out, and I have never spoken
13 in the public. If you will bear with me for just a few
14 minutes.

15 We lived in the area at the time of the accident.
16 My fiance lived five miles approximately -- I lived
17 approximately five miles from the towers. My fiance lived
18 within three miles from the towers.

19 Wednesday we were not aware that anything was
20 going on. We did not hear anything about the Island. Any
21 problems on the Island. Thursday, when I went to work, my
22 employer said: I didn't think you would be here.

23 And I said why? They said, well there is a problem
24 down there. I said well, it must not be big, or they would
25 have told us. We lived there. I trusted them to tell us

1 if there was a problem.

2 So, I went back home and stayed there.

3 Friday morning, when we had the big problem, I
4 got my daughter up. She stood outside waiting for the
5 school bus that morning. She went to school. Mid-morning
6 the sirens started. I turned on the radio, they were
7 advising pregnant women and five year old children to leave
8 the area.

9 I am supposed to be factual. It is a fact that
10 that is a stomach churning, knee-shaking fear that you get
11 in a time like that. I threw things in the car that I
12 didn't want to leave behind. I tried to use the phone.
13 You can't use your phone at a time like that. The phone
14 doesn't work. The lines are busy. You can't get through
15 at all.

16 I started over to meet my fiance to tell him I
17 was going to get my daughter. He was coming over to meet
18 me. So we met in the road halfway there. He went up to
19 Lemoyne, about nine miles north. I went down, signed a
20 release to get my daughter out of school, along with
21 numerous other parents, and we evacuated at that time. We
22 moved about ten miles north.

23 I stayed there for the whole week following the
24 accident. My daughter stayed there the whole time. She
25 did not go back any closer than ten miles.

1 My fiance and I went down every day to check his
2 business and our homes, and various things like that. We
3 were down every day. We spent time outside checking things
4 out.

5 The day, Friday, of the accident, there was a
6 strong metallic taste. It tasted like you would put an
7 old copper penny on your tongue. And subsequent days
8 when we were outside checking things in the area, we again
9 tasted that metallic taste. We tasted that subsequent
10 times in the next three, four years when we went outside;
11 when they were reporting releases you could taste that,
12 and some days when they were not reporting emissions you
13 could taste that.

14 My fiance was in good health until the Summer of
15 1980 when he began tiring early, catching long heavy colds
16 and chest congestion, and having back pains. He went to
17 see several practitioners over the summer and fall. They
18 diagnosed flu, cold, things like that. The symptoms got
19 worse. He had a subnormal temperature for several months.
20 He had severe night sweats. His back pain got worse. He
21 had cracking and bleeding on his fingers and around his
22 mouth. He had small hemorrhages under the skin inside his
23 mouth.

24 As the fall progressed, he was not able to walk
25 without a cane at times. His back pain was that severe.

1 They said he pulled a muscle, but it got gradually
2 worse, and none of the treatments did anything. In January,
3 he was rarely out of bed. He got an attack so severe in
4 January of 1981, that they took him to the hospital in the
5 ambulance. The same weekend, they took two neighbors who
6 live within half a mile or less to the hospital. Their
7 diagnosis was the same as his; cancer.

8 The doctor, the cancer specialist who took care of
9 him diagnosed multiple myeloma, which he explained to me
10 as a bone cancer involving the bone marrow which manufactures
11 blood cells. He received chemical chemotherapy and radiation
12 which gave him some remission that summer.

13 We were married in the following spring. Then
14 he got worse again. He suffered severe and crippling
15 pain. He was not able to work in his business. He had
16 to make a heartbreaking decision to close his business which
17 he had built up himself. As the disease progressed, the
18 leukemia grew in severity, as did the pain and crippling,
19 necessitating the use of a TENS unit, which is transtaneous
20 electrical nerve stimulation, with strong narcotics for
21 pain. He also had to go to the hospital for sessions on
22 a machine that cleansed his blood of the abnormalities in
23 the blood, and blood transfusions. He progressed from
24 use of a cane to the wheelchair to being bedridden. He
25 died one year and ten months after the diagnosis.

1 He was 51 years of age.

2 During that time, and since then, my daughter who
3 was twelve at the time of the accident has suffered severe
4 sinus attacks, headaches, frequent sore throats, bouts with
5 nausea for days at a time. She sleeps long hours; twelve
6 to fourteen hours at a time, and she is always tired.

7 She has ^{chondra} condyle malesia, which is a painful
8 softening of the kneecaps and joints. She has several
9 friends in our church and in her school who suffer from
10 this same thing. And sclerosis. Both are bone problems.
11 And she had none of these problems, or any sign of them
12 previous to the accident. She has been tested three times
13 in the last year for mononucleosis, with negative results.
14 And the doctors have not been able to find a cause or a
15 diagnosis for these symptoms.

16 However, they -- especially the joint problems --
17 limit her range of activity and her future range of job
18 possibilities, since she cannot work or stand for long
19 periods due to joint pain.

20 I must conclude this by stating that the impact
21 of Three Mile Island and the accident there on the lives
22 of my family and myself, has been overwhelming. Medical
23 expenses that are high, loss of the business, loss of
24 something more precious, our health, and the most precious
25 gift of all, a beloved human life.

1 That is all I have to say.

2 (Applause.)

3 MRS. AAMODT: That is the story of the people.

4 That summarizes it. So many -- the business of the knee -
5 caps of the children, I didn't even know that until now.

6 It is reminiscent of what happened to the animals. They
7 couldn't stand up. They staggered and fell down. And
8 ~~this~~ ^{that} was right after the accident. And that was dismissed
9 as a selenium deficiency.

10 MR. BLASS: Thank you very much. We have time
11 for one more speaker. Whom would you suggest?

12 MRS. AAMODT: I believe Mary has prepared some
13 work on the flora abnormalities that you might be interested
14 in hearing.

15 MR. BLASS: We would like to wind up by maybe
16 two o'clock or shortly thereafter.

17 So, if you will remain standing and raise your
18 right hand, please?

19 (Whereupon, Mary Osborn was sworn by Mr.
20 Blass.)

21 Please be seated. State your name, address, and
22 occupation for the record, and begin your statement.

23 MS. OSBORN: Mary Osborn, Swatara Township. I am
24 a housewife.

25 First, I want to comment on something he said

(29) ~~Referring to Steven Ferry. See Tr. 78, forward.~~
Referring to Legislator Englebright's question, Tr. 55.

Statement of Carl J. Johnson, M.D., M.P.H.
(as a supplement to the statement of the Aamodts to the
to the Nuclear Regulatory Commission on May 22, 1985)

There are oversights and misconceptions in the Nuclear
Regulatory Commission's Memorandum and Order, CLI-85-08
of May 16, 1985, responding to motions made by the Aamodts.

Area household surveys of cancer incidence and mortality
are a more valid approach than the state's use of concentric
circles, when those areas lie in the usual direction of exhaust
plumes from an industrial point source like TMI-1 and TMI-2.

What the NRC characterizes as "anecdotal information"
is the same information that physicians value as medical
history, or that the Bureau of the Census considers to be
vital census data. The information necessary for a valid
cohort study must be obtained from area household surveys,
it cannot be obtained from state cancer registries.

The radiation exposures to the communities around Three
Mile Island began in 1974 with the start-up of TMI-1. This
plant also had serious problems, had a chronically-leaking
PORV, or pressure relief valve, and nearly had the same sort
of meltdown in 1977 that later occurred at TMI-2 in 1979.
The responsibility for the excess cancer deaths in the
communities near Three Mile Island must be shared by both
plants. The same management responsible for the lying, the
cheating, the misrepresentation of the radiation releases
of TMI-2 also operated TMI-1 since 1974, and I believe that
TMI-1 also released large amounts of radioactive gasses and
particulates. This belief is supported by reports of a
chronically-leaking PORV and an aborted meltdown in 1977.

An underlying problem with the nuclear establishment is the reliance on doctrine, which is treated as a matter of religious belief. The doctrinal approach to science was supposed to have been displaced centuries ago by the empirical approach. In this case, if an unusually high incidence or death rate from cancer is observed near two failed nuclear plants, sources of extremely potent carcinogens, we had better believe it, and not strive tortuously to find some spurious but plausible explanation.

If you choose to believe that the time since the TMI-2 accident is not compatible with some of the cancer deaths, simply consider TMI-1, which has also been a very dirty operation, releasing plumes of radioactive gases and particulates since 1974.

The importance of the seven cases of neonatal hypothyroidism in 1979, when only 0.6 cases were expected, has been confirmed by the rates for this condition since, falling sharply in 1980 and 1981, and now down to 1 or 2 cases yearly. The opinions of the State Health Department here is asinine and inexcusable.


The tone of the NRC comments lead me to ask the Commission if their policy on radiation effects research has changed from that outlined in a 1962 Atomic Energy Commission memo addressed to the Commission. "The basic approach to the report would be to start with a simple, straight-forward statement of conclusions. We would thus identify the major questions that could be expected to be asked in connection with these conclusions. It would then be a straightforward matter to select the key

scientific consultants whose opinions should be sought in order to substantiate the validity of the conclusions, or recommend appropriate modifications."

Reference attached documents:

An Internal Memorandum of the Atomic Energy Commission,
September 25, 1962

Remarks, May 21, 1985, Transuranics and the Impact on
Health, Carl J. Johnson, M.D., M.P.H.

A handwritten signature in cursive script that reads "Carl J. Johnson".

Carl J. Johnson, M.D., M.P.H.
42 Hillside Drive
Denver, CO 80215

(303) 232-2328



Please return

SEPT 25, 1962

OFFICIAL USE ONLY -

MEMORANDUM FOR COMMISSIONER HAWORTH
THROUGH DIRECTOR OF REGULATION

SUBJECT: STATUS REPORT ON CURRENT ACTIVITIES OF THE FEDERAL
RADIATION COUNCIL WORKING GROUP

The purpose of this status report is to call to your attention the activities of the Working Group with which I feel you should be acquainted.

Members of the Council were informed by memorandum, on September 20, that the Secretariat of the Council would have to vacate its quarters in the Executive Office Building, by October 1, and move to new quarters at 718 Jackson Place. I inspected the proposed new quarters, along with the other members of the Working Group. It is our unanimous conclusion that these particular quarters are totally inadequate to serve as a base for the Federal Radiation Council, particularly in view of the proposal to develop a permanent professional staff. I, personally, am of the opinion that new quarters should be sought as soon as possible. You may wish to include this problem, along with those of organization and qualifications of personnel, in the Subcommittee that is developing this subject.

The Working Group decided that the only efficient manner in which to proceed on plans for the preparation of the report on the health implications of fallout in relation to radiation protection standards and the applicability of countermeasures, would be to assign a specific member of the Working Group to act as the Project Leader. I was asked to accept this assignment and agreed to do so, subject to the concurrence of Dr. Western, Mr. E. Price and you.

Commissioner Haworth

- 2 -

Commissioner Haworth

- 3 -

The Working Group spent one meeting considering alternative kinds of organization, format and content for the proposed report, I then undertook to write a project outline, submitting alternative ways to approach the report, both in terms of content and in the organization and execution of the study. The draft was reviewed at the last meeting of the Working Group, where it was concluded that the project really had to be divided into two phases.

1. It was agreed that current levels of radiation from fallout were too low to impose a practical problem in public health. It was suggested that the Public Health Service come up with its views as to what levels would correspond to enough of a health risk to justify diversion of resources in order to provide protection. If any reasonable agreement on this subject can be reached among the agencies, the basic approach to the report would be to start with a simple, straightforward statement of conclusions. We would then identify the major questions that could be expected to be asked in connection with these conclusions. It would then be a straightforward matter to select the key scientific consultants whose opinions should be sought in order to substantiate the validity of the conclusions or recommend appropriate modifications.

2. Part two would recognize that all of the radiation protection philosophies which have been developed have dealt primarily with problems inherent in the control of sources, where it is recognized that lack of proper care can readily lead to demonstrable physical injury. It will be suggested by the Working Group, that the Council consider setting up a high level study group to examine this subject and present an advisory report to the Council.

Up until the present time, there has been no serious examination of what general national philosophy regarding radiation exposure matters would be most appropriate, as a basis of policy for the Federal Government. This is a rather deep subject that would require a highly sophisticated examination and could justify about a two-year study by a highly competent group. Depending on the depth and detail in which the questions were to be considered, this study could range anywhere from three months to two years. The three-month study could deal only with broad approaches and criteria, but could probably go no further. The longer study would be expected to be something almost as comprehensive as the recently published report by the United Nations, but with an orientation completely different than either the United Nations report or the corresponding

study in this country, undertaken by the Biological Effects of Atomic Radiation Committee of the National Academy of Sciences. The problem in this case would be to investigate the influence of radiation quantitatively as a causative agent at all levels and rates of exposure in relation to other agents. The fundamental philosophy to which this study would be directed is that radiation protection measures against a source over which one has no control cannot be influenced by a "benefit-risk" concept or a concept such as "no radiation should be accepted unless there is good reason for doing so." Under these conditions, the relevant concept would be that protection measures become justified when the risk of injury from radiation can be expected to start having a practical influence on a person's future life expectancy. Where and how genetic considerations should enter such concepts is not at all clear. Similarly, the philosophy of an appropriate cutoff point based on direct somatic effects, under non-emergency conditions, is also obscure. Better information relevant to these judgments made to be systematically developed.

I am proposing to concentrate on the first approach exclusively until this possibility is either dropped, or is far enough along to justify consideration of the second. Any thoughts which you may have, which would be of assistance to me in this project, would be greatly appreciated.

Paul C. Tompkins, Deputy Director
Division of Radiation Protection Standard

cc: Chairman Seaborg
Commissioner Palfrey
Commissioner Ramsey
Commissioner Wilson
Federal Radiation Council Working Group
A. R. Lewicki, General Manager
D. A. Ink, Assistant General Manager
W. B. McCool, Secretary (2)
C. L. Dunham, Director, Biology & Medicine
H. H. Woodruff, Director, Operational Safety

May 21, 1995

TRANSURANICS AND THE IMPACT ON HEALTH

Carl J. Johnson, MD, MPH*

A typical nuclear reactor like TMI-2 has about 97 tons of uranium 238 and 3 tons of U-235. Although some reactors are also fueled with plutonium, all operating reactors make large amounts of plutonium.

A typical reactor in a year will produce 100,000 to 600,000 curies of alpha-radiation emitting plutonium, 7,000 to 110,000 curies of americium, and 400,000 to over one million curies of curium.

Each curie will exceed the Department of Energy's (DOE) maximum permissible body burden for 24 million nuclear workers, or 2.4 billion people. This DOE exposure standard does not protect workers, however. At Rocky Flats, nuclear workers with less plutonium in their bodies than permitted by DOE had sharply increased rates of chromosome damage, even at only 1% to 10% of the permitted dosage of plutonium.

Put another way, a teaspoon of plutonium 238 would exceed the DOE exposure limit for 40 billion nuclear workers, or 4 trillion people, and even a small fraction of this maximum permissible dosage will cause severe chromosome damage.

There are about 40 transuranics of importance, like plutonium 238, produced in all nuclear reactors. Some are somewhat less toxic, some are more toxic. Plutonium and similar radionuclides occur in all tissues in the body in man, and become a permanent resident in the body. The excretion rate is very slow, about one-half would be excreted every 200 years.

In animals, plutonium causes cancer of the lung, bone, kidney, mammary gland, lymph nodes, mesothelium, and ten types of soft tissue cancer. In one animal study, plutonium caused a cancer rate of 114% with a mean induction period of about one year. Many animals have two different types of cancer.

Excess cancer incidence has been reported in Rocky Flats workers and in the population living downwind in Denver. The children and young adults in Arvada and the area near the plant in 1957, when an explosion blew out the filters at the plant, had a greater than four-fold excess of leukemia in 1969-1971 at the time of the National Cancer Institute's Third National Survey of Cancer Incidence. I estimate that the Rocky Flats exposures will cause more than 12,000 excess cases of leukemia and cancer in the Denver area between 1960 and 1990, and a somewhat greater number will be affected by birth defects and non-specific effects on health. This was the only Federally-supported study of cancer incidence around a Federal nuclear facility.

An Environmental Protection Agency (EPA) report states that a nuclear reactor can routinely release over a million curies of fission products in the exhaust each year. These routine releases include 6.8 curies of neptunium, a transuranic. I asked an EPA regional radiation officer why the release of the other 40 plus transuranics were not reported, and he said "that would not be self-serving to the industry."

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Nuclear fuel, uranium and plutonium, are contained in a reactor in rods. The rods quickly deteriorate under the heavy bombardment of countless neutrons, and the heat and increasing pressure, as these very heavy metals fission into some 1,800 different lighter isotopes, many of them gases. The rods quickly develop more and more leaks, which permit fission products and transuranics to escape. An operating reactor like TMI-2 produces as much fallout fission products and transuranics as the Hiroshima bomb every 4 ~~years~~ hours.

There is evidence that there was a large release of nuclear fuel, of uranium, plutonium, of the 40+ transuranics, along with the release of huge amounts of fission products from the core. At a core temperature of 5,100° F, or 2816° C, all of the nuclear fuel can melt, and many of the transuranics, like americium, will boil, producing large volumes of metal fumes. Iodine boils at 184° C, cesium boils at 678°, polonium at 962°, radium at 1,140°, strontium at 1,384°, and americium at 2,607°.

Contrast a teaspoon of plutonium to the 3 to 11 tons of nuclear material missing from the TMI-2 reactor vessel. I am certain that a large amount of plutonium, curium, and other transuranics have been disseminated offsite.

These releases in the exhaust fumes from TMI would be in the form of metallic fumes and gases, and extremely fine particles of radionuclides. Such exhaust plumes have been called "dry fallout" and are much less likely to be deposited on the ground than "wet fallout" brought down by rain or snow. However, it is very important that a survey of contamination of surface respirable dust be carried out, to a distance of 20 miles at least, around the plant. The survey should look at all of the important isotopes of curium, plutonium, americium, neptunium and uranium.

After the TMI-2 accident, I asked the NRC and the DOE to do such a survey around TMI, using a surface respirable dust method I developed in collaboration with the U.S. Geological Survey that was published in Science. The Department of Energy itself has used and recommended a very similar approach around the Savannah River Plant.

However, the DOE refused to do this survey around TMI. They did soil tests to a depth of 15". This approach guarantees negative results. A later study by the EPA to a depth of 1 centimeter is not much better.

A large lawsuit brought by landowners against Dow, Rockwell and DOE for the contamination of their land with plutonium by Rocky Flats was recently settled in favor of the plaintiffs, based in large part on the sort of evidence I present here. I was the health officer for the county involved in this issue. The federal judge in this case ruled that the plant was guilty of conducting an ultrahazardous operation, according to the reports in local newspapers. Similarly, I believe that both TMI-1 and TMI-2 have been conducting an ultrahazardous operation, and must not be permitted to resume operations.