



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**

In the matter of:

MEETING WITH CITIZEN'S GROUP
ON TMI CLEANUP

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1 CITIZEN GROUP:

- 2 Nancy Prelesnik
- 3 Warren Prelesnik
- 4 Jane Lee
- 5 Dr. Robert Colman
- 6 Rev. William Vastine
- 7 Patricia Smith
- 8 Jordan Cunningham

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P R O C E E D I N G S

11:05 a.m.

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3 CHAIRMAN AHEARNE: The Commission meets this
4 morning to hear from a citizens group on TMI Cleanup. We
5 have received a request from Mrs. Nancy Prelesnik some
6 weeks ago to have such a meeting.

7 Commissioners Kennedy and Hendry, who had already
8 had obligations not to be here today, I think you were told
9 that they were not going to be here. It is an issue that
10 has occupied much of all of the peoples in this room time
11 and not to cut into any further of your time I turn it
12 over to you Mrs. Prelesnik.

13 MRS. PRELESNIK: Thank you very much Chairman
14 Ahearne. Chairman Ahearne, Commissioner Gilinsky and
15 Commissioner Bradford I would like to thank all of you on
16 behalf of ourselves and on behalf of the people from
17 central Pennsylvania for granting us the opportunity to come
18 here and meet with you and to sit at this table.

19 It has been a very difficult year for all of us
20 and I am sure it has been the same for everybody on the
21 Nuclear Regulatory staff as well as Metropolitan Edison
22 and a variety of other organizations as a whole.

23 Throughout this last year, I don't know if you
24 have had a sense of frustration, but I know it has been very
25 apparent to us that we have followed all of your procedures

1 and tried to resolve issues and concerns and they haven't
 2 helped. So the way most of the people feel now is that we
 3 have been backed up against a wall and we really need to
 4 have some direct contact with the men that are making the
 5 decisions who are directly concerning almost every aspect
 6 of our lives.

7 This is why we have requested the meeting with
 8 the Commission. I would hope that this will be a first of
 9 additional meetings, whether they be in relation to before
 10 any particular decision or aspect of the cleanup is involved,
 11 or whether it be because we see a critical situation develop-
 12 ing around our area that we might feel that we could come
 13 to the Commission to discuss the important issues.

14 We just really strongly feel that way. We have
 15 been told many different times and through many different
 16 Government and regulatory documents, that the public health
 17 and safety of the environment has always been a number one
 18 concern. But for most residents it is not clear to us that
 19 that has been carried out.

20 As I understand, the Commission is charged with
 21 regulating and licensing the nuclear industry and also to
 22 protect and serve the public. We don't feel that the public
 23 has been adequately and responsibly served. We feel that the
 24 industry is being served and not the public. The only way
 25 that I can see, I am a registered nurse, the only way that

1 I can see to maybe give you an understanding of where we
2 are is, Chairman Ahearne, Commissioner Gilinsky and Commiss-
3 ioner Bradford, if you were seriously ill or seriously
4 injured and a patient in a hospital you would be totally
5 dependent upon the doctors and nurses and medical profession
6 that were caring for you and this is how we are. We are
7 totally dependent upon you. You do pull a lot of strings
8 as far as the conditions that will be determined in our
9 life.

10 So we don't feel that enough concern and care
11 and honesty has been given us. If you were that patient, if
12 I didn't care, and I am a caring person and I am a caring
13 nurse, but if I didn't care and if I wasn't educated enough
14 or if I was careless in my practice, if I didn't listen to
15 you when you were to tell me about your pain or any other
16 of your concerns it could be very easy for me to not come
17 when you called.

18 If you had a cardiac arrest, if I were five or
19 six minutes late, which would be too late for you. It would
20 be very easy with an overdose situation and we have been
21 receiving a lot of over dosages. A document can be halted,
22 plugs are tripped on or pulled. I am not saying that this
23 happens, but this is how we feel that we are at your mercy
24 and if you were in our position, if you were a patient and
25 at our mercy, I think that you might possibly feel something

1 or see it differently. I guess this is the way we would like
2 to approach this meeting this morning on an informal basis,
3 with all of the cards on the table, with honesty and with
4 everything up front because the processes in the past, whether
5 they be from the Commission, the licensee, the Government,
6 our legislators, the people of central Pennsylvania feel
7 that they have been sold down the tubes by everyone and we
8 feel very isolated and I could go on and on.

9 But none of that is improving the situation that
10 we are all in. It just has to be dealt with. March 28, 1979
11 happened; it happened to everybody in this country and every-
12 body in the world. It effects us more. It effects every
13 aspect of our life everyday and night and it is like a cancer.

14 If it is not accepted exactly for what it is by
15 the business industry in our area, which it is not by the
16 Commission, by the banking industry in this country, by
17 everybody really for what it is and start treating the
18 entire issue and all of its ramifications effectively and
19 efficiently and deal with the reality of the entire scope
20 it is just going to be like a cancer in more ways than one.
21 It will consume us.

22 We just have to start dealing with things in an
23 appropriate manner. This is why we are here. We hope that
24 you will listen to us with open minds and open hearts because
25 we are crying out to you to really listen to us. We do not

1 feel we have really had that opportunity before.

2 CHAIRMAN AHEARNE: We will try, certainly.

3 MRS. PRELESNIK: Thank you very much sir. The first
4 aspect or the first item on our agenda would be the environ-
5 mental impact statement NUREG 0062 going back to the date
6 of the accident.

7 It was apparent that according to Government
8 regulations that an EIS would possibly be required anyway.
9 We feel that the Commission and various Governmental agencies
10 and the bodies that would review this were negligent and not
11 dealing with the environmental impact statement right away
12 instead of waiting for the letter to come out in November
13 and the draft in January. It should have been initiated as
14 soon as the accident happened.

15 And so by summer, parts of either the epicore or
16 the krypton releases could have been dealt with. Appropriate
17 technical equipment could have been put on order and we
18 wouldn't be faced with the position we are in now with the
19 krypton 85.

20 I want to go back to a letter that was sent to
21 The Commission Chairman Ahearne by Al Reneke, I believe the
22 Acting Director OPE, dated April 2nd, factories and decon-
23 tamination of TMI, and I know that this is just a preliminary
24 report because of its state. It says, "preliminary steps
25 in decontamination, decontamination must proceed in a planned

1 orderly fashion with two overriding objectives. It must
2 cost out correctly in Governing and cost out with objective
3 written over it. So these two objectives that are listed
4 as it was originally listed as minimized exposure to workers
5 and public and minimized was crossed out and controlled placed
6 over it.

7 The second objective "was" to obtain information
8 on plant to insure diagnosis of accident can be made, "quote,
9 quote. That comes out even very clear in our mind at this
10 point in time that with minimized being crossed out that
11 there was already -- the public in the area had already
12 dealt with one of its first blows that we clearly weren't
13 going to be in the best concerns.

14 Getting down to the quality of the report itself,
15 a number of our people in our area, a great number of people
16 that reside in central Pennsylvania have read the report
17 and to many of us it does not appear to be extremely profes-
18 sional. I know that there was a push to get it out, that
19 it was completed in approximately nine days and by approx-
20 imately six people onsite and five or six in Washington
21 making interjections which I do feel is not an adequate amount
22 of time and I don't know if it is a lot of people --

23 CHAIRMAN AHEARNE: When report now?

24 MRS. PRELESNIK: NUREG 0062. I know everybody that

25 POOR ORIGINAL

1 is in the Three Mile Island area, whether it is Metropolitan
2 Edison or the NRC, it is not their fault. They are working
3 very hard, the hours are very long, and I think just probably
4 more funding or more engineers onsite should have probably
5 dealt with this report.

6 The reference list was very scanty and there was
7 no appearance in the report at all of any independent study.
8 The cost analysis figure, other than the last one, were all
9 provided by the licensee. I see that as having a minimum
10 of three plus figures; one from the staff; one from the
11 licensee; and at least one independent study author here.

12 The alternative, I do not feel that all of the
13 alternatives are covered. There is a variety of inadequacies
14 as we see it, which I know that there are hearings going on
15 for it that are in the report. And if this is going to be
16 an indication of the further program assessments that will
17 be dealt with for the rest of the cleanup, as the cleanup
18 goes on, each step becomes more difficult and more serious
19 with greater consequences. And if that cleanup is not going
20 to be carried out in a total responsible manner, I hate to
21 think of the consequences.

22 CHAIRMAN AHEARNE: Can I ask you one question?

23 MRS. PRELESNIK: Surely.

24 CHAIRMAN AHEARNE: On the cost we have been, I think,
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1 taking the position that the costs were not really relevant.
2 Do you feel the costs are relevant?

3 MRS. PRELESNIK: Well, our feeling that the cost
4 benefit analysis was one of the determining factors in the
5 report and if the cost is of no concern to you that makes
6 me happy. I would like to know that my life does not have
7 \$1000 figure price tag on it when this country can give vast
8 sums of money for foreign aid and anything else inside of
9 this country and outside, and it can't give an adequate
10 amount of funding to something that concerns a great number
11 of its citizens then something is wrong with the system.

12 One aspect that was not covered as an alternative
13 was encapsulation. I would like Mr. Prelesnik to go over
14 this a bit with you. I do not know how much this has been
15 dealt with at all.

16 MR. PRESLENIK: I would just like to interject some
17 comments in terms of encapsulation. This is -- I would like
18 to quote from an article by Jay Van Vestin. He is a research
19 scientist from IBM and this is from the "IBM Journal of
20 Research and Development," Volume 23, Number 3, May, 1979.

21 "In the course of the development of amorphous
22 material for magnetic bubble memory devices, we have come
23 up on a method for the storage of krypton, xenon and other
24 Noble gases, whether or not radioactive, which seems capable
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1 of containing the radioactive waste from one of these
2 reprocessing plants in just 0.2 cubic meters of material and
3 of retaining it up to temperatures as high as 1070 kelvin."

4 "We estimate the cost of storing the krypton 85
5 by this method as little as under one percent of the storage
6 and the compressed gas cylinders, less than \$.24 million
7 per processing plant." They are talking obviously from the
8 reprocessing plant angle.

9 But I am concerned why this has not been looked
10 into further and deeper in terms of the smaller amounts that
11 we have in the TMI containment at this point in time.

12 COMMISSIONER GILINSKY: What is the date of this
13 article?

14 MR. PRELESNIK: May, 1979.

15 CHAIRMAN AHEARNE: That was Volume 23.

16 MR. PRELESNIK: I will give you a copy of this
17 when we are done. This appears to be a rather stable,
18 straightforward simple mechanism of capturing it. The
19 technology has been developed already.

20 I would like to see someone in your offices or
21 some of your scientists followup with the IBM people and
22 see if this is indeed a viable alternative.

23 CHAIRMAN AHEARNE: Certainly.

24 MRS. PRELESNIK: And this is also one our State
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1 Representatives who was Representative Stephen Reed, who was
2 in to see President Carter yesterday. One of his questions
3 was in regard to governmental funding in relation to the
4 cleanup and in relation to the EIS and I believe that it
5 was approved. I have yet to see the final conditions and
6 arrangements, but for us to have our own independent Govern-
7 ment funded assessment, people and experts that would be deal-
8 ing with the aspects of the cleanup, we just cannot accept
9 the fact that either the licensee or the NRC has the only,
10 and I say again, the only control in relation to this cleanup
11 which controls our lives. It is consuming us.

12 In relation to what he was talking about in the
13 encapsulation, another aspect that is always looked at th-
14 roughout all of the other alternatives in relation to the
15 storage, I know that the full chain takes a while to break-
16 down, but even as far as storage went, and even to me, but
17 I am not an expert, but it would seem to me at least the 10.7
18 that it is past its half life and if it were even stored
19 for 20 years it would still be a great deal less than venting
20 it or approaching it all at once.

21 So, always to be seeing a figure of 100 years and
22 other items, I don't know if that is always the utmost of
23 concern.

24 Also, according to this article, it was addressing
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the issue that the krypton 85 levels were going to be lowered as of January, I believe, of 1983 and for a number of reasons. I say that if they feel it is very important to lower those levels, I find it somewhat incongruent with purging it now.

I do understand the reasons that have been presented for the purge. We know that the plant has not had any maintenance for the last year and that it is a critical situation. We are not unaware of that fact at all.

Can you absolutely assure us that if you do purge that they can be controlled.

CHAIRMAN AHEARNE: If we do vent?

MRS. PRELESNIK: If they do vent can those ventings be absolutely controlled? We have been told that there is really no chance for the accident to happen. We were told that it was an impossibility that you could really have an accident like that; there are too many backup systems. The chances of it are very, very unlikely.

Since the time of the accident, every time that a certain procedure has to be carried out at that plant a number of problems arise and I am not looking at that unrealistically either. I would like to know what the problems that will be dealt with, as far as even the purge and the venting, would be concerned. What insurances do we have

1 that that aspect is not going to have a lot of flaws in it
2 and have a total vent?

3 REV. VASTINE: May I make a comment about that?

4 MRS. PRELESNIK: Sure.

5 REV. VASTINE: You see, gentlemen, even though you
6 had responsibility for the system, and responsibility for
7 the purging, one of the real problems in our area is that
8 we no longer trust, we no longer believe. And I am not sure,
9 sir, and I have respect for your position and so forth, but
10 we are all human beings, therefore, as far as a Quaker is
11 concerned we are on the same level.

12 CHAIRMAN AHEARNE: As far as many people are
13 concerned, I agree.

14 REV. VASTINE: That is not always true, sir. But
15 as far as the people in our area is concerned, I don't know
16 whether you are aware of the response that we are talking
17 about to the environment which means the psychological,
18 et cetera, environment of the Three Mile Island area, even
19 though there was some assurance from you by word, by paper,
20 by some way . Unless there was an independent agency system,
21 what have you, you see the credibility bit has been so
22 shattered in our area , my dear friend you have not a chance
23 in a carload to convince us.

24 See, I am very sorry about that. I would like
25 to believe in America. You know, this bit I would like to

1 believe. I would like very much to believe but there are
2 hundreds and literally thousands of us who don't believe.

3 CHAIRMAN AHEARNE: I understand.

4 REV. VASTINE: Okay? I am not sure that the NRC
5 does, sir. I am not sure the NRC doesn't. As far as my message
6 here. My message, my message here is, that in order to pro-
7 vide the kind of environment, you have heard this a thousand
8 times, but you are going to hear it 1000 more, in order to
9 provide the kind of environment, sir, in which business in
10 Harrisburg can flourish, in which children can live without
11 fear, in which families can have happiness and no psycholog-
12 ical problems and not be all bent out of shape, the greatest
13 contribution you can make, my dear friend, is to close those
14 plants and to assure us in some independent way that we
15 can believe.

16 I am a minister, see. I don't know whether that
17 gives anybody credibility or not, but maybe I am only a
18 little better than a used car salesman, but I am saying to
19 you, friend, that in terms of my measure of where the people
20 are in relationship to the environment and the purge in the
21 reports, hey friend we have had it. We have had it.

22 And the meeting at Middle Town the other night,
23 that is only the beginning. I said to myself as I was driving
24 down here, dare I say this to the Commissioners. Am I out
25

1 of order here? I don't want to be out of order

2 CHAIRMAN AHEARNE: Go ahead.

3 MRS. PRELESNIK: If you don't talk too long.

4 REV. VASTINE: I won't talk too long, but I want
5 to apologize for talking too long because I haven't had the
6 chance to talk to you ever and I probably will not again.

7 I am saying, friend, that you know if there is
8 violence, God help us that there won't be, in the Harrisburg
9 area, if there is eruption of the population there, my
10 dear friend, in terms of the rush of emotion to do something,
11 to do something that is untoward, I say, my dear friend,
12 that it is in your hands.

13 DR. COLMAN: Let me try to pick up here if I can.

14 CHAIRMAN AHEARNE: I think we both perhaps have
15 some roles in that. Go ahead, Doctor.

16 DR. COLMAN: I think perhaps Reverend Vastine
17 is picking up on a point that I wanted to try to emphasize
18 here.

19 The fact that we are here indicates that there
20 is a problem and the fact that we are having to gather our
21 own technical information and present it to you indicates
22 that there is a problem. And the fact that there were so many
23 people as angry as they were in Middle Town on Wednesday and
24 I gather in Elizabeth Town last night indicates that there
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1 is a problem. And I think the problem really is one of
2 distrust, absolute distrust for the variety of authorities
3 who have been hoping to be in control in the matter of
4 TMI; that includes Met. Ed., that includes the NRC.

5 One of the results of that is that we need
6 assurance from independent experts that the new information
7 which we are being fed is, in fact, accurate. And I think
8 increasingly we are capable of drawing our own conclusions
9 once we have the facts in front of us. But I think that what
10 Reverend Vastine was alluding to is, I guess really it is
11 the main point I want to try to make here.

12 We have felt out of control of our own lives in
13 that area ever since the 28th of March last year. Every time
14 we are told that something is about to happen, although which
15 there is no real assurance of our safety, we again feel out
16 of control. Every time we here that there is the most minimal
17 leak, as in yesterday's leak, we feel again that we are out
18 of control.

19 I was at the meeting in Middle Town on Wednesday,
20 just for a short time because I got there late. One of the
21 clearest things that was coming across there was that the
22 people in that area seemed to be sick and tired of listening
23 to or speaking to people from the NRC who are incapable of
24 making decisions there onsite. The clearest message that that
25 group got across, other than its anger, was they want you

1 there. They want you there before any decision is made on
2 venting and want you to make it in full view of the strength
3 of the opinions that are held in that area.

4 I have been tracking sort of the tone of meetings
5 ever since the one in Middle Town that Mr. Gilinsky was at
6 with Congressman Ertle. It was kind of a watershed meeting.
7 It became clear, I think, at that point of the total
8 emotional reaction of people in the area and Mr. Gilinsky
9 gave some indication of hearing that and that heartened us
10 to a degree.

11 I am getting scared. As a psychologist I am getting
12 scared. Those meetings are rowdy. Middle Town is a reasonably
13 rough town as they go. I was on my way over to the Liberty
14 Fire Hall the other night to go to those meetings and I
15 was warned by some high school kids, you don't want to go
16 there mister, this is turning into a heavy scene and they
17 were right.

18 It is monotonic. It just seems going up. And I
19 think unless some mechanism can be developed so the people
20 in that area have a realistic understanding that they are
21 gaining control over the situation there by having a clear
22 effect on the Commission about its decision, that anger
23 level is going to keep on going. Wherever it goes, I don't
24 want to speculate, but it is not healthy, it is not good.
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1 And on top of the kind of the just in general
2 uncertainty that the people are exposed to in that area
3 because we don't know what is going to happen, we don't
4 know if the venting occurs, when, short, long, period. We
5 just don't know and we don't know what to do, do you take
6 your kids out of school, do you not, do you keep your job,
7 do you not, on top of that to feel out of control is just
8 not acceptable to people.

9 That is just something I really want to underline,
10 the intensity factor of our emotional reaction.

11 COMMISSIONER BRADFORD: Do you have any feel for
12 what kind of mechanism would be helpful?

13 MS. LEE: May I respond? The people at Three Mile
14 Island want all of the NRC Commissioners, they want their
15 presence there. They want them to see their faces, the fear,
16 the frustration, the out and out hatred and contempt. I am
17 using strong words, gentlemen, but let me assure you that
18 I am not exaggerating.

19 And I sat in on the meeting at Middle Town and
20 I sat in on the meeting at Elizabeth Town last night. The
21 licensees can tell you, Mr. Arnold was nearly attacked by a
22 teacher. He sprang out of his chair like a wild man, a raging
23 wild man, and he hurled over that stage and it was a very
24 critical point because the police were present to try to
25

1 quell the man and the audience nearly came after the police.
2 We have a very explosive situation. I am using that termin-
3 ology because I want to convey to you these people are very
4 simple people. They do not understand the technology and the
5 complexities of all of the new jargon that many of us have
6 studied for 10 years. It is just now catching up to them.

7 I see mothers with their faces firey red, the tears
8 rolling down their cheeks and they shake both fists at the
9 NRC, at the Department of Environmental Resources and it is
10 truly a very serious situation. This is why we came. We
11 don't want violence. We have violence in that area everybody
12 is going to get hurt. Everyone in this nation is going to
13 be caught up in it because the nuclear power industry itself
14 is extremely controversial and it is growing. You wouldn't
15 believe how this situation has grown since the accident as
16 far as organization is concerned.

17 DR. COLMAN: Can I pick up just a minute on the
18 mechanisms? I think it is an important point. The clearest
19 thing that would be of help would be for the Commissioners
20 to be there in view of the people and give an indication
21 of responsiveness to the concerns of the people.

22 MS. SMITH: All five, I might add.

23 DR. COLMAN: That was just those of us who were
24 at the meeting tried to check out with each other what the
25 message seemed to be, so far as we were able to pick it up,

1 and that was the bottom line; we want you there. We want you
2 there before venting and we want you to know that the fact
3 of any additional plan, the radiation release in that area,
4 would be seen as a threat to people's lives over which they
5 feel they have to have some control.

6 REV. VASTINE: There is another point I would like
7 to make in terms of the mechanism. The Department of Environ-
8 mental Resources of the State has not had enough money in
9 its budget to have the instruments to do monitoring for the
10 people. Only recently, I do not know whether it has been
11 passed yet, the budget for DER on the State level, how do
12 you feed into the State, and Governor Thornburg and his
13 mechanism? I mean actually we are beginning not even to
14 trust the Department of Environmental Resources.

15 CHAIRMAN AHEARNE: Would you trust them if they
16 had some money and did the monitoring?

17 MRS. PRELESNIK: We do not trust our State government
18 at all.

19 REV. VASTINE: Valinsky, what is his name?

20 MRS. PRELESNIK: Jerusky.

21 REV. VASTINE: That is Gilinsky. I am talking about
22 Jerusky. I don't know you sir, but I know Jerusky and I
23 wouldn't trust him with my granddaughter. No. He is an
24 irresponsible -- that is the problem. We need a mechanism on
25

1 the State level that we can trust.

2 CHAIRMAN AHEARNE: That is what I was after before.
3 What kind of mechanism would you trust?

4 DR. COLMAN: We are talking about two kinds of
5 mechanisms. One is, in effect, a political mechanism which
6 shows responsiveness on your part. You are also talking
7 about a technical mechanism, people in the area . I think
8 Ms. Smith's group has probably done more on this. They have
9 been calling for independent monitoring facilities and
10 training in the use of monitoring facilities by the Depart-
11 ment of Health -- I mean Human Resources.

12 MS.SMITH: We want our citizens to do it. We don't
13 want the Department of Health to do it. And our citizens
14 are in the last stage of some classes and they will be
15 requisition monitors supposedly.

16 We only have faith in ourselves at this point.
17 I think, gentlemen, you sit in your ivory towers down here
18 and I think it is like the school teacher who became a
19 principal and forgot what it is like in the classroom. That
20 is why we really beg you to come up, hear the people. We
21 don't know if you really are hearing the situation from
22 your representatives up there. Things have to change.

23 I think it is a pretty sad state of affairs when
24 we pay your salaries and we have to come down here like
25 this. We would like to have the faith.

1 We are very involved citizens and all my neighbors call me.
2 I know how they feel. Each time there is a release some
3 people want to leave. I took my girls out last week for
4 the three days. Why would I take a chance on their health?
5 I have been so careful so far. I took them out March 28th.

6 People say, oh it is just a little bit each time.
7 It is just a little bit. The key word is cumulative.

8 REV. VASTINE: That is right.

9 MS. SMITH: We cannot take a chance on our children's
10 lives. I am pretty young myself. We do not believe when they
11 say just a little bit.

12 MRS. PRELESNIK: We were told just a little bit
13 and the plant was going to be under control in eight hours.

14 MS. SMITH: Then a short time later we will find
15 out well it was a little bit more than we thought, but it
16 was still minute.

17 REV. VASTINE: That is a lot of crap.

18 MS. SMITH: Please don't make us come down here
19 again, you come up to us. We pay your salaries.

20 MS. LEE: May I followup sir, please? Mrs. Prelesnik
21 had said we want to get back on the agenda. We have many
22 things we want to discuss with you and we do not want to get
23 too far off.

24 I would like to make a proposal at this time and
25 to understand there are some discussions in this room that

1 Mr. Arnold, Senior Vice President of Met. Ed. alluded to
2 last night. He did not go into detail.

3 I am not an expert in the field, but I would like
4 to make a proposal and if it is not feasible that is fine.
5 And this proposal is that instead of venting this krypton,
6 if you feel that there is no other technology, there is on
7 other way to go, and if there isn't I would like you to just
8 abbreviate very briefly why there is no other means of doing
9 this other than venting.

10 Let me pursue my suggestion. I was wondering if
11 the NRC has weighed the possibilities of venting all of
12 the 57,000 Curies in one venting, picking and choosing their
13 own little pattern of the line of least resistance and the
14 least resistance with the least populated that would go out
15 to the Atlantic and that would be Southeast over the Chesapeake
16 and at the same time evacuating the entire area?

17 This would be at the expense of the Government.
18 These people no longer have the funds. They used up their
19 savings to evacuate the last time. It would prove valuable
20 in several areas. First of all, we could remove the psycho-
21 logical distress from the people. Also we could prove or
22 disprove the viability, or a viable evacuation plan if it is
23 in place, if it is effective, how long it would take. So I
24 think that we could give a lot of input from this for the
25 future.

1 MRS. PRENESLIK: I would like to go into the value
2 judgements on lives and questions as far as justification
3 and reasoning that go into the ABIS on the alternate methods
4 of dealing with the krypton.

5 It is clear in our minds that with the purge we
6 are receiving, the public, the citizens are receiving the
7 largest dosage. By any of the other methods this is the
8 largest dose that we would be receiving. Who says whose life
9 is more valuable than another's?

10 You are very concerned in the report about worker
11 exposure. We are very concerned too. But they do make that
12 choice of working there; we don't. So in many aspects, under
13 the present concept, they are very concerned about the worker
14 exposure. They are concerned about an accident with the
15 container in transit. They are concerned about a population
16 in another area if there were to be an accident with a
17 containerized object. They are concerned about those lives
18 and those exposures, yet they are not concerned about our
19 lives and our exposures. What kind of a value judgement is
20 that? Where is the justice in this decision. It is incon-
21 gruent in the report.

22 CHAIRMAN AHEARNE: I think that what they are
23 trying to do is to find out what are the potential radiation
24 exposures to all of the people the various groups would
25

1 be addressing. We could at least try to examine, in making
2 any choice, and any decision that we would at least be able
3 to understand what other people are put at risk by that
4 decision.

5 DR. COLMAN: It does seem likely, unfortunately
6 to people in the area though, that what appears to be the
7 most likely choice is the one which is certain to expose the
8 general population to a radiological risk. Whereas some of
9 the other methods have a likelihood that it could occur
10 for containment to be brief.

11 MRS. PRELESNIK: Another item I think has been
12 slightly touched on before is purging in the summer. Child-
13 ren would have a chance then to leave, to be taken out of
14 school. And the way it stands right now, in many of the
15 communities, according to the regulations from the school
16 districts, you take your children out for more than three
17 days you are in violation and you can be fined.

18 These little bodies don't have a chance of resp-
19 onding to you or anything.

20 MS. SMITH: I want to add, we did check and some
21 of the people in our area didn't evacuate last March 28th
22 through the 30th because of financial reasons. We don't
23 want that to happen again.

24 MRS. PRELESNIK: There are many people that will
25 be leaving if you purge and they don't have any funds. Who

1 is going to pay them, and when is the payment going to be
2 made?

3 MS. SMITH: May I say at this point what happens
4 too with the people leaving the area. Many homes are for
5 sale already in the Newbury Township. What happens to the
6 morale of the people, then the economy of the Township, the
7 County up to this date? It starts snowballing. And I think
8 these are all of the more concerns you have to deal with.

9 MRS. PRELESNIK: These things we are dealing with
10 right now in relation to the krypton releases. There are
11 going to be further procedures down the line on the cleanup
12 and a lot of them even more serious than this. This just
13 has to be dealt with right now. It should have been dealt
14 with before. But it is only going to get worse, whether it
15 be in an economic respect or a dosage respect, a trust in
16 the Government, the psychological impacts on the people, I
17 mean it just has to be dealt with.

18 I think we will go on to the next area which is
19 really in relation to health effects and environmental
20 effects and all of that. Ms. Lee will start out with that.

21 MS. LEE: Gentlemen, I am an Assistant Manager
22 on a dairy farm that is Federally and State inspected. It
23 is 3.5 miles from the Island. 159 acres and there is approx-
24 imately right now 60 head that includes the calves, the
25

1 heifers and the milk cows. We have about 30 cats, we have
2 two dogs, 14 ducks and four goats. I am going to abbreviate
3 this and I brought a report along of what I have logged
4 over the years.

5 And it is interesting to note that the health
6 effects that have transpired did not begin after the
7 accident, they began in 1976.

8 I also have a deposition signed by our local
9 vet who has already testified. You may want to request
10 the testimony that the veterinarian gave to the Public
11 Utility Commission in Commonwealth of Pennsylvania.

12 I am going to run down very briefly what we have
13 encountered because we do not have the time to go into all
14 of it.

15 CHAIRMAN AHEARNE: You are going to leave a report?

16 MS. LEE: I want to leave the report with you. Yes
17 sir. We have quite a bit of information that you will want
18 to go over that we brought with us.

19 Before I do that I would like reveal that the
20 most recent Heidelberg reports states -- the report now
21 reveals that the actual dosage from a normal operating
22 nuclear power plant may be 10 to 1000 times higher than
23 five milirems. The only reason I am quoting that particular
24 rate, sir, is because we are beginning to encounter a great
25 many problems with the animals, not just on our farm, but in

1 The whole five mile radius, radius of Three Mile Island. Those
2 problems are multiple fractures, water logged bones, which
3 were determined through autopsies, lack of muscle stability
4 and coordination, blindness, increases in arthritis, Hodgskins
5 Disease, miscarriages, stillborns, abortions, Cesearians
6 due to lack of dilation even though hormones were administered
7 to stimulate dilation and delivery, breeding, an increase in
8 breeding problems, failure for animals to come into heat,
9 prolonged periods of heat or not at all, respiratory problems
10 ensuing in death.

11 We had a specific incident in the Hershey area
12 500 exotic birds died all at one time, this was located
13 approximately 15 to 20 miles from the plant, on May 2, 1979
14 Natural circulation at the plant began on April the 28th.
15 And autopsy on some of the birds revealed violent, painful
16 and rapid death with internal hemorrhaging and cerebral
17 complications.

18 Those animals that I am alluding to in my report
19 are: rabbits, guinea pigs, horses, cows, sheep, goats,
20 ducks, geese, chickens, pigs, dogs, cats, and the cats
21 are especially vulnerable. So are rabbits. The smaller the
22 animal the greater the rate of reproduction, the more we
23 are encountering the problems.

24 It is a concern of the veterinarian, Robert Weber,
25 who is Mechanicsburg and we have tried to bring attention

1 to this. And the Department of Agriculture promised Dr.
2 Weber that they would come in with a \$300,000 environmental
3 study which has not come forth.

4 The disappearance of wildlife, in August following
5 the accident, we had a wide and very heavy defoliation of
6 the trees within a 10 mile radius of TMI, we took a tour,
7 we took the pictures, disappearance of birds following the
8 accident and when the farmers went to the field to plow there
9 was no sign of any birds.

10 York County is notorious for the starlings that
11 come by the hundreds of thousands, like locust, every year.
12 In fact, they were a very severe problem to the farmers and
13 they never showed up that summer at all.

14 We didn't see any finches. We saw one robin. And
15 there were no bluejays. The entire system down there is
16 being affected by something.

17 Now, gentlemen, I am not prepared to say what it
18 is. I am not an expert. But there is something wrong in that
19 area and it is happening within nature itself, within the
20 environment. And the problem is that the animals are going
21 to reveal the situation first because they live in the
22 environment, they feed from the environment, but it is
23 eventually going to filter down to us and effect our lives,
24 our health, and I think it is long past due that we do an
25

1 indepth study and do an environmental impact. And I don't
2 know if they made you aware or not. Sometimes I think that
3 the message does not get through down here that the hyperthy-
4 roidism in our area now, in several counties, is now five
5 times the national level and this is a huge increase just
6 since the accident.

7 We have some serious problems and people are
8 running scared and I think we need some input. We need some
9 real cooperation from the Commissioners themselves which
10 you are certainly among.

11 MS. SMITH: I just want to add that Dr. Weber
12 the veterinarian did testify for me at the P.U.C. since I
13 am an intervener and he has all of these problems documented.
14 He did request the Department of Agriculture, the State
15 of or district of Pennsylvania to come in and do a study.
16 They have not. They do not cooperate. And I guess that is
17 another reason why we are here.

18 MRS. PRELESNIK: We have no trust in any of our
19 State Departments, including the Governor and the Lieutenant
20 Governor.

21 MS. LEE: I might add that we asked for an
22 appointment with the Governor. We wanted to speak to him
23 personally, just as we did you, and we got no cooperation
24 in that vein.

25 MRS. PRELESNIK: Also the Lieutenant Governor. We

1 were refused meetings with both of them.

2 MS. LEE: That is correct.

3 MRS. PRELESNIK: Going on to the next item on
4 the agenda, the evacuation. It has been one year since the
5 accident and there are still no final drafts or plans. They
6 are still in a draft stage. Some areas have not done any
7 planning at all. The planning that has been done has not
8 been done on a regional basis. There has been little inter-
9 facing being done.

10 In most areas it has either been down on a township,
11 or a city or a county level with very little interacting
12 amongst the entire region or from one county to another.

13 A lot of over duplication of services that keep
14 becoming apparent, I mean there is not only probably a lot
15 of flaws in the plans, but I mean they are not even ready
16 yet. Those plans should have been in existence, really, even
17 before the accident happened. They will be beneficial for
18 other reasons; chemical problems.

19 So I am not saying that the plans aren't good or
20 that they shouldn't be there, but they should have been done
21 even by early summer of 1979. We were still in a critical
22 condition at that plant. And at times it borders to date
23 and will in the future. We are lucky that we didn't have
24 to have an evacuation sometime the last half of 1979. We
25 would not be any better off than we were on March 28, 1979.

1 We still aren't today.

2 No plan has ever been tried yet, and even if these
3 plans were carried out and perfect, we seriously doubt and
4 I believe that so does the NRC, I think you know that and
5 so does the Government. If there is a melt and a breach of
6 containment that there is no evacuation plan or evacuation
7 that can really be carried out. It is impossible.

8 REV. VASTINE: If I may illustrate the confusion.
9 I live in New Cumberland, nine miles from the plant. We
10 had a meeting in New Cumberland about two or three weeks
11 ago in which we had the Director of Civil Defense speak to
12 our community .

13 He illustrated the confusion by telling us this:
14 that in order to evacuate New Cumberland people he is going
15 to have to send us not in a direction away from the plant,
16 but in order to get on to the Pennsylvania Turnpike he is
17 going to have to send us toward the plant.

18 Secondly, not only that, but he learned that the
19 York County Civil Defense, and he just happened to learn
20 this by hearsay, not by the report, that the York people
21 were going to be sent -- what is that route that goes down
22 to Baltimore?

23 DR. COLMAN: Eighty three.

24 REV. VASTINE: Up 83 to the Turnpike and everybody
25 would have been jamming to get on the Turnpike at the west

1 exit of the Turnpike.

2 I am simply illustrating, sir, about the report
3 of a Civil Defense person in Cumberland County that the plans
4 are confused and in a sense unfair because they do not take
5 into account the movement of the elderly and the poor and,
6 as far as Harrisburg is concerned, the blacks.

7 We are very greatly concerned that the plans for
8 evacuation are inadequate and have not been clear from the
9 State level. The fact of the matter is that it is my under-
10 standing that there is no relationship between the State
11 Civil Defense authorities and the county authorities. There
12 is no authority, no relationship, no real clearing there.
13 I think it is a very, very, unfortunate way to assure us.

14 MS. SMITH: I want to add one thing with regard
15 to that. The state of affairs with many of my neighbors, they
16 have sat down and worked with their own individual families
17 where the husband is at work, the wife will be home, the
18 children in school, they have worked out their own meeting
19 place, be it a hunting lodge, another state with relatives,
20 and they will decide 24 to 48 hours later that is where
21 they will meet.

22 In America this is the way they must live around
23 Three Mile Island.

24 MRS. PRELESNIK: We feel like hostages. We feel
25 like hostages. They are very concerned about the hostages in

1 fran and nobody is concerned about us at all. And when we
2 evacuated during the accident, I thought I could empathize
3 with what a refugee might feel like. I never thought I would
4 feel like a refugee in my own country under peacetime. It
5 is inconceivable.

6 REV. VASTINE: That is another aspect to the problem
7 in Harrisburg. It was expressed by a mother at our New
8 Cumberland meeting. She works in the city; her children go
9 to school on the west shore. And the other is we want to
10 be assured that the time that is given in terms of the
11 alert to go home to do this or do that is adequate for a
12 mother or a father who is working in the city to be able to
13 go and get his child. This is not spelled out anywhere.

14 MS. SMITH: A mother would never leave without
15 her children, just wouldn't leave.

16 MS. LEE: Sir, I would like to get back on to the
17 agenda. There is some effort on the part of Lieutenant
18 Governor Scranton to try to consolidate something on the
19 State level with military personnel or military men in a
20 retirement stage or who have some background in civil defense
21 to bring all of these counties together and formulate some
22 kind of a constructive evacuation plan.

23 The thing that bothers me about this is that the
24 military are going to become involved and many of the things
25

1 that are personal that we do not want to reveal or discuss
2 with the Commissioners, but rather with our Governor, really
3 give me a great deal of difficulty as far as the way that
4 this situation is going to be handled. But even greater than
5 that is the strong suspicions of a mass decontamination of
6 people with complete disrobement, shaving, mass showers,
7 confined encampments.

8 This may seem ludicrous on the surface, but I
9 think in reality, when we are talking about radioactive
10 contamination, this is exactly what we are going to have
11 to deal with, the total dehumanizing process. And also
12 the procedures for cordoning off areas where there is great
13 contamination and there are people in there who have to be
14 locked in because they have been contaminated. These are
15 real fears. I think they are genuine and I think we have to
16 deal with them.

17 And I would like also for the Commissioners
18 perhaps to come up with something that can reassure the
19 public, and I don't really know if you can do this because
20 if there were a melt down at Three Mile Island or any
21 nuclear power plant in close proximity to a large populated
22 area you are not going to have any choice. This is the
23 procedure that is going to have to be used.

24 We found that some of the Civil Defense program is
25

1 now classified and is not even in our hands. At the present
2 time York County has no Civil Defense program. In fact, the
3 most recent brochure that I received from the NRC on responses
4 was that York County is self evacuation. That is what they
5 are relying on; self evacuation.

6 MRS. PRELESNIK: I would like to get back on the
7 schedule so that we can wind up in time. In regards to the
8 evacuation and the suspicions that Mrs. Lee was listing, we
9 have arrived at this logically and one can accept that, but
10 why can't the Government, why can't the NRC tell the public
11 that that is exactly the situation that it involves? Why
12 can't they tell them all of the risks?

13 We have never been told before and we are still
14 not now being told everything. We have to dig and pull
15 everything out. Why can't everything be laid out on the
16 table. We know why, but when is it going to happen? When
17 is the Government or the NRC finally going to say it like
18 it is?

19 To finish up I would like to go over some of the
20 requests that we have. In brief, one of them is to request,
21 I know that you are not in control of this, but for any
22 legislative aides that might be present, we seriously do
23 need Governmental funding in a variety of ways. The economic
24 base will be hit eventually in different ways and at
25 different times, and we do need some economic support. We

1 also need more health programs as far as environmental
2 studies go. I should say health and environmental studies
3 which would be Government funded.

4 Also it has been alluded to in the staff report
5 on the cleanup, the Heller Report, that eventually the
6 Government is going to have to start picking up the tab on
7 the cleanup.

8 Most people in the area don't have very many fond
9 feelings for Met. Ed. but -- so I don't care which way you
10 want to work it out or which way the Congress wants to work
11 it out, but I hate to have my life or my family, or friends,
12 jeopardized because of a dollar figure. And I don't know
13 why the Government is dragging their feet on getting into
14 it. They are going to have to get into it sooner or later.
15 I mean, it is a fact that is basically known and I wish the
16 people would start working that out now.

17 Also in relation to the NRC's backgrounds, could
18 I please ask one of you gentlemen to tell me what your
19 backgrounds are and also of Mr. Hendrie's and Mr. Kennedy's
20 who is not here, your degrees, you know, in brief, you are
21 a physicist or, you know --

22 CHAIRMAN AHEARNE: A physicist.

23 MRS. PRELESNIK: And Mr. Gilinsky?

24 COMMISSIONER GILINSKY: I, as Mr. Ahearne, have
25 degrees in engineering and physics.

1 MRS. PRELESNIK: Engineering and physics, basically
2 science. Mr. Bradford?

3 COMMISSIONER BRADFORD: A law degree.

4 MRS. PRELESNIK: And Mr. Hendrie is a nuclear
5 engineer?

6 CHAIRMAN AHEARNE: He is a physicist.

7 MRS. PRELESNIK: Physicist also. And Mr. Kennedy
8 is a --

9 CHAIRMAN AHEARNE: I don't know what his degree --

10 COMMISSIONER BRADFORD: Business Administration, I
11 think.

12 CHAIRMAN AHEARNE: All of us are probably colored
13 more by our experiences at this stage over the years.

14 MRS. PRELESNIK: This is what I was going to say.
15 That for a Commission or a Board that has to make judgements
16 and decisions that reach into various aspects of our lives
17 and the country as a whole, I mean the nuclear industry, and
18 has a great deal of control over the economic stability of
19 this country and the world, why aren't there two people in
20 health related fields on this Commission?

21 Why, to balance it off, then have two technical
22 or scientific experts? How about an environmentalist? I
23 don't see that the adequate that I know that you weight --
24 I know that you have staff and I know that you have consult-
25 ants, but it just seems that the votes come down to the

1 Commissioners themselves. It seems there should be more
2 of a scale and a balance, more equality on the Board or
3 the Commission.

4 Another thing I would like to ask is, we wish --

5 CHAIRMAN AHEARNE: We, of course, do not control
6 that process.

7 MS. SMITH: They are all appointments, aren't they?

8 MRS. PRELESNIK: I know that they are appointments.

9 MS. SMITH: You talk to Carter.

10 COMMISSIONER GILINSKY: I understand.

11 MRS. PRELESNIK: We are speaking --

12 COMMISSIONER GILINSKY: The Commissioners are
13 appointed by the President and approved by the Senate.

14 MRS. PRELESNIK: We are speaking for the Government,
15 for all branches.

16 CHAIRMAN AHEARNE: I understand, yes.

17 MRS. PRELESNIK: The other thing that was asked,
18 we have all -- it has been of utmost concern to all of us,
19 especially since the accident, and it was brought forth at
20 a hearing on the draft of the EIS in Middle Town in February,
21 we all really want to know exactly, honestly, honestly, what
22 we have received from the accident and to date a cumulative
23 dose.

24 MS. SMITH: Or if they don't know it, admit it.

25 MRS. PRELESNIK: The other things that we were told

1 at that meeting that are those figures, that they do have
2 those cums. They say we have them. They would supply them
3 and given them to us. We haven't heard from them yet. We
4 would like to know what those cums are. We would like to
5 know what our dosages are, that would even give us something
6 to go with in relation to the releases of the krypton or
7 any part along the cleanup process.

8 CHAIRMAN AHEARNE: You certainly should have this
9 and I don't see why you don't. But if I get to one of the
10 points that both you -- that all of you made, particularly
11 the Reverend, would you believe them?

12 MR. PRELESNIK: It would give us something to chew
13 on, more than we have right now.

14 MRS. PRELESNIK: That is going to help. The other
15 thing that I would like to bring up today, and so far the
16 figures that we have been told or received basically come
17 from EPA, FDA, NRC, Met. Ed., I mean as far as our dosages
18 go, DER, I don't know if you gentlemen are familiar with the
19 NRC's gross under estimation of the radioactive releases
20 and population dose during the TMI accident. This is a report
21 prepared by Seo, S-e-o, Takeshi, T-a-ke-s-h-i, from Kyoto
22 University Nuclear Reactor Laboratory in Japan.

23 They were over in this country. They took mud
24 samples, water, air --
25

CHAIRMAN AHEARNE: I know.

MRS. PRELESNIK: They took your figures, Met. Ed. figures and ran them through a computer and came up with a report on the situation.

We are not experts and cannot evaluate this. But according to this report I would just like to quote one paragraph.

"The value of 0.05 is considered to be about the average. Then from the very beginning the 37 NRC TLD's had been set up, the dose of 770/0.05 for 15,400 person rems would be acquired for the first three days to this figure of 15,400 the 770 for the next six days is added and the total of 16,200 person rems is consequently estimated to be the collective dose for the period of March 31st through April 6th. Although the above calculation is an estimation which ignores factors such as the possible changes in meteorological conditions, there is evidence that the actual dose would be probably far greater since 37 dosimeters can hardly be considered sufficient in number."

We really want a dosage. I would like to know how many. I don't really believe we received millirems. I want to know how many rems we received.

MS. SMITH: I would like to add to that. Could my neighbor be more vulnerable than me?

CHAIRMAN AHEARNED: Yes.

perhaps we will be finished. I would like one more question.

I called President Carter this morning because we were going to be here and also because of the way the situation is deteriorating and we are fearful of some kind of a riot or some kind of real trouble up there. I don't know if you can do this or not, but I think it is imperative that we at least convey, and very briefly we do not want to know essentially this, all we want is a couple of minutes, 20 minutes at the most, to talk with the President.

We were asked -- we were wondering if you called the President if he would take a couple of minutes to speak to us. We felt that we were here, we felt that this situation is so critical right now, there are so many people up there, you have no idea, they are ready to go right over the edge.

The people that you are talking to here today have grasped this knowledge over a long range of time. Therefore, we are not as unstable. But if something isn't done, President Carter is going to be very, very embarrassed. We want to avoid the violence and we need to make him aware of how serious the situation is.

If he won't see us, all right. We can't force him. But we are the people of this nation and I think the people have to be considered first. Everything else, and that includes anything on foreign policy, this nation comes

1 first, governed under a Constitution unfortunately, we feel,
2 has deteriorated very much. And we would like very much to
3 prevail upon you to do this for us and let us know just
4 as soon as possible. We want to see him today before we leave.
5 Thank you.

6 MRS. PRELESNIK: I would just like to make a couple
7 of comments in closing. I realize we have run over by about
8 six minutes.

9 CHAIRMAN AHEARNE: That is no problem.

10 MRS. PRELESNIK: I wanted again to thank you very
11 much for allowing us to come to Washington and to speak
12 directly to you. And, again, we need to have contact with
13 you gentlemen because you do have a great deal of control
14 over our lives.

15 I just hope that you really heard, with an open
16 mind and your heart, what we have said to you today. Thank
17 you.

18 COMMISSIONER BRADFORD: Let me just ask another
19 variant of the question I asked before. If you had adequate
20 funding, what kind of mechanism would you set up for your-
21 selves, leaving aside the question that you yourselves would
22 believe in, leaving aside the question as to whether we
23 would come and I am prepared to committing to do that at
24 some point.

25 DR. COLMAN: The people in the area have been trying

1 to develop some way to put together a resource center of
2 expertise relating to this issue. And I think that if you
3 could talk to the organized groups in the area about the
4 mechanisms they have in mind, it would be relatively easy
5 to plug in funded expertise.

6 They are so kind of emergent right now. We have
7 proposals out right now. I hesitate to talk about them in
8 any great detail, but we are trying to draw together the
9 ideas from all of the groups in the area and put them into
10 some centralized package.

11 If you would like to get in touch with us more
12 informally, I mean out of a hearing kind of setting, you
13 know, we can give leads and so forth.

14 CHAIRMAN AHEARNE: That is important.

15 DR. COLMAN: We would like to pass that on.

16 CHAIRMAN AHEARNE: The sense that I get is that
17 certainly with good reason that you want to restore the
18 center of control over your own lives.

19 DR. COLMAN: That is right.

20 MS. SMITH: Will you deal with us directly rather
21 than Mr. Collins? Is that possible?

22 CHAIRMAN AHEARNE: What is the problem with Mr.
23 Collins?

24 MS. LEE: Credibility.

25 CHAIRMAN AHEARNE: I think, as the Reverend has

1 already pointed out, none of us have credibility.

2 DR. COLMAN: But the simple fact is that you people
3 do make the final decisions and I think just the fact that
4 it does matter to the people in the area.

5 REV. VASTINE: It is not that you can't restore
6 credibility, sir, you know today can be a new beginning in
7 terms of restoring credibility. Yes sir, you can restore
8 credibility by helping us respond in dealing with the people,
9 not Mr. Collins but with the people.

10 MR. PRELESNIK: I think the buck has to stop
11 someplace.

12 MRS. PRELESNIK: And I know it gets around between
13 Congress, the White House, and this Commission. And no one
14 really wants to accept that buck.

15 CHAIRMAN AHEARNE: We certainly have the responsib-
16 ility to approve or disapprove the actions that have to go
17 on. So the buck, in that sense, does stop.

18 MS. LEE: Mr. Ahearne, I think what we are talking
19 about here is a citizens group that can act as a buifer
20 between the Commission and the citizens so that this does
21 not deteriorate into something far worse and that it gets
22 out of control.

23 We don't want that. We don't want to see our
24 community torn apart. We do not want to see violence.
25

1 MRS. PRELESNIK: The other thing is in relation to
2 your asking. Sometimes when I was hearing things from Mr.
3 Bradford, and I am not saying this in a negative way because
4 you have been good to us, I think, was is that sometimes
5 I get these bandaid approaches coming out like, you know,
6 what can we do that is going to do it. I don't know that there
7 is any one thing that is really going to do it.

8 Yes, we could use some citizens monitoring and
9 citizens advisory groups that could have government funding
10 for experts independent of the Government. But, on the
11 other hand, it is going to take the actions on behalf of
12 the Board that is going to restore that back to the people.

13 When they feel that you are really acting in
14 their better behalf, that is what is really going to count.

15 MR. PRELESNIK: The old axiom of actions being
16 louder than words probably has a lot to say for it in this
17 case.

18 DR. COLMAN: Again, come to Harrisburg. I cannot
19 underline it more thoroughly. Come to Harrisburg.

20 MS. LEE: One final point. If you decide to have
21 a citizens committee, we don't want the appointments made
22 by any politicians or any bureaucratic offices. We can
23 submit a list of names that I feel perhaps will meet with
24 the approval of most of the people in the TMT area who feel
25

1 that their best interests are being served. We don't want
2 any appointments coming from the Governor, from Washington,
3 or from anyplace else. The credibility is gone. We now feel
4 that we have to get in control of our own lives and I would
5 appreciate anything that you could do in that area.

6 MS. SMITH: When can we hear from you?

7 CHAIRMAN AHEARNE: Obviously as soon as I can discuss
8 it with five of us.

9 MS. SMITH: Within a week?

10 CHAIRMAN AHEARNE: We have five people. If I could
11 get to that particular question with a citizens advisory --
12 we shouldn't be saying who it is. It is an awkward question
13 to ask. But to what extent do you believe that you do
14 represent then all of the concerned citizens?

15 MS. SMITH: Have the faith, we do.

16 MRS. PRELESNIK: If you were to be present, you know,
17 you would see .

18 CHAIRMAN AHEARNE: You are comfortable that you
19 essentially do represent --

20 MS. SMITH: Yes.

21 MRS. PRELESNIK: There is a cross section in any
22 community as there is anyplace. There are professionals,
23 educated people, uneducated farmers, a variety of people
24 across this cross section. There are people in every segment
25 that are either informed or uninformed.

1 You can speak with many professionals, whether they
2 be physicians or what have you. And if you are going to
3 start to talk to them and find out what they really know,
4 actually they don't know. So I am not just talking about--
5 the same is true of the business community or any community.
6 There are people that are in all segments.

7 There is also a great number of people that the
8 total enormity of this problem and the situation is so they
9 cannot deal with it. Their defense mechanisms are up, the
10 denial, they just want to lead their lives the way they
11 did before. They want to do everything in that respect that
12 they can. They stick their head in the sand. They just
13 hopelessly go on trying to maintain anything they can that
14 was true of their normal past lifestyle. And so not every-
15 body comes to meetings, whether they be public or otherwise.

16 But if you were to come and see these people --

17 DR. COLMAN: I think you will find that we are a
18 little bit more polite.

19 MS. LEE: I don't think we answered your question
20 quite adequately, when you said do we represent the people
21 in the area. What we did was, we went to many of the groups
22 that were organized and we spoke to them and we we told
23 them what we planned to do and we were coming down here
24 and they were all agreeable. Yes, that was very necessary.

25 I had a woman put her head on my shoulder last night

1 and cried, and she said, "Oh God, Jane, please, please, do
2 something to help us." I said, I am only one person. I said,
3 we will do all we can when we come down here.

4 Now what I am saying is yes, I think that this
5 was needed. I think that it was constructive. I think that
6 the Board must be commended for the way that they have
7 listened. I don't know what your response is going to be,
8 but you certainly have listened. There has been a lot of
9 input.

10 I think we are voicing the concerns and the fears
11 of the vast majority of those people; not the business
12 community because the business community has not come to
13 grips with this. And I don't even want to get into the
14 ramifications of that. We are concerned about these people
15 who are on the verge of cracking up mentally. And I think
16 we have presented to you what the situation is and I think
17 that we are representing the majority of the people in that
18 area.

19 MRS. PRELESNIK: Just one final question. Someone
20 here proposed something about calling the President, and I
21 don't know if we got an answer.

22 CHAIRMAN AHEARNE: I can certainly relay the message.
23 I do not have much success in reaching the President myself.
24 I gather that you had -- Mr. Reed I think talked to the
25

1 President yesterday on behalf --

2 MRS. PRELESNIK: Yes. He spoke to the President
3 yesterday.

4 CHAIRMAN AHEARNE: That is a lot closer than I
5 manage to get.

6 DR. COLMAN: Will you try?

7 CHAIRMAN AHEARNE: I will try.

8 DR. COLMAN: Thank you.

9 CHAIRMAN AHEARNE: Thank you.

10 MS. LEE: How much time do we have if you do call?

11 CHAIRMAN AHEARNE: Ms. Lee, my honest belief is
12 that I will send a message, but Mr. Reed talked to him
13 yesterday.

14 MS. LEE: Mr. Reed is a politician. We are citizens.
15 We pay the taxes.

16 CHAIRMAN AHEARNE: The impression I got , I thought
17 he went on your behalf. I am sorry.

18 MS. LEE: No.

19 MS. SMITH: No. He doesn't represent my district.

20 MS. LEE: Nor my district.

21 REV. VASTINE: Or mine.

22 MRS. PRELESNIK: He spoke -- I don't know of every-
23 thing that he spoke. I am sure that he spoke on behalf of
24 some of the citizens of Pennsylvania and in general and did
25

1 get the approval apparently on some funding, but that is
2 not the only issues.

3 MR. PRELESNIK: His contact was very positive and
4 we appreciate that. But we want to have our own contact to
5 tell him what the people feel, not the politicians.

6 CHAIRMAN AHEARNE: I will try as soon as everything
7 is over. That is all I can do.

8 MS. LEE: We appreciate that, whatever you can do.

9 MRS. PRELESNIK: We thank you again very much for
10 everything. We thank you very much for this meeting today.

11 CHAIRMAN AHEARNE: Thank you.

12 MRS. PRELESNIK: Also I would like to know if there
13 is any press? I just want to make a note before any press
14 leaves today that we have something for them, so please
15 don't leave.

16 CHAIRMAN AHEARNE: Mr. Prelesnik, you were going
17 to give me at least a reference.

18 (Whereupon, at 12:17 p.m., the meeting was
19 adjourned.)
20
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12:20 p.m.

CHAIRMAN AHEARNE: We also received a request from the general public to have 10 minutes at the completion of this morning's meeting. So, Mr. Arnold, you have 10 minutes.

STATEMENT OF ROBERT C. ARNOLD
SENIOR VICE PRESIDENT
METROPOLITAN EDISON COMPANY

MR. ARNOLD: Thank you, Mr. Chairman. My name is Robert C. Arnold. I am the Senior Vice President of the Metropolitan Edison Company and responsible for all activities at Three Mile Island.

I appreciate the opportunity to say a couple of remarks at this time and I will probably not even require my full 10 minutes.

I would like to express the Company's awareness and appreciation of the concern that has existed in the area of Three Mile Island. We do not in any way question that it is a substantial concern on the part of some of the citizens with regard to some of the activities associated with the cleanup.

I think also it is quite clear that the Company's ability to disseminate the information and have that information listened and accepted at face value is not the case with many members of the surrounding community. We are pledged to a completely open approach on our activities

1 there. And we will continue to try to do our best to make
2 available to the public, in a timely way, information that
3 concerns Three Mile Island.

4 I think that it is important and desirable to
5 find additional mechanisms by which the events at Three
6 Mile Island and the judgements that are being made regarding
7 the potential impact on public health and safety should
8 be found. And I think that we, within the general Public
9 Utilities system, will certainly cooperate and support
10 any efforts along those lines.

11 I would just note very briefly that what I have
12 encountered and the interactions that I have had with the
13 public, and I think I also see in the comments that were
14 made here today, is the need for the explanation to the
15 people in the area of Three Mile Island as to what the
16 bases are for being able to proceed with cleanup activities
17 with proper regard for public health and safety, without
18 having to achieve a zero release situation.

19 I think it is quite clear from the reaction that
20 we have had in the community it there is no acceptance on
21 the part of many of them that any releases from the plant
22 at all, anything that is other than zero, is absent of
23 significant enough risk that they need not worry about or
24 perhaps saying it a little better, that there is a perception
25

1 that if there is any release from the plant then there is
2 enough risk associated with that release that they should
3 worry.

4 And while we are dedicated to keeping the releases
5 just as low as we can achieve, the cleanup cannot be carried
6 out without some releases. Their potential impact on public
7 health and safety of these releases needs to be explained
8 to the people in the community. The basis to the judgements
9 as to which levels are acceptable needs to be provided and
10 they need to be provided by somebody that clearly has more
11 credibility in that type of task than the Company has.

12 And I would urge the Commission to look for the
13 mechanisms that would provide that kind of education to the
14 public in the vicinity of Three Mile Island.

15 CHAIRMAN AHEARNE: Thank you, Mr. Arnold.

16 (Whereupon, at 12:23 p.m. the meeting was adjourned.)
17
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U.S. NUCLEAR REGULATORY MEETING
March 21, 1980

I. Introduction - 5 min.

- A. Thank them for meeting, hope for open lines of communication with the Commission.
- B. Reasons for coming, increase frustration after one year. Need direct contact with those making final decisions.
- C. Public Health & Safety - No. 1 priority
Comparison NRC with Medicine/Nursing
How much would you want me to care?
- D. Irreversibility of March 28, 1979. Like a cancer.
Must accept it, treat it effectively and learn to deal with the reality.
We are the figures in your experiment and on going accident.
- E. We sincerely hope you will be able to hear us today with an open mind and heart.

II. Environmental Impact Statement - Nureg 0662

- A. Past - accident, orders in summer, Epicore II
- B. Present - Kr. 85
 - 1. Quality of report, time spent
 - 2. Encapsulation
 - 3. Should never have been need to purge if had been handled correctly.
 - 4. Absolute assurance that purge can be controlled?
 - 5. Value judgement on lives--who's more valuable--question justification and reasoning.
 - 6. Vent over S.E. Cheseapeake Bay.
- C. Future - Is this an example of what to expect for more critical procedures in clean up

III. Health Effects

- A. Animal reports
- B. Hypothyroidisim - 5 times national average.
- C. Disruption of our daily lives, increase stress levels, abandoned by our government, hopelessness, depression, anger, fear, hostility, distrust, attention spar, sleeping problems, lack of desire to do enjoyable things, discord in families, lost controll of our lives, no ability to plan for future short range and long range.

Yesterday's leak--each time a problem at plant, increase adrenalin levels, flight syndrome, can't be good for our health.
- D. Physical

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OFFICE OF THE SECRETARY
D.C.

RECEIVED

IV. Evacuation - One year later-no final plans

- A. Poor interfacement with surrounding areas, over duplication.
- B. Even if plans were perfect, given a melt it would be impossible to evacuate.
- C. Strong suspicions of mass decontamination, with complete disrobement, shaving, mass showers, confined encampments. Total dehumanizing process. Procedures for cording off areas possible defoliation.

V. Request

- A. Increased study into long range health effects of low level radiation.
- B. NRC - Background - Ask individuals
Suggest 2 health related fields
 2 technical - scientific
 1 environmentalist
- C. Citizen Committee with timely funding
- D. What have we really received to date and what are we honestly likely to receive from the purging? Still no answer.
 - 1. Japanese report

VI. Conclusion

...RC'S GROSS UNDERESTIMATION OF THE RADIOACTIVE RELEASES
AND POPULATION DOSES DURING THE TMI-2 ACCIDENT

by Seo Takeshi

Kyoto University Nuclear Reactor Laboratory

POPULATION DOSE ESTIMATES

Direction	Distance (Miles)									
	0-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50
N	1	1	1	1	1	1	1	1	1	1
NE	1	1	1	1	1	1	1	1	1	1
E	1	1	1	1	1	1	1	1	1	1
SE	1	1	1	1	1	1	1	1	1	1
S	1	1	1	1	1	1	1	1	1	1
SW	1	1	1	1	1	1	1	1	1	1
W	1	1	1	1	1	1	1	1	1	1
NW	1	1	1	1	1	1	1	1	1	1

Table 1

Location of 20 TLD stations deployed by the utility, showing that there are no data at all for most of the 160 sectors (10 different distance divisions in the 16 directions). Estimates of the collective dose and quantity of released radioactivity based on this poor data cannot be accurate and should be considerably under the actual level.

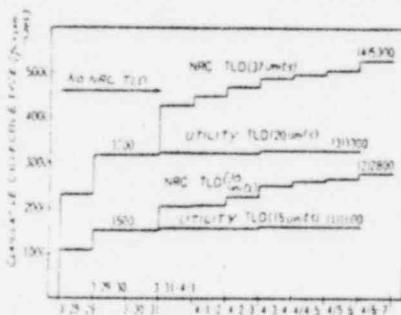


Figure 1

Estimates of the collective dose made by the ad hoc committee. The collective doses are significantly underestimated when TLDs are fewer in number. Moreover, there are no NRC data for the first 3 days of the accident. By correcting these deficiencies, the collective dose should be estimated to be at least as high as 16,200 person rems.

Here, four different sets of cumulative doses are shown:

- (1) 1,600 person rems based on 15 TLDs deployed within the 8 mile-radius by the utility;
- (2) 2,800 person rems based on 30 NRC TLDs in the same sectors as above;
- (3) 3,300 person rems based on 20 TLDs of the utility;
- (4) 5,300 person rems based on all the 37 NRC TLDs.

These differences clearly indicate that the number of dosimeters affects the dose estimation. It has been pointed out that the background radiation for the NRC dosimeters was evaluated at too low a level,³¹ and that the data for the first day, the period of March 31-April 1, is not reliable because of the poor maintenance of TLDs.³¹ It would be reasonable to suppose that the background level was underestimated by 40 person rems per day. Consequently, the cumulative dose for the period of March 31 through April 6 is 460 person rems for the 30 NRC TLDs within the 8 mile-radius, and 770 person rems for all the 37 NRC dosimeters.

$$\begin{array}{r}
 2,800 \text{ person rems} \quad \text{NRC TLDs (30 units)} \\
 - 2,100 \quad \quad \quad \text{NRC TLDs on March 31st (30 units)} \\
 \hline
 700 \\
 - 240 \quad \quad \quad (40 \text{ person rems} \times 6 \text{ days}) \\
 \hline
 460 \text{ person rems} \\
 \\
 5,300 \text{ person rems} \quad \text{NRC TLDs (37 units)} \\
 - 3,290 \quad \quad \quad \text{NRC TLDs on March 31st (37 units)} \\
 \hline
 1,010 \\
 - 240 \quad \quad \quad (40 \text{ person rems} \times 6 \text{ days}) \\
 \hline
 770 \text{ person rems}
 \end{array}$$

As a result, the collective dose for the whole period based on the 30 NRC dosimeters is approximately 2,000 person rems, and 4,000 person rems for all the 37 NRC dosimeters, by adding 460 and 770 to the two different sets of doses recorded by the utility for the first three days.

Based on these figures, the dose for the first three days when NRC dosimeters were not being used should be estimated as follows: The ratio of the dose received by 15 TLDs of the utility for the period of March 31 through April 6 and that for March 28 through 31 is

$$\frac{1600 - 1500}{1500} = 0.07.$$

And as the 20 utility TLDs are concerned, it is

$$\frac{3300 - 3200}{3200} = 0.03.$$

The value of 0.05 is considered to be about the average. Then, if from the very beginning the 37 NRC TLDs had been set up, the dose of

$$770 / 0.05 = 15,400 \text{ person rems}$$

would be acquired for the first three days. To this figure of 15,400, the dose of 770 for the next 6 days is added and the total of 16,200 person rems is consequently estimated to be the collective dose for the period of March 31 through April 6.

Although the above calculation is an estimation which ignores factors such as the possible changes in meteorological conditions, there is evidence that the actual dose could probably be far greater since 37 dosimeters can hardly be considered sufficient in number.

NOBLE GAS RELEASES

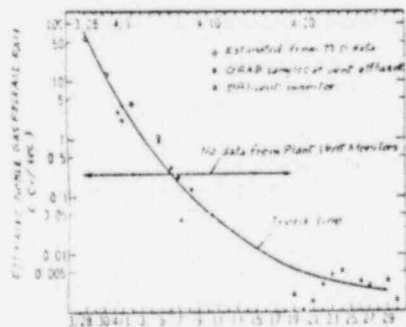


Figure 2

Estimated noble gas release rate by the utility.¹⁾ The earliest two values based on data from the TLDs are underestimated as to be less than one fourth the actual level.

Evaluating the released amount of radioactive noble gases solely on the bases of this uncorrected TLD data, combined with the available meteorological information, cannot but result in an underestimation of the released levels. The final conclusion by NRC (NUREG-0600)⁵⁾ adopts their own preliminary estimation made in their July report⁴⁾ of 1.0×10^7 Ci for the total amount of the noble gas releases. This July report presents a sequence of the noble gas releases (see Figure 2) tabulated after a detailed calculation with a computer system. However, such detailed and precise calculations cannot correct an extensive loss of actual, basic data.

As already shown, the collective dose for the period of March 28 through April 6 should, by correcting the apparent technical deficiencies, be estimated at around 16,200 person rems, while NRC provides the figure of 3,500 person rems for the same period.⁷⁾ Here, the value of

$$3,500 / 16,200 = 0.22$$

should be adopted to correct the final estimation made by NRC of the amount of

noble gas releases. Thus, instead of 1.0×10^7 Ci (or 9×10^7 Ci in terms of Xe-133) should be the estimate for the amount of noble gases released.

IODINE RELEASES

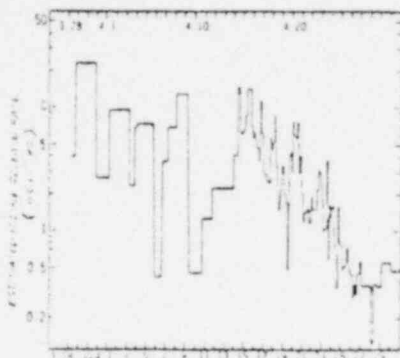


Figure 3

Radioactive iodine release rate based on TMI-2 vent monitors (charcoal cartridges).²³

It is clear that during the first two weeks the time intervals between cartridge changings were significantly longer than the following weeks. This indicates that for the first two weeks there should be a major underestimation in the iodine releases. The actual iodine quantity released during those two weeks may have been over several hundredfold of the level estimated by NRC.

It is clear that during the period before April 14 the average sampling intervals were seven to eight times longer than those during the period after April 14. Also it should be noted that after the sampling intervals became shorter, the declining gradient of the release rate was at a higher level by several tenfolds from that for the period between March 29 and April 14.

The Japanese Atomic Energy Commission's second report on the TMI-2 accident states that this sudden rising of the monitored iodine release is due to the filter change one between April 12 and April 20.²¹ If this were the case, however, the effect of the replacement of filters would appear in peaks rather than in the overall increased level as shown in Figure 3. Moreover, according to the NRC staff report published in June, those cartridge changings were done not during April 12-20 but on April 20, 24-25, and May 23-24.²²

Therefore, it seems reasonable, instead, to explain this strange behavior of the monitored iodine releases as follows: For the first two weeks the charcoal cartridges were changed only every day or every two days because there existed a real danger that workers replacing the cartridges would be exposed to extremely high levels of radiation. This period was the most critical phase of the plant's status with an extremely high iodine concentration in the ventilation system. There also existed unusual amount of aqueous vapor. Under those conditions the absorbent capacity of the cartridges must have been rapidly minimized, resulting in the unusually low level of iodine concentration as shown in Figure 3. NRC and the utility did not make any corrections on those values recorded from the vent monitors in their estimates of the actual iodine releases. This is inexcusable.

Figure 2 and 3 indicate that on April 20 the approximate quantity of released iodine and noble gases were $1.4 \mu\text{Ci/sec}$ and $4,700 \mu\text{Ci/sec}$ respectively. The ratio of iodine to noble gases is

$$1 / 3,400.$$

The reason for obtaining the ratio from the time period of April 20 is that the noble gas radiation monitors in the plant ventilation exhaust which went off scale at a very early stage had been recovered by then so that direct measurement of noble gas release were available, and that the time intervals between charcoal cartridge changings were short enough to provide relatively reliable data. Then, if we assume that the ratio of iodine to noble gases was relatively constant, we can estimate the

iodine/noble gas ratio for the period right after the beginning of the accident to be around

$$1 / 8,800$$

by taking the different half-lives of iodine and noble gases into account.

As the total amount of released noble gases is at least 4.5×10^7 Ci, the total released iodine should be estimated to be over 5,100 Ci.

However, the above assumption of constant ratio between iodine and noble gases demands some discussion. First, iodine concentration in the effluent air depends on the temperature of the liquids. During the early stages of the accident the temperature is expected to have been considerably high so that the ratio would be much greater. For example, Table II-3-3 of NUREG 0600 provides the ratio of 1 / 700 for the time period a little before 7:00a.m. March 28. Also on page II-3-20 of the same report it states that the major release of noble gases began around 7:00a.m. March 28 and that a few hours later the major iodine release started. Thus, it is very probable that after these few hours the ratio was much greater than 1 / 700 which corresponds to the quantity of 64,000Ci. It is also reported that even during routine operation these iodine filters had been used at TMI-2,¹² and there seems to be no reason to negate the value of 1 / 700.

Consequently, even the most conservative calculation would estimate the total iodine quantity released during the accident to be 5,100Ci. There remain reasons to expect that the released iodine quantity was far greater than 64,000Ci as indicated above.

Among the survey data in a task group report to the presidential commission,¹³ there are some fragmentary data to challenge NRC's unconvincing estimation of released iodine. For example, (1) 1.2×10^{-8} μ Ci/cc of airborne I-131 concentration recorded at 2:27p.m., March 28 in Middletown (2.6 miles, north), and (2) 9.6×10^{-6} μ Ci/cc during 4:00-6:00p.m. at an off-site location, are hundreds or a thousand times larger than the values expected from the assumed release rate (several ten μ Ci/sec) on which NRC's estimation of the total iodine release (14Ci) was based.

Also, Lake Barrett reported the rate of 40 μ Ci/sec of iodine release at TMI-1 vent stack (6:00a.m., March 29)¹⁴ Now, according to the July report,¹⁵ the rate at TMI-2 vent stack was approximately a hundred times greater than TMI-1. This leads us to estimate that radioactive iodine was released into the atmosphere at the rate of 4mCi/sec from TMI-2 at that time of the accident. This value is approximately two hundred times greater than the quantity shown in Figure 3.

(Excerpts from the author's review published in Nuclear Engineering Vol.26,no.3)

1) Ad Hoc Population Dose Assessment Group (L. Battist et al.), "Population Dose and Health Impact of the Accident at the Three Mile Island Nuclear Station" (A preliminary assessment for the period March 18 through April 7, 1979), May 19 (1979).

12) Ibid.

13) J. A. Auxier, C. D. Berger, C. M. Eisenbauer, T. F. Gezell, A. R. Jones and M. L. Maxierman, "Report of the Task Group on Health Physics and Dosimetry to President's Commission on the Accident at Three Mile Island", Oct. 31 (1979).

14) "Second Interim Report on the Three Mile Island Nuclear Station Unit-2 (TMI-2) Accident", Metropolitan Edison Company, June 15 (1979).

15) Office of Inspection and Enforcement, Nuclear Regulatory Commission, "Investigation into the March 15, 1979, Three Mile Island Accident" NUREG-0600, Aug. (1979).

16) "Assessment of Off-site Radiation Doses from the Three Mile Island Unit-2 Accident", July 11 (1979).

17) "Assessment of Off-site Radiation Levels from the Three Mile Island Unit-2 Accident", op. cit.

18) "Second Interim Report on the Three Mile Island Nuclear Station Unit-2 Accident", op. cit.

19) "Assessment of Off-site Radiation Levels from the Three Mile Island Unit-2 Accident", op. cit.

20) J. T. Collins, W. D. Travers and K. R. Bellamy, "Report on Preliminary Radioactive Airborne Release and Charcoal Efficiency Data - Three Mile Island Unit-2", June (1979).

21) W. M. Bland, "Technical Staff Analysis Report on Iodine Filter Performance to President's Commission on the Accident at Three Mile Island", Oct. 11 (1979).

22) J. A. Auxier, op. cit.

23) L. H. Barrett, NRC memo unpublished, Mar. 30 (1979).

24) "Assessment of Off-site Radiation Levels from the Three Mile Island Unit-2 Accident", op. cit.

POOR ORIGINAL

Irwin D.J. Bross, Ph.D.
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No opinions here expressed should be construed as reflecting official positions of the administration of
Roswell Park Memorial Institute or of the N.Y. State Health Department.

February 28, 1980

President Jimmy Carter
White House
1600 Pennsylvania Avenue
Washington, D.C. 20500

Dear Mr. President:

Although there is little chance that you will see or hear about this letter, it contains an urgent warning concerning the health and safety of hundreds of thousands of Americans who live downwind or downstream from Three Mile Island.

According to the news reports, the Presidential Commission has recommended venting the radioactive gases at TMI into the atmosphere. This is said to be necessary to get the clean-up started. It is also said that by venting very slowly, the hazards from the gases will be minimal.

The latter statement sounds plausible and statements like this have been made for 25 years, but it is flatly contradicted by the scientific evidence on low-level radiation hazards that is available in 1980 (A). No matter what the rate of venting may be, the total radioactivity vented is the same. What is now clear (see the attached report that summarizes the new findings on this question) is that the amount of genetic damage in the exposed population will be maximized by slow release over an extended period. A brief non-technical scientific explanation for this is appended (B).

The assertion that this venting is necessary is also a serious technical error that derives from the mind-set of federal regulators, not from the technical evidence. There is a technical option which would not require any venting of radioactivity into the atmosphere. It is called "entombment" and with this option all of the radioactivity presently in the containment would remain in the containment. It could not be a danger to the health and safety of persons living in the general area of Three Mile Island. The basic idea of entombment is simply to immobilize the radioactivity in the air and water or elsewhere in the entombment in concrete. In effect, the containment would be partially filled up with concrete by remote-controlled processes.

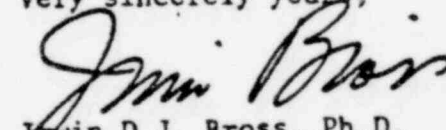
The NRC will not consider this option because the current regulations require a plant to be in good operating condition when it is entombed. TMI is obviously not in such condition. An exchange of letters between NRC and myself (C) is enclosed. It may sound incredible that a federal regulatory agency should take the position that the radioactivity should be vented, dumped into the river, or trucked out, and the health and safety of hundreds of thousands of persons endangered before it is willing to consider the entombment option. Read the letters for yourself and you can see why the Commission was misinformed.

Let me stress that this letter concerns a public health question and that "pro-nuke" vs. "anti-nuke" issues are irrelevant here. The NRC regulation makes sense in ordinary circumstances but not in the TMI accident situation. Entombment is a major option here which should be seriously considered on its own merits and should not be ruled out by fiat.

In terms of costs, it is by far the most economical option. This is true whether the costs are measured in dollars, energy, workers' lives, or residents' lives. I believe it is the only practical option and that it will be the eventual choice. Hence, before an irreversible step such as venting into the atmosphere is taken, a step that is clearly unnecessary with entombment, this option should at least get careful consideration.

I urge you to instruct the Presidential Commission to reconsider its recommendation and to prohibit venting until they have at least taken the trouble to consider the new evidence on low-level radiation hazards. As can be seen from the Abstract for my new report (which is based on an invited lecture given last October in Heidelberg at the Cancer Center), the proposed venting will maximize the risks of cancer and other manifestations of genetic damage to the persons living downwind from TMI.

Very sincerely yours,


Irwin D.J. Bross, Ph.D.
Director of Biostatistics

IDJB/mak

- Attachments: (A) A 1980 Reassessment of the Health Hazards of Low-Level Radiation Hazards.
(B) Why the Cancer Risk-per-Rad is Maximized at Low Doses.
(C) Correspondence with NRC

POOR ORIGINAL

Abstract

A decade ago the risks of leukemia from exposures to low levels of ionizing radiation were estimated by linear extrapolation from data on persons exposed to much higher levels. In recent years, however, a number of scientific studies have reported excess risks where the data was on persons actually exposed to low-level radiation. The new findings are incompatible with the estimates based on the Linear Hypothesis although these estimates continue to be used in public health. Fifteen studies involving low-level nuclear radiation and ten studies involving diagnostic radiation are listed and briefly described. Most of these studies have positive qualitative findings but a few also have quantitative estimates of risk such as doubling doses. The qualitative findings would be extremely unlikely at the estimated exposure levels (which represent average exposures well under 5 rads or rems) if the extrapolative estimate of over 100 rads of the Federal Interagency Task Force Report were correct. The quantitative estimates from the data on persons exposed to low-level radiation give doubling doses in the vicinity of 5 rads and are also incompatible with the extrapolative estimates. The failure of the Linear Hypothesis to fit the new facts seems to reflect a greater efficiency-per-rad in producing genetic damage for the low-dose range than for the high-dose range.

WHY THE CANCER RISK-PER-RAD IS MAXIMIZED AT LOW DOSES

While at first it might seem surprising that the risk of cancer and other manifestations of genetic damage will be greater on a per-rad basis for low doses extended over a long period of time than for high doses given in a short period, there is now little scientific question that this is actually the case.

This means that the proposed venting of radioactive gases from the Three Mile Island containment in small amounts over a longer period of time is not any safer for those living in the TMI area than an accidental loss of containment of the same amount of radiation. Spreading out a given total dose minimizes the short-term biological effects but actually maximizes the much more serious long-term effects which involve genetic damage.

There is a simple scientific explanation of why the effects are maximized by repeated low-dose exposures. We now know that the immediate cause of radiation-induced cancers is the production of a break-point or damage to the complex biochemical structure of the DNA of human genetic material. As Dr. B.N. Ames recently reported in Science, 204(4393):587-593, 1979:

"Damage to DNA appears to be the major cause of most cancers and genetic birth defects, and it may contribute to aging and heart disease."

There are two steps in the causation of cancer. First, the production of the break-point by the ionizing radiation. Second, the reproduction of this misinformation by cloning of the damaged cell. The misinformation must be reproduced many millions of times before the effects can be seen clinically. This is why low-level radiation effects are subtle and occur many years after the actual exposure.

At low levels of ionizing radiation it is unlikely that there will be a single break point produced in a given cell and extremely unlikely that there will be more than one. However, at high levels of radiation two or more break-points may occur. This heavier damage is likely to be "wasted" for the production of cancer since it may block the reproduction of the damaged cell. In effect, the cancer is caused and cured at the same time.

Because the break-points produced at high doses are "wasted" so far as the production of cancer is concerned, the risk of cancer on a per-rad basis is less at high doses than at low doses. This is not a theoretical point because in the data from the Rochester epidemic of breast cancer produced by high doses of x-ray given for post-partum mastitis this can be seen from the dosage-response curve (JNCI, 60(4): 727-728, 1978). My invited lecture at Heidelberg cites more than 20 scientific reports that support this finding on efficiency of genetic damage per rad.

Hence, the proposed venting of radioactive gases at TMI will not be safe and will actually result in the maximum risk of genetic damage and cancer for the population downwind from the containment.

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Roswell Park Memorial Institute
666 Elm Street
Buffalo, N.Y. 14263

No opinions here expressed should be construed as reflecting official positions of the administration of
Roswell Park Memorial Institute or of the N.Y. State Health Department.

February 1, 1980

Richard H. Vollmer, Director
Three Mile Island Support
United States
Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Dr. Vollmer:

Thank you for your letter of January 18, 1980, commenting on the entombment option for the damaged installation at Three Mile Island and enclosing a notice of intent for an environmental impact statement dated 21 November 1979.

I can't believe that you mean what your letter says, so I will try to continue this dialogue. For one thing, what you say seems to contradict the last paragraph of the notice.

As I read you, you say in effect: We have rules and regulations that an installation must be neat and tidy before we would permit entombment. To follow these rules we will have to take the radioactivity now in the containment (where it is not harming anyone) and vent it into the atmosphere or dump it into the river (where it will be a serious hazard to the health and safety of the public). We are going to put workers into the containment (where the radioactivity will still be at dangerously high levels after dumping) to tidy things up so that we can, in the end, decide what to do (and probably end up entombing the whole thing). In other words, we are determined to go by the book even if this means we end up with the same concrete mausoleum and, in the process, we waste hundreds of millions of dollars and kill or harm the workers and the citizens of at least three states.

I can't believe it.

The Three Mile Island accident did not go "by the book" and NRC and DOE and everyone else have got to consider solutions which are not in the book. I take your point about heat generation. However, this simply means that there must be a self-contained cooling system (e.g. a piping system) in the concrete for this purpose. As a child in the early 1930's at Boulder Dam, I saw this technology (which is really a part of the process of putting in the concrete). True, there may

Richard H. Vollmer
February 1, 1980
Page 2

have to be additional heat-exchangers here to get the concrete to set properly, but apart from the current NRC regulations (which I hope can be modified to save a few hundred lives) there is no reason to remove the fuel rods. Entombment would be ample protection against this immobilized radioactivity.

My basic points are:

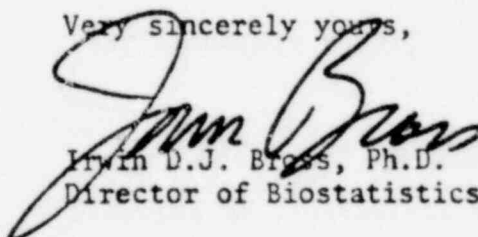
(1) As long as the radioactivity is immobilized in concrete inside the containment it won't hurt anyone. On the other hand, if it is dumped it will vitiate the whole point of the expensive containment and will produce an environmental disaster.

(2) The entombment can be done remote--by machines and not men. Hence, the system can be put in place without serious exposure to workers and at a fraction of the cost of "going by the book".

(3) This NRC offhand dismissal of what should have been the first option considered hardly indicates that clean-up would be "done consistently with the public health and safety, and with awareness of the choices ahead". Instead it shows a "regulatory mentality" which is determined to "go by the book" when the book needs to be rewritten.

From DOE I would expect this (see my enclosed Draft Environmental Impact Statement for the West Valley clean-up). I was hoping for more from NRC. I did, at least, get a coherent and organized statement from you (which I probably wouldn't have received from DOE) so there is at least a basis for dialogue. What I would like to hear from you is that NRC would consider and at least get a preliminary feasibility study on the entombment option (even if it means changing some regulations). I believe Congress would help you if new laws are needed for the changes.

Very sincerely yours,



Irwin D.J. Brass, Ph.D.
Director of Biostatistics

IDJB/mak
Enc.

Irwin D.J. Bross, Ph.D.
Director of Biostatistics
Roswell Park Memorial Institute
666 Elm Street
Buffalo, N.Y. 14263

No opinions here expressed should be construed as reflecting official positions of the administration of
Roswell Park Memorial Institute or of the N.Y. State Health Department.

To the Editor:

President Carter has given the go-ahead (as of April 8, 1980) for dumping substantial amounts of radioactivity into the air and water around Three Mile Island as part of a "clean-up" operation.

This dumping of radioactivity into the environment could eventually cause as many as 5000 deaths and serious illnesses among persons (especially children) downwind or downstream in Pennsylvania, Maryland, and other states.

This should raise serious questions about the competence of the Nuclear Regulatory Commission with its pro-industry bias to make decisions affecting the public health and safety.

How do we know that, despite "official assurances" to the contrary, there will be disastrous health effects from the deliberate and unnecessary dumping of radioactivity at Three Mile Island? The answer is that some 25 years ago a similar decision with similar assurances was made in order to get on with Big Smoky and other weapons tests. Now many servicemen at the tests and civilians in Utah downwind from them have died, are dying, or are very sick from these officially "harmless" levels of radiation.

Why have the federal agencies learned nothing from this terrible experience? The answer is that the cover-up which started in 1955 is still in effect and the information is suppressed. For example, the 1979 Federal Interagency Report cites more than a dozen new studies (including ours) which have found serious health hazards among persons actually exposed to low-level radiation (including Big Smoky). The Report then proceeds to denigrate and dismiss the scientific evidence which contradicts official policy.

Why is it official policy to cover up the hazards? The 1979 Report was specifically produced to deal with the compensation to the veterans at the nuclear tests. The Carter Administration, determined to go into the 1980 election with a "balanced budget", wanted to deny the billions of dollars in compensation to the victims of the tests. Hence the "scientific" basis for the NRC decision is a document that was rigged to maintain the doctrine that the radiation was "harmless". Hence Three Mile Island will be a rerun of Big Smoky.

What can be done to prevent 5000 new radiation casualties in 1980? As the U.N. vote on Israel shows, the President will reconsider a decision if there is political fallout to himself. If you let him know that dumping the radioactivity at Three Mile Island will not win your vote, you might help to save these radiation victims from their politically determined fate.

Very sincerely yours,

Irwin D.J. Bross, Ph.D.
Director of Biostatistics

IDJB/mak

P.S. This letter has been written so that if there are space limitations, paragraphs can be successfully eliminated starting from the last paragraph and going backwards.

P.P.S. Possibly you have not received the enclosed press release on our latest study of the effects of low-level radiation exposures of parents on the risk of leukemia and other diseases in their children. It makes an important scientific point about cumulation of genetic damage for the first time (in humans).

POOR ORIGINAL



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

JAN 21 1980

Irwin D. J. Bross, Jr., Ph.D.
Director of Biostatistics
Roswell Park Memorial Institute
666 Elm Street
Buffalo, New York 14263

JAN 21 REC'D

Dear Dr. Bross:

I am writing in response to your letters of August 16 and October 4, 1979, to Dr. Parsont regarding your concerns about Three Mile Island. Dr. Parsont requested that I respond to your suggestion that entombment is the only technology that will permit adequate protection of the public and the workers. I regret that this answer to your letters has been delayed.

First, with regard to the best method of dealing with Three Mile Island, Unit 2. No decision has been made as to whether to recover and restart the plant or to decommission it, nor has the licensee submitted any proposals to the NRC in this regard.

Secondly, with regard to your suggestion of entombment. It appears to me that there are a number of items which must be accomplished whether the plant is recovered and returned to service or decommissioned. For example, in either case the reactor fuel must be removed from the reactor vessel, put in a safe configuration, stored on site or shipped off site for disposal. There are several reasons why these actions have to be performed. First, heat generation (approximately 250 kilowatts at present) is continuing in the reactor core due to the radioactive decay of fission products in the fuel material. This heat must be removed. Secondly, current NRC regulations do not allow a licensee to leave a reactor core in place without adequate safeguards. That is, the plant could not be entombed without providing for long-term cooling of the reactor core and adequate safeguards; therefore, the fuel in the reactor vessel must be removed.

In order to remove the fuel, the reactor building must be made accessible for long-term occupancy by the on-site personnel. To permit long-term occupancy of the reactor building, the contaminated water and air in this building must be removed and the building must be decontaminated. Commitments to specific clean-up choices have not yet been made. On November 21, 1979, the Commission issued a Statement of Policy and Notice of Intent to Prepare a Programmatic Environmental Impact Statement directing the NRC staff to prepare a programmatic environmental impact statement on the decontamination and disposal of radioactive wastes resulting from the March 28, 1979, accident at Three Mile Island, Unit 2; a copy of this statement is enclosed for your information. This programmatic environmental impact statement will focus on the environmental issues and alternatives associated with the performance of these clean-up activities.

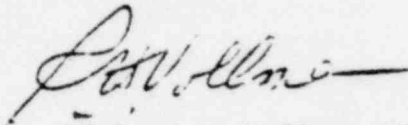
POOR ORIGINAL

Dr. Irwin D. J. Bross

-2-

I trust this response has addressed your concerns about entombment of the Three Mile Island, Unit 2, facility.

Sincerely,

A handwritten signature in cursive script, appearing to read "R. Vollmer", with a long horizontal flourish extending to the right.

Richard H. Vollmer, Director
Three Mile Island Support

Enclosure:
Statement of Policy and Notice
of Intent to Prepare a
Programmatic Environmental
Impact Statement dated
November 21, 1979

No opinions here expressed should be construed as reflecting official positions of the administration of
Roswell Park Memorial Institute or of the N.Y. State Health Department.

Dear

A few months ago, the American public breathed a sigh of relief--the danger from the Three Mile Accident was over. This now seems to have been premature. An August 14, 1979 news story from AP (copy enclosed) suggests that mismanagement by General Public Utilities may result in far greater hazards from the nuclear waste disposal than from the original accident.

The situation is as follows:

1. The plant was damaged beyond repair but GPU is determined to cover up this fact.
2. The only technology now available for disposal of this plant that will permit adequate protection of the public and the workers is entombment. My letter to Dr. Kemeny on this point is enclosed.
3. Any other technology would require disposal of the radioactive wastes by venting into air, dumping into the river, or transport of large amounts of such material by truck or other means. Any or all of these will expose workers and the public to dosages of radioactivity which will result in far more deaths and disabilities than the original accident.
4. Testimony in New Jersey involving inclusion of entombment costs in the current utility rates illustrates that even if a nuclear power plant is shut down when it is intact and functioning, there is at present no better technology for disposal available than entombment. The Bechtel report involves "paper" technology, methods that have never been previously used or tested or applied on the large-scale operations required here. Clean up of the present shambles is clearly a job which is several orders of magnitude more difficult than clean up of an intact installation. The Bechtel report is the same kind of technical-sounding claptrap that the DOE subcontractors produced on the West Valley clean up. (See enclosed note on lying with Mickey Mouse arithmetic).

5. I suspect that the purpose of this scheme is to stall action indefinitely by exploiting the almost automatic environmentalist reaction. What with environmental impact statements, the litigation could go on for years. It could take 5 years before it is finally admitted that the installation will have to be entombed. In the meantime with the decision in limbo, the Three Mile Island installation would continue as a passive threat to the public health and safety. If there were dumping, it will be an active threat.

6. In view of the continuing and deliberate mismanagement by General Public Utilities, it is essential that the Presidential Commission, or Congress, or both, consider the nuclear waste disposal problem that resulted from the Three Mile Island accident as well as the accident itself. I believe that the federal and state agencies should advise GPU to start to develop plans for entombment as an alternative to the Bechtel report. The decision-making on waste disposal should be taken away from GPU since the utility is completely unqualified for this task.

A critical factor in all this (although it is not so evident) is the new research on the health hazards of low-level ionizing radiation that shows that the NRC permissible levels are in fact dangerous levels. The 5 rem dose to workers permitted each year is probably more than a doubling dose for leukemia and genetic damage and other health problems. Thus, even if the clean-up is in compliance with present standards, the exposures during the clean-up and after its theoretical completion would produce heavy mortality and morbidity among the workers. It would also endanger the general population down-wind or down-stream from the dumping or on the routes used in transport of radioactive materials.

Despite the apparent technological complications the situation here is as simple as 1,2,3. One, there is (according to recent measurements) enough radioactivity loose at this site to kill a lot of people. Two, with entombment the radioactivity stays on site. Three, with any other plan the radioactivity has to be dumped somewhere and any attempt to do this can kill both workers and the public. Clearly, no dumping whatever should be allowed until there is a final decision on disposal since there can be no excuse for unnecessarily jeopardizing human health and safety.

Very sincerely yours,

Irwin D.J. Bross, Ph.D.
Director of Biostatistics

IDJB/mak

Attachments: (1) AP News Story (8/14/79)
(2) Letter to Dr. John Kemeny (07/30/79)
(3) "How to Lie With Mathematics"

J. A. Van Vecht^{en}
R. J. Gambino
J. J. Cuomo

Encapsulation of Radioactive Noble Gas Waste in Amorphous Alloy

Public demand for the containment and safe storage of radioactive waste materials has caused the U.S. Government to require that, beginning in January 1983, most of the ^{85}Kr , which until now has been vented to the atmosphere during the reprocessing of nuclear fission fuel rods, will have to be captured and retained for several decades. The cost of accomplishing this with present compressed-gas technology is enough to increase the cost of nuclear-generated electricity by an estimated 0.3%. However, materials developed for amorphous magnetic bubble memory devices have been found to be capable of storing large quantities of Kr (30 atomic percent) with great stability up to temperatures above 1070 K. The cost of ^{85}Kr storage in the magnetic bubble memory material appears to be less than 1% of that for present compressed-gas technology.

Introduction

The problem of safe disposal of radioactive wastes from nuclear fission power plants is a major obstacle to the continued and expanded use of fission reactors. Perhaps the most difficult radioactive fission product to capture and contain is an isotope of the noble gas Kr, ^{85}Kr , which has a half-life of 10.7 years and emits β -particles at energies up to 0.67 MeV and γ -rays at 0.5 MeV [1, 2]. Unlike most other fission products, it is neither solid (above 121 K) in its elemental form nor can it be reacted to a stable solid compound. Although heavier than air, it mixes thoroughly in the atmosphere; if released even in a deep mine shaft, it would quickly diffuse into the atmosphere. It also diffuses rapidly through water and earth. It is produced in about 0.3% of all ^{235}U fission events. This is about 6% of the Kr and 0.8% of the noble gas produced by fission of ^{235}U . (The other major noble gas produced is Xe.) Almost all processors of nuclear fuel around the world have allowed these radioactive gases to escape to the atmosphere. (It should be noted that essentially all the Kr is released in reprocessing; less than 1% is released from the reactor [3].) One exception is the Chemical Processing Plant at the Idaho National Engineering Laboratory, Idaho Falls, which is operated by Allied Chemical

Corp. and which has developed several methods [1] to capture ^{85}Kr . The National Engineering Laboratory reprocesses only U.S. Navy nuclear fuels; there are no commercial reprocessing plants at present.

Figure 1 shows the increase in atmospheric ^{85}Kr measured at various geographic locations up to 1968, at which time there were about 56 million curies (56 MCi) or about 10^{27} atoms of ^{85}Kr in the atmosphere worldwide [4]. Almost all ^{85}Kr is introduced by man; of this only 5% is due to nuclear weapons testing. If the rate of expansion of nuclear power along with the concomitant increases in atmospheric ^{85}Kr experienced up to 1968 had continued, there would now be about 0.6 GCi or about 10^{28} atoms of ^{85}Kr in the atmosphere [4]. (The medical consequences of this dose are argued [4] to be slight.) The actual amount is much less due to slowed progress in bringing on nuclear fission power as a replacement for fossil fuels. The rate of release has also been limited by the fact that spent fuel from power reactors is not being reprocessed at present. Spent fuel is stored on-site in deep pools, an unsatisfactory procedure for long-term storage. If nuclear fission power were to provide the projected fraction of our en-

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POOR ORIGINAL

ergy needs and if simple venting were to continue, the atmospheric burden would level out at well over 1 GCi. It might also be noted that 1 GCi of ^{85}Kr produces 4 MW of power, which might be put to some practical use if it could be safely handled; admittedly, this is an almost negligible amount compared to the total power that would be produced by the reactors.

To give perspective to the quantities involved, let us note that the fission of ^{235}U produces 200 MeV of thermal energy directly and, depending on design, approximately another 200 MeV of thermal energy by emitting neutrons that produce other fissionable isotopes, principally ^{239}Pu and ^{241}U , by transmutation. Thus, the complete fission of one gram of ^{235}U in a typical reactor would produce about 5.2×10^3 watt-years of heat. As nuclear power plants are about 32% efficient in converting heat to electricity, this one gram of ^{235}U would provide about 1.7 kW of electricity for a year. A typical nuclear power plant generates 1 GW of electricity. To run such a plant continuously for a year requires the complete fissioning of 0.6 Mg of ^{235}U . In a typical fueling cycle, 3% of the initial charge and 1% of the spent fuel is ^{235}U , so that fifty times as much material must be processed as is fissioned. At this rate of production, the alternative of storing spent-fuel bundles on-site is untenable. Thus a typical plant would require 30 Mg of fuel to be reprocessed each year of continuous operation. Of this mass, about 390 g would be ^{85}Kr , about 5×10^4 atoms or 2.8×10^3 Ci. If we project to the year 2000 and assume that each of 3×10^8 Americans is to be provided electric energy totally supplied by nuclear fission at the present average consumption rate of 2 kW, i.e., 600 GW for the nation, then 600 standard 1-GW plants would be required for the U.S. alone. These would produce 2.3 Mg or 1.7×10^6 Ci of ^{85}Kr annually. If nuclear power were to provide only a fraction of this energy need or if the average electric consumption were to decrease, the ^{85}Kr release would be correspondingly reduced. World production of ^{85}Kr would be at least three times this figure.

U.S. Federal regulations to take effect January 1983 [5] will limit the amount of ^{85}Kr that may be vented to 5×10^4 Ci/GW of electricity generated for one year, for fuel irradiated in 1983 or thereafter. [Editor's note: The global body dose rate per capita from the release of all of the ^{85}Kr generated in continuous operation of a 1-GW (electricity) reactor is $\approx 2 \times 10^{-3}$ mrem/year (rem = roentgen equivalent man). This dose rate is about 2×10^{-7} times the average background dose rate; see Reference [3].] Reprocessing with unrestricted venting would result in a release rate about seven times higher than this. The fuel reprocessing plants would be responsible for keeping the ^{85}Kr release down to this level. (A standard reprocessing plant handles about 2 Gg of spent fuel per year, which is

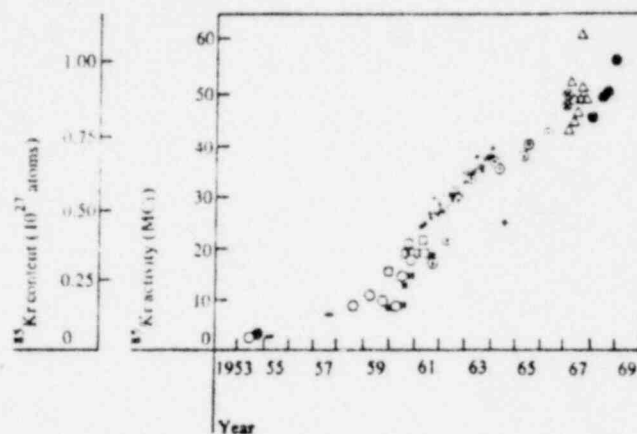


Figure 1 Atmospheric ^{85}Kr as a function of time up to 1968. Data taken from Ref. [3].

the amount produced by 67 standard nuclear power plants, each producing 1 GW of electricity [2].)

Where the Kr has been captured, the only technology available for storing it is to compress it into cylinders [2]; 133 cylinders 23 cm in diameter would be required to contain the noble gas released each year at each fuel reprocessing plant. There are several problems with this method of containment. Rubidium, the decay product of ^{85}Kr , causes a deterioration of ferrous alloys; so there is doubt about the long-term integrity of the cylinders. There is also the danger that the cylinders might burst due to some accident in handling and transport or due to corrosion- and radiation-induced damage over long periods of time. Because the radioactive gas is present in large quantity and under pressure, such an accident could easily be fatal to those nearby unless some means of secondary confinement of the gas is provided. The cost of meeting federally imposed safety standards with the compressed gas technology is rather high [2]. The estimated cost of a facility to contain on a 40-year cycle the compressed gas produced by a single reprocessing plant is \$208.5 million. For a 30-year loan at an 11.5% interest rate, this would require an annual payment of more than \$24 million. The cost of compressing the gas, of purchasing and transporting the cylinders, and of salaries and energy would be additional. The warehouse cost alone would run to more than \$200 million per year for the U.S. by the year 2000. In other terms, this would add \$0.00006 to the cost of generating a kWh of electricity, which would be an increase of about 0.3%.

Proposed alternate methods of storage have included incorporation into zeolite lattice pores by high temperature-pressure diffusion and by incorporation into crystalline [2a] and amorphous [2b] metals. The zeolite method

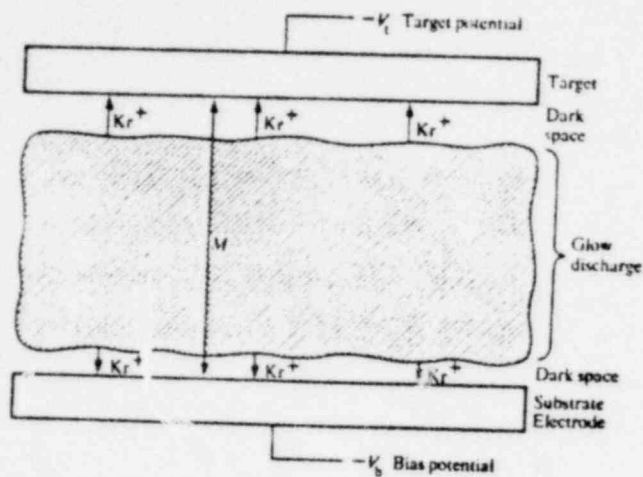


Figure 2 Schematic representation of the bias sputtering process.

suffers from the fact that if water gets to the material, it reacts and rapidly releases the gas. In crystalline metals the Kr forms small bubbles. At high concentration the pressure in these bubbles is sufficient to cause mechanical failure, a phenomenon known as blistering, in which the gas escapes. Furthermore, these bubbles tend to collect at grain boundaries and microcracks along which they diffuse at significant rates even at room temperature. Moreover, due to the power produced by the decay of the ^{85}Kr , the containment material will be self-heated to a temperature dependent on the size of the individual container; the larger the container, the larger the maximal temperature and the more severe the thermal diffusion and degradation. For most storage schemes the volumes of containment material required are substantial. Each reprocessing plant would require [2] the following volumes per year for the various proposed methods: compressed gas cylinders, 6.5 m^3 ; zeolite, 7.3 m^3 ; Ni, 1.3 m^3 ; Al, 1.6 m^3 ; glass, $>190 \text{ m}^3$.

Storage in bias-sputtered amorphous metallic alloy

In the course of development of amorphous materials for magnetic bubble memory devices [6], we have come upon a method for the storage of Kr, Xe and other noble gases, whether or not radioactive, which seems capable of containing the radioactive waste from one of these reprocessing plants in just 0.2 m^3 of material, and of retaining it stably up to temperatures as high as 1070 K . We estimate the cost of storing the ^{85}Kr by this method as well under 1% that of storage in the compressed-gas cylinders, *i.e.*, less than \$0.24 million per reprocessing plant.

The containment materials in question are formed by bias-sputter deposition [7]. This process is illustrated in

Fig. 2. A low-pressure discharge is established in a sputtering gas between two electrodes, one of which is known as the target and the other as the substrate electrode. The sputtering gas is normally chosen to be one of the noble gases, He, Ne, Ar, Kr, or Xe, to avoid chemical reactions with the target and substrate materials. In practice, Ar is usually chosen on the basis of cost and sputtering rate. The Kr and Xe sputter as rapidly in most applications but are more expensive. The discharge converts the noble gas to a positive ionization state, *e.g.*, Kr^+ . These ions are accelerated toward the target electrode, which is biased negative with respect to the plasma by the *target potential*. The plasma is in turn biased from ground by a small *plasma potential*. When the noble gas ions reach the target surface they penetrate several atomic layers, producing a process known as a collision cascade in which the energy of an incident ion is transferred to many atoms of the target material. Several of these atoms are subsequently emitted from the target surface in a manner similar to the "break" at the start of a game of billiards. The target atoms are generally neutral and travel by virtue of their kinetic energy through the intervening space between the target and the substrate, perhaps suffering a few collisions with the sputtering gas on the way. For normal choices of substrate temperature and materials, virtually all of the target atoms reaching the substrate stick there. As normally practiced, this results in the growth of a polycrystalline film on the substrate. However, Nowick and Mader [8] discovered that when two or more elements are deposited simultaneously and the radii of their atoms are sufficiently different, the resultant films are not polycrystalline but amorphous. (This means that they are microscopically disordered but macroscopically homogeneous as contrasted to the polycrystalline films, which are microscopically ordered but macroscopically disordered.) It is also possible to obtain amorphous films with atoms all the same size if one deposits faster than a critical rate, this rate being a function of substrate temperature [9].

In bias sputtering, a *substrate bias* is also applied between the plasma and the substrate. This has the effect of accelerating noble gas ions toward the surface of the growing film as well as toward the target. The ion bombardment of the film during growth has a number of useful effects. In the first place, it introduces anisotropies in the properties of the film. In the development of amorphous magnetic bubble materials, it was necessary to use this effect to induce a perpendicular easy axis of magnetization. In the second place, it allows one to eliminate many types of impurities that are not as well bound as host atoms. This is done by inducing a collision cascade in the substrate that is not sufficiently violent to remove host atoms. A third effect, which was discovered by

Cuomo and Gambino [10], is that high concentrations of noble gas ions tend to remain stably in the growing amorphous metallic films. Sputtered gas ions are also known to become incorporated in polycrystalline films formed by bias sputtering, but only in concentrations much lower than those observed with the amorphous-alloy materials. As noted above, this method has previously been suggested as a means of storing ^{85}Kr in polycrystalline Ni or Al material.

In order to understand the difference between the noble gas containment properties of amorphous and polycrystalline bias-sputtered materials, we need to understand the atomic structure of the two classes of solids.

In the polycrystalline phase of these alloys, the atoms assume a close-packed structure within each crystalline grain, as they would in an elemental film. In the close-packed structure foreign atoms can be accommodated only on substitutional sites, where they replace a host atom, or in one of the interstitial spaces between host atoms in their regular crystalline array. The noble elements do not form substitutional impurities because these elements are much less chemically reactive than the host atoms they would replace. Moreover, the interstitial spaces in the crystalline structure are large enough to accommodate only He, the smallest of the noble gases. Therefore, although bias sputtering causes the larger noble gases to be incorporated into crystalline alloys, they are found in grain boundaries, dislocations, and, at large concentrations, in macroscopic bubbles [11]. Such bubbles of noble gas are found both in the grain boundaries and in the bulk of the crystallites and, as noted above, tend to destabilize the structure and to diffuse out of the material.

The structure of the type of amorphous alloy films we are concerned with has been most successfully described by the dense-random-packing-of-hard-spheres (drphs) model [12]. In particular, the drphs model has been very successful in explaining the observed radial-distribution function of amorphous alloys. Some materials, such as elemental Se, form stable amorphous phases due to directional covalent bonding between atoms that tend to favor chain or ring structures. In the amorphous phase of these materials, cross-linking between chains and/or rings tangles the covalent network, preventing it from assuming an ordered array. In our case, the individual atoms behave much more like hard spheres than do atoms of Se and other "glass-forming" elements. Our materials are stabilized in the microscopically disordered amorphous phase by the mismatch in size of the atoms of the two or more elements present. The microscopic disorder of such amorphous alloys introduces a large number of interstitial

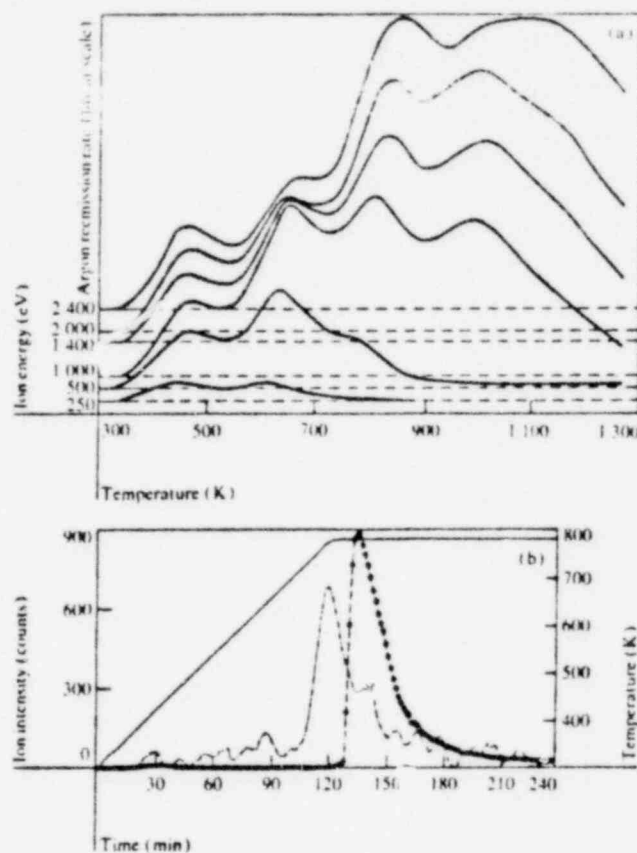


Figure 3 (a) Argon release from a nickel single crystal; data of Rantanen *et al.* [13a, his Fig. 6]. (b) Krypton release from amorphous GdCo (dotted line and data points). The solid line is a plot of temperature as a function of time (right-hand scale). Evolution of H_2 is shown by the dot-dash line [14].

spaces that are much larger than those in the crystalline phase. In favorable cases these interstitial spaces are large enough to accommodate a large noble gas atom such as Kr.

This difference in the distribution of the noble gas in the amorphous film as compared to the crystalline film has a profound effect on the stability of containment of the gas and on the kinetics of the process by which that gas may be liberated [13a, b; 14a]. For example, Rantanen *et al.* [13a] have studied the rate of evolution of noble gases from crystalline Ni. Their data for Ar release from a (100) oriented Ni single crystal are shown in Fig. 3(a). The samples were bombarded with 3.86×10^{14} ions/cm² at ambient temperature with the ion energies indicated in the figure. The samples were then heated at a linear rate of 100 K/min to obtain the thermal re-emission spectra shown. Note that there is a detectable evolution of Ar at all temperatures above the implantation temperature, 300 K. Also, there is considerable structure to the evolution curves, with peaks occurring at 478, 630, 794, and

990 K. The authors associate these peaks with mechanisms having activation energies of 1.31, 1.74, 2.21, and 2.78 eV, respectively.

Rantanen *et al.* [13a] also studied the thermal re-emission spectra of Kr from polycrystalline Ni. They reported activation energies of 1.18, 1.36, 1.50, and 1.71 eV for this case. They also pointed out that these activation energies are probably associated with interstitial migration (1.03–1.09 eV), vacancy formation (1.35 eV), vacancy migration (1.55 eV), and surface diffusion (1.68 eV).

The above results for Kr in polycrystalline Ni should be compared with the thermal release of Kr from amorphous GdCo and GdCoMo alloy films by Frisch and Reuter [14]; see Fig. 3(b). The method used to study the amorphous film was similar to that of Rantanen *et al.*, except that the heating rate was 10 K/min and a high-sensitivity mass spectrometer was used. Extensive measurements have been made on a large number of these bias-sputtered amorphous GdCo and GdCoMo alloy films. All of the thermal re-emission spectra for *unoxidized* films have the character shown in Fig. 3(b). Oxidation lowers the temperature at which Kr release occurs [14b]. In the amorphous alloy films no detectable rate of noble gas evolution was observed until the film began to crystallize [14a]. At the crystallization temperature the gas was evolved very rapidly. In this case the kinetics of gas liberation are determined by the kinetics of the crystallization, which is a nucleation-and-growth process. An activation energy of 4 eV has been estimated for the migration of Kr in amorphous GdCo alloy [14a]. This implies that the mean time to diffuse one atomic site would be about 10^{14} years at 570 K; at 1070 K, the Kr would diffuse about 10 nm in the 40 years required for the radioactivity to decay to 3% of its original value.

A further benefit of an amorphous structure for a material to contain ^{85}Kr is that the disorder improves the ability of the material to tolerate radiation damage and impurities. Even if the containment material were pure to begin with, it would not remain so because the ^{85}Kr transmutes to Rb by radioactive decay. The stability of a crystalline host material would be adversely affected by the simultaneous effects of irradiation, which generally enhances atomic diffusion, and of the incorporation of the daughter isotope, which is chemically incompatible with the crystal lattice of the proposed host materials. This would cause embrittlement of a crystalline host material and would accelerate mechanical failure by such mechanisms as blistering. However, those amorphous alloys which are stabilized by atomic size mismatch and a highly disordered drphs structure are much less sensitive to the

chemical nature of minor impurity constituents and can exist over a broad range of composition. The amorphous alloys in question will contain about 30 at% Kr or Xe, but, as noted above, only 6% of the total Kr released at the reprocessing plant would be radioactive ^{85}Kr . Let us assume that the Xe is separated out by distillation so that only Kr is stored. This would seem to be economically desirable, although one could also easily store the Xe by expanding the size of the sputtering unit. Eventually, 1.8 at% Rb will be contained in the storage material. This would be enough to affect many crystalline hosts substantially but would have a negligible effect on a drphs-amorphous host. Such host materials are also less susceptible to radiation damage because the currents produced by ionizing radiation do not persist as long and because the resultant atomic diffusion does not have as much effect on a structure that is already disordered.

The selection of the most practical composition from which to form the encapsulating host material requires the consideration of four factors: gas-incorporation capacity, thermal stability, chemical stability, and cost. Let us start with the amorphous magnetic bubble memory material, GdCoMo, for which the incorporation of large quantities of noble gas was first discovered. This material can incorporate more than 50 at% Ar and more than 30 at% Kr and Xe when the three bias voltages of the system are adjusted properly. This large noble gas incorporation capacity occurs because the rare earth element Gd has an atomic radius much larger than the first-series transition element Co. The second-series transition element Mo is intermediate in size and serves to further disorder the drphs structure so that these mixtures will condense in an amorphous phase over a wide range of compositions and will have a relatively large number of interstitial spaces large enough to accommodate a Kr or Xe atom. However, the GdCoMo composition of the magnetic bubble memory would not be an attractive choice from the point of view of cost. Because the rare-earth elements (which in fact are not that rare) are all very similar in their chemical behavior, they are expensive in their pure elemental form. A typical price for pure Gd would be \$500/kg. If one instead purchases the rare earth elements in an unseparated form, called mischmetal or RMM [15], the price is much less, typically \$10/kg, and the chemical behavior as it affects Kr storage in amorphous alloys is no worse. One can also replace Co with Fe without affecting the containment properties significantly. With respect to thermal stability, it has been shown that GdCoMo and GdCoCr ternary alloys are much more stable than binary alloys like GdCo or even ternary alloys containing Au or Cu, e.g., GdCoAu or GdCoCu. For example, 15 to 20 at% Mo increases the crystallization temperature from 770 K for GdCo to more

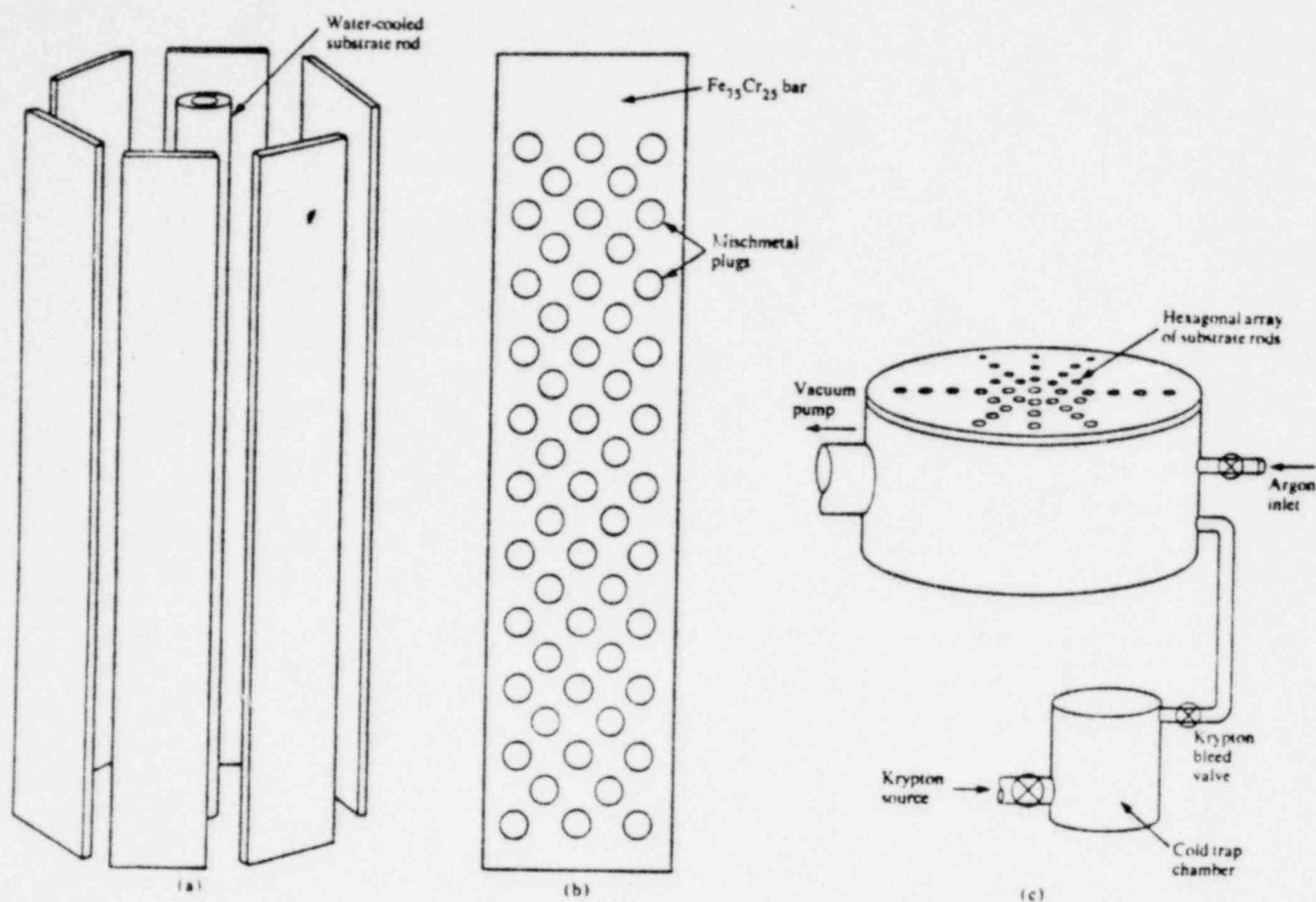


Figure 4 Proposed sputtering apparatus for incorporation of Kr into the amorphous alloy on a production scale. (a) Modular sputtering unit, (b) target bar assembly, and (c) sputtering chamber.

than 1070 K for the ternary alloys. From the point of view of chemical stability, the rare earth concentrations should be kept low because these materials oxidize (as well as cost more than the other constituents). Chromium, on the other hand, significantly improves the oxidation resistance and should be added at a concentration consistent with its cost. Therefore, an appropriate composition for the containment application would be (in atomic percent): RMM 20%, Fe 60%, and Cr 20%. The 2.1 Mg, or about 0.2 m³, of this composition that would be required to store the Kr retrieved at each 2-Gg/year reprocessing plant would cost about \$10 thousand. Of course, this material could be recovered and recycled every century or so as the level of Kr radioactivity from each charge decreases.

The process

At the reprocessing plant, spent fuel elements containing UO₂ ceramic pellets encased in metal are dissolved in nitric acid. At this point the Kr and Xe are released and bubble out of solution together with several other volatile species. The various volatile species can be separated and

trapped in a cryogenic distillation tower [1]. The Kr and Xe would be trapped at the end of the distillation sequence in cold traps or on charcoal cooled to 77 K with liquid nitrogen.

The liquified noble gas is maintained at 77 K and transferred to the sputtering station for incorporation into the amorphous alloy; see Fig. 4. The vapor pressure of the Kr at this temperature is about 10² Pa (10⁻³ atm), which is enough to bleed through valving into the sputtering chamber but low enough that the danger of excessive leaks would be easily managed. The gas pressure in the sputtering chamber is about 10⁻² Pa (10⁻⁷ atm). [Compare this situation with that of the compressed gas cylinders, which handle the gas at a pressure of about 10⁷ Pa (10² atm).]

The rate at which material may be deposited by bias-sputter deposition varies from 1 μm/h for very simple diode systems to 10 μm/h for systems that use electron injection or magnetic-field confinement of the plasma. We feel that the most practical arrangement would be modular and would consist of a hexagonal array of water-

cooled substrate rods surrounded by bar-shaped target electrodes. With this arrangement a continuous deposition rate of $10 \mu\text{m/h}$ would be practical. In order to deposit the 0.2 m^3 of material per year required to contain the Kr retrieved at each 2-Gg/year reprocessing plant, the volume deposition rate will have to be $2.3 \times 10^{-3} \text{ m}^3/\text{h}$, so that 2.3 m^2 of deposition area are needed. This can be accommodated with a system of 232 rods 2 cm in diameter and 30 cm long arrayed honeycomb fashion in a cylindrical vacuum chamber 1.5 m in diameter and 0.5 m high. Such sputtering systems sell commercially for about \$80 thousand [16].

About 200 kW/m^2 input power would be required to sputter at the proposed rate of $10 \mu\text{m/h}$ [17]. Therefore, the sputtering station would consume about 460 kW of electrical power in order to capture the Kr retrieved at a 2-Gg/year fuel reprocessing plant. At \$0.04/kWh the cost of this power would be \$160 thousand per year. Perhaps another \$10 thousand per year of electricity would be consumed running the vacuum, cooling and control systems.

Due to the inherent simplicity of the sputtering process itself, this could easily be automated or remotely controlled. The cost of special control equipment for the radioactive environment automated operation should not exceed \$100 thousand. However, the deposited rods would have to be removed and replaced periodically. This could be accomplished by valving off the source of ^{85}Kr and of the cooling water, breaking the vacuum of the system, and pulling the top flange of the vacuum chamber with all the rods and the remains of the target electrodes attached to it out of the body of the vacuum chamber and removing from the sputtering station. Operators could then attach a new top flange with substrate-rod assembly and target electrodes to the vacuum and cooling systems. This should be done about once a month after about 7 mm of material has been deposited on the rods.

The configuration of the target electrodes shown in Fig. 4 indicates that these consist of $\text{Fe}_{73}\text{Cr}_{27}$ bars with mischmetal plugs inserted into drilled holes. This configuration is recommended for easy handling of the mischmetal, which is hard and brittle. With this configuration one could also arrange to coat the deposited layer of amorphous metal with crystalline stainless steel in order to provide further protection from corrosion and abrasion, and to contain the beta particles emitted by the Kr. This would be done by continuing to sputter after the Kr source had been turned off and the mischmetal plugs nearly consumed, and the bias voltage would be increased to 250 V in order to increase the fraction of Fe and Cr in the deposited mixture.

For final storage one might wish to pot the entire top flange, rod and target remains assembly in cement and wrap it in lead. However, we feel that the amorphous alloy is so stable a method of storage that the material could be released for several practical applications (ranging from nuclear batteries to fire detectors, cold-cathode stabilizers, thickness monitors, and simple sources of heat) rather than simply putting it away in a deep salt mine.

Conclusion

The materials developed for the amorphous magnetic bubble memory system have been shown to provide a very stable medium for the long-term/high-temperature storage of the noble gases Kr and Xe. The radioactive isotope ^{85}Kr , produced in ^{235}U fission reactors, is difficult and expensive to contain by other means. Compared to the present technology of compressed-gas cylinder storage, which is estimated to cost \$24 million per year per reprocessing plant for warehouse amortization alone, our process would cost approximately \$180 thousand for capital equipment, which would be amortized at less than \$40 thousand per year, plus \$10 thousand per year for materials and \$170 thousand per year for electricity. In our economic analysis we have not considered the cost of the building to contain the process, but since the process runs at high vacuum instead of at high pressure and since the product is quite stable to high temperatures, we feel the cost of this building should be minimal. In the high-pressure cylinder technology the cost of the building is a major part of the total expense. With our process the radioactive material is present only in small quantities before it is incorporated into the solid, and because of the stability of that solid, can be dispersed in practical applications afterwards.

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10 West Simpson Street
Mechanicsburg, PA 17055

In the Matter of
ANIMAL HEALTH
(West side of Three Mile Island)

Mar. 3, 1980

EXPLANATION OF CONDITIONS

Since 1976 I have detected problems with cows, horses, pigs, etc. Some of the animals are blind others experience multiple fractures in the hip and legs; this is especially prevalent in the ribs. There is also a noticeable increase in arthritis and muscle problems.

Once the deficiencies take hold, it is difficult to correct. The animals get down and are unable to get back up. They either linger and die or must be destroyed.

I have encountered increases in caesarean deliveries in sows. The normal caesarean rate for sows is one a year. I am now encountering one a week. The area directly affected is the west side of the Susquehanna River and in close proximity to the Three Mile Island area. (summer of 1979)

I am not prepared to say it is radiation. I do not know what the cause is. However, I did request an on-site investigation be made in the area by the Pennsylvania Agriculture Dept.

Goats & sheep unable to dilate during labor - must be delivered via caesarean. The normal caesarean rate for goats and sheep is one a year. It's now two a week.

Dr. William Bush - R.D. 1, Etters, PA - ^{ARDIN}~~Alden~~ Horse Farm - 938-4901

Farm purchased in Oct. 1976

1976 Dec. Purchased 5 Brood Mares - four in foal - all had full-term foals.

Next breeding period all 7 mares were bred to his stallion.

1977 Four in foal - at birth:

1-day-old foal died

1 unable to be delivered - foal died

2 were normal births and healthy

1977 Rebred 7 mares - 1 in foal - delivered - normal - 6 did not breed.

1978 Five brood mares were sent to Kentucky for breeding.

Three out of five were confirmed in foal.

After mares were returned from Kentucky, Dr. Enck could only confirm 2 in foal.

This past spring 1 mare aborted

Two months later a foal was born dead. Fetus and placenta analyzed.

One mare aborted after 5 months.

another mare aborted.

1979 Mar. 24, Boarded Mare - still born - confirmed by Dr. Enck - colt appeared to be normal in every way.

Dr. Bush's horses are also remaining in heat longer than normal.

Milk glands are not functioning normally. (foal - full-term comes before milk glands drop)


WILLIAM BUSH, M. D.

Date: 5/30/79

Charles Conley, Etters, PA within 1 mile of TMI. 938-2042

Mr. Conley has farmed all his life.

1978 Sept. Steer Died - was down unable to get up.

Dec. Steer Died - was down and unable to get up.

One steer down and drags itself about.

One steer appears to be normal

These animals were treated by the Vet. with shots of vitamins and minerals.

Mr. Vance Fisher followed through and administered the shots every day for a week. These animals were purchased sometime in April 1978.

Mr. Conley is puzzled about the white powery substance that he finds in the watering trough every morning and also on the grass. When he sweeps the substance away the water turns milky white.

Animals also suffer from diarrhea and weakness. Also, walked in a humped fashion.

Vet. bills over \$100.00. The Vet informed them that they will have to have $2\frac{1}{2}$ times the required amount of minerals for the animals to survive.

Sixty dollars was spent in two months for minerals. The Vet said if the minerals loss in the ground continues, the farmer will be unable to grow hay.

Last summer 10 kittens from two separate litters all died.

1978 - Pigs for this year did not develop as rapidly as in the past.

1979 - Kittens - litter of three - one unable to turn its head - died.

Charles Conley
Charles Conley

Date: May 24, 79

Jane Lee
R.D. 3, Box 3521
Etters, PA 17319
938-6628

Elias Conley, R.D. 1, Etters, PA 938-6162

Mr. Conley has always been a farmer and now has 20 head of cattle on his farm.

1977 Oct. Young Steer slipped coming out of the barn and broke his hip.

This animal walked for about two days with a broken leg.

When the vet noticed that it wasn't getting any better, he

suggested that it be slaughtered. Slaughtering revealed a broken

leg. The bone had broken at the hip line. The damage was so great that the meat was unusable on that leg.

1978

Two young steers 7 to 8 months old - purchased at the Bashore

Farm. (weight about 250 lbs.) The Vet. discovered that both

steers were blind. They began to have walking problems.

(staggering) The legs of one steer split while walking

from the barn. When it was butchered, it was discovered

that the pelvis had been cracked. Dr. Webber sent the

other steer to the Newbolton Center for study. The University

paid \$150 for the animal. They later returned with seven

students and two vets. to collect feed and blood samples.

Mr. Conley has farmed on this same farm for 36 years.

Elias Conley
Elias Conley

Date: May 24 1979

Jane Lee
R.D. 3, Box 3521
Etters, PA
938-6628

Mr. Joseph Conley, Etters, PA Far was within 1 mile of TMI.

The Conleys moved all their stock and the family the day after the accident and do not plan to return. They moved up to Franklin Co. Phone 369-4568.

Mr. Conley complained about reproduction problems, weakened livestock and high Vet bills. Also, the cattle suffered severe nervous disorders . So much so that it was necessary to hobble their legs in order to milk them.

Mr. Conley was also puzzled about the white substance that accumulated in the watering trough overnight. When he tried to sweep it out the water turned milky white. The watering trough had to swept out every morning.

Mr. Conley did not leave a documented account on how many animals aborted or died.

Mr. Joseph Conley

Unable to obtain signature because he is no longer in the area.

HEALTH REPORT

J. Fisher Farm

UPDATE

- Jan. 14, 1988

Goat

7 - 7 - 79

Goat - Black & White - $4\frac{1}{2}$ years old.
Hair fell out on back - Paw sores developed the size of half dollars
Treated sores with bacon fat to keep flies off.
Sores healed - hair came in red.
Have pictures.

Cats

Three males do not breed some less than a year old
one $1\frac{1}{2}$ years old.

5 - 1 - 79

Charles Conley's farm. Kitten born with head locked in position - unable to move it's head - died.

5 - 8 - 79

Three kittens in a litter - one died. (J.K. Fisher Farm)

7 - 5 - 79

Four kittens in a litter - all died. (Vance Fisher Farm)

7 - 6 - 79

Eight kittens died - Five in one litter and 3 in the other.
(J.K. Fisher Farm)

7 - 7 - 79

One black kitten born - only one in litter. Name: Flip -Flop
Deserted by mother at six weeks. rescued and kept for study and observation. Motion film on this one.
Symptoms: Although unable to walk at birth, it now takes eight or nine steps before it flops over. This animal is now five months old. It is small for it's age but responds to us, finds it's own dish, compensates for it's walking liabilities by walking and leaning against the baseboard and can move quite rapidly despite it's impairments. There is a definite weakness in the hindquarters and while eating pecks it's food like a chicken. The nervous system appears to be damaged.

This animal must stabilize itself under something three inches off the floor while eating otherwise it will lose control and flip over backwards landing on it's back.

8 - 12 - 79

Two kittens in this litter

One kitten developed the same symptoms as the above with less severity. This animal is able to walk. This was not the same mother. The same father is a strong possibility.

8 - 9 - 79

Litter of kittens - three - another mother

These kittens were all in different stages of development.

1. born with fur - died next day
2. smaller with no fur - fetal stage
3. smaller yet - lesser fetal stage

Have pictures on these.

All these case histories came from the J. K. Fisher Farm

Charles Conley
Farm

Mr. Conley raises pigs. This is the second year with different pigs that Mr. Conley's animals did not come into heat.

THE FOLLOWING IS A RECENT HISTORY OF DAIRY COWS ON THE
JEREMIAH K. FISHER FARM

COWS' NAMES

Alice

Could not breed - sold 10-30-79

Edith

Calf due Oct. 79 aborted 6/19-79 - sold 8-9-79

Babe

Last Calving - July 1979

Came in heat off and on for five months.

Examined by Vet. three times.

On 12-31-79 a cyst was discovered - Sold Jan. 29 80

Page 3 Health Report

Cows' Names:

Baby Bunting Stillborn - 12-16-79

Barb Calved 10-14-79
Came in heat - breeding negative
Treated for cyst by Vet. 12-31-79

Dorothy Stillborn 5- - 79

Orange Juice Bred early Oct - 79 - negative
Bred early Dec. Too early for confirmation

Tomato Calving 12-28-79
Six weeks premature
Calf appeared to have respiratory problems.
Administered penicillin. Fed calf mother's milk by bottle.
Calf is doing well.

Grace Checked by Vet 10-11-79
Breeding unsuccessful - has cyst

Naggie " " " "

All these cows are from the Jeremiah K. Fisher Farm.

Many farmers are fearful of revealing their problems because of the economical consequences. Therefore, I fear that this is less than the tip of the iceberg. No one, least of all the government, will take the responsibility for damages.

This update is not a repeat of the original report.

4/14 46 days premature - doing well

Jane Lee

R.D. 3, 183 Valley Rd.

Etters, PA 17319

938-6628

Jeremiah K. Fisher, R.D. 3, Box 3521, Etters, PA 17319 - Phone 938-6628

1977 Jan. 4, Calf Born - died Jan. 11
Feb. 3, Beefalo Calf died
Aug. 9, Calf aborted
Sept. 6. Calf died - three months old
Sept. 9 Calf - Still Birth
Oct. 5, Cow slaughtered - diagnoses cancer - confirmed by vet.
Dec. 15, Goat aborted
Other goats did not conceive - one suspected hermaphroditic.
We do not inner-bred our goats.

1978 May Day-old calf dead.
Spring Four female ducks laid 70 eggs - out of the 70 eggs were seven ducklings - one a mutation.

Mutation: We separated this duck to restrain the other ducks from attacking it. The duck was unable to sustain its own weight; dragging its leg behind it. We fashioned a sling-harness so we could force it to walk for therapy. It was placed in a swimming pool daily adding live bugs to the water for the duck to consume. The duck appeared to function best in the water. It never fully developed.. The feathers were brittle and stood out. Beneath the feathers was a hard bone structure - very hard without flesh. This duck was fed the same feed, supplemented with minerals, as the other ducks who were normal. We managed to keep it alive for six months. Its condition never showed improvement.

1979 May This year the ducks secreted their eggs very well and we ^{were} unable to establish the exact number of eggs in the nest. However 12 ducklings came forth and again one was a mutation and died shortly after birth. (two days) The symptoms were the same except that this one also experienced a digestive problem. (little excretion swelling of the intestinal area).

Jeremiah K. Fisher 5-23-79
Jeremiah K. Fisher

Joan S. Fisher
Joan S. Fisher 5/23/79

Jane Lee
R.D. 3, Box 3521
Etters, PA Phone 938-6628

Jeremiah K. Fisher, R.D. 3, Box 3521, Etters, PA 17319 - Phone 938-6628

Nov. 28, 1978 Pet cat found dead in barn loft. This cat was discovered before rigor mortis set in and was taken to a vet for an autopsy. The Vet. described the cat as healthy and in good physical condition. Death was due to some type of poisoning which he was unable to name. The Vet. said that despite the symptoms of poison he found no poison mixed with the residue in her stomach. When I queried him if this was unusual, he said, "if an animal is poisoned, there is usually a residue of the poison mixed with the stomach contents to establish the type of poison". However, in this case no poison was found in the stomach.

Dec. 1978

Pet bunny which was always confined and never ate the grass was found dead in its pen without any outward sign of damage or forced entry into the pen. (three years old).

Mar. 1979

Nanny Goat had a still-born. (After Nuclear Accident)

Week old calf had to be shot- respiratory problems. Death was imminent.

Reproduction problems have increased from 5 to 10 percent in the past year.

This farm has been in the same family since the early 1700's
It is Federally and State inspected with a high rating.

May 10

Cat suffered illness - unable to walk or eat. A week later was walking with a stagger - sides caved in - walks very slow.

1975 - 48 cows - 7 breeding problems

1976 - 44 " - 4 " "

1977 - 39 " - 4 " "

1978 - 43 " - 6 " "

1979 - 45 " - 1 Bred five times

A breeding problem is no breeding after three failures.

Jeremiah K. Fisher 5-23-79
Jeremiah K. Fisher
R.D. 3, Box 3521
Etters, PA 17319

Joan Fisher

Date: 5-23-79

Jane Lee

R.D. 3, Box 3521

Etters, PA 17319

938-6628

Mrs. Mary Ann Fisher - 1351 Oberlin Rd. - Middletown, PA 944-7194

1978 Litter of kittens - 3 weeks old died overnight.
1978 12 Geese laid 100 eggs - results: one hatching which died.
1979 Jan. Four litters of cats aborted
One full-term litter - still-born.
Four heifers unable to conceive thus far.
Geese laid eggs again - results: nothing - Geese stopped setting.
May 8, Litter of kittens died.

Mary Ann Fisher
Mrs. Mary Ann Fisher

Date: May 22, 1979

Jane Lee
R.D. 3, Box 3521
Etters, PA 17319
938-6628

Mr. Robert Fisher, R.D. 3, Etters, PA Phone 938-5343

April 16, 1979 Pet Rabbit found dead.

Robert Fisher
Robert Fisher

Date: 5-26-79

Jane Lee
R.D. 3, Box 3521
Etters, PA
938-6628

Mr. Vance Fisher, R.D. 3, Etters, PA 938-2762

Mr. Vance Fisher was raised on a farm and has been a farmer all his life except for a short stint in the service.

1978 Jan. Goat - Polly aborted.

June Same goat rebred - delivered twins

Two calves died - both purchased from Jeremiah Fisher, Etters, PA

Three goats bred - results - none.

1979 March Goat aborted (Bambi)

May 9 Steer down - unable to stand - now in its eleventh day.

This animal reveals the same problem as many others. The hind quarters weaken they go down and are unable to get back up again. Mr. Fisher is considering the sale of the animal before it dies. Prognosis: the animal will die shortly. This steer survived for 23 days in this condition. Died May 29, 1979.

Vance B. Fisher
Mr. Vance Fisher

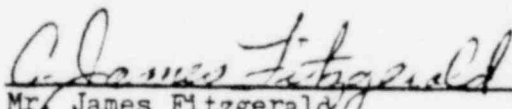
Date: 27 May 1979

Jane Lee
R.D. 3, Box 3521
Etters, PA 17319
Phone 938-6628

Mr. James Fitzgerald - R.D. 1, Ethers, PA 938-1265

1978 Two Steers - both blind - Soft bones.

1979 Jan. One steer - 400 lb. unable to stand - had to be destroyed
One steer - 425 lb. despite confinement, both hips broken.
No discernible explanation. Parts of the animals were taken
to Newbolton Center in Kennett Square, PA
Mr. Fitzgerald also breeds throughbred horses. Mare had a colt
this year (1979). The colt's leg has a slight deformity.
Legs are bowed.
Mr. Fitzgerald is an Agriculture Teacher.


Mr. James Fitzgerald

Date: 5/26/79

Jane Lee
R.D. 3, Box 3521
Ethers, PA
938-6628

HEALTH SURVEY

Louise Hardison - Middletown - Phone 944-0712

Mrs. Hardison has a farm where she raises goats, sheep and rabbits.

At one time she had sixteen Does and two Bucks. The numbers remain the same except for one goat.

Because she lives in such close proximity to the TMI plant, she thought something from the plant might be the cause of the following problems:

During the years 1976 and 1977 the herd did not produce a single kid.

Metropolitan Edison Co. called in Drs. Samuel B. Guss and M. I. Park of the University of Pennsylvania on April 1978. The Drs. gave two reasons for the lack of reproduction: 1. The Billy had no horns. 2. Some of the Does were hermaphroditic. The explanation being: Those born without horns could be infertile. Those described as hermaphroditic by Drs. Samuel B. Guss and M. I. Park later proved to be in error since they bred and delivered normal kids. The Drs. recommended that Mrs. Hardison introduce a horned Billy to the herd. A Buck was introduced to the herd which belonged to a man who had purchased it from Mrs. Hardison at an earlier date. On July 1978, her Does gave birth to 14 kids. However, the father of the kids was also minus horns.*

Note: "Sparkie", which is Mrs. Hardison's regular Billy, sired one of the kids.

Later a horned Billy was introduced to the herd. Some of the Nannies gave birth and then stopped v ing milk after six months. After I, (Jane Lee), personally visited Mrs. .son's goat farm this spring, (May 10, 1979), there was clear evidence of a healthy group of kids except for one which was experiencing breathing difficulties and feeding was very sporadic but frequent. There were two very ill Nannies who had just delivered. They had to be hand fed and have not, as of this writing, returned to normal. Sometime in 1978 a lamb was born with one eye. Three lambs also died several days old.

Jane Lee
R.D. 3, Box 3521
Etters, PA 17319
Phone 938-6628

Louise Hardison

Date: _____

Louise Hardison - R.D. 1, Middletown - Phone 944-0712 (cont.)

Right before the TMI accident one lamb died.

After the accident, one adult female sheep died which was pregnant.

Three lambs, which were two to three hours old, died. These lambs were perfectly formed.

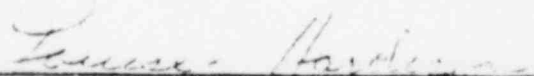
One female goat died - It was revealed that she had reach full-term for delivery and she carried four kids. (all dead).

Three kids had to be bottle fed because the mothers had no milk.

March 1. 1979 pet male cat one year old found dead. No discernible evidence of injuries.

Three mother rabbits - one bred twice delivered 8 rabbits per litter.

All baby rabbits died.


Louise Hardison
R.D. 1, Middletown Phone 944-0712

Date: 7/11/79

Jane Lee
R.D. 3, Box 3521
Etters, PA 17319
Phone 938-6628

Clair Hoover, Bainbridge Phone 426-3108 J.E. Baker Farm- $5\frac{1}{2}$ miles from TMI.

Manager: Ralph Snyder - Office Ph. 848-1501 - Home 792-2561

Mr. Hoover is a tenant farmer - I do not have any farm background on him. On May 18, 1979, I visited his farm. I noticed that a calf was racing as though it were being pursued yet nothing was chasing it. Other cows were standing about. The only people who were present when I arrived were three boys, the oldest being about 12 years of age. Also some mental patients who assist Mr. Hoover in the farming operation. The State pays Mr. Hoover for their keep which amounts to about \$260 per month for each patient. This information was passed on to me by one of his neighbors. I visited the farm about 4:00 p.m. and when I returned home at 8:00 p.m. I was still unable to contact Mr. Hoover and was informed that he and his wife had still not returned.

1979 4/26 1 cow down sick
4/26 Cow died and was sent to the Summerdale Lab for an autopsy.
4/22 Cow aborted - both cow and calf died
4/16 Cow died - discovered twin fetus
4/26 Two bred heifers sick - walking in a humped fashion

Note: When a cow is in labor she will hump when she is having a contraction.

Sackinaw Farm also owned by J. E. Baker - located back of Mt. Wolf on west side of river are experiencing reproduction problems and Vet fees have soared. Dr. Blair English, from Drover, said, "We have a lot of problems in the area of TMI but we do not know what is causing them"

Clair Hoover

Date: May 24, 1979

Jane Lee
R.D. 3, Box 3521
Etters, PA 17319
Ph. 938-6628

POOR ORIGINAL

Ralph Snyder, Manager
Figures given by the Manager

Mr. & Mrs. John Kauffman, R.D. 1, Etters, PA phone - 938-2480

1978 Dec. One Steer - 200 lbs. lost control of hindquarters

1979 Jan One Steer - 300 lbs. lost control of hindquarters.

One steer was ill for a week before it was decided to send it to the butchers. The other steer which was treated by Vet Webber on a Friday evening was found dead the following morning. The Vet. was very surprised that it was dead/ The Kauffmans had four cats all suffering from the same symptoms. Very ill - unable to get up. All were found in various degrees of illness, dying and death. There was no discernible evidence that the cats had been attacked, mutilated, or damaged in any way.

John Kauffman

Ruth Kauffman 5/23/79
Ruth Kauffman

Date: May 23, 79

Jane Lee
R.D. 3, Box 3521
Etters, PA 17319
Phone 938-6628

Mrs. Clair Nissley, R.D. 1, Middletown, PA 367-2033

1979	2/26	Steer	Died
	3/10	Steer	Died
	4/8	Steer	Died
	4/18	Steer	Died

Symptoms: Respiratory problems - heavy breathing before death.

5/15 Pig 40 lb. died same symptoms.

Mr. Nissley believes the animals may have died from shipping fever.

Clair Nissley
Mrs. Clair Nissley

Date: 5-23-79

Jane Lee
R.D. 3, Box 3521
Etters, PA 17319
phone 938-6628

Mrs. Curvin Snyder, R.D. 3, Etters, PA 938-6167

Mr. & Mrs. Snyder raise steers.

1978 - Two litters of kittens died

1979 May 3, Calf delivered - good condition - no problems.

Mrs. Curvin Snyder
Mrs. Curvin Snyder

Date: May 24, 79

Jane Lee
R.D. 3, Box 3521
Etters, PA 17319
938-6628

Emma Whitehill, R.D. 1, Etters, PA No Phone

Emma Whitehill has been on a farm all her life and has been raising geese and ducks since she was 12 years old.

1978 Ducks laid 290 eggs without a single hatching

Lost one milk cow and her calf - The cow was a very good milker.

April 6, 1979 - Nanny Goat aborted twins

Since that

time Two nannies died - both were pregnant.

Twenty-six rabbits died - 11 weeks old and 3 weeks old.

Mother rabbits still living

19 Guinea pigs Died

Emma Whitehill
Emma Whitehill

Date: 5/23/79

Jane Lee
R.D. 3, Box 3521
Etters, PA 17319
Ph. 938-6628

Mrs. Alice Wilt, P.O. Box 120, Lewisberry PA 17339 - Phone 938-5264

Mrs. Wilt raises rabbits.

1976 Began business with rabbits - purchased 1 buck and 3 doe from Lancaster. Reproduction was not successful so she bought a mixed breed. Still the reproduction problems continued. She then switched to Dutch rabbits.

The following is a history of each individual rabbit:

1976 May Up to 1978 this rabbit had five healthy litters

1978 Oct. Bred

Nov. Due - results - none.

Rebred

Dec.
24 Due

1979 Jan Aborted - had experienced several false pregnancies.

1978 Oct. 12 - Bred

No results

Nov. 15 Bred

Dec. 16 No results

Dec. 22 Bred

Mar. 26 Litter of 7 - 5 died

One animal was frozen and sent to a laboratory in Ohio - report is still pending.

1977 Nov. Born

1978 Dec. 24, 1st litter due

Feb. 15 Litter of 4

Apr. 26 pregnant and due

Apr. " litter of 10 - on May 6th five died.

Alice Wilt

Alice Wilt, Lewisberry PA Phone 938-5264 (cont.)

1978 Mar. 29 Born
Oct. 12 Bred - no results
Nov. 15 Bred - No results
1979 Feb. 17 Bred
Mar. 18 Litter of 5 - all died
Mar. 26 Bred
Apr. 26 Due

1978 Mar. 29 Born
Oct. 12 Bred
Nov. 12 delivered litter of six - all in good condition
1979 Feb. 17 Bred - no results
Mar. 9 litter of 10 all seem healthy

1977 Oct. 2 Born
1978 May 2 1st Breeding
June 2 litter of 11 - only three survived - others were mutations.
Born without legs - without ears - hind quarters complete /
gone. Owner said "they were shaped like casper the ghost"
Mother was in the process of trying to devour them when she
snatched them away. Those which were deformed were ^{not} mangled;
they were just malformed.
This rabbit's breeding record has now returned and is
considered stable.

Alice Wilt

Jane Lee
R.D. 3, Box 3521

Date: 4/11/89