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Criteria Subcommittee Meeting

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PUBLIC NOTICE BY THE
UNITED STATES NUCLEAR REGULATORY COMMISSION'S
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

DATE: February 5, 1991

The contents of this transcript of the
proceedings of the United States Nuclear Regulatory
Commission's Advisory Committee on Reactor Safeguards,
(date) February 5, 1991,
as reported herein, are a record of the discussions recorded at
the meeting held on the above date.

This transcript has not been reviewed, corrected
or edited, and it may contain inaccuracies.

1 UNITED STATES OF AMERICA
2 NUCLEAR REGULATORY COMMISSION

3 ***

4 ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

5 ***

6 SAFETY PHILOSOPHY, TECHNOLOGY AND CRITERIA
7 SUBCOMMITTEE MEETING

8
9 Nuclear Regulatory Commission
10 7920 Norfolk Avenue
11 Bethesda, Maryland

12
13 Tuesday, February 5, 1991

14
15 The above-entitled proceedings commenced at 3:07
16 o'clock p.m., pursuant to notice, David Ward, Subcommittee
17 Chairman, presiding.

18
19 PRESENT FOR THE SUBCOMMITTEE:

20 D. Ward

21 W. Kerr

22 C. Wylie

23 J. Carroll

24 C. Michelson

25

P R O C E E D I N G S

[3:07 p.m.]

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MR. WARD: The meeting will now come to order. This is a meeting of the Advisory Committee on Reactor Safeguards Subcommittee on Safety Philosophy, Technology and Criteria. I'm David Ward, the Subcommittee Chairman. Other ACRS members in attendance are Mr. Kerr, Mr. Wylie and Mr. Michelson.

The purpose of the meeting is to discuss the formulation of a definition of a large release to be used in the safety goal policy implementation plan. Mr. Dean Houston is the cognizant ACRS staff member for the meeting.

Rules for participation were announced as part of the notice of the meeting previously published in the Federal Register on January 23. A transcript of the meeting is being kept and will be made available as stated in that notice.

I request that each speaker first identify herself or himself and speak with sufficient clarity and volume so that he or she can be readily heard. We've received no written statements nor requests to make oral statements from members of the public.

Gentlemen, the ACRS has had a good bit to say over the last couple years about the staff's plan, the Commission's and staff's plan for implementation of the

1 safety goal policy. In general, I think the Committee has
2 been well pleased with the directions that are being taken
3 with the policy. One particular kind of major issue has
4 been on the definition of a large release, which is an
5 important part of some of the quantitative guidelines in the
6 policy.

7 We have here today people from the staff who have
8 developed a proposal which is documented in the SECY-90-405
9 paper, which we've all looked at or we've had a chance to
10 look at. We're going to hear a presentation from the staff
11 this afternoon just describing that, I believe, and we will
12 have an opportunity to answer any questions.

13 I expect we will be asking the staff to come into
14 the Full Committee meeting. We have some time allotted on
15 Friday. I think it will be appropriate for the Committee to
16 write a letter on the topic, even if it's just a short one,
17 for example, endorsing what the staff proposes, because, as
18 I said, we have taken a pretty active role in development of
19 the policy and I think the Commission will be looking for
20 our comments on this aspect of the development.

21 Bill, Charlie, do you have anything you want to
22 say?

23 [No response.]

24 MR. WARD: I'd like to lead off on the agenda and
25 Mr. Tom King of the Research staff. Begin.

1 MR. KING: I'm Tom King. I'm with the Division of
2 Safety Issue Resolution in the Office of Research. We
3 received the responsibility to develop the large release
4 definition or take the lead for development in the staff as
5 a result of the Commission's SRM on the safety goal policy
6 implementation which came down in June of 1990.

7 As you said, Dr. Ward, we're here at your request
8 and we've put together a briefing that tries to summarize
9 what was in the paper and where we see we're going from
10 here. At the end of the briefing, maybe we could talk a
11 little bit about what you want to hear for the Full
12 Committee, if, indeed, you do want us to come back for the
13 Full Committee.

14 A couple things I'd like to mention at the start.
15 First, we haven't heard back from the Commission yet on
16 SECY-90-405. I don't have any idea when we're going to hear
17 anything, but we are proceeding to put together our plans
18 and we'll start down the path that I'm going to talk about
19 today.

20 If the Commission comes in and it causes a mid-
21 course correction, then we'll have to change direction, but
22 we don't want to waste too much time. The second thing is
23 we haven't done any calculations yet, so we don't have any
24 numbers to show you today. We can talk about what we're
25 planning to do to get some numbers. We're not requesting a

1 letter at this time, but, certainly, if you want to write a
2 letter, that's fine.

3 We did plan to come back later on. When we get to
4 the schedule part, you'll see when we did plan to come back
5 and request a letter and present to you our technical
6 results and what we plan to do.

7 [Slide.]

8 MR. KERR: Mr. King, I had thought that the
9 Commission asked the staff to examine whether it made sense
10 to adopt such a guideline. I assume considering the amount
11 of effort the staff has put in so far, that the staff
12 concluded that it does make sense to have such a guideline.

13 MR. KING: I think the Commission went a little
14 further than just to say examine whether it makes sense. In
15 their SRM, they actually told us to go ahead and develop a
16 definition and come back to them with the definition and how
17 we intend to use it.

18 MR. KERR: I didn't see the SRM. They went beyond
19 their original statement.

20 MR. KING: They went beyond what was in the
21 original policy statement, yes.

22 MR. KERR: The policy statement, if I remember,
23 asked for an examination of whether this made sense.

24 MR. KING: Yes, I think you're right. But the SRM
25 said go --

1 MR. KERR: The SRM went beyond that.

MR. KING: Yes. I have the SRM here.

3 MR. KERR: The Commission does not follow its own
4 policy statement. That's not a question, that's a comment.

5 MR. WARD: The SRM you're talking about is the one
6 of last June.

7 MR. KING: June 15, yes.

8 MR. WARD: Pardon?

9 MR. KING: The one of June 15 last year.

10 MR. WARD: Yes. SECY-89-102.

11 MR. KING: Yes.

12 [Slide.]

13 MR. KING: Just by way of background, Page 2 of
14 the viewgraphs just has the quote from the Commission's
15 policy statement and note what we're talking about in the
16 terms of a large release are -- in the hierarchical
17 structure proposed by ACS, we're talking about Level III,
18 the large release guideline, which is the next level below
19 the quantitative health objectives.

20 MR. KERR: Excuse me. The SECY has this language,
21 "The Commission believes that the basic concept of the plant
22 performance objective is appropriate. The staff should
23 evaluate and advise the Commission whether such an objective
24 can be developed and how it would be useful."

25 In response to this SECY, you have apparently

1 advised the Commission it can be developed and it will be
2 useful at some point.

3 MR. KING: I think the SECY paper talks about that
4 it can be developed. How it's going to be used is still
5 being worked on at this point in time.

6 MR. KERR: This says you should evaluate and
7 advise the Commission whether the objective can be developed
8 and whether it would be useful and how it would be useful.
9 I think we're talking about the same thing, aren't we?

10 MR. KING: The June 15 SRM.

11 MR. KERR: Yes. You've got to read the following
12 sentence. It says "In conducting this evaluation, the staff
13 should formulate a new definition for large release and
14 supporting rationale consistent with this approach."

15 MR. KERR: But you first have to advise them as to
16 whether it's practical and useful, it seems to me. It would
17 seem to me that with that language, your first
18 responsibility was to advise them as to whether it could be
19 done and whether it would be useful. You've not done that
20 formally.

21 MR. KING: I think our SECY-90-405 tells them that
22 it can be done and gives them an approach that the staff
23 proposes to go do that.

24 MR. KERR: Okay.

25 MR. KING: As far as how it's going to be used or

1 its usefulness, there's an effort underway to look at how
2 we're going to use it. SECY-90-405 didn't really talk about
3 that.

4 MR. KERR: So at this point, you have decided it
5 can be done, but you haven't decided whether it would be
6 used for anything or not.

7 MR. KING: We haven't decided exactly how to use
8 it yet. That's right. But we've decided it can be done.

9 MR. KERR: All right.

10 [Slide.]

11 MR. KING: To continue with a little background,
12 the original SECY-89-102, which was the staff's paper on
13 implementing the safety goal policy, basically had a
14 recommended definition for the large release that was a
15 release that would have the potential for causing one or
16 more off-site early fatalities.

17 In an Enclosure 1 to that package, it also talked
18 about four other alternate definitions, not in any great
19 detail, but did acknowledge that there were other ways to
20 go. I think the staff's view at the time that we
21 recommended the definition that we did recommend was that
22 the definition should have a connection to off-site
23 consequences and we chose an early off-site fatality because
24 it's the more controlling of the quantitative health
25 objectives.

1 It seems it's going to stay in the definition that
2 we come back and recommend in SECY-90-405, it's just going
3 to do it in a way that doesn't rely on a Level III PRA and
4 site-specific information.

5 [Slide.]

6 MR. KING: At about the same time that SECY-90-102
7 went up to the Commission, maybe a month or so before, the
8 ACRS had provided their comments on what the basis for a
9 large release should be. Basically, there were four points
10 in a February 6 ACRS letter; that it should represent a
11 level of safety consistent with the qualitative goals and
12 quantitative health objectives; it should be in terms of the
13 release itself, curies, release rate, fraction of the core,
14 so forth; it should be independent of site characteristics;
15 and, it should provide some criteria against which the
16 design or performance of containments can be tested.

17 The Commission SRM that came back on June 15, I
18 think they pretty much across the board endorsed the ACRS
19 recommendations and stated in their SRM that they agreed the
20 large release should be independent of the site, should
21 focus on accidental releases. They acknowledge that it may
22 be as much as an order of magnitude more conservative than
23 the quantitative health objectives, but they seemed to
24 accept that as the price to pay for a simplification.

25 They mentioned that the staff should advise the

1 Commission on the development and use of the large release.
2 Accordingly, we developed SECY-90-405 that went up to the
3 Commission in December.

4 [Slide.]

5 MR. KING: In that paper, we talked about two
6 options, although we actually considered three in putting
7 the paper together. I'll talk about the third one. The
8 first option we looked at in the paper was a qualitative
9 option. It was similar to one that was discussed in the
10 original SECY-89-102. The way it read was a large release
11 is any release from an event involving severe core damage,
12 reactor coolant system pressure boundary failure, an early
13 failure or bypass of containment.

14 [Slide.]

15 MR. KING: The thought was that, again, we had in
16 mind preventing an off-site early fatality. The thought was
17 that if containment holds together for a sufficiently long
18 period of time, it's very unlikely you're going to have an
19 off-site early fatality. Therefore, we felt any qualitative
20 definition ought to be tied to early containment failure or
21 significant bypass.

22 So after a lot of discussion over the words, we
23 recommended this as a qualitative definition. The
24 advantages of it are it doesn't require detailed fission
25 product release calculations. It is independent of site

1 characteristics, although it probably does have some
2 limitation in terms of its application to reactors that have
3 conventional containments.

4 It would probably be tough to apply to one that
5 doesn't have conventional containment. However, the biggest
6 difficulty we saw with it was it's subject to
7 interpretation. Using terms like early failure or
8 significant bypass can be interpreted by different people
9 different ways and you'd have to develop a lot of guidance
10 to try and put some level of consistency in the
11 interpretation of this.

12 That was the main reason we didn't recommend
13 proceeding with this definition. It would be subject to a
14 lot of interpretation and not really achieve what we were
15 trying to achieve.

16 MR. KERR: Mr. King, it seems to me that what you
17 have there does bear on the damage to people off-site or
18 does bear on off-site consequences. But severe core damage,
19 system pressure boundary failure, and early failure of
20 containment are not themselves a large release.

21 MR. KING: That's another problem with it. You
22 could have events that really wouldn't be large releases.

23 MR. KERR: So it seems to me the difficulties that
24 you encounter here, and I see that they are real, could lead
25 you to conclude and report to the Commission that you don't

1 believe a definition of a large release is very useful,
2 because it doesn't have much to do with the off-site
3 consequences.

4 It seems to me the objections you are raising here
5 are objections that have to do with the difficulty in
6 relating this to off-site consequences.

7 MR. KING: For this definition, yes. For this
8 definition. We did not recommend this definition to the
9 Commission.

10 MR. KERR: I can see you didn't recommend it
11 because it doesn't have anything to do with a large release.
12 But you put it up as sort of a strawman which might be a
13 definition of a large release, but it really isn't. None of
14 those things have any relationship to a large release
15 necessarily.

16 MR. KING: There could be some events that would
17 meet that definition that would not be large releases, and
18 we discussed that as part of the pros and cons of this
19 particular item. John, did you want to say something?

20 MR. LANE: My name is John Lane. I'm in the
21 Severe Accident Issues Branch. One of the reasons that we
22 considered this option was that the Commissioners, in their
23 vote sheets on the original proposal that was put up, I
24 guess it was 89-102, some of their vote sheets recommended
25 that we consider this type of an option.

1 We found many difficulties with it, as we're
2 outlining here, but it was primarily considered because it
3 was discussed by the Commissioners in their voting on 89-
4 102.

5 MR. KERR: So you were too polite to tell them it
6 didn't have anything to do with a large release. Okay.

7 [Slide.]

8 MR. KING: The second option discussed in the
9 paper is the one we did recommend. That is one where you
10 would come up with a numerical value, although we are not
11 prepared at this time to recommend one. Basically the
12 definition would read "A large release is a release of
13 radioactivity from the containment to the environment of a
14 magnitude equal or greater to" and the value would be
15 determined through a series of calculations.

16 We'd express it either in curies or fraction of
17 core inventory, and the basis for determining that value
18 would be such that we wanted to have it cause no more than
19 one off-site early fatality, and we would use some
20 representative site characteristics in doing those
21 calculations.

22 We spent a couple of pages in the paper trying to
23 describe what we had planned to do in terms to come up with
24 this value, and we'll talk about that a little bit more.

25 MR. KERR: But, again, it seems to me that what

1 you have concluded is that the large release taken by itself
2 is not very useful. It's much more useful to talk about
3 off-site consequences, which is really the basis for what
4 you're recommending.

5 MR. KING: Our original proposal was a definition
6 stated in terms of off-site consequences.

7 MR. KERR: It, therefore, seems to me that you
8 have concluded, maybe implicitly, maybe unconsciously, that
9 a large release criterion isn't much good and what you need
10 is a criterion that's based on off-site consequences.

11 MR. KING: I wouldn't say that.

12 MR. KERR: What is that? That's an off-site
13 consequence. It, as yet, has no quantitative definition of
14 the amount of release.

15 MR. KING: That's right.

16 MR. KERR: The only thing quantitative is the off-
17 site consequence.

18 MR. KING: Hopefully, six months from now we'll
19 have a number to put in that definition that will be based
20 upon off-site consequences, but it will be a number.

21 MR. KERR: But what I'm saying is the large
22 release criterion is not particularly useful. It's off-site
23 consequence that sticks out here. You could use that
24 definition somewhere in your safety goal without saying
25 anything about the magnitude of the release.

1 The ultimate goal is to arrive at some probability
2 of a specified off-site consequence.

3 MR. KING: We feel that the basis for any
4 definition --

5 MR. WARD: Bill, that's already in the upper level
6 of the safety goal. That's what it is.

7 MR. KERR: What I'm saying is there isn't anything
8 new about this.

9 MR. WARD: What's new about this is it's an
10 attempt -- the whole approach of the hierarchy of the safety
11 goal is for each lower level to be a simplification of the
12 level above it, simplified in that you don't need to make as
13 elaborate a calculation to determine compliance.

14 I think what they're trying to show here is that
15 when they define a large release, they could use that as
16 some sort of a standard of a guideline for looking at
17 performance of a plant without having to make use of a Level
18 III PRA and other details.

19 MR. KING: When we did recommend a definition that
20 was based on off-site consequence, we had some constraints
21 put on us by the Commission. They said we don't want to
22 deal with off-site --

23 MR. KERR: But when they do this, if I read the
24 language of the SECY correctly, it's going to include not
25 just the magnitude of the release, but the timing of the

1 release, as well, for example, because that's going to have
2 a significant effect on whatever the potential for a
3 fatality means. I'm not sure I know what the potential
4 fatality means.

5 So it's not just --

6 MR. WARD: He hasn't said there's going to be a
7 time --

8 MR. KERR: No. But, for example, an early release
9 is going to be much more likely to cause this -- an early
10 containment failure is going to be much more likely to cause
11 this than a late failure. So in using --

12 MR. CARROLL: Because of evacuation or what?

13 MR. KERR: Yes. Continue. I've said enough.

14 MR. CARROLL: I guess I'm worried about the word -
15 - the concept of a potential early fatality. "Potential" is
16 in the beholder's eye.

17 MR. KERR: Potential was put in there because of
18 the way we could calculate this. It would be the same way
19 1150 calculated early off-site fatalities. It's a
20 probabilistic calculation. It looks at the probability of
21 various types of meteorology over the year, the probability
22 of the accident, and comes up with a probability per reactor
23 year.

24 MR. CARROLL: Probability of evacuation being
25 successful?

1 MR. KERR: Evacuation assumptions are in that off-
2 site model and NUREG-1150 looked at some variations in that.
3 So that's the reason the word "potential" is in there,
4 because it's going to be on a --

5 MR. CARROLL: Potential and probability are two
6 different concepts, aren't they?

7 MR. WARD: I think what they mean here is you
8 could say which would be predicted to cause one or more off-
9 site fatalities based on the representative site. People
10 have trouble with that word "potential." They think it
11 means something else.

12 MR. KING: You're right. It would be predicted
13 based upon the calculational techniques that we use.

14 MR. WARD: Right.

15 MR. KING: We felt that this definition met the
16 constraints put on us by the Commission or the guidelines
17 put on us by the Commission in that it is independent or
18 will be when the numbers develop, be independent of plan and
19 site characteristics.

20 You won't need to have a Level III PRA to be --

21 MR. KERR: Is it accurate to say it will be
22 independent of site characteristics, because it seems to me
23 it will be very dependent on site characteristics, those
24 that are assumed.

25 MR. KING: The development of it, specifying the

1 value will make some assumptions of site characteristics.
2 But once that value is set, to apply it to any plant out
3 there, it will not have to go to those individual plant site
4 characteristics to apply it.

5 You'd be able to apply it without consideration
6 anymore of site characteristics. That's what we had in
7 mind.

8 MR. WARD: If I understand what they're trying to
9 do, Bill, it's something like the emergency planning zone
10 diameter, radius or whatever. It's ten miles. It isn't
11 calculated for each and every plant, but 20 years ago they
12 did a lot of calculations and they said, gee, it looks like
13 ten miles is a pretty good representative number, so let's
14 use that for all plants.

15 That's the sort of thing you're doing here, isn't
16 it?

17 MR. KING: Yes. We're coming up with a number we
18 feel would be representative for all plants out there.
19 We're going to talk about the site characteristics, how we
20 plan to choose those in actually doing the calculations to
21 develop this number.

22 A couple other points about this definition. If
23 we do specify it in terms of curies or equivalent curies,
24 then it could be applicable to any reactor design. It
25 wouldn't be dependent upon whether it has a containment,

1 doesn't have a containment, so forth.

2 Also, if you specify it in terms of fraction of
3 core inventory, it would make that same statement.

4 MR. CARROLL: How do you deal with the timing and
5 all of this? An early release, Bill talked about the
6 evacuation issue. Early versus late release also has
7 implicit in it some isotopic composition.

8 MR. KING: We're trying to divorce the timing from
9 the definition of the value of large release. Whether that
10 amount is released early or late, if that amount is released
11 --

12 MF. KERR: But if you use MACCS, as you're
13 proposing to do, that certainly depends on the time at which
14 the containment rupture occurs, because that will influence
15 the sort of stuff that is released, won't it?

16 MR. KING: For the NUREG-1150 plants, the various
17 source terms that are used there have timing assumptions and
18 that certainly affects what gets out and how fast it gets
19 out.

20 MR. KERR: So you will also have to arrive at some
21 sort of representative or typical or some kind of timing for
22 containment response.

23 MR. KING: We're going to get to that. Can we
24 come back to that in a few slides? Okay.

25 [Slide.]

1 MR. KING. The two main things we feel we need to
2 do to implement this definition are, one, decide what this
3 representative site is going to be and, two, to actually run
4 some calculations using those site characteristics to come
5 up with a magnitude, a number for the large release, and
6 then decide whether you're going to specify it in terms of
7 curies or in terms of fraction of core inventory. So that's
8 really the work that we have ahead of us, if the Commission
9 adopts our proposed definition.

10 [Slide.]

11 MR. KING: I had mentioned we had talked about one
12 other definition that didn't get put into the SECY paper
13 because we felt it had too many negatives to even be
14 mentioned in there, but I'll mention it anyway. It's one of
15 the ones that was mentioned in the original SECY-89-102.
16 That was defining the large release in terms of off-site
17 dose.

18 What we kicked around was having a dose at the
19 exclusionary boundary, setting a boundary for dose at the
20 exclusionary boundary that would be equivalent to that dose
21 that you'd expect an early off-site fatality. But it had a
22 number of drawbacks in it. You either had to have site-
23 specific information to do it or you had to make some
24 assumptions that were more along the lines of what's used
25 for Part 100 type dose calculations.

1 In other words, they were very deterministic
2 assumptions. You'd assume the dose stayed at ground level,
3 the wind was always blowing in one direction, and that kind
4 of thing to do the calculation. We did some comparisons of
5 coming up with a definition like this versus using MACCS and
6 doing a more probabilistic assessment of calculation of early
7 off-site fatalities, and it turns out this is even another
8 order of magnitude more conservative than calculating a
9 large release using the probabilistic MACCS type calculation.

10 We felt it had several drawbacks and we didn't
11 propose it to the Commission, but we did look at it as part
12 of developing the paper.

13 [Slide.]

14 MR. WARD: I'm sorry. You said this is even more
15 than an order of magnitude more conservative than the QHOS?

16 MR. KING: If you recall, the large release
17 definition, there was a general understanding that it may be
18 up to a factor of ten more conservative than the
19 quantitative health objectives. Our feeling, if we went to
20 the dose value, a fencepost dose value, we'd even be another
21 order of magnitude more conservative than that. So it would
22 be like two orders of magnitude below the quantitative
23 health objectives.

24 MR. WARD: What was the definition of the first
25 one? Okay. You're saying the definition you're proposing

1 here or your second option is an order of magnitude, and if
2 you went to the 25 rem or something fencepost --

3 MR. KING: Or the 450 rem at the fencepost would
4 even be another order of magnitude.

5 MR. WARD: I'm sorry. Go ahead.

6 MR. KING: We took the definitions and just made a
7 comparison against the guidelines for subsidiary objectives
8 that were included in Enclosure 1 to SECY-89-102. If you
9 recall, they had seven items listed in there that any large
10 release definition they felt ought to meet.

11 I won't go through all of these, but, basically,
12 we felt the definition that we proposed originally met them.
13 The definition that we're proposing now meets them. The
14 other two definitions don't. The qualitative early
15 containment failure and/or the fencepost dose kind of
16 calculation doesn't meet all seven of those objectives.

17 So that was another factor we considered in
18 recommending the one we did.

19 MR. KERR: I must say I don't understand how you
20 decide whether it's understandable to the public or not, but
21 that must have been interesting.

22 MR. CARROLL: He puts his public hat on.

23 MR. WARD: Ask his wife.

24 MR. KERR: Maybe you decided if the ACRS could
25 understand it, the public could.

1 MR. KING: I think the concept was -- it's fairly
2 simple if you're talking about a magnitude that comes out of
3 a building, that's something everybody can understand. If
4 you're talking about a fraction of the core being dumped
5 outside the building, that's something everybody can
6 understand.

7 If you start to have a definition that's based
8 upon some assumptions that may not be too realistic, it
9 starts to get a little fuzzy. Granted, that was just our
10 judgment, but that's the way we looked at the definitions.

11 [Slide.]

12 MR. KING: Let's talk about what are we going to
13 do now. Assuming the Commission endorses the option we sent
14 them, what we have in mind is doing a set of calculations
15 that would build upon the NUREG-1150 plants, plus LaSalle
16 because we have source term data for those plants that can
17 easily be put into MACCS and calculations run.

18 Also, looking at these six plants, we consider
19 those to be a fairly good representative set of plants that
20 could be used as surrogates to represent the entire
21 population of plants that are out there today. They cover
22 all the containment types. They're all large plants. I
23 think they represent about 80 percent of the types of plants
24 that are out there in terms of their Westinghouse, their GE
25 types and so forth.

1 The intent would be not to select any one of those
2 as typical and do all the calculations with just one, but to
3 use all six in doing the calculations. What we plan to do
4 would be to develop a set of site parameters for this
5 representative site. In doing that, we're doing that in
6 conjunction at looking at the Part 100 update that's going
7 on now, where we're looking at putting more site criteria
8 into Part 100.

9 We're planning to do a set of calculations that
10 will provide a basis for whatever parameters we end up
11 putting into Part 100 in terms of how they relate to the
12 safety goals. We're looking at things like exclusionary
13 distance, population density around the plant, low
14 population zone, that kind of thing.

15 We feel whatever values we come up with and
16 recommend to go into Part 100 would be the same values that
17 we'd use for this representative site. We'll also have to
18 bring in some other things into the representative site.
19 We're going to have to make some assumptions on
20 precipitation, emergency planning and so forth that would
21 not show up in the Part 100 update, wind direction and that
22 kind of thing.

23 We plan to look at the sites that are out there
24 today and try to pick a value that may not be the worst
25 value in terms of precipitation, for example, but it will be

1 one that will represent a fairly large fraction of the
2 plants in terms of its consequences.

3 MR. WARD: Tom, when you say you're going to
4 coordinate it with the Part 100 update, you talked about six
5 months it might be before you get some numbers to plug into
6 this sort of thing, do you anticipate that the Part 100
7 update is going to be well developed by then?

8 MR. KING: We anticipate the calculations to
9 develop the basis for the numbers for the revised Part 100
10 will be done in the next six months. The rule change itself
11 won't be done, no, but the technical basis to support that
12 rule change will be done.

13 MR. WARD: But the staff expects to have a
14 proposal for that developed over the six-month period.

15 MR. KING: We expect to have the calculations done
16 and be ready to write the draft Part 100 revision.

17 MR. CARROLL: What is it exactly you're
18 calculating?

19 MR. KING: What we're going to calculate is once
20 we get this representative site defined, we're going to take
21 for each of the six plants, 1150 plants plus LaSalle, we're
22 going to take each of their source terms -- their source
23 terms are broken up and I think they're called source term
24 bins, there's like 50 of them per plant.

25 We're going to take each of those and run it in

1 MACCS for this representative site and we're going to look
2 for where -- if you skip back to slide 14, I'll put it up.

3 [Slide.]

4 MR. KING: For each of those source term bins, and
5 we don't really care what the probability of that release is
6 at this point or what the timing is. What we want to see is
7 if that amount is released -- I shouldn't say we don't care
8 about the timing. It will have assumptions on the timing
9 coming out of it when it goes into MACCS. We don't really
10 care what the probability is.

11 What we want to see is if that source term is
12 released, what will it mean in terms of number of off-site
13 early fatalities. For any given plant, for each of the
14 source terms, there will be a curve. It will be number of
15 off-site early fatalities versus the conventional frequency,
16 that being the frequency coming out of the meteorology
17 assumptions.

18 So you'll have a series of curves for each plant.
19 What we'll be interested in are the ones that come in right
20 around one early off-site fatality. We want to look at what
21 are the characteristics of those source terms.

22 MR. KERR: Don't you almost have a source term for
23 each sequence and then you consolidate them in 1150, so that
24 you have a subset. Do you ever have a single source term?

25 MR. KING: No. We are taking the consolidated

1 source terms from 1150. As I understand 1150, there may be
2 a number of sequences that feed into a given source term.
3 But the source term that comes from those different
4 sequences all have certain similar characteristics so that
5 they can let this one bin represent that source term from a
6 number of different sequences.

7 MR. KERR: And your understanding is you just feed
8 one bin into MACCS?

9 MR. KING: That we would take each -- there's a
10 number of bins for each plant in 1150. We'd take each of
11 those bins individually, feed them into MACCS and see what
12 kind of curve is generated, and do that for all the plants,
13 for all the bins for all the six plants.

14 MR. KERR: Then how would you get from that to the
15 source term or to the specification of a large release?

16 MR. KING: What we would do from that is look for
17 those source term bins that came in with a value of about
18 one off-site early fatality. We're not interested in ones
19 that were too small to cause an off-site early fatality and
20 we're not interested in ones that were real large that
21 caused a lot of off-site early fatalities.

22 I don't know how many of these we'll find. We
23 might find one, we might find 50, I don't know. But we'll
24 take whatever number of those we find and we want to look at
25 them from the standpoint of is there some characteristics of

1 those that makes them -- that they all have in common in
2 terms of fraction of core inventory, fraction of isotopes,
3 maybe timing, so forth.

4 If there is and if they're all over the place, it
5 will probably tell us pretty quickly that we need to specify
6 a large release in terms of curies, that we can't do it very
7 well in terms of fraction of core inventory. If they all
8 look like they have the same characteristics, maybe the
9 definition of a large release would be to define those
10 characteristics.

11 Till we run the numbers, I'm sort of speculating
12 here on what we're going to find. But that's the idea
13 behind it.

14 MR. KERR: So you would look first for a
15 description in terms of X curies of iodine and Y curies of
16 xenon.

17 MR. KING: Yes.

18 MR. KERR: So it wouldn't just be number of
19 curies, but --

20 MR. KING: No, no. The fraction of core
21 inventory, what isotopes are in there, see if there's any
22 common thread that runs among them.

23 MR. CARROLL: If there is not, then you fall back
24 to the idea of expressing this somehow in terms of curies of
25 different classes of isotopes?

1 MR. KING: I think we'd be locked in to expressing
2 it in curies if there's no common thread. I think if there
3 is a common thread, we may still express it in curies, but I
4 think we'd have another option that we'd want to look at.
5 It can be translated to even designs that are not ALWRs, for
6 example. So there is an advantage to doing it in curies or
7 equivalent curies.

8 MR. CARROLL: An equivalent curie. I'm still
9 trying to solidify that concept in my mind.

10 MR. KING: Equivalent curie would be converting
11 everything to one isotope, Cobalt-60, for example. So you'd
12 look at the curves that come out around one and you'd go
13 look at the source terms that generated those and they'd be
14 expressed in percent of noble gases, iodine, so forth, and
15 you convert all of those to an equivalent curie of Cobalt-60
16 or Iodine-131 or whatever equivalent isotope you want to
17 choose.

18 You can put everything on the same basis. Then
19 the large release would be expressed just in terms of the
20 magnitude of that one isotope.

21 MR. CARROLL: When you start thinking about the
22 biological effects of different isotopes, isn't that kind of
23 a simplistic approach? Iodine isn't going to cause, by
24 itself isn't going to cause prompt fatalities. You can live
25 without your thyroid gland. Lots of people do.

1 MR. KING: Considering a biological effectiveness,
2 you'd have to convert, say, cesium to what's that mean in
3 terms of its biological effectiveness if it were Iodine-131
4 or Cobalt-60. In other words, it just wouldn't be a one-
5 for-one translation of curies. I'm not an expert on how to
6 do that, but I understand it can be done.

7 MR. CARROLL: I think iodine is an exception to
8 what you think you understand. It does not, in and of
9 itself, cause a fatality normally.

10 MR. KING: You're talking about just thinking of
11 iodine alone.

12 MR. CARROLL: Yes.

13 MR. KING: Whatever isotope we chose to be the
14 representative isotope, we'd have to be careful that it
15 doesn't cause some misinterpretation that people think
16 that's the only thing that's coming out and, therefore -- we
17 haven't decided to go that way. It's just a thought in the
18 paper. That's something we're going to look at.

19 The reason we'd want to look at it is because then
20 this large release would be even more stable in terms of
21 applying it to different kinds of plants.

22 MR. WARD: Are these fatalities at the site
23 boundary?

24 MR. KING: No. These fatalities would be anywhere
25 beyond the site boundary. When MACCS does its calculation,

1 depending on -- it's looking at the different meteorology
2 over the year and the probability of it. Some releases
3 could go up and way out beyond the site boundary. Some
4 could come right across the fence. MACCS is looking at the
5 probabilities of the different weather patterns, calculates
6 a probability for all of that happening coincident with the
7 accident happening. It generates a curve like this.

8 So you can't really tell where the fatality is
9 going to be. It's more of a probabilistic calculation, but
10 it's somewhere beyond the fencepost. I guess you could
11 generate, if you have an idea of the range, how far out
12 you'd expect early fatalities, just due to how much dose you
13 get as you go out from the plant. But exactly where the
14 person is going to be, you wouldn't get that.

15 MR. CARROLL: We've skipped you ahead. You missed
16 13.

17 MR. KING: Let me go back to 13.

18 [Slide.]

19 MR. KING: I talked about the first two bullets.
20 Let me talk about the second and third a little bit. One of
21 the things we talked about in writing the paper, the SECY-
22 90-405, was when you do a MACCS calculation, there are
23 assumptions on emergency planning that are put into the
24 calculation. There was some discussion of how consistent
25 are they with what really happens at a plant and if we

1 select some assumptions on emergency planning for defining a
2 large release, how well will that represent what's going to
3 happen at all the ensembled plants that are out there.

4 So we decided to take a look at some different
5 emergency planning assumptions as part of the calculation,
6 not just pick one and say this is it for everybody. What we
7 have in mind is we're going to look at changing the time at
8 which evacuation starts, as well as the speed with which it
9 takes place and see what the impacts are on the large
10 release by doing that.

11 We suspect the early releases will dominate the
12 calculation of early off-site fatalities and, therefore,
13 will dominate the large release definition, in which case,
14 if they're early enough, the evacuation won't buy you a
15 whole lot in terms of reducing that value.

16 We do want to look at a spread of evacuation
17 assumptions as part of this. The other thing we want to do
18 is look at land --

19 MR. KERR: If you do find that the early releases
20 dominate, will you consider asking the Commission to change
21 their criteria to a large early release?

22 MR. KING: At this point, I'm not going to
23 speculate on what we'll ask the Commission to do, till we
24 run the numbers and see what comes out. The second thing we
25 said we want to do is look at the extent of land

1 contamination. MACCS will calculate that automatically.
2 It's not anything additional we have to do to MACCS. But we
3 think it's an important piece of information.

4 Even though the large release definition itself is
5 being based upon early fatalities, health concerns, land
6 contamination is a concern. We think the Commission ought
7 to know, whatever definition that we settle in on, what that
8 means in terms of land contamination. I'm not sure we're
9 going to do anything with it other than just make that
10 information available at this point in time. But we will
11 run that calculation and get that information.

12 MR. CARROLL: That would be translated into a
13 dollar impact of such contamination?

14 MR. KING: Dollar impact, how many miles of land
15 will have to be interdicted, that kind of thing, square
16 miles of land. The idea when all this is done is we'd come
17 up with a single value for the large release, whether it's
18 curies or fraction of core inventory, to come up with a
19 single value.

20 MR. WARD: All of these plants in 1150 are roughly
21 1,000 megawatt plants, I guess. They're all large.

22 MR. KING: I had a backup slide on that. I can't
23 find it. All the plants in 1150 are large plants. Five out
24 of the six are over 1,000 electric and I think one of them
25 is 600 or 800.

1 MR. WARD: Right now the safety goal policy itself
2 does :t differentiate between a 300 megawatt plant and an
3 1,100 megawatt plant.

4 MR. KING: That's right. That's a good point. If
5 we define a large release in terms of fraction of core
6 inventory, we may have to make it per megawatt, because for
7 a small plant, if we're talking off-site early fatalities,
8 it could release a lot more fraction of its core than a
9 large plant in terms to equal the same number of curies.

10 If we expressed it in terms of curies, then it
11 will be independent of power level. But if we express them
12 in terms of fraction of core inventory --

13 MR. WARD: You could do that, but you'd be kind of
14 improving on the overall safety goal idea which smears over
15 that point right now.

16 MR. CARROLL: Fraction of core inventory
17 normalized to a 3,250 megawatt thermal plant or something
18 like that.

19 MR. KING: Something like that.

20 MR. WARD: I'm not saying that it doesn't make
21 sense, but we're sort of stuck now with the safety goal
22 policy that talks about the quantitative health objectives
23 don't differentiate between the 300 megawatt plant and the
24 1,100 megawatt plant, right?

25 MR. CARROLL: True. But is there something that

1 says that this next tier down --

2 MR. WARD: I don't know.

3 MR. CARROLL: -- can't --

4 MR. WARD: No. I guess not.

5 MR. KING: We mentioned that in the paper that
6 went up to the Commission. They pointed out that we may
7 have to bring in power level if it's expressed in fraction
8 of core inventory.

9 MR. KERR: You could normalize to some arbitrary
10 power level and pick a different fraction. For a lower
11 power plant, you'd release a bigger fraction. For a higher
12 power plant, a smaller fraction. All normalized to this
13 thing that was calculated with a potential single fatality.

14 [Slide.]

15 MR. KING: Our schedule. We're just about ready
16 to go out with a statement of work to get started on this.
17 This is a statement of work for both Part 100 calculations,
18 we're ready to start those, as well as get started planning
19 for these calculations on the large release.

20 We would hope to have both sets of calculations
21 done around June and be able to draft up a NUREG for the
22 supporting document, provide the documentation to support
23 the large release value we recommend in about September. We
24 plan to come back to the Committee in October and to the
25 Commission in November. That's our best estimate right now

1 of when we could get this work done.

2 MR. KERR: Tom, it concerns me a little, unless I
3 misunderstood you, that you said you aren't really sure how
4 you would use this, but you're going ahead with these
5 calculations. It would seem to me that some idea of how
6 it's to be used could very well guide the approach that you
7 take in arriving at whatever it is you're going to arrive
8 at. If you go ahead and do this development before you've
9 thought much about how it's going to be used, I think you
10 may find when you try to apply it that you maybe neglected
11 some important things.

12 It would seem to me you'd want to give some
13 serious thought to how you're going to use what it is you
14 finally develop.

15 MR. KING: I agree with you. Eric Beckjord
16 established a steering committee a few weeks ago to address
17 that very issue. It's looking more than at large releases.
18 It's looking at the whole concept of how we're going to use
19 safety goals in regulation from now on. A large release is
20 just one piece of that. They hope to have an interim
21 position developed in the next couple of months.

22 MR. CARROLL: Who is on the steering committee?

23 MR. KING: Jack Heltemes is the Chairman of it.
24 Bernero is on it. I've got the list of members over here.
25 I'll go get it. Bernero from NMSS, Bill Russell from NRR,

1 Denny Ross from AEOD, Marty Malsch from OGC, and Matt Taylor
2 from the EDO's Office. Their charter is to go take a look
3 at how are we going to use the safety goals and to come up
4 with an interim position in the next couple of months.

5 So I agree with you; depending on what they come
6 up with, it could cause a change in direction in what we're
7 doing.

8 MR. KERR: Those are very good people, I think,
9 but they have a tough job. I hope they have the time to put
10 in on this task. I would guess that before they were
11 appointed to this task force, none of them would admit not
12 to being busy about one point 110 percent of the time.

13 MR. CARROLL: Taylor couldn't be that busy. He
14 comes down to our meetings all the time.

15 MR. KING: That completes a rundown on where we're
16 planning to go. If it would be useful, we could give this
17 same sort of discussion at the Full Committee or, if you
18 have other things you want to talk about, we could talk
19 about them.

20 MR. KERR: Tom, as we looked at 1150, the part of
21 the calculation for which no effort was made to estimate the
22 uncertainty was the MACCS part in the Level III. One might
23 conclude, I don't know whether it's valid or not, that one
24 could calculate Level I and Level II with somewhat less
25 uncertainty than if one goes to a Level III.

1 It seems to me what you're going to do could very
2 well introduce additional uncertainty into this. I'm not
3 sure how to avoid that, but you are dealing with a code
4 which the staff either they didn't have time and resources
5 or didn't know how to do an uncertainty estimate on. It is
6 a code that has not received very much validation up to this
7 point.

8 MR. KING: It is a code, I know, that hasn't --
9 I've never seen any rigorous comparison with CRAC-2 or CRAC
10 to see what the differences are there. It's been used less
11 than CRAC-2 and CRAC has. As far as the uncertainty goes, I
12 guess I'd have to talk to somebody like Joe Murphy.

13 MR. KERR: You don't have to talk to anybody to
14 recognize that, in contrast to a Level I and Level II, for
15 which uncertainty estimates were made in 1150, there was no
16 such estimate for a Level III.

17 MR. KING: I think you're pointing out the need
18 that when we develop the large release definition, we need
19 to consider the uncertainty and try and give at least a feel
20 for what that level of uncertainty is when we come back with
21 a number.

22 MR. CARROLL: Aren't you pleased, Bill, to learn
23 that there is some use for 1150 in a generic sense?

24 MR. WARD: I was going to comment. There seems to
25 be a part of the staff which has insisted that there are no

1 generic conclusions that can be drawn from 1150. I don't
2 know if they've remained steadfast in that opinion or not.
3 But you're sure doing it here. You're going to be doing it.
4 If it isn't ever used, it doesn't matter, I guess, but I'd
5 like to think it's going to be used.

6 MR. KING: 1150 has developed a lot of good
7 information which I think you can use not only here, but
8 elsewhere.

9 MR. CARROLL: Somebody's been saying that.

10 MR. WARD: I agree with you.

11 MR. CARROLL: Let's see. I'm looking at what Hal
12 Lewis, who couldn't be here today, had on the bulletin board
13 that we haven't talked about. I guess he's a little
14 disjointed because he wrote this big long treatise without
15 having read the material, it sounds like. The shorter one
16 sounds like he thinks the staff is on the right track.

17 MR. KERR: He will be here tomorrow, won't he?

18 MR. CARROLL: I think so. I would, however, when
19 he's talking about the general problem of definitions, and
20 he had a good line in this thing that I will share with you,
21 talking about the problems we had with the definition of
22 core melt and some of those things we've managed to mix up
23 there. He says "This is like defining the Mona Lisa as a
24 bucket of paint."

25 MR. WARD: That is a good line. I couldn't figure

1 out what quite it related to.

2 MR. KERR: You couldn't see how to use it.

3 MR. WARD: No. Tom, the reason we asked you to
4 come and talk to the Subcommittee and the Full Committee is
5 I think you are going to go off and do a lot of work now and
6 flesh this out and see if it really works and, as Bill
7 suggested, part of your charge is to figure out how you'll
8 use it. I agree with the Bill; the Commission did ask you
9 to do that.

10 But I think the reason I wanted you to come in and
11 talk to the Subcommittee at this point is just so if we were
12 going to jump and down and scream and say you're going in
13 the wrong direction, we'd say it now instead of six months
14 from now. My impression is that you're going in the right
15 direction, but I don't know how the rest of the Committee
16 members feel.

17 MR. WYLIE: He seems to be doing what the
18 committee recommended.

19 MR. KERR: I could, I think, easily reach the
20 conclusion that they have decided it doesn't make much sense
21 to talk about a large release apart from doing risk
22 calculations from what they've done up to now, and that what
23 they're doing -- if the Commission had told me to do what
24 they told them, I might be doing the same thing.

25 But what they are doing, I think, is backing into

1 a large release by doing risk calculations. It seems to me
2 it well may develop that what they'll finally get is a
3 recipe for a large release which will involve certain
4 fractions and certain assumptions about early release. So
5 that if somebody is trying to see whether they meet this, it
6 may be just as complicated a doing a Level III PRA.

7 MR. WARD: I it is, the idea has failed.

8 MR. KERR: That's the reason I think it's
9 important to start looking at how one would use the product
10 that's being calculated, because it may turn out to be --
11 depending on where one goes, it may turn out to be so
12 complicated to use it that it would be simpler to do a Level
13 III PRA. I think that the large release criterion -- I
14 think it would have two purposes.

15 I think at least one Commissioner just wanted to
16 say something about a large release and he was fairly vocal.
17 But it also may have been an effort to try to simplify
18 things so that one wouldn't have to go through a Level III
19 PRA.

20 MR. KING: Our intent is to avoid having to have a
21 Level III PRA.

22 MR. KERR: If that's the intent, and I think it's
23 a reasonable one, you have to be careful that in order to
24 apply this, it isn't more complicated than if one did a
25 Level III PRA.

1 MR. KING: I agree with that. It should be
2 simpler. That is one of the groundrules.

3 MR. WARD: One way of looking at it is you've got
4 a whole order of magnitude there to play with for
5 simplifying it. The reason it's more conservative and you
6 want it to be more conservative is to accommodate the
7 simplification that you're putting into it. That's kind of
8 the strategy of the safety goal hierarchy.

9 MR. KING: It's the tradeoff.

10 MR. WARD: Yes. You've got a pretty big hunk of -
11 - I mean it happens that talking about anything once in a
12 million years gives you a pretty generous margin from the
13 QHOs. So you can do a lot of simplifications. The one of
14 smearing over the difference between 300 megawatts and 1,100
15 megawatts is probably a relatively minor smearing over, I
16 guess, compared to some of the other things.

17 MR. KING: I agree. The idea is to make it
18 simple, that a designer can meet without having to do a
19 Level III PRA.

20 MR. WARD: Yes. As Bill says, if you partition it
21 or do something and make it so complicated that it doesn't
22 satisfy that simplification ideal, then there's no point in
23 doing it. But I guess there's no reason to give up on it
24 yet. That's what you're going to find out over the next few
25 months.

1 I guess I hadn't heard anything about this
2 steering group. I'd sort of like to hear from them at some
3 point.

4 MR. KERR: Have you made a presentation like this
5 to them?

6 MR. KING: No.

7 MR. KERR: They've just been formed.

8 MR. KING: They were set up January 22.

9 MR. KERR: So they don't know what you're doing.
10 We're ahead of them.

11 MR. KING: They know what we're doing. Several of
12 the people on the steering group know what we're doing.
13 They concurred in the package that went up to the
14 Commission. So it's not that we're disconnected, but, no,
15 we haven't made a presentation to them yet.

16 MR. WYLIE: Have they got a schedule?

17 MR. KING: Their schedule, according to Eric
18 Beckjord's letter which was dated January 22, is the target
19 schedule for development of this interim guidance for trial
20 use is two months from now.

21 MR. KERR: We haven't seen this letter, have we?

22 MR. WARD: No.

23 MR. KERR: Is it privileged so that we can't see
24 it or could you let us have a copy?

25 MR. WARD: Maybe Dean could contact Heltemes or

1 somebody. I think we're interested in following up on that,
2 now that Tom spilled the beans.

3 MR. KING: I think it's important, though. I
4 think it's important that that's being looked at.

5 MR. WARD: Anything else? That's all you want to
6 say?

7 MR. KING: That's really all there is to say at
8 this point.

9 MR. KERR: Are there any different professional
10 opinions?

11 MR. KING: Not that I know of.

12 MR. KERR: Do we need to record any more of this?

13 MR. WARD: No. In fact, I think we can just about
14 bang the gavel here in a minute.

15 MR. KING: Would you want this same presentation
16 on Friday? Is that the question?

17 MR. WARD: I don't see why not.

18 MR. KERR: In fact, I see a number of reasons why.

19 MR. WARD: Anything else?

20 [No response.]

21 MR. WARD: Thanks very much, Tom.

22 [Whereupon, at 4:18 p.m., the Subcommittee was
23 recessed.]

24

25

REPORTER'S CERTIFICATE

This is to certify that the attached proceedings before the United States Nuclear Regulatory Commission

in the matter of:

NAME OF PROCEEDING: ACRS Safety Philosophy

DOCKET NUMBER:

PLACE OF PROCEEDING: Bethesda, Maryland

were held as herein appears, and that this is the original transcript thereof for the file of the United States Nuclear Regulatory Commission taken by me and thereafter reduced to typewriting by me or under the direction of the court reporting company, and that the transcript is a true and accurate record of the foregoing proceedings.

Mary C. Larkin

Official Reporter
Ann Riley & Associates, Ltd.

①

RES STAFF PRESENTATION

SAFETY GOAL

LARGE RELEASE DEFINITION

ACRS SUBCOMMITTEE MEETING

FEBRUARY 5, 1991

TOM KING (X23980)

PURPOSE OF BRIEFING

- o TO RESPOND TO AN ACRS REQUEST FOR A STATUS REPORT ON THE STAFF'S EFFORTS TO DEFINE A LARGE RELEASE, AS DESCRIBED IN SECY-90-405.
- o STAFF IS NOT REQUESTING A LETTER AT THIS TIME.

BACKGROUND

IN THE 1986 SAFETY GOAL POLICY STATEMENT, THE COMMISSION PROPOSED A GENERAL PERFORMANCE GUIDELINE FOR FURTHER STAFF EXAMINATION:

"CONSISTENT WITH THE TRADITIONAL DEFENSE-IN-DEPTH APPROACH AND ACCIDENT MITIGATION PHILOSOPHY REQUIRING RELIABLE PERFORMANCE OF CONTAINMENT SYSTEMS, THE OVERALL MEAN FREQUENCY OF A LARGE RELEASE OF RADIOACTIVE MATERIALS TO THE ENVIRONMENT FROM A REACTOR ACCIDENT SHOULD BE LESS THAN 1 IN 1,000,000 PER YEAR OF REACTOR OPERATION."

ACRS HAD PROPOSED A 5 LEVEL SAFETY GOAL HIERARCHY:

LEVEL 1 - QUALITATIVE SAFETY GOALS

LEVEL 2 - QUANTITATIVE HEALTH OBJECTIVES

LEVEL 3 - LARGE RELEASE GUIDELINE

LEVEL 4 - PERFORMANCE OBJECTIVES

LEVEL 5 - REGULATIONS AND REGULATORY PRACTICES

OPTIONS FOR LR DISCUSSED IN SECY-89-102

o RECOMMENDED OPTION:

RELEASE THAT WOULD HAVE THE POTENTIAL FOR CAUSING ONE OR MORE OFFSITE EARLY FATALITIES.

o OFFSITE HEALTH EFFECTS:

COLLECTION OF ALL RELEASES THAT WOULD RESULT IN ONE OR MORE EARLY FATALITIES.

o OFFSITE DOSE:

EXPOSURE TO ANY OFFSITE INDIVIDUAL RESULTING IN A DOSE OF X REM OR MORE.

o MAGNITUDE OF RELEASE:

ALL THE NOBLE GASES, AND $X\%$ OR MORE OF ANY OF THE OTHER SOURCE TERM ELEMENT GROUPS.

o CONTAINMENT FAILURE MODES:

ANY RELEASE FROM AN EVENT INVOLVING SEVERE CORE DAMAGE, PRIMARY SYSTEM PRESSURE BOUNDARY FAILURE, AND EARLY CONTAINMENT FAILURE.

PREVIOUS ACRS COMMENTS ON "LARGE RELEASE"
DEFINITION (FROM FEB. 16, 1989 ACRS LETTER):

- o IT SHOULD REPRESENT A LEVEL OF SAFETY CONSISTENT WITH THE QUALITATIVE GOALS AND QUANTITATIVE HEALTH OBJECTIVES
- o IT SHOULD BE IN TERMS OF THE RELEASE ITSELF, E.G., CURIES, LEAK OR RELEASE RATE, FRACTION OF THE CORE, OR CONTAINMENT INVENTORY
- o IT SHOULD BE INDEPENDENT OF THE SITE CHARACTERISTICS
- o IT SHOULD PROVIDE SOME CRITERIA AGAINST WHICH THE DESIGN OR PERFORMANCE OF CONTAINMENTS CAN BE TESTED

COMMISSION GUIDANCE TO THE STAFF

- o COMMISSION REJECTED STAFF PROPOSED DEFINITION
IN A JUNE 15, 1990 SRM:
 - LARGE RELEASE SHOULD BE SITE INDEPENDENT
 - LARGE RELEASE SHOULD FOCUS ON ACCIDENTAL
RELEASES
 - ACKNOWLEDGED THAT LR GUIDELINE MAY BE AN
ORDER OF MAGNITUDE MORE
CONSERVATIVE THAN QROs
 - STAFF SHOULD ADVISE THE COMMISSION ON
DEVELOPMENT AND USE

- o ADDITIONAL LR DEFINITION OPTIONS WERE THEN
SUBSEQUENTLY CONSIDERED AND DISCUSSED IN SECY-
90-405, DATED 12/14/90

OPTION 1

QUALITATIVE STATEMENT ON EARLY CONTAINMENT FAILURE:

A LARGE RELEASE IS ANY RELEASE FROM AN EVENT INVOLVING SEVERE CORE DAMAGE, REACTOR COOLANT SYSTEM PRESSURE BOUNDARY FAILURE, AND EARLY FAILURE OR SIGNIFICANT BYPASS OF CONTAINMENT.

DISCUSSION:

- o DOES NOT REQUIRE DETAILED FISSION PRODUCT RELEASE CALCULATIONS
- o INDEPENDENT OF SITE CHARACTERISTICS
- o LIMITED IN APPLICATION TO REACTORS HAVING CONVENTIONAL CONTAINMENTS
- o DIFFICULT TO DEFINE KEY TERMS, e.g., "EARLY CONTAINMENT FAILURE" AND "SIGNIFICANT BYPASS."

OPTION 2 (Recommended by Staff)

MAGNITUDE OF RELEASE

"A LARGE RELEASE IS A RELEASE OF RADIOACTIVITY FROM THE CONTAINMENT TO THE ENVIRONMENT OF A MAGNITUDE EQUAL TO OR GREATER THAT: (AN AMOUNT, TO BE DETERMINED BY THE STAFF, EXPRESSED IN CURIES OR FRACTION OF THE CORE INVENTORY, WHICH HAS THE POTENTIAL, BASED ON REPRESENTATIVE SITE CHARACTERISTICS, FOR CAUSING ONE OR MORE OFFSITE EARLY FATALITIES.)"

DISCUSSION:

- o TIES THE RELEASE DEFINITION TO AN OFFSITE CONSEQUENCE WHICH IN CONCEPT IS EASILY UNDERSTOOD BY THE PUBLIC

OPTION 2

(CONTINUED)

- o INDEPENDENT OF PLANT OR SITE CHARACTERISTICS
- o NO PLANT SPECIFIC LEVEL III PRA REQUIRED
- o USE OF "EQUIVALENT CURIES" COULD EXTEND THE APPLICATION OF THIS OPTION TO ADVANCED REACTORS WHICH WILL HAVE DIFFERENT RADIONUCLIDES IN THE RELEASE
- o REPRESENTATIVE SITE NEEDS TO BE DEFINED TO CALCULATE A SINGLE VALUE

OPTION 3 (Not discussed in SECY-90-405)

OFFSITE DOSE

A LARGE RELEASE IS ONE WHICH CAUSES A DOSE OF (250-450) REM TO AN INDIVIDUAL LOCATED AT THE EXCLUSION AREA BOUNDARY.

DISCUSSION:

- o DOSE SELECTED BASED ON OFFSITE FATALITY CONSIDERATIONS

- o NO NEED TO CONSIDER OFFSITE PARAMETERS (E.G., POPULATION DENSITY OR EVACUATION EFFECTIVENESS)

- o SIMILAR IN NATURE TO THE FENCEPOST DOSE USED IN CURRENT LICENSING ACTIVITIES (E.G., ASSUMES GROUND LEVEL RELEASE, WIND IN ONE DIRECTION, ETC.)

OPTION 3

(CONTINUED)

- o MORE THAN AN ORDER OF MAGNITUDE CONSERVATIVE THAN A PROBABILISTIC BASED APPROACH (E.G., CRAC OR MACCS).

- o A SINGLE VALUE COULD BE CALCULATED USING REPRESENTATIVE SITE CHARACTERISTICS.

COMPARISON OF LARGE RELEASE DEFINITIONS

<u>GUIDELINES FOR SUBSIDIARY OBJECTIVES IN SECY-89-102</u>	<u>DEFINITION SECY-89-102</u>	<u>DEFINITION-EARLY CONTAINMENT FAILURE</u>	<u>DEFINITION-MAG. OF RELEASE</u>	<u>DEFINITION OFFSITE DOSE</u>
1) SHOULD BE CONSISTENT WITH LEVEL ABOVE	YES	YES	YES	YES
2) SHOULD NOT BE MORE CONSERVATIVE SUCH THAT IT IS A NEW POLICY	YES	YES	YES	NO
3) SHOULD BE A SIMPLIFICATION OF PREVIOUS LEVEL	YES	NO	YES	YES
4) SHOULD PROVIDE A BASIS FOR ASSURING QHOs ARE MET	YES	YES	YES	YES
5) SHOULD HAVE BROAD GENERIC APPLICABILITY	YES	NO	YES	YES
6) SHOULD BE UNDERSTANDABLE TO PUBLIC	YES	YES	YES	YES
7) SHOULD COMPORT WITH CURRENT PRA PRACTICE	YES	YES	YES	NO

APPROACH TO DEVELOPMENT OF LR DEFINITION

RADIOACTIVE RELEASE:

USE NUREG/1150 PLANTS PLUS LASALLE FOR
CALCULATIONS:

- o CONSIDER THESE PLANTS TO BE
"REPRESENTATIVE" OF U.S. PLANTS ACTING AS
SURROGATES FOR ALL OTHERS
- o DO NOT SELECT ANY ONE AS BEING TYPICAL
- o AVAILABLE DATA FOR MCCS AND RELEASE
CALCULATIONS

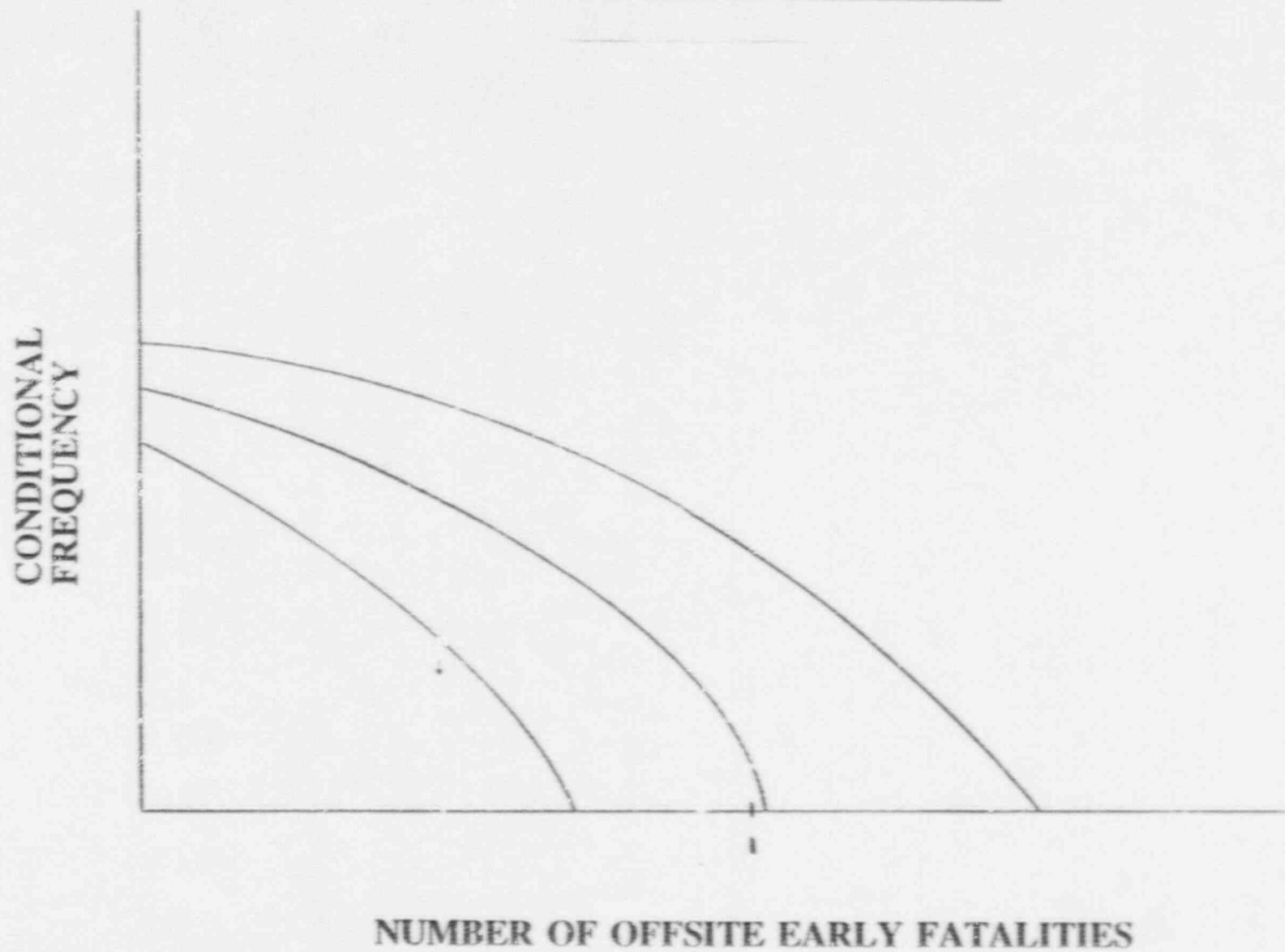
DEVELOPMENT OF REPRESENTATIVE SITE

- o COORDINATE WITH PART 100 UPDATE
- o REPRESENTATIVE SITE CHARACTERISTICS TO BE
THE SAME AS WHAT IS SELECTED FOR PART 100
UPDATE

LARGE RELEASE MAGNITUDE DETERMINATION

- o USE 1150 PLANTS AND LASALLE RELEASE DATA TO DETERMINE RELEASES APPROXIMATING 1 EARLY FATALITY AT REPRESENTATIVE SITE
- o EVALUATE MAGNITUDE, TIMING, AND COMPOSITION OF CANDIDATE RELEASES
- o WILL EVALUATE AFFECT OF DIFFERENT EP ASSUMPTIONS (EVACUATION START TIME AND SPEED)
- o WILL CALCULATE EXTENT OF LAND CONTAMINATION
- o SELECT A SINGLE VALUE

MACCS CALCULATION



SCHEDULE

- o START CALCS - 2/91

- o CALCS COMPLETE - 6/91

- o DRAFT NUREG - 9/91

- o ACRS/CRGR - 10/91

- o TO COMMISSION - 11/91

USE OF LARGE RELEASE DEFINITION

- o STEERING GROUP ESTABLISHED IN JANUARY 91 TO DETERMINE HOW TO INCORPORATE SAFETY GOAL CONSIDERATIONS INTO THE DEVELOPMENT OF REGULATIONS AND OTHER REGULATORY ACTIONS

- o INTERIM POSITION FOR TRIAL USE BY APRIL 91