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NUCLEAR REGULATORY COMMISSION

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Document for Advanced Light Water Reactors

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BRIEFING ON EPRI DESIGN REQUIREMENTS  
DOCUMENT FOR ADVANCED LIGHT WATER REACTORS

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PUBLIC MEETING

Nuclear Regulatory Commission  
One White Flint North  
Rockville, Maryland

Wednesday, September 20, 1989

The Commission met in open session, pursuant to notice, at 10:00 a.m., Kenneth M. Carr, Chairman, presiding.

COMMISSIONERS PRESENT:

KENNETH M. CARR, Chairman of the Commission  
THOMAS M. ROBERTS, Commissioner  
KENNETH C. ROGERS, Commissioner  
JAMES R. CURTISS, Commissioner

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STAFF AND PRESENTERS SEATED AT THE COMMISSION TABLE:

WILLIAM C. PARLER, General Counsel

JACK GUTTMANN, Office of the Secretary

BYRON LEE, NUMARC

ED KINTNER, EPRI

JOHN TAYLOR, EPRI

JACK DeVINE, EPRI

KARL STAHLKOPF, EPRI

## P-R-O-C-E-E-D-I-N-G-S

10:02 a.m.

CHAIRMAN CARR: Good morning, ladies and gentlemen.

The purpose of today's meeting is for the Electric Power Research Institute, EPRI, and the Nuclear Management and Resources Council, NUMARC, to brief the Commission on the design requirements document for advanced light water reactors currently being prepared by EPRI and under review by the NRC staff.

The Commission was briefed on this subject by the staff on August 1st of 1989. As a result of that briefing, the Commission is considering the priority to be applied to design reviews in light of resource constraints and the apparent lack of expressed domestic interest in purchasing an advanced light water reactor.

Also troubling is the concurrent development of specific advanced evolutionary designs and the EPRI design requirements document which, as I understand the program, was intended to be a compilation of utility requirements for design, construction and performance of future light water reactors.

Finally, it is not clear that the industry

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1 activities currently in progress and planned are  
2 leading to the Commission's goal of standardization.

3 Today, we hope to hear answers to these  
4 concerns that will enable us to make an informed  
5 decision as to whether our present course of action is  
6 appropriate.

7 Copies of the slide presentations to be used  
8 today are available at the entrance to the meeting  
9 room.

10 Do any of my fellow Commissioners have any  
11 opening comments?

12 If not, Mr. Lee, please proceed.

13 MR. LEE: Thank you, Mr. Chairman. I  
14 appreciate the opportunity for NUMARC to be a part of  
15 this program and to discuss the industry's advanced  
16 light water reactor program and represent a major  
17 segment of the nuclear industry in the U.S.

18 I believe I can safely say that the vast  
19 majority of the nuclear industry in this country is  
20 still committed to nuclear power and believes that  
21 nuclear units can be designed, constructed and  
22 operated safely with a minimal impact upon the  
23 environment. And if we continue to proceed along the  
24 course started by this program and your new Part 52  
25 rule, it can be built economically. I say that based

1 upon my discussions with the leadership in the nuclear  
2 utilities, the vendors and the architect/engineers.

3 I don't believe any utility is ready now to  
4 step up and order the next reactor, and I can't say  
5 with anymore certainty than anyone else when that will  
6 be. However, I do believe that there are three major  
7 prerequisites that will be necessary before that  
8 happens.

9 First and foremost, of course, is the need  
10 for power. In certain segments of this country at the  
11 present time, I believe the utilities are aware of a  
12 need for power, but there needs to be additional  
13 perception changes before that will be met, that  
14 criteria.

15 Secondly, there will need to be a licensing  
16 process in place that will give some reasonable  
17 assurance that a plant, once licensed and construction  
18 started, can be completed in about five years. This  
19 will require some stability in that process during  
20 that period.

21 Lastly, that there is a standardized design  
22 that has progressed through the certification process.  
23 I believe the approach the industry and NRC has taken,  
24 as well as will be described to you today, coupled  
25 with the efforts related to the new Part 52 rule are a

1 major step in the proper direction.

2 The industry's position on the proper  
3 approach was described by James O'Connor, Chairman and  
4 Chief Executive Officer of Commonwealth Edison and  
5 Chairman of the Nuclear Power Oversight Committee, in  
6 his testimony before the Senate Energy and Natural  
7 Resources Committee on advanced reactors in May of  
8 last year.

9 Jim said, and I quote, "It's my judgment and  
10 that of the majority of the nuclear power industry  
11 that the light water reactor will remain the dominant  
12 nuclear power technology over the next several  
13 decades. Over 25 years of favorable operating  
14 experience worldwide, along with extensive development  
15 and testing programs support the light water reactor  
16 and provide a sound basis for confidence in this  
17 technology. It would be unrealistic to look for a  
18 utility to order in the near future a reactor based on  
19 technology that has yet to be proven commercially  
20 viable when an advanced version of a technology proven  
21 and accepted worldwide will be available.

22 "To this end, a major program has been  
23 undertaken in the past several years to develop an  
24 advanced light water reactor for deployment as this  
25 next increment of nuclear power generation capacity.

1 This program, supported by the utilities, the vendors,  
2 DOE and EPRI, has shown exceptional promise in  
3 providing standardized advanced light water designs,"  
4 and that's the end of the quote.

5 Although that testimony is over a year old,  
6 I can say from recent first-hand discussions with the  
7 utility and vendor leadership that that position still  
8 holds true.

9 The industry is committed and continues to  
10 believe it's important to finish the review of the  
11 evolutionary plant requirements document, even though  
12 it may now be close to being in parallel with the  
13 review of individual certification efforts. We say  
14 that because we believe that the process is extremely  
15 important at this point in time and the resolution of  
16 some of the major issues in that process is essential.  
17 We believe that this can and should be done through  
18 the requirements document.

19 Most of the major problems facing us are  
20 generic and really require policy input to reach  
21 decisions on the part of both the NRC and the  
22 industry. It seems only logical to resolve those  
23 issues as quickly as possible and the requirements  
24 document is the best vehicle. As Jim O'Connor  
25 indicated, there is a high level of confidence on the

1 past of the utilities that the advanced light water  
2 reactors can be built and operated successfully, but  
3 there's far less confidence that any design can get  
4 through the licensing process with the same degree of  
5 probability.

6 The utilities' sponsored EPRI ALWR program,  
7 coupled with the DOE sponsored vendor certification  
8 program, will provide the first step in developing  
9 that confidence. This logical and rational program  
10 that was embarked upon several years ago is still a  
11 favored program by the industry. We believe the  
12 requirements document reviews should continue along  
13 with the design certification reviews currently in  
14 process.

15 The Commission has discussed and asked for  
16 suggestions on how to establish priorities to most  
17 effectively use you staff resources. And once again,  
18 I'd like to suggest there are three criteria.

19 The first criteria, which is discussed in  
20 your own statement of considerations from the Part 52  
21 rule, is the demonstrated interest in the U.S. by  
22 potential users, which at this time appears to be  
23 utilities. Demonstrated interest should be judged by  
24 financial support and involvement of senior level  
25 people from the potential user's organization. I

1 don't believe it's necessary or practical to require a  
2 commitment to a specific design on the part of a  
3 utility or a group of investors. In fact, it seems  
4 that that would be counter to the whole philosophy of  
5 standardization.

6 The second criteria is the completeness of  
7 the design. Here I believe your own rule, Part 52-47,  
8 defines a rather complete set of requirements when  
9 filing an application for the certification and those  
10 requirements are extremely extensive and require a  
11 major commitment on the part of the applicant. For  
12 the initial reviews prior to the actual certification  
13 application filing, I believe the Commission would  
14 have to analyze the commitment an applicant has made  
15 to that design. The level of commitment would be  
16 obvious from the degree of completeness of the design.  
17 Your resources required would be proportional to the  
18 commitment made by the proposed applicant.

19 If those two criteria do not give adequate  
20 guidance, familiarity with that design on the part of  
21 both the NRC staff and the potential U.S. market could  
22 be analyzed to assist in your prioritization.

23 I'd like to add that NUMARC in its new form  
24 as a council has been actively involved in this  
25 program through our Technical Division Director, Bill

1 Rasin, who is behind me here. Bill has been an active  
2 participant in the program while at Duke and has  
3 continued participation as our Technical Director.

4 In addition, our Standardization Oversight  
5 Working Group has played a lead role in developing the  
6 responses to the Part 52 rule and continues with a  
7 major program to try to assist the Commission and the  
8 industry in developing the mechanisms that will be  
9 necessary to make that rule work.

10 Our working group was chaired for many  
11 years, until earlier this year, by Richard Priory,  
12 Senior Vice President of Duke, and is presently  
13 chaired by Bill Council, Vice Chairman of Texas  
14 Utilities. It includes members from major utilities  
15 with recent experience in design, construction and  
16 licensing, as well as EPRI, the three major nuclear  
17 steam supply vendors involved in the ALWR program and  
18 several of the architect/engineers.

19 The industry, through the EPRI ALWR program,  
20 the NUMARC Standardization Oversight Working Group,  
21 and the nuclear steam supply system design  
22 certification programs has dedicated a considerable  
23 number of dollars and a large number of extremely  
24 experienced manhours to this effort. We believe  
25 that's a strong indication of the high priority given

1 to these efforts by the U.S. nuclear industry.

2 I thank you again for the opportunity. I'd  
3 like now to turn the meeting over to Ed Kintner,  
4 Executive Vice President for General Public Utility  
5 Nuclear and the Chairman of the ALWR Utility Steering  
6 Committee. He'll be followed by Carl Stahlkopf, Jack  
7 DeVine and John Taylor from EPRI.

8 MR. KINTNER: The Utility Steering Committee  
9 are happy to be here and have this opportunity to meet  
10 with you again and bring you current with the advanced  
11 light water reactor program. We met with the  
12 Commissioners on two previous occasions, in October  
13 1986 and June 1988. We believe we're making good  
14 progress in preparation of the central product of our  
15 effort, the ALWR requirements document. We've  
16 completed 12 of the 13 chapters for the evolutionary  
17 1100-1300 megawatt plant. And while the NRC staff is  
18 reviewing those chapters, we're in the process of  
19 ensuring self-consistency throughout, what we call  
20 "roll-up."

21 Beyond that, we're engaged in preparation of  
22 similar chapters covering a 600 megawatt electric so-  
23 called passive plant which is fundamentally different  
24 from other LWRs in that it incorporates natural  
25 circulation decay heat removal completely, as well as

1 other important safety improvements. We expect the  
2 passive plant effort will take several more years, but  
3 the work done in evolutionary plant will establish a  
4 good base for the passive plant to follow.

5 We believe if there is to be a potential for  
6 reinauguration of large-scale nuclear power plant  
7 construction in this country, it must be inspired by a  
8 fresh look at how nuclear utility plants are designed  
9 and built.

10 The advanced light water reactor program is  
11 an attempt to provide such a fresh look. It differs  
12 from previous history of developmental light water  
13 reactors in this country in two significant ways.  
14 First, this is a utility initiative, carried out to  
15 the Electric Power Research Institute, which of course  
16 is a creature of the utilities. Its intent is to  
17 digest the lessons of more than 1300 reactor years of  
18 experience in light water reactors in the U.S. and  
19 more than 1300 more experience overseas.. They will  
20 then apply those lessons deliberately and  
21 thoughtfully, so as better to adapt an available and  
22 proven technology to the needs of large-scale  
23 electricity generation.

24 Unlike the circumstances in the early days  
25 of commercial nuclear design and construction,

1 utilities now have the experience, some of it quite  
2 painful, of the early learning process. The utilities  
3 have borne, and will bear, the costs of the learning  
4 process in applying nuclear energy to commercial use.  
5 The utilities now know the risks and incentives of  
6 reactor plant operation. If there is to be another  
7 commercial power reactor committed in the United  
8 States, the utilities obviously will have a leading  
9 role and bear much of the responsibility for that  
10 initiative too.

11 Much of the work in this program is carried  
12 out by the suppliers, General Electric, Westinghouse,  
13 Combustion, and the nuclear architect/engineers,  
14 Bechtel, Stone & Webster and Sargeant & Lundy.  
15 Department of Energy recently has awarded a \$50  
16 million multi-year contract to both GE and  
17 Westinghouse to further detail the 600 megawatt  
18 passive plant, both BWR and PWR designs.

19 Oversight for the total programs provided by  
20 Utility Steering Committee made up of senior and  
21 experienced nuclear executives from U.S. utilities,  
22 including some of the major ones like Commonwealth,  
23 Duke, SONOPCO, Consolidated Edison.

24 (Slide) The U.S. members of the steering  
25 committee are shown in the first figure and four of

1 the officials representing the nuclear utilities are  
2 with me today in the row right behind. This is, in  
3 fact, a utility effort, one which is trying to digest  
4 the real experience of people who run those plants and  
5 know what it is to run them safely and with proper  
6 results for their companies.

7 Now, each chapter of the requirements, in  
8 draft, is reviewed and criticized by staff of these  
9 supporting utilities through the steering committee.  
10 We have over 6,000 comments or suggestions which have  
11 been made by the utilities and other industry  
12 reviewers and they've been resolved in the process of  
13 preparing the requirements document, so that the  
14 experience which has been generated in the utility  
15 industry is, in fact, incorporated in the requirements  
16 document.

17 (Slide) This effort began as a solely U.S.  
18 activity, but I think it's remarkable that it's been  
19 joined by six foreign utility participants, both from  
20 the standpoint of funds and also from the standpoint  
21 of participating engineers. I think the next  
22 viewgraph shows where that support is coming from.

23 Even Electricite de France could see fit to  
24 join us and participate. I might say that one very  
25 real contribution they're making is the great work

1 they've done in terms of control room design, the  
2 man/machine interface, and we're taking that very  
3 seriously into consideration and in the requirements  
4 document it covers that. I think that's a very  
5 important safety consideration, one which high time  
6 that the modern capabilities of computers and  
7 electronics put into effect to help the operators.

8 So, the ALWR is a knowledgeable customer  
9 effort, not a vendor effort.

10 The second way in which the ALWR program  
11 differs from early development of nuclear commercial  
12 power is that we're attempting to bring the design  
13 process in a different way of looking at nuclear  
14 safety. In the early days of nuclear energy, there  
15 was commercial competition in size and thermal  
16 efficiency and initial capital costs. That  
17 competition resulted in reduced margins and rapidly  
18 increased component ratings which in turn led to  
19 rapidly increased system complexity to protect against  
20 accidents. We all know the latest reactor plant  
21 designs are overly complex and they present  
22 unnecessary challenges to operators and maintenance  
23 personnel. I've never heard anyone argue that point  
24 in all the years we've talked about simplification in  
25 our program.

1           Utilities know that for future reactors,  
2           it's essential to reduce risk to investment and to  
3           ease the burden of operations and maintenance.  
4           Furthermore, improvements in these areas have a direct  
5           positive effect on safety. If accident probability is  
6           reduced so that core damaging accidents are much less  
7           likely, then the public is automatically protected as  
8           well. In fact, some of us believe the best way to  
9           protect the public is to first of all protect the  
10          plant, and that disproportionate emphasis on  
11          mitigating severe accidents versus avoiding accidents  
12          or their precursors may be counterproductive, even  
13          with regard to public safety.

14                 We're not in the program avoiding severe  
15          accident considerations, but we want to do our best  
16          first to prevent accidents and their precursors by  
17          sound engineering for safety and then apply rational  
18          severe accident considerations. That is a reversal of  
19          much of what happened in the earlier history of  
20          development of light water reactors.

21                 In other words, the utilities have a selfish  
22          interest in safety distinct from the interest of  
23          suppliers, but we are trying to emphasize that  
24          interest in the ALWR program to the benefit, we  
25          believe, of the public's interest as well.

1           These two differences from the historic  
2 development of reactor plant design and regulation  
3 lead to differences in the way we're approaching the  
4 conceptualization of the next generation of ALWRs.  
5 We're concentrating on simplification throughout the  
6 plant, not only in the reactor systems but in the  
7 plant as an entirety since the secondary plant plays a  
8 vital role in ensuring safety. And, in addition,  
9 we're emphasizing significant additional engineering  
10 margins. We believe this is sound because thermal  
11 efficiency which is a major part of the cost of any  
12 fossil-fired generating station, is far less important  
13 in a nuclear plant in which fuel costs are a smaller  
14 part of the total economics and operations and  
15 maintenance costs, as well as the initial capital  
16 costs, are relatively far more important.

17           (Slide) The ALWR requirements documents are  
18 filled with design improvements which have been made  
19 for safety on that basis. Those shown in figure 3 are  
20 included in the requirements document chapters already  
21 submitted to the staff, and I won't read them. You  
22 can see that they're really fundamental questions of  
23 increased thermal margins, increased negative  
24 temperature coefficients, absolute natural circulation  
25 dependency for decay heat removal, greatly improved

1 man/machine interfaces and so forth. Now, these are,  
2 we believe, in the main, steps that the NRC could not  
3 have taken. Plants would have been licensed if they  
4 had been submitted to you which did not include these  
5 kinds of safety margins and care for safety in the  
6 fundamental sense.

7 (Slide) In addition to these, the 600  
8 megawatt plants have even further safety improvements  
9 of a fundamental nature and these are shown on the  
10 next viewgraph. Natural circulation decay heat  
11 removal dependent only on gravity throughout; canned  
12 rotor pumps in the PWRs, avoiding the pump seal loss  
13 of coolant accident; no recirculation pumps or pipes  
14 in the BWRs and no penetrations in the bottoms of the  
15 PWR vessels. In addition, we're working, and I think  
16 we're going to be successful, in removing boron from  
17 these systems because boron does reduce temperature  
18 coefficients and it does represent a threat in terms  
19 of corrosion.

20 These have not been achieved easily.  
21 They're the results of several years of methodical  
22 engineering work and debate, leading to consensus  
23 building among the utilities, the engineering firms  
24 and the suppliers. The willingness of these parties  
25 to reach agreements is based in part on commitments

1 previously made by the NRC that they would join with  
2 us in using the requirements document as a basis for  
3 meaningful resolution and stabilization of regulatory  
4 requirements. Our concern that this is not happening  
5 is an important topic for discussion today.

6 Let me touch again on the matter of the  
7 respective roles of the evolutionary and passive  
8 plants. We've elected to work on both because we  
9 believe there's potential for both to play important  
10 roles in the energy future. The evolutionary plant,  
11 as we see it, is a clear improvement over today's  
12 designs and one which can be available in the  
13 relatively near term if circumstances demand, and one  
14 which provides an opportunity to address safety issues  
15 on a generic basis. The passive plant is an exciting  
16 concept which offers the promise of further  
17 fundamental advances in safety, economy,  
18 constructability and reliability.

19 Our objective for the ALWR is to improve  
20 core damage frequency by at least a factor of 10  
21 compared to existing plants. I personally believe  
22 when we are through we'll be able to show a factor  
23 greater than that, especially if human factors are  
24 taken into consideration in the final calculation.  
25 But we will also include severe accident production in

1 every reasonable and practical way.

2 Here I'd like to say we are not departing  
3 from the bedrock of regulatory requirements. We're  
4 starting from those. We've factored them into the  
5 design in every respect and we are not attacking what  
6 exists. As a matter of fact, one of the things it  
7 seems to me important to recognize when we start  
8 talking about other reactor systems as compared to  
9 light water reactor, that there is a very large body  
10 of regulatory experience, knowledge and rules which is  
11 going to have to be recreated, not entirely, but a lot  
12 of that is going to have to be done. The magnitude of  
13 that task is usually underestimated.

14 Our expectation is that by these means we  
15 will arrive at a reconceptualization of the light  
16 water reactors which will provide the basis for  
17 regulatory stability, plant standardization, shorter  
18 construction times, greater reliability, readier  
19 maintenance and resultant improved economics, to the  
20 end that the United States will once more have a  
21 rational nuclear capability available to it, and the  
22 painful experiences of the last 20 years of commercial  
23 nuclear development in the United States will not have  
24 been in vain.

25 In fact, if we want to arrive at a more

1 stable regulatory framework which, as Byron points  
2 out, seems from a utility point of view as an absolute  
3 necessity, and want to have a rationalization of  
4 important "engineering for safety" issues which have  
5 developed over the last two decades, we want to have a  
6 sound basis for standardization, the ALWR effort, led  
7 by the nuclear utilities through EPRI is the best, if  
8 not the only, vehicle available. But achieving those  
9 goals will require the active participation in this  
10 process by the NRC.

11 Thank you very much.

12 Now I'd like to ask Karl Stahlkopf to  
13 continue with our presentation.

14 MR. STAHLKOPF: Thank you, Ed.

15 (Slide) If I could have the first slide,  
16 please.

17 Both EPRI and the utilities feel that the  
18 ALWR is an outstanding plant. It builds on the  
19 success of proven technology, this technology, the  
20 success coming from over 110 plants operated and the  
21 experience that the utilities have gained in operating  
22 these plants. You saw on Ed's slide as well the fact  
23 that not only U.S. experience but foreign experience  
24 as well is factored into our program and brought to  
25 bear.

1           The ALWR employs the bulk of existing  
2 regulations, regulatory guidance and industry  
3 standards. Being based on proven experience, no  
4 prototypes are required. Being based on prudent  
5 technology, much of the majority of the existing  
6 regulations are applicable.

7           It incorporates major utility-initiated  
8 improvements. Again harking back to Ed's  
9 presentation, you saw the list of both passive and  
10 evolutionary plants of just some of those  
11 improvements. I think it's important to note that  
12 these changes were driven not by regulatory  
13 requirements, but really driven by user need and  
14 that's important.

15           (Slide) We feel -- and if I could have the  
16 next slide, please -- that there are important matters  
17 of safety that should be resolved in a generic manner,  
18 not on a case by case basis. We feel, and our  
19 requirements document is written in such a way that  
20 the top-tier safety requirements apply to all future  
21 light water plants, be they BWR or PWR.

22           Regulatory stabilization demands and early  
23 resolution of issues, a consistent resolution of  
24 issues and I think, most important, the involvement of  
25 the ultimate user. As we presently look at 10 CFR 52,

1 it means that the only chance that the utilities have  
2 to react with the NRC on major safety issues which  
3 will affect their plant, is through the requirements  
4 document. Under 10 CFR 52, it's the vendor, not the  
5 utility, who ultimately holds the certificate and the  
6 utilities need to gain confidence in their plant  
7 designs and in their interactions with the Nuclear  
8 Regulatory Commission through the requirements  
9 document and through their interaction with you.

10 Further, we feel that generic resolution of  
11 key safety issues enhances the industry, the user and  
12 the public confidence, not only in the safety of the  
13 plants, but in the fact that the process actually  
14 works.

15 (Slide) Next slide, please.

16 We feel that generic issue resolution is  
17 achievable and we feel that it's achievable within the  
18 current laws, regulatory framework without generic  
19 rulemaking. Really right now, as we look, we see that  
20 SERs and reg guides are used by the industry for the  
21 majority of its regulatory guidance. The same should  
22 be true here. Let the NRC lay out its positions via  
23 the SERs on the requirements document chapter in the  
24 same manner that we've entered into this program. The  
25 requirements documents then are used to guide the

1 vendors' designs and have been used to guide the  
2 vendors' designs to these dates. The vendors' designs  
3 ultimately go through formal rulemaking in the  
4 certification process.

5 We feel that generic issue resolution is  
6 achievable within the U.S. commercial structure. The  
7 majority of the regulatory issues are really  
8 independent of BWR or PWR. They're independent of  
9 vendor. The requirements documents put these generic  
10 issues into a single -- many times a single volume or  
11 a single place in a unified way and thus we believe  
12 it's possible for the regulations to deal with them  
13 generically as opposed to specifically.

14 Finally, we think that these issues are  
15 resolvable through the requirements document because  
16 the requirements document is at a level of engineering  
17 detail which is great enough to let both you and your  
18 staff look in depth to review what's being proposed  
19 and to make appropriate regulatory decisions.

20 At this point I'd like to turn it over to my  
21 colleague, Jack DeVine, who will speak more about the  
22 requirements document and how we see the interface  
23 between the documents, the utility and the Nuclear  
24 Regulatory Commission.

25 Jack?

1 MR. DeVINE: Thank you, Karl.

2 Good morning.

3 CHAIRMAN CARR: Good morning.

4 MR. DeVINE: At this point, as Karl  
5 indicated, I'd like to turn to the practical  
6 implementation of this process that we started several  
7 years ago and that the previous speakers have  
8 described to you in general terms.

9 (Slide) The first slide, please.

10 Let's first talk about the requirements  
11 document itself. We've been referring to it through  
12 the course of the discussion this morning. To  
13 characterize it perhaps more fully, you should  
14 understand first that the requirements document is a  
15 directive to the designer from the customer. It does  
16 address key user needs. That's its main purpose.  
17 Those key user needs include regulatory requirements  
18 and the regulatory aspects of the requirements  
19 document, while not its only function, certainly  
20 represent an important part of the requirements  
21 document.

22 It addresses regulatory provisions by  
23 identifying applicable regulations and regulatory  
24 guides specifically and by number, tabulated in the  
25 document. It proposes resolutions to major -- the

1 important, unresolved, safety issues and generic  
2 safety issues. It addresses and proposes a few  
3 limited but important optimization issues, areas in  
4 which we think the existing regulations ought to be  
5 updated to address the needs of current plants. And  
6 it addresses the very timely topics on your mind such  
7 as severe accident treatment.

8 The document covers the whole plant and it  
9 covers it in substantial detail. I don't have a set  
10 of requirements documents with me right now, but the  
11 existing chapters in the staff's hands take up a major  
12 part of a bookshelf, 12 rather large, comprehensive  
13 documents. It presents these requirements in a  
14 hierarchy of information. It addresses policy and  
15 design principles at the highest level. It develops  
16 from them specific performance requirements and then  
17 fairly detailed design requirements in areas such as  
18 specific material requirements, conceptual P&ID level  
19 of detail.

20 It attempts to apply in fairly specific  
21 terms the principles that Ed Kintner described,  
22 simplification. Rather than just talk about  
23 simplification, we've presented in the requirements a  
24 specific application of simplification principles, how  
25 redundant should systems be, how much should they be

1 cross connected, what kind of instrumentations and  
2 controls are required, et cetera, on a system by  
3 system basis.

4 Karl addressed the linkage with Part 52 and  
5 I'd like to amplify that point. Part 52 takes a major  
6 step forward in reaching standardization, but there is  
7 a missing link and that is that the applicant for a  
8 certification under Part 52 is the vendor and in the  
9 absence of a vehicle such as the requirements  
10 document, key design decisions, including key safety  
11 decisions, could be made without participation of the  
12 parties ultimately responsible for carrying them out  
13 and protecting the public health and safety. The  
14 requirements document is an idea vehicle for meeting  
15 that need.

16 It serves the whole family of users. It  
17 serves the customer, certainly, by giving him  
18 confidence that he knows what the plant that he buys  
19 will do. It serves the vendor by telling him what the  
20 customers need and what the regulator needs, and we  
21 think it serves the NRC very well because it takes an  
22 unprecedented step in developing, at the initiative of  
23 the user, a commitment to a comprehensive set of  
24 safety standards.

25 (Slide) Next slide, please.

1           We've been at this for several years and in  
2           the main we're quite happy with the process that we've  
3           achieved. We think the process is working. We've  
4           produced 12 chapters of the evolutionary plant  
5           requirements documents. They're in the hands of the  
6           staff for review now. The final chapter, which covers  
7           man/machine interface, has turned out to be  
8           particularly challenging and in that area we're  
9           exploring some new and we think very important issues.  
10          But it is essentially complete and it will be in your  
11          hands in the next 30 days.

12                 We've achieved consensus on most key issues  
13                 among utilities, vendors and architect/engineers. I  
14                 have to say that that's probably a remarkable  
15                 accomplishment given the diversity of opinions and  
16                 experiences in the U.S. Ed mentioned over 6,500  
17                 comments resolved, received from all corners of the  
18                 industry and with the exception of distinct and  
19                 relatively unimportant minority, we have handed out  
20                 consensus positions on a whole gamut of technical  
21                 areas.

22                 The certification designs which are being  
23                 submitted to you incorporate, in fact, most of our  
24                 ALWR requirements. That's been done, we think,  
25                 because the vendors who are preparing those

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1 certification submittals truly believe that the  
2 requirements document represents the needs of their  
3 customers and that it will be endorsed by the NRC.  
4 Therefore, it has high value to them.

5 Springing from this effort on the  
6 evolutionary plant, we've now made a great deal of  
7 progress in the passive plant requirements document  
8 production. You haven't seen any of that yet, but  
9 we're well along on producing chapters that cover the  
10 reactor coolant systems, the main safety systems, the  
11 fuel, the containment requirements and the main plant  
12 arrangements.

13 (Slide) Next slide, please.

14 Looking more specifically at the regulatory  
15 application of the requirements document, our  
16 intentions from the beginning were that the  
17 requirements document would be a basis for, first,  
18 agreement in principle on the safety design of future  
19 reactors. And we think, by the way, that that  
20 agreement in principle is very important. It's a  
21 trap, we think, to look through a knothole and just  
22 focus on individual safety provisions, specific  
23 requirements and reg guides for certain kinds of  
24 systems. The requirements document provides a logical  
25 overview of the whole plant as well as the specific

1 point by point, system by system requirements.

2 It provides, as I said, a vehicle for  
3 resolution of safety and regulatory issues for future  
4 reactors, USIs, GSIs, optimization issues, et cetera.  
5 And the requirements document in its final approved  
6 form with the safety evaluation report should be a  
7 basis -- was intended to be a basis for that use. And  
8 it was intended to be the basis for the direction  
9 taken by applicants, therefore, in preparing  
10 certification submittals and then by the NRC in  
11 reviewing and approving those submittals. That was  
12 our plan.

13 (Slide) Next slide, please.

14 Unfortunately, we see that not happening.  
15 Requirements document submittals right now are  
16 sidetracked at NRC. Of the 12 chapters produced,  
17 we've received safety evaluation reports on the first  
18 four. Chapter number 5, which covers the safety  
19 systems and addresses probably the most pivotal issues  
20 in the entire requirements document, has not yet  
21 reached the point of a draft safety evaluation report  
22 in our hands. Therefore, the dialogue which will  
23 result from that process in resolution of these issues  
24 hasn't really been started yet. We emphasize, we're  
25 not sure all of the solutions we've proposed in the

1 requirements document are ideal or perfect or will  
2 meet your approval, but we desperately want to get  
3 that process underway so that we can reach final  
4 resolution on those important issues.

5 At the same time, NRC is proceeding with  
6 certification activities and they're proceeding at  
7 pace. The consequence of that is that issue  
8 resolution is being affected on some important issues  
9 on a plant-specific basis with little utility  
10 involvement. Let me say that we're not suggesting  
11 that the vendors have ignored the requirements  
12 document. In fact, I think the certifications that  
13 you have in front of you include the lion's share of  
14 our requirements. But the important connection  
15 between that requirement submittal and the NRC  
16 endorsement and the resolution of the outlying issues  
17 hasn't happened according to the process that we had  
18 in mind and we think it really should.

19 (Slide) We've spent a lot of time working  
20 this problem -- next slide, please -- in trying to  
21 assess from our standpoint what's the problem. You  
22 know, why isn't it working? We would offer to you  
23 four main contributors and we've tried to address  
24 possible solutions to those problems. I'm not sure  
25 these are the real good issues, but I think they're

1 certainly main contributors.

2           The first is that the requirements document,  
3 in fact, lacks the regulatory stature of an  
4 application under 10 CFR 52. It is not a formal  
5 application and now that 10 CFR 52 has become the  
6 gospel, so to speak, it is certainly receiving a great  
7 deal of attention and the requirements document is  
8 perhaps viewed as a less important vehicle. It  
9 certainly is a new idea. Nobody, to our knowledge,  
10 has ever tried to write a requirements document before  
11 and you've never tried to deal with one. There is not  
12 an established practice or procedure for doing so.

13           Secondly, for the evolutionary plant, there  
14 is a timing complication and I would like to address  
15 just for a minute what that means and I'll also say  
16 what it doesn't mean. We proposed to schedule to you  
17 requirements document submittals about three years  
18 ago. We are somewhat behind that schedule, but not  
19 greatly. The intent was that the bulk of the  
20 requirements document chapters would be in your hands  
21 late last year. By about the first of this year, you  
22 had 12 of 13. The 13th will be in your hands this  
23 year. I don't believe that somewhat modest slippage  
24 in this very large effort is a main contributor to  
25 this timing mismatch that seems to exist.

1           The fact of the matter, however, is that  
2 even on the process that we agreed to, at best  
3 resolutions of the issues in the requirements document  
4 is simultaneous with resolution of issues on  
5 certification submittals. The simple fact is that the  
6 designs being proposed for certification have been in  
7 process for a long time. So, we've always recognized  
8 there is a need for very close coordination. It's  
9 rather cumbersome.

10           We would like the requirements document to  
11 be a pure front end document and for all decisions to  
12 be made before certification decisions are made, but  
13 that's not practical, and I think if you look at our  
14 original plan, it was never intended. The process for  
15 your approval of our requirements document involves  
16 reviewing on a chapter by chapter our sets of  
17 requirements, producing a draft safety evaluation  
18 report in approximately a nine month period. That was  
19 the schedule. Then a process of incorporation and  
20 resolution of loose ends, and then a final SER  
21 process. I think even if we had followed that  
22 process, met that schedule, we would still have to  
23 address this problem of simultaneous dealing with  
24 issues as opposed to a sequential dealing of issues.

25           Thirdly, the ABWR certification specifically

1 has apparently been assigned higher NRC priority and  
2 resources than the requirements document has. Simply  
3 an observation on our part that that seems to be where  
4 the bulk of the attention is going within the staff.

5 Finally, the requirements document covers  
6 areas outside of the traditional regulatory  
7 jurisdiction. We think this is a confusion factor,  
8 although not a central one. As we've described, we've  
9 attempted in the requirements document to define  
10 utility requirements for the whole plant, and that  
11 includes many things which are outside the aegis of an  
12 NRC review. We suspect that sometimes when the staff  
13 reviewers get that product, they're confused, and  
14 understandably so, about what actions should be taken  
15 on things that they're not used to seeing.

16 Let us offer some at least partial solutions  
17 to these problems.

18 (Slide) Next slide, please.

19 First, and I think the most important is  
20 this question of the regulatory stature. Here I'd  
21 like to echo Karl's comments and simply point out that  
22 certainly NRC has full authority to join issues which  
23 are outside the certification arena. It's done that  
24 through its whole history and now the advent of 10 CFR  
25 52 should not put us in the position where we can no

1 longer take on issues until they're presented in the  
2 context of a design by an applicant for certification.

3 NRC can and should, in our view, endorse  
4 agreed upon positions by means of a safety evaluation  
5 report or a set of safety evaluation reports on the  
6 requirements document. Their stature should be  
7 equivalent to standard review plan or reg guides.  
8 Those have been invaluable for utility users and  
9 architect/engineers over the years and that kind of  
10 stature, which is not a rule but is a very solid and  
11 meaningful indication of NRC's technical position and  
12 acceptance criteria, is exactly what we need in this  
13 program.

14 In that sense, they can be used as baseline  
15 criteria then for certification decisions. Again  
16 we're not suggesting they're the only criteria, but  
17 they're certainly among the important ones. And we  
18 emphasize that that approach does not require  
19 rulemaking. This is not a question of somehow  
20 sidestepping the certification process and instead  
21 dealing with generic rulemaking for requirements  
22 document type issues.

23 (Slide) Next slide, please.

24 With respect to timing and resources,  
25 particularly for the evolutionary plant, while it is

1           cumbersome, the reality, as I said, is that there are  
2 simultaneous tracks for requirements development and  
3 approval and certification actions. Our view is that  
4 with agreement on the part of NRC, the utilities and  
5 the certification applicants working together through  
6 the ALWR program, we can resolve these key safety  
7 issues jointly and contemporaneously and that solves  
8 the needs of both parties. We don't think that means  
9 moving ALWR ahead of the certification program. We  
10 think it means dealing with them in parallel. As I  
11 said, somewhat cumbersome, but we see no reason why  
12 that's not doable.

13                       For this process to work, NRC must apply  
14 resources to the ALWR consistent with the needs of the  
15 job. Staff has mentioned several times to you that the  
16 issues we've presented are very tough issues. We've  
17 taken on items as difficult as source term in our  
18 requirements document. We think we've got solid  
19 technical positions. We know that creates technical  
20 difficulty within the staff and it's going to require  
21 resources to take those on. We don't feel that we can  
22 afford to let them sit on a sidetrack.

23                       (Slide) Next slide, please.

24                       With respect to the fact that requirements  
25 in our document include many which are outside of

1 NRC's scope, just an observation. First, the complete  
2 and integrated set of utility requirements really  
3 should be a basis for increased confidence in the  
4 overall product. It covers the whole plant. We know  
5 you're interested in covering the whole plant.

6 As examples, the requirements beyond the  
7 normal regulatory envelope improve reliability, we  
8 think will clearly reduce the frequency of initiating  
9 events, increased time for operator diagnosis and  
10 response and that sort of thing. They should be a  
11 basis for increased NRC confidence. They should not  
12 become licensing requirements and we're certainly not  
13 suggesting that they should be by submitting you a  
14 requirements document and we don't think they should  
15 in any way complicate NRC's review of the requirements  
16 document.

17 Let me say in passing, if there is a need  
18 for dialogue in identifying or discriminating among  
19 our requirements for those which should have  
20 regulatory teeth and those which are acknowledged but  
21 not acted upon by you, we're standing by to work with  
22 you to try to make that discrimination.

23 (Slide) Next slide, please.

24 In summary, as a composite solution, just to  
25 reiterate the things I've already mentioned, we're

1 asking for NRC to review its commitment to support the  
2 program with resources and priority attention. We  
3 want to work together with you and the certification  
4 applicants to address and resolve issues jointly.  
5 Most importantly from our standpoint, we're looking  
6 for, in the final analysis, SERs which endorse the  
7 agreed upon set of ALWR requirements and which have  
8 stature equivalent to reg guides and, in that sense,  
9 the same level of meaning and importance to the users.

10 From our side, we will offer very simply to  
11 work hard to improve our technical dialogue with the  
12 staff. We've made some reorganizations within our own  
13 staff to try to put more manpower on the NRC interface  
14 question. We're hoping that will help. To continue  
15 to identify and propose workable solutions to key  
16 issues and to provide very prompt response to staff  
17 positions and, of course, staff questions on the  
18 requirements document.

19 With that, let me turn the meeting over to  
20 John Taylor.

21 MR. TAYLOR: I'd like to sum up briefly by  
22 reviewing what our product is, what our plans in the  
23 immediate future are, what our concerns are and what  
24 we'd like to hear from you.

25 (Slide) The product is a requirements

1 document which provides safer plants. Ed has, in his  
2 listings of changes in both the evolutionary and  
3 passive plant, specific tangible safety improvements  
4 which, as has been pointed out, have been provided in  
5 many senses in excess of existing requirements.

6 It's an integrated design, covering every  
7 aspect of the plant, a lesson I think we've clearly  
8 learned from the past.

9 Its full-scope coverage of design,  
10 construction, operation and maintenance and by that  
11 full-scope coverage, it's led to increasing margins,  
12 simplification, a more rugged design and one that  
13 imposes much less burden on the operator to run and  
14 maintain. We believe it is a fundamental step in  
15 standardization and bringing the owner/operator needs  
16 on a standard, uniform basis.

17 It incorporates two decades of operating and  
18 licensing experience which has been accumulated  
19 worldwide and is continuing everyday to provide us  
20 with further input. We believe it's a fundamental  
21 basis for the certification process. But since these  
22 two processes are being carried out in parallel, it's  
23 essential that there be close coordination within the  
24 industry and between the industry and NRC.

25 (Slide) Our immediate plans, if I may have

1 the next slide, are to continue our work on the  
2 evolutionary plant to the point of a completed,  
3 utility-endorsed and NRC-approved requirements  
4 document. We intend to submit the final rollup  
5 version with total consistency, including all the  
6 comments we have received up to that time from NRC, in  
7 the document to NRC in April of 1990.

8 (Slide) On the passive plant, we've already  
9 begun development of utility requirements that are  
10 specific and different for the passive plant, but  
11 building on the foundation of the evolutionary plant  
12 requirements document as well as in the past three  
13 years of passive plant study work both at EPRI and  
14 under the sponsorship of the Department of Energy.

15 We intend to submit the passive plant  
16 requirements document to NRC for review and  
17 endorsement via a safety evaluation report over the  
18 next 12 months. We believe we can do that rapidly  
19 because so much of that work has already been done and  
20 incorporated in the requirements document already  
21 being submitted to you.

22 (Slide) What are our concerns? Some of the  
23 statements made thus far, that the ALWR requirements  
24 document is largely complete, but it's not being used  
25 by NRC as a basis for industry and NRC agreement on

1 generic safety and regulatory requirements for future  
2 U.S. reactors and the review process is substantially  
3 behind schedule. We don't think we can afford to let  
4 this opportunity pass to obtain that kind of generic  
5 resolution to contribute to the standardization  
6 effort.

7 (Slide) What we are asking of you is a  
8 renewed commitment to apply resources, a renewed  
9 commitment to address and resolve issues generically,  
10 conclusively and with the utilities' interaction and  
11 detail with the NRC staff. And we want a renewed  
12 commitment to use the requirements document as a  
13 vehicle for safety and regulatory issue resolution and  
14 as a basis for your certification actions.

15 I want to thank you for your patience in  
16 listening to us. We'd be pleased to answer any  
17 questions you have.

18 CHAIRMAN CARR: Thank you, gentlemen.

19 Commissioner Roberts?

20 Commissioner Rogers?

21 COMMISSIONER ROGERS: Yes, a couple of  
22 questions.

23 There are approximately a half a dozen or so  
24 specific issues that the staff and EPRI are not in  
25 agreement on, such as source term, hydrogen evaluation

1 and control and containment performance. How do you  
2 propose that those be resolved in a way that  
3 establishes credibility, not only with the NRC but  
4 also with the general public? For example, do you  
5 agree that the ultimate resolution of those issues and  
6 closures should involve a broad consensus within the  
7 U.S. scientific community, not just simply the nuclear  
8 community?

9 MR. TAYLOR: We have presented -- Jack? Ed,  
10 go ahead.

11 MR. KINTNER: I was going to say this. The  
12 problem is the process, not the result so far. The  
13 issue is a solid, honest technical dialogue on these  
14 subjects. Everybody, I think, who has taken the time  
15 to understand the situation with regard to source term  
16 understands that it's obsolete and, in my view,  
17 contradictory to actual safety.

18 In the ten years since TMI-2, the accident  
19 itself and all the information that's been developed  
20 since indicates the practice now underway with source  
21 term is obsolete. The Commission has had a number of  
22 studies. There have been a number of actions taken  
23 which have generated a tremendous body of knowledge in  
24 this regard. But if you want to license a plant in  
25 the United States today or get certification, you use

1 the same source term basis you did ten years ago.

2 Now, the problem therefore is not that we  
3 are proposing the only right answer. What we're  
4 proposing is the time has come for a technical  
5 dialectic on that very fundamental issue. The British  
6 just recently completed their long study of wind  
7 scale. They've got a two and a half mile evacuation  
8 range for a 1300 megawatt plant. We're the only  
9 country in the world that has, with one exception,  
10 Finland, ten mile evacuation zones.

11 I don't know what the right answer is, but I  
12 do know that the time has come if there's going to be  
13 a new look at nuclear power in the future of this  
14 nation, for a thorough airing of that issue and a  
15 decision made on solid technical grounds, not ones  
16 which were made 15 years ago.

17 So, we're not pleading for anything other  
18 than let's face the issues, let's start the  
19 discussions. Let's look at it honestly. That's all  
20 we're asking for.

21 So, I think that answers your question as  
22 well as I know how to do it.

23 COMMISSIONER ROGERS: You would encourage a  
24 broad use of the scientific and technical community's  
25 participation?

1 MR. KINTNER: Absolutely. And I think if  
2 you really get a consensus of the scientific community  
3 who have looked at this subject -- I'm not talking  
4 about the national laboratories now that want to do  
5 more research, I'm talking about people who honestly  
6 look the source term in the eye, you will find that  
7 there is a consensus.

8 MR. TAYLOR: Just to make two supplementary  
9 comments. We have presented a position to the NRC  
10 staff. Our problem, we haven't heard back. In other  
11 words, we want to get into a dialogue. The second  
12 point is that I've been privileged to be asked by NRC  
13 to participate in the peer review panel on NUREG-1150  
14 where much of the details of this matter are being  
15 discussed among the scientific community and, needless  
16 to say, we'll pursue that with all the energy and  
17 capability we have with supplementary effort from  
18 other parts of our staff.

19 COMMISSIONER CURTISS: Until we have that  
20 discussion, excuse me --

21 COMMISSIONER ROGERS: Go ahead.

22 COMMISSIONER CURTISS: Until we have that  
23 discussion, how would you propose that we deal with  
24 applications like GE's and CE's where we're clearly  
25 talking about source term is really going to be a

1 component together with hydrogen control and  
2 containment performance? That's really where the  
3 rubber hits the road.

4 MR. KINTNER: I think you're absolutely  
5 right and I think that's one of the problems, if  
6 you'll pardon my saying so, with our getting attention  
7 to our discussion. General Electric has agreed to  
8 present source term considerations. They're going to  
9 sell the plant overseas.

10 So, in terms of facing that issue for the  
11 United States in the future application of reactors in  
12 this country, we're back where we were ten years ago.

13 MR. TAYLOR: Again, a supplementary comment,  
14 that from the beginning, as Jack said, we recognized  
15 that the needs for certification for the advanced  
16 B&PWR large plants would result in a parallel effort.  
17 So, we entered into an understanding with DOE and with  
18 the vendors involved that our requirements document  
19 would be used by the vendors and as they were ready to  
20 submit material to NRC for certification, we get a  
21 chance to review that so that differences would be  
22 identified. We'd have a discussion as to whether  
23 those differences could be closed.

24 I've been gratified over the years at the  
25 large number of cases in which those differences were,

1 in fact, resolved and the certification submission  
2 went with the consistency.

3 However, we recognize that there could well  
4 be, by dint of the very issue you brought forth,  
5 Commissioner Curtiss, a difference. The only point is  
6 we wanted to be sure it was understood there was a  
7 difference, everybody understood that and that that  
8 difference would be explained as having to do with the  
9 difference in schedules, et cetera, between that  
10 certification effort and the requirements document  
11 effort. I see no problem with that as long as it's  
12 fully understood by all.

13 GE in this instance, in fact, has written a  
14 letter pointing out that the agreement to go ahead  
15 with certification on this basis does not challenge  
16 the technical validity of the position we're trying to  
17 establish on the requirements document in their mind.

18 MR. DeVINE: Now I'd add one point just for  
19 clarification. We tend to speak of source term as if  
20 it were a single issue. It is a monster if you look  
21 at the whole thing. But, in fact, our sense is that  
22 there are many sub-elements. They're all important.  
23 There is consensus on many of those and lots of room  
24 to move in the right direction without getting into  
25 major rulemaking or without requiring all the

1 principals to decide in the ultimate final form of the  
2 multi-headed monster. We've proposed many specific  
3 points and we think moving ahead selectively and  
4 carefully and prudently on those as individuals is a  
5 reasonable thing to do.

6 COMMISSIONER ROGERS: Well, now, one of the  
7 points that you've made several times, I think, is  
8 that you accept the notion that there be parallel  
9 efforts here and recognize that that's a practical  
10 reality from your point of view. However, there's  
11 another issue and that is resources. When you say  
12 parallel efforts, I suspect that what you really have  
13 in mind is that basically parallel efforts of adequate  
14 intensity for each of the individual efforts.

15 If there is a resource problem and one has  
16 to choose as to where to put the resources, how do  
17 you see the relative priorities of the requirements  
18 document, reviews of evolutionary plant designs or  
19 passive designs that are submitted?

20 MR. KINTNER: I think it's very simple. We  
21 see that priorities ought to be on this program, that  
22 if there's going to be something done with regard to  
23 the United States future of light water reactors it's  
24 going to be on this program. Here we are with a  
25 budget --

1 Jack, what's your budget, \$2.5 million?

2 MR. DEVINE: Six million dollars.

3 MR. KINTNER: Okay, \$6 million a year. It's  
4 hard for me to believe that with a \$6 million budget,  
5 we're clogging up the machinery of the Nuclear  
6 Regulatory Commission. As an old bureaucrat myself, I  
7 think there are other reasons than manpower --

8 COMMISSIONER ROGERS: Well, a piece of sand  
9 can bring an apparatus to a halt.

10 MR. KINTNER: All I know is there are other  
11 reasons than manpower or dollars to keep you from  
12 facing issues.

13 MR. TAYLOR: On your point, Commissioner  
14 Rogers, having to do with the passive plant  
15 requirements review and the evolutionary plant, at the  
16 moment there is no conflict. The material you have is  
17 evolutionary and a large amount of it applies to the  
18 passive plant. We'll be coming in, as I mentioned, in  
19 the near future with the first submissions on those  
20 parts that are different. If we're able to follow the  
21 schedule we have in mind, that will follow the  
22 evolutionary plant review work. So, we don't see a  
23 fundamental conflict there but a continuity of effort.

24 From the beginning we've accepted there is a  
25 need for the certification effort. I agree with Ed's

1 comment. After all, we are pursuing the interest we've  
2 described to you and we will ask for that priority.  
3 But we do recognize the importance of the  
4 certification effort. It provides our U.S. suppliers  
5 with a potential export opportunity. It's very vital  
6 to our country in a broad sense. It provides a means  
7 for them maintaining strength and their strength is  
8 very important to the utilities. It is a process by  
9 which we're proving out the standardization process  
10 that you have established. Like all new things,  
11 trying them out is very helpful to find out weaknesses  
12 and improve upon them.

13 So, we want ours to get that first priority,  
14 but we're not telling you we want you to abandon the  
15 certification effort by a long shot.

16 MR. STAHLKOPF: Well, I think it's also fair  
17 to point out that this is nothing new. As John  
18 indicated earlier, when we first entered into this  
19 program, we entered into a memorandum of understanding  
20 with DOE who is fostering the certification effort,  
21 and with each one of the individual vendors, talking  
22 about the parallelism of the submission of the  
23 requirements documents and the certification packages.  
24 And in the years that we've been working with the  
25 vendors, DOE and the Nuclear Regulatory Commission, it

1 has always been on this pattern of the requirements  
2 document, followed very shortly thereafter by the  
3 submission of the certification information.

4 So, it's not a new problem. It's not a new  
5 concept. It's the way that we originally envisioned  
6 the program and the way that the Commission initially  
7 envisioned working with us on the program.

8 COMMISSIONER ROGERS: I guess I don't have  
9 any more.

10 CHAIRMAN CARR: Commissioner Curtiss?

11 COMMISSIONER CURTISS: Well, I guess in  
12 concept, I think that requirements document as it was  
13 originally envisioned and with the explanation you've  
14 given here holds a lot of potential. From your  
15 perspective, it does seem to me that it reflects what  
16 amounts to a buyer's guide that the utilities  
17 collectively use as the vehicle to express their  
18 interest in the kind of plants that they'd like to see  
19 available on the shelf for them in the event that they  
20 order future plants in that next generation.

21 From our perspective, it seems to me that it  
22 gives us the opportunity or the vehicle to resolve  
23 questions that come up more than once, that will come  
24 up more than once if we review them in individual  
25 vendor applications and that, by virtue of addressing

1       them in this vehicle, have the potential for saving us  
2       some resources and permitting us to resolve those  
3       issues in a single forum.

4               So, I've, in concept I guess, been a big  
5       supporter of the requirements document. I guess I  
6       wonder though if, as a practical matter, as we look at  
7       how we're approaching the requirements document, now  
8       the two requirements documents that we're talking  
9       about for the evolutionary and the passive, and with  
10      what we know today about the status of the GE  
11      application, the Combustion Engineering interest  
12      application and the interest on the part of AECL and  
13      other vendors in other countries, whether it still  
14      makes sense in the context of where we are today or  
15      whether it requires some adjustment to accomplish what  
16      everybody set out to accomplish when this process  
17      first geared up in the early '80s.

18             It does seem to me, in looking at the  
19      passive requirements document, the requirements  
20      document for the evolutionary plants, that we're  
21      almost to the point for the GE application where,  
22      given its status, unless Westinghouse saddles up and  
23      gets its horse in the race for the evolutionary  
24      plants, it looks to me like we're down to the point  
25      where the passive requirements document, if we turned

1 around today and addressed all the questions -- I'm  
2 sorry, the evolutionary requirements document--  
3 addressed all the questions that remained to be  
4 resolved, and I gather they're considerable, may in  
5 the final analysis only end up applying to the  
6 combustion engineering application.

7 And if that is the case, I guess I wonder  
8 whether as a practical matter we can realize the  
9 benefit that we were seeking five or six years ago if  
10 it looks like the requirements document for this  
11 generation is only going to apply to a single plant.  
12 How do we reconcile that? What benefit do we gain if  
13 those are the two purposes that the requirements  
14 document serves -- an explication of what the buyer's  
15 interests are and a forum or vehicle for us to address  
16 questions that will arise in multiple vendor  
17 applications -- if as a practical matter today it  
18 looks like it only applies to one vendor application?

19 MR. LEE: Well, Commissioner Curtiss, I  
20 might just respond. It seems to me that that's  
21 prejudging what the future's going to hold. And I  
22 think if we take that course, if we take the course to  
23 deviate away, you'll be right. There will only be two  
24 certifications. And I'm not so sure that's the right  
25 course we ought to take at this point in time.

1 I think we should be looking at a bigger,  
2 broader opportunity there and some diversity. We're  
3 looking for standardization in the process, and we're  
4 looking for a standardization in a design and a kind  
5 of a fix in the design once it has gone through the  
6 process.

7 But I think that we ought not believe that  
8 we would preclude a variety of standard designs. If  
9 in fact the market and the people out there that are  
10 going to be investing the money in these designs and  
11 this activity believe there is an opportunity to sell  
12 something. That's the decisions they'll have to make.

13 MR. TAYLOR: I'd make two other points,  
14 Commissioner Curtiss. The requirements document has  
15 in a very vital measure served its purpose insofar as  
16 the GE design and the CE design, until very recently  
17 on the GE design only. It's served its purpose in a  
18 very real way, and we can give you chapter and verse  
19 of the many interactions and the many changes that  
20 were made in those designs to accommodate this  
21 requirements document.

22 The second point is that we find ourselves  
23 in the decisions that have been made recently on a  
24 relatively small area -- key issues, but relatively  
25 small number -- with an agreement to go down that path

1 in contradiction to the present position we're taking  
2 on the requirements document, but with the statement  
3 that it's the wrong technical way to go by the vendor  
4 himself.

5 Now I don't think that's anything that we  
6 want to have as a permanent circumstance. Maybe it's  
7 necessary to proceed, to provide the support mentioned  
8 for the vendor's overseas export activities, but it is  
9 not something we want to have as a continuing or  
10 permanent arrangement. The vendor has agreed simply  
11 to get the application, and he says it's not  
12 technically correct.

13 We want to be technically correct. We're  
14 talking about a program that won't resolve itself in  
15 an operating plant for all we know in a decade or  
16 more. Nature will show us that we're wrong if we  
17 insist on staying wrong.

18 COMMISSIONER ROGERS: What is your view of  
19 the issue of the necessity of a prototype for passive  
20 plants?

21 MR. KINTNER: One of the first rules written  
22 down in the guidelines for this entire effort is that  
23 a prototype shall not be required. We are using solid  
24 technology, an experienced technology base. We're  
25 backing off from it in many instances as regards to

1 temperatures and materials and so forth. We are using  
2 the technology in a different way.

3 For example, the basic question, the basic  
4 issue, the technical issue in the passive plant is  
5 simply natural circulation by gravity. And  
6 Commissioner Carr certainly knows how that works. His  
7 life depended on it many times. And it's been used in  
8 a number of different designs. The FFTF, for example,  
9 uses natural circulation, and many of the other plants  
10 use it in the steam generator side. It's fairly easy  
11 to calculate and test. That's the only real  
12 diversion. But the technology's the same. The  
13 temperatures are lower. It's not requiring a  
14 prototype, and that, as I said, was one of the first  
15 things we wrote into the requirements documents.

16 COMMISSIONER CURTISS: Let me pick up on  
17 that point. The briefing that the staff provided to  
18 us for the requirements document, I asked the question  
19 of whether the staff anticipated that the review of  
20 the passive requirements document would take longer  
21 because of the nature of the physical challenges that  
22 had to be addressed, or would in fact be something  
23 that would be done more quickly because we've  
24 addressed a number of the issues in the context of the  
25 evolutionary requirements document.

1           They indicated they thought it would take  
2 longer to address the passive requirements document.  
3 Does that comport with what you're seeing and what you  
4 would expect?

5           MR. KINTNER: I think it's both.

6           First, a number of the issues, if they are  
7 resolved in the evolutionary case, will in fact stay  
8 resolved and be a base in the passive plant.

9           On the other side, the passive plant  
10 resolution of these issues we're talking about are as  
11 difficult as you want to make them. I mean, if in  
12 fact you want to argue that you really have trouble  
13 understanding natural circulation with gravity as the  
14 impetus, if you want to argue that point you can argue  
15 that one forever. But I think it's fairly easy to  
16 show, if properly engineered -- there will certainly  
17 be requirements for some model testing, but it doesn't  
18 need to be a major additional questioning of the base  
19 safety issues.

20           MR. STAHLKOPF: I think there's another way  
21 to answer it too, and it can be shown by the reliance  
22 with which we place the work that we've done on the  
23 evolutionary requirements document for the passive  
24 requirements document. And really, if one simply  
25 wants to look at bulk commodities, the bulk

1 commodities or the bulk of the evolutionary plant  
2 requirements document is moved into the passive plant  
3 requirements document. So the reviews that would  
4 continue on the evolutionary plant, as a matter of  
5 fact, would greatly speed the reviews which would  
6 ultimately be necessary for the passive plant.

7 So assuming that we complete our work on the  
8 evolutionary plant requirements document and you  
9 complete your reviews and SERs thereof, I do not think  
10 it will be a larger effort that is required on the  
11 evolutionary plant, and as a matter of fact, maybe  
12 less.

13 MR. TAYLOR: The requirements that we're  
14 stipulating for the passive plant provide a greater  
15 challenge to the designer. What we really would like  
16 is a fairly timely decision that these are the right  
17 requirements, recognizing that we've got years ahead  
18 of a very in-depth testing and design program to  
19 demonstrate to NRC that those requirements are being  
20 met.

21 Issues such as natural circulation, once  
22 stipulated that it is required, will have to be  
23 confirmed over a lengthy period of time with intensive  
24 NRC review. So we hope the decision making on  
25 requirements could be done in a timely way to prepare

1 the way for the verification steps, with NRC complete  
2 visibility of every step of the way.

3 CHAIRMAN CARR: Well, let me jump in there a  
4 minute. Now when you talk about right requirements--  
5 and you've already talked about these exceed  
6 regulatory requirements -- I don't see our  
7 responsibility as deciding what the right requirements  
8 are. It's the utilities' requirements you're talking  
9 about. All we want to make sure is that they are safe  
10 requirements, and so the rightness or wrongness of  
11 them is not what we're going to look at as much as  
12 whether what you want to buy is safe to operate.

13 Are we in agreement?

14 MR. TAYLOR: Chairman Carr, you said it far  
15 better than I.

16 CHAIRMAN CARR: Okay.

17 COMMISSIONER ROGERS: Would you comment on  
18 the question or the issue of the relationship of a  
19 passive design -- you emphasize natural circulation--  
20 to the philosophy of defense in depth and the notion  
21 that the diversity of safety functions may be reduced  
22 in such designs?

23 MR. KINTNER: I don't know what you mean by  
24 reducing the diversity of safety functions. There are  
25 several different circuits to apply natural

1 circulation, so that the diversity remains. If you  
2 mean we're not going to have three 1E diesels standing  
3 by -- Oyster Creek was shut down this last week for a  
4 week because we couldn't get the diesel to run. If  
5 that's what you mean, then we are proposing to have no  
6 1E diesels. We're proposing we don't need them. And  
7 we're proposing to show we don't need them.

8 But the idea of keeping that reactor cool,  
9 let's take the example of the BWR. General Electric  
10 is proposing to use the same reactor vessel that they  
11 are using in their 1,300 megawatt plants for a 600  
12 megawatt plant. The result of that is that in terms  
13 of the decayed heat process, there are four as times  
14 as much water over the reactor core, which just  
15 changes the whole picture of timing and necessity for  
16 these kinds of emergency reactions.

17 So we really propose to show and believe  
18 wholeheartedly that we are going to have a safer plant  
19 than the ones which depend upon a large number of  
20 complicated safety systems.

21 MR. DeVINE: Further, let me state that the  
22 defense in depth concept is not being challenged at  
23 all.

24 MR. KINTNER: No, it's still the same.

25 MR. DeVINE: Absolute multiple barriers,

1 independent barriers for fission product release will  
2 be adhered to. The mechanisms will be different, we  
3 think somewhat more simple. And I think if you look  
4 at the whole plant, the degree of diversity will be  
5 greater, although part of that diversity may not be in  
6 safety-related equipment. That will come out of the  
7 whole review process, obviously.

8 MR. STAHLKOPF: It's certainly our intent to  
9 retain the ultimate depth in defense, which is a very  
10 robust containment. And going back to Ed's example,  
11 we see that the containment for the 600 megawatt AP  
12 600 will be approximately the same volume as is  
13 proposed for their present 1,300 megawatt plants.

14 So we see margin being added in. We see  
15 defense in depth being maintained. And we see current  
16 containment concepts being maintained as well.

17 COMMISSIONER CURTISS: I don't have any  
18 other further questions, but let me just make an  
19 observation. As I said at the outset, it does seem to  
20 me that the requirements document concept is one that  
21 has quite a bit to commend it, not just in concept but  
22 in practice.

23 As I said, it does seem to me from our end  
24 that there are some resource savings that could accrue  
25 by virtue of our ability to discuss and resolve issues

1 in a single vehicle that would then be applicable to  
2 vendor applications that might come through for a  
3 given class of plants. It has a parallel, I guess, in  
4 our PART 52 rule where the benefit of reviewing a  
5 vendor application that would be subsequently  
6 referenced by utilities provides the same kind of  
7 benefit. We don't review every utility application  
8 for a custom design.

9 I also think, and I've expressed this at the  
10 earlier meetings, that the time has come for us to  
11 join the debate, resolve the issues on source term, or  
12 at least the TID and questions like the instantaneous  
13 release assumption that I think are going to drive us  
14 in the direction of making decisions one way or the  
15 other, unless we resolve them for individual vendor  
16 designs.

17 The question of containment performance,  
18 whether we want a separate containment performance  
19 criteria that would be applied to the next generation  
20 of reactors is a matter that, at least for the GE  
21 design, is driving GE and us in the direction of  
22 saying that that design ought to have a vent to the  
23 open environment. It seems to me that's a significant  
24 policy question that ought to be joined and resolved.

25 Hydrogen is a third one. The staff tells us

1 that the ball may be in your court on that, because  
2 they're looking for additional information on core  
3 concrete interaction, and we'll look forward to that  
4 information. But it does seem to me that hydrogen is  
5 a third issue that ought to be discussed and resolved,  
6 and particularly because of its importance when we get  
7 to the passive plants.

8 So in short, I guess, I'm a firm believer in  
9 the concept of the requirements document. It requires  
10 a considerable degree of discipline on your part,  
11 which I think you've exercised in large measure,  
12 although there are some synchronization problems, I  
13 guess, in terms of timing. And it involves a  
14 considerable degree of discipline on our part, but one  
15 that is complicated by the difficulty that we have in  
16 always getting the resources that we'd like to apply  
17 to a whole range of things that we could look at and  
18 address. Limited resources need to be spread around.

19 So with that, I guess, I'm not sure I have a  
20 solution to all the problems or concerns that you've  
21 raised. I think it's an issue that we ought to  
22 reconnoiter on and decide, as the Chairman has already  
23 suggested, how we intend to apply our resources to--  
24 how we intend to establish our priorities and how  
25 generally we intend to approach the question of the

1 requirements document vis a vis the vendor  
2 applications; and then in the context of individual  
3 vendor applications, how we intend to prioritize those  
4 resources.

5 That's all I have.

6 MR. DeVINE: Commissioner Curtiss, may I  
7 just correct the record on one point? With respect to  
8 hydrogen, I'm not aware of an outstanding request for  
9 information on core concrete interaction.

10 We have presented a detailed position with  
11 respect to hydrogen production. It applies to the  
12 case of an accident in vessel. That is where we  
13 intend to apply our hydrogen limit. We think we've  
14 made a defensible case. We'd like very much to get  
15 into a dialogue on that. That is not a make or break  
16 issue for the ALWR program and I don't want to suggest  
17 it is, but I think that item's been thoroughly  
18 presented.

19 COMMISSIONER CURTISS: As I recall, the  
20 staff said at the last briefing that the analysis  
21 thoroughly considered metal/water reactions, but  
22 concrete --

23 MR. DeVINE: I think there was confusion on  
24 that point in how we apply our proposed oxidation  
25 fraction.

1 COMMISSIONER CURTISS: Okay.

2 MR. DeVINE: And we've had some dialogue  
3 with the staff since then too.

4 COMMISSIONER CURTISS: Okay.

5 CHAIRMAN CARR: I'm not sure that particular  
6 issue is not a matter of just saying how much hydrogen  
7 we think we can take care of instead of where it comes  
8 from.

9 MR. DeVINE: Well, that's another way to  
10 look at it.

11 CHAIRMAN CARR: Well, let me say first what  
12 we're doing here is very important in my mind. We're  
13 having -- what we do and how we do it is going to have  
14 a very important effect on what comes along and  
15 whether we have a future for nuclear power in this  
16 country probably. So I don't mind spending a little  
17 more time, which I plan to do, because I'm not sure  
18 I've got the answer to the question I really want to  
19 ask.

20 First, let's go over your statements. I'll  
21 ask Mr. Lee this one. It says "The utility-sponsored  
22 EPRI ALWR Program, coupled with the DOE-sponsored  
23 vendor certification programs, will provide the first  
24 step in developing that confidence." Let's explore  
25 that word "coupled" a little bit. How closely coupled

1 is it, and what do you mean by "coupled with"?

2 MR. LEE: Well, I guess I would say that  
3 maybe it's too closely coupled at this point in time,  
4 as was discussed here now. We appear to be in  
5 parallel. But I guess what I meant was that the  
6 orderly sequence would have been to have had the  
7 design or the requirements documents prepared, the  
8 certification application filed, based upon that, if  
9 it would have been the proper approach, and in that  
10 way give some assurance to the industry that this  
11 process is going to be able to proceed in an orderly  
12 fashion, that we are going to be able to come to some  
13 decisions.

14 CHAIRMAN CARR: But it's easy to uncouple  
15 them. I mean, we can uncouple them now. We can stop  
16 work on those and do what we planned to do, do the  
17 EPRI design requirements first and then turn on the  
18 effort again to certify the design.

19 MR. LEE: And we're not suggesting that at  
20 this point in time.

21 CHAIRMAN CARR: Well, is that necessary?

22 MR. LEE: Is it necessary to --

23 CHAIRMAN CARR: To uncouple them.

24 MR. LEE: No.

25 CHAIRMAN CARR: Is coupling a problem, or is

1 it a requirement? There are some people who think  
2 that if you don't have a design to look at, you can't  
3 ever build the requirements document.

4 MR. LEE: I think -- and I'll let these  
5 people speak on that -- but I don't believe that's  
6 necessary.

7 CHAIRMAN CARR: If we don't have a designer  
8 for a -- or a design buyer, we'll say, for a passive  
9 plant, can we build the design requirements document?

10 MR. LEE: Yes. That's what this program is  
11 all about.

12 MR. KINTNER: Let me go back to your  
13 previous question. About three years ago, this  
14 question arose between ourselves, the Department of  
15 Energy, and the suppliers. After a considerable  
16 discussion, it was agreed, and I thought it was  
17 absolutely understood and would be accepted that the  
18 requirements document would be the basis for the  
19 certification submittals, which is to say that they  
20 would -- the submitter to you would make a statement  
21 that "we meet the requirements document, except in the  
22 following cases," and then describe where and why they  
23 did not meet it.

24 Now that process was followed, and as John  
25 said, many, many contributions have been made to those

1 designs that came out of this certification -- out of  
2 the requirements document, and it's broken down  
3 recently because the General Electric design -- I'm  
4 not attacking General Electric -- had the priority and  
5 these decisions were faced and settled, presumably,  
6 before the requirements document had the same kind of  
7 settlement.

8 So there was a logic to what we were  
9 attempting to do, which would have coupled -- it  
10 didn't say the suppliers had to follow the  
11 requirements document. They'd follow it where they  
12 felt --

13 CHAIRMAN CARR: I'm trying to figure out  
14 should we pull those back into phase.

15 MR. KINTNER: From our perspective, that  
16 would be ideal, although it's going to be extremely  
17 difficult to do starting now.

18 CHAIRMAN CARR: Well, now let --

19 COMMISSIONER CURTISS: I gather what you're  
20 saying is that you don't want the GE decisions to be  
21 the precedent. You'd like to view them in the four  
22 corners of the GE application, but you don't want them  
23 to have any precedent or bearing on the resolution of  
24 those key issues in the context of the requirements.

25 MR. KINTNER: That's what we would like.

1 MR. LEE: And I think GE has expressed that  
2 same desire.

3 CHAIRMAN CARR: Could you have built the  
4 passive document without the evolutionary document?

5 MR. KINTNER: It would have taken longer.  
6 It would have been a little bit more difficult to  
7 digest the experience. We've mentioned it was 1,300  
8 reactor years. But it could have been done. It would  
9 have taken longer.

10 CHAIRMAN CARR: Well, the concept of  
11 requirements documents to me is familiar and it's what  
12 I've lived with all my life. I tell the designer I  
13 want a submarine that dives X deep and goes X fast and  
14 shoots X number of torpedoes, has periscopes and  
15 radars. And then, he goes and designs it and I look  
16 at the design and decide whether I want to buy it or  
17 not. I don't understand how you can do it any other  
18 way. I mean, it's very natural for me to look at  
19 something like that.

20 The problem is that you're -- I'm worried  
21 about you always being behind in your requirements  
22 document to the salesman who is out trying to sell me  
23 a better submarine that he has designed, rather than  
24 really what I want. And I think that's why we're  
25 here.

1                   So the question I want to ask now is should  
2 we say we are not going to review any passive designs  
3 until the passive requirements document is out, and  
4 get in front of the next concern?

5                   MR. KINTNER: Well, obviously that's not our  
6 desire.

7                   CHAIRMAN CARR: Let's ask the buyer. He's  
8 the --

9                   MR. KINTNER: Who's the buyer?

10                  MR. LEE: Well, we're all the buyers.

11                  CHAIRMAN CARR: There's six of you here. I  
12 can't find a buyer today, so I'm not sure there are  
13 any.

14                  MR. LEE: You're right. I don't think --

15                  CHAIRMAN CARR: Let's call them potential  
16 buyers.

17                  MR. TAYLOR: Let me be so brave as to enter  
18 into that. We are proposing to submit to you the  
19 requirements on the passive plant, which will be  
20 supplementary to the very large bulk of information  
21 that applies to the passive plan you already have  
22 within the next year. If NRC responds in a timely  
23 way, I think we'll be very close to satisfying the  
24 condition you've stipulated.

25                  Our problem with these issues that have

1 broken apart between the GE ABWR certification  
2 requirements document. Those issues were presented to  
3 NRC a long time ago. They've been on the table a long  
4 time. So I would find it difficult to agree --

5 CHAIRMAN CARR: Let's look at it this way.

6 MR. TAYLOR: -- that we would synchronize,  
7 when we don't have any control over one element of the  
8 schedule.

9 CHAIRMAN CARR: But I don't have any control  
10 over the guy who's going to submit the certification  
11 request. So while you're merrily -- and we're trying  
12 to work along on the passive requirements document--  
13 and we don't have enough people to do everything--  
14 some designer is working on his passive design and he  
15 flops that on a desk and says, "I want it certified."

16 MR. TAYLOR: Yes.

17 CHAIRMAN CARR: I'm trying to avoid that.  
18 We're already in one problem.

19 MR. KINTNER: Someone somewhere -- and I  
20 don't know who that person is, maybe it's you -- has  
21 to decide these priorities, it seems to me, on the  
22 basis of national welfare. I mean, at what point and  
23 on what occasion is there going to be one of those  
24 plants built in the United States? To what degree  
25 does the U.S. interest lie in certifying evolutionary

1 plants which may or may not be built here, may not be  
2 built anywhere. But nevertheless, it compares that  
3 possibility with following this whole process we're  
4 talking to, which eventually ends up with the passive  
5 plant, which in fact has a different fundamental  
6 approach to safety.

7 Now it seems to me that the Nuclear  
8 Regulatory Commission, the Commission itself, is in a  
9 position to make that kind of a judgement.

10 CHAIRMAN CARR: I think that's clearly our  
11 responsibility. We're trying to get a little help to  
12 do it.

13 MR. KINTNER: Well, that's what we're here  
14 for.

15 CHAIRMAN CARR: But I think in our statement  
16 of consideration on the standardization -- and I'm  
17 kind of on record, which I want to make sure people  
18 understand -- says "However, the Commission will give  
19 priority to designs for which there is a demonstrated  
20 interest in the United States. The Commission will  
21 review other designs as resources permit."

22 Now NUMARC has said to us, "Here's how we  
23 demonstrate interest. If the utilities are willing to  
24 work on these problems and are willing to -- that's a  
25 demonstrated interest." Well, we may have to define

1 "demonstrated interest" a little to help us with that.

2 But nevertheless, it seems to me that one of  
3 the decisions we can make is the passive design  
4 requirements document comes first, while everybody is  
5 on notice that we can say that. And then, they  
6 proceed at their own risk, because we aren't going to  
7 look until the design requirements document is done,  
8 in the passive case. I need a few more votes to make  
9 that decision, of course, but it's certainly one of  
10 the things that we've got to consider, I think.

11 MR. TAYLOR: Commissioner, again, that is a  
12 reasonable request if there can be some assurance that  
13 there will be a timely response to the requirements  
14 from NRC. If there is not, then we put the vendor in  
15 a hold on a program we are sponsoring, as well as the  
16 Department of Energy, with a given schedule, which is  
17 very disturbing.

18 CHAIRMAN CARR: But our work load should  
19 decrease, if we're not doing anything for the vendor  
20 except looking at the design requirements document.

21 MR. TAYLOR: Well, it should.

22 CHAIRMAN CARR: Right now, I'm looking at a  
23 couple or three vendors and a design requirements  
24 document, and I'm behind in a lot of other work that I  
25 need to be doing on plants that are already out there.

1 MR. LEE: The problem, of course, is as you  
2 put it in series you just extend the time interval  
3 situation. And I guess that's the trade-off.

4 CHAIRMAN CARR: What do you mean?

5 MR. LEE: If you put the requirements  
6 document in series with the review of a specific  
7 application, whether it's passive or evolutionary.

8 CHAIRMAN CARR: How can we do it any other  
9 way and still meet what the utilities want to buy?

10 MR. LEE: I think portions of the  
11 discussions and initial reviews can be done -- the  
12 document's going to be done in somewhat -- in series,  
13 various chapters. And part of the process can be done  
14 in parallel. There's no reason it can't.

15 COMMISSIONER CURTISS: I guess I'm puzzled  
16 by that. I thought that --

17 MR. KINTNER: Well, may I -- here I am  
18 really walking on very thin ice.

19 CHAIRMAN CARR: Well, that's where we all  
20 are today.

21 COMMISSIONER CURTISS: Some of us have  
22 fallen through.

23 MR. KINTNER: But I am hard put to believe  
24 the issue is resources. I think the full-time  
25 application --

1 CHAIRMAN CARR: The issue is priorities.

2 MR. KINTNER: Priorities, of course,  
3 determine application of resources. And I think the  
4 full-time effort placed on the requirements document  
5 in its entirety is somewhere between four and twenty  
6 professionals. I don't know which number that is.  
7 Now that doesn't seem to me to be the basis for a  
8 question as to where priorities ought to be. Now,  
9 that's my view from outside.

10 CHAIRMAN CARR: Well, as I've said before,  
11 if we have a buyer, he goes to the head of the list,  
12 because that's what we've taken the position -- but,  
13 we'll have to work that out.

14 On the evolutionary LWRs, I don't get the  
15 warm feeling that the evolutionary LWR is what the  
16 current U.S. industry wants to buy.

17 MR. LEE: Well, and I've talked to a variety  
18 of those people also, and there's not unanimity. And  
19 I think that's just a matter of timing, where people  
20 believe they are in a time situation and what they are  
21 willing to wait for or willing to invest their money  
22 in.

23 But I think it would be a mistake to believe  
24 that there are no interests in evolutionary designs on  
25 the part of U.S. utilities. I think there is. I

1 think there is also a strong interest in developing  
2 the passive designs. But I think it's, again, back to  
3 the question of can we get these things through the  
4 process here in a reasonable period of time and  
5 resolve the issues or decide, I guess, that we can't  
6 resolve the issues, and then do what has to be done to  
7 meet those answers and move on.

8 I think John's point about the capabilities  
9 of the industry and what have you, the longer it takes  
10 us to resolve some of these issues, the weaker our  
11 position is going to be.

12 CHAIRMAN CARR: Okay. Let me get into some  
13 of my other questions here. You said one of the -- in  
14 the second way, that "we all know the latest reactor  
15 plant designs are overly complex and present  
16 unnecessary challenges to operators and maintenance  
17 personnel." I assume that also applies to the  
18 evolutionary design, since that's a current plant  
19 design. They only build on current plant designs.

20 MR. KINTNER: Except that what we have tried  
21 to do is apply the evolutionary -- in the evolutionary  
22 plants, the simplification and margin considerations.  
23 And we've made significant changes in that regard, so  
24 that an evolutionary plant will be simpler. It will  
25 be easier to operate and maintain if they follow the

1 requirements documents.

2 CHAIRMAN CARR: So I can rephrase that so  
3 say that the evolutionary plants are less complex and  
4 present fewer unnecessary challenges than --

5 MR. KINTNER: Yes.

6 CHAIRMAN CARR: -- current operating ones?

7 MR. KINTNER: Exactly.

8 MR. TAYLOR: If they weren't, I think the  
9 interest that I indicated I think is out there would  
10 go away.

11 CHAIRMAN CARR: Well, I guess we're arguing  
12 about how much significant difference there really is,  
13 whether it's enough to --

14 MR. STAHLKOPF: The bigger step is later.

15 CHAIRMAN CARR: -- whether it's enough to  
16 tilt the prospective buyer into hard cash.

17 "The ALWR requirements documents are filled  
18 with design improvements for safety made on that  
19 basis. Those shown in Figure 3 are included in the  
20 requirements document chapters already submitted to  
21 the staff." Are those A through M also in the  
22 evolutionary designs?

23 MR. KINTNER: That's in the evolutionary.  
24 The first list is evolutionary and the second list is  
25 in addition for passive.

1 CHAIRMAN CARR: Well, I'm trying to sort out  
2 advanced light water versus evolutionary light water.

3 MR. KINTNER: Both are advanced, and there's  
4 just two phases, evolutionary and passive.

5 CHAIRMAN CARR: Well, in our definition of  
6 advanced light water reactors, as we -- it's somewhere  
7 here -- we say, "The Commission considers the term  
8 'advanced' to apply to reactors that are significantly  
9 different from current generation light water  
10 reactors." So that would mean to me, maybe, the 600  
11 megawatt style plant would be an advanced plant,  
12 because I consider the evolutionary ones are not  
13 significantly different from current generation light  
14 water reactors. Is that a false --

15 MR. TAYLOR: Commissioner Carr, in my  
16 opinion, the evolutionary plans are significantly  
17 different. If you look at the listing that Ed  
18 presented to you, higher pressure decay heat removal  
19 system, now this is an area that clearly takes the  
20 burden off the operator. And it's a real difference.

21 The lower temperature, that is going against  
22 the grain of power engineering over the past four to  
23 five decades. Lower the temperature, reduce the  
24 efficiency, that's a real difference. And it makes  
25 one hell of a difference in the long-term reliability

1 of the system. We've learned that from our experience  
2 in the field. And so on through this.

3 The man/machine interface, that's the one  
4 document that we've really admittedly slipped in  
5 getting our material to you on time. But we  
6 desperately wanted to make that a major step forward.

7 CHAIRMAN CARR: So there is a significant  
8 difference, then --

9 MR. TAYLOR: You're darn right there is.

10 CHAIRMAN CARR: -- in the evolutionary  
11 design.

12 COMMISSIONER ROBERTS: You're going through  
13 this list A through M, I have a real nit question.

14 "J. Reactor vessels made of ring forgings  
15 so that vertical welds are not necessary." Do we have  
16 that capability to do that?

17 MR. STAHLKOPF: Not in this country.

18 COMMISSIONER ROBERTS: That's my question.  
19 Thank you.

20 MR. STAHLKOPF: Those forgings are being  
21 made in Japan now.

22 CHAIRMAN CARR: They can be bought. They  
23 could be made here, but we don't do it?

24 MR. STAHLKOPF: You just need a piece of  
25 bigger equipment for forging than you have.

1                   CHAIRMAN CARR:     I guess this is what  
2 Commissioner Curtiss was touching on. Would you run  
3 through those unresolved issues common to both the  
4 evolutionary and passive plants for us?

5                   MR. DeVINE:    I don't have a complete list of  
6 issues.

7                   CHAIRMAN CARR:   Well, just a few samples.

8                   MR. DeVINE:    The biggies. We talked about  
9 the ones that Commissioner Curtiss raised: hydrogen  
10 source term and containment. All clearly apply to  
11 both. And we think, in fact, that the resolution will  
12 apply -- will be a common resolution.

13                   There are a number of more specific ones.  
14 Unresolved issues in the area -- for example, I  
15 remember there are four or five of them in the area of  
16 emergency feed system. We proposed specific system  
17 requirement resolutions to those issues in the  
18 requirements document. And to some degree, they will  
19 apply to the passive plant. It depends on the actual  
20 design.

21                   CHAIRMAN CARR:   Well, it seems to me that I  
22 should focus my resources, perhaps, on those that are  
23 common to the passive plants and the evolutionary  
24 plants, if I have a shortage of resources.

25                   MR. DeVINE:    Right. And in fact, our

1 steering committee has directed us to focus our  
2 attention as well on those issues which are likely to  
3 have a common root.

4 CHAIRMAN CARR: And as I heard you, you said  
5 you're going to get us the material on the passive  
6 plants by September of next year?

7 MR. DeVINE: Yes. Actually, our schedule is  
8 by July of next year. I loosely said within the next  
9 year you'll have those packages.

10 And I would like to point out that the  
11 certification programs that the two main vendors, GE  
12 and Westinghouse, are embarking on are intended to  
13 achieve certification in the 1995 time frame. So I  
14 think the sequence that you're looking for is quite  
15 plausible. In fact, we're right on today.

16 CHAIRMAN CARR: Do you expect that the  
17 specific vendor designs for passive plants will  
18 conform to the passive design requirements memorandum,  
19 or program?

20 MR. DeVINE: Yes, we do.

21 MR. TAYLOR: We're determined that that be  
22 the case.

23 MR. KINTNER: And if, in fact, that has gone  
24 through the process we described as far as you are  
25 concerned, it will.

1 MR. STAHLKOPF: And I think even already to  
2 that end we've executed a memorandum of understanding  
3 with DOE, who is funding the other part of this  
4 passive plant work, to ensure management coordination  
5 between the two organizations for just that purpose.

6 And it is our intent, now that DOE has made  
7 it's selection of its two main vendors, to again enter  
8 into the same type of memorandum of understanding as  
9 we did for the evolutionary plant with each of the  
10 specific vendors to ensure their good will in showing  
11 that the requirements document and their certification  
12 will be the same, and in submitting to EPRI their  
13 certification material prior to submitting it to you  
14 so that we can understand exactly how it does meet our  
15 requirements.

16 CHAIRMAN CARR: Ed, you said they will if we  
17 do it the way we said we were going to do it. But of  
18 course, all we're doing is saying that if that's going  
19 to be a guide, the design requirements document, we're  
20 only saying this is acceptable if you do it like this.  
21 But if they come outside of that, they can still --

22 MR. KINTNER: They can still come to you --

23 CHAIRMAN CARR: -- come and say these are  
24 outside?

25 MR. KINTNER: That's right. But I think

1 it's highly unlikely. On important issues, if the  
2 requirements document had met your final conclusions  
3 and was in consonance with --

4 CHAIRMAN CARR: Not going to be a rule. I  
5 mean, that's what you wanted.

6 MR. KINTNER: Not going to be a rule, but as  
7 Jack says, as a guide or whatever you wish to call it,  
8 if it's in conformance with that, then the vendor's  
9 unlikely -- he could, but he's unlikely to diverge  
10 very much.

11 MR. DEVINE: Let me say also, it's not a  
12 shot in the dark. We've been working with these  
13 vendors for years. In fact, the two designs which DOE  
14 is now supporting for certification were created as a  
15 result of design competition run within the EPRI ALWR  
16 program about three years ago. Since that time, we've  
17 been conducting with those vendors and with DOE  
18 specific technical studies which have led to the  
19 maturing designs.

20 So we're not ships passing in the night on  
21 this. We're working very closely and we think that  
22 there's a very high likelihood that the designs will  
23 match up very, very well with the requirements  
24 document.

25 MR. TAYLOR: Vendors have participated in

1 the development of the requirements. We don't want a  
2 set of requirements where the vendors end up saying,  
3 "Hey, we can't meet those. They're not practical." et  
4 cetera. They have been deeply involved in setting the  
5 requirements with us.

6 CHAIRMAN CARR: That's the way we used to do  
7 it in submarines. We'd give a design and they'd tell  
8 us they couldn't make it.

9 But it seems to me what you're telling me is  
10 we're going to standardize on a design requirement,  
11 rather than on a certified design.

12 MR. STAHLKOPF: No. I think it's different  
13 than that. We focus on a design requirement. That  
14 design requirement ultimately drives the design, which  
15 is then certified by you and becomes a standard. So  
16 it's a different way to get the standard.

17 CHAIRMAN CARR: Yes, but I may have an  
18 unlimited number of vendors, whoever they are, who  
19 meet the design requirements but have many different  
20 designs.

21 MR. STAHLKOPF: That's right.

22 CHAIRMAN CARR: And I'm not sure--  
23 standardization, when I started out, you know, that's  
24 not the way it translates to me. Standardization  
25 means that at least I'll have a bunch of vendors out

1 there not only that are designing plants, but that are  
2 designing pieces of plants that know they have a  
3 continuing business for my pump and valve industry,  
4 which right now, as you know better than I do, many of  
5 your suppliers are out of business and you can't find  
6 somebody to buy parts from.

7 MR. KINTNER: Well, as you know better than  
8 I, standardization is by no means an assured result at  
9 the moment. How it's done, with a diversity of  
10 companies and theories and utilities is hard to see  
11 completely to the end product.

12 But what we have suggested and what I  
13 believe to be the case is that the mechanism to start  
14 that process in a significant way is to engineer a  
15 design which utilities have contributed to and which  
16 is, in fact, well done. I mean, it follows these  
17 kinds of principles we're talking to, puts the  
18 information from the 20 years or so of experience into  
19 effect.

20 Then, it's up to other processes to take  
21 over and standardize. To the degree -- we've talked  
22 this in the steering committee. Pat McDonald thinks  
23 we ought to specify the pumps and the valves and buy  
24 them all from the same vendor. We're a long way from  
25 that. But nevertheless --

1                   COMMISSIONER ROBERTS:   Don't we have some  
2 laws that preclude that?

3                   MR. KINTNER:   But if you had this document,  
4 and the requirements were specified in detail, and the  
5 NRC said "If you do that, we think you're okay," then  
6 I think the effort on the part of the utilities and  
7 the vendors is going to be focused on closer to  
8 standardization than any other mechanism I know at  
9 this point.

10                  COMMISSIONER CURTISS:   Would it be correct  
11 to say that the objective of standardization here--  
12 that you are going to have an enhanced degree of  
13 standardization with the requirements document than  
14 without it?

15                  MR. KINTNER:   Yes, sir.

16                  COMMISSIONER CURTISS:   You will have fewer  
17 differences between and among vendors with a  
18 requirements document than without.

19                  MR. KINTNER:   Yes, sir.

20                  CHAIRMAN CARR:   We've got to inch our way  
21 toward it is what you're telling me, rather than take  
22 a giant step for mankind.

23                  MR. TAYLOR:   We call it a fundamental step.  
24 And the rest of it, I think Commissioner Roberts put  
25 his finger on it, is a little bit beyond our ability.

1                   COMMISSIONER ROGERS: You suggest that -- in  
2 your presentation, you said the process is working.  
3 You cited some examples of that, and you said that  
4 certification designs incorporate most ALWR  
5 requirements. So there is some deviation right now.  
6 How do you feel about those deviations that have  
7 surfaced so far? There is GE, of course, but are  
8 there others?

9                   MR. DEVINE: In large measure, I think the  
10 designs that are being submitted have been  
11 significantly altered and improved, in our view, to  
12 match the ALWR requirements. They're better designs.  
13 We think you're going to like them better, and we're  
14 quite happy with their conclusions.

15                   There are some differences that we're  
16 uncomfortable with that are outside of the regulatory  
17 arena that we're trying to work with the vendors  
18 directly.

19                   Ed mentioned the lower operating  
20 temperature. Our understanding right now is that the  
21 PWR certification design will not achieve the 600  
22 degrees we'd like to achieve. We think that's very  
23 important and we're still twisting arms to try to make  
24 that happen.

25                   MR. TAYLOR: It's come down substantially.

1 MR. DeVINE: It's come down significantly,  
2 and that was the point I was going to make. We've  
3 probably come halfway and we'd like to go further.

4 So I think, in short, we think we've made  
5 real progress in the right direction. We're not all  
6 the way home yet.

7 COMMISSIONER ROGERS: Okay.

8 CHAIRMAN CARR: Well, I think I've got most  
9 of my questions answered.

10 COMMISSIONER CURTISS: I have one other  
11 quick one. I would just be curious on the CANDU  
12 design, since that's one that now is coming up on our  
13 screen. Has your organization, to the extent that it  
14 reflects the joint expression of utility interests,  
15 reached the point where you envision the EPRI process  
16 or the requirements document process in particular for  
17 the passive plants moving in a direction that would  
18 include or account for or allow for the possibility of  
19 a CANDU design that would fit the requirements  
20 document?

21 MR. KINTNER: No. I think the differences  
22 between heavy water reactors and ours are so wide that  
23 it would be very hard to use that.

24 COMMISSIONER CURTISS: Okay.

25 MR. DeVINE: There may be some points of

1 commonality, but the document's quite specific.

2 MR. TAYLOR: There are no plans of any kind  
3 to do that.

4 COMMISSIONER CURTISS: Okay.

5 CHAIRMAN CARR: And I don't suppose what I  
6 really would like to hear is everybody's opinion on  
7 whether a domestic energy supplier will ever order an  
8 evolutionary/or not would be a fair question, to see  
9 if you all wanted to give your percentage of  
10 probabilities that that would happen?

11 MR. TAYLOR: Whether one will order?

12 CHAIRMAN CARR: Yes.

13 MR. TAYLOR: Well, again, as I said earlier  
14 I think, Mr. Chairman, I guess that depends on how far  
15 and how soon we move through the process and how  
16 successful -- either of the processes.

17 CHAIRMAN CARR: I'm trying to narrow it  
18 down, like 60/40, or 50/50, or ten percent, you know.  
19 Those are decisions we've got to make. Because if  
20 we're going to make decisions that decide where we're  
21 going to put our resources and we've got a limited  
22 number of resources -- the guys who are running plants  
23 out there today, they've got a lot of work for me to  
24 do too.

25 And with no orders on the books, I've got a

1 lot of manpower working on future things that I could  
2 put to working on those problems that I know are out  
3 there that have to be solved, such things as plant  
4 life extension and why aren't you up to date on your  
5 tech spec revisions? I've got lots of people I can  
6 keep busy.

7 But I recognize that we need to do the  
8 future work. The question is, how much of it can I do  
9 and where should I best put those resources? And if I  
10 had some feel for what U.S. industry was going to buy  
11 to produce power with it, then obviously if you told  
12 me you knew what that was, I could focus on it. And I  
13 am having a hard time getting that. And it seems to  
14 me we're going to have to make some tough decisions,  
15 and I certainly agree that putting requirements in  
16 front of designs is a logical way to go, from my  
17 standpoint.

18 MR. TAYLOR: Commissioner Carr, I'm not  
19 going to attempt to really answer that, but I might  
20 suggest there is a cause/effect relationship here.  
21 Utilities, at the very outset of this program  
22 expressed the greatest importance that we establish  
23 the regulatory basis for a future plant. They thought  
24 that was by far the most open issue, bigger in their  
25 mind than anything else.

1 CHAIRMAN CARR: And a wise move.

2 MR. TAYLOR: And this process is, in fact,  
3 an attempt to define what that regulatory basis would  
4 be. And that in turn could motivate a favorable  
5 decision.

6 CHAIRMAN CARR: But my problem there is the  
7 vendors got out ahead of that problem.

8 MR. TAYLOR: The vendors, for purposes of  
9 export, have gotten out ahead, for purposes of export.

10 CHAIRMAN CARR: Well, I don't know whether  
11 it was only -- I view that a little different. I  
12 think it's for purposes of sales, be it export or  
13 local.

14 MR. TAYLOR: We're working for the U.S.  
15 utilities, Chairman Carr, trying to do what they want.

16 CHAIRMAN CARR: Well, and I --

17 MR. TAYLOR: And right now, the urgency for  
18 the vendors is overseas. I think it's real. I'm not  
19 in any way denigrating it, but it's overseas.

20 CHAIRMAN CARR: But I guess I still say that  
21 we're here to kind of make sure that the U.S. utility  
22 industry builds safe reactors to generate power in  
23 this country.

24 MR. TAYLOR: Yes, sir.

25 CHAIRMAN CARR: And so, that's my priority

1 of putting my people to work.

2 MR. TAYLOR: And your demonstrating that we  
3 have a regulatory definition of sound technical base  
4 and stable nature can be a motivating factor, not the  
5 only one, but can be a motivating factor for them to  
6 make a move.

7 MR. KINTNER: And I would just like to  
8 repeat what I said earlier, that in the best of all  
9 worlds, which this is not, what we are attempting to  
10 do is so important if in fact you look to this  
11 question of future availability in the United States  
12 of useful reactor plants, that both of these ought to  
13 be attacked full-bore.

14 As a matter of fact -- and this is a  
15 facetious comment, don't hold me to it -- I think --

16 CHAIRMAN CARR: I make those all the time  
17 and they hold me to them.

18 MR. KINTNER: -- the Nuclear Regulatory  
19 Commission ought to be paying us for this effort.

20 CHAIRMAN CARR: I thought we were. I pay  
21 somebody an awful lot of money every month in my  
22 utility bill.

23 I have two more comments in passing. One is  
24 on prevention versus mitigation. I couldn't agree  
25 more. Prevention, in my opinion, is the way to go. I

1 agree you've got to have mitigation in case you  
2 misjudge some of your prevention designs, but the  
3 money certainly ought to be to prevent the accident.

4 The second one is margin. I must admit I  
5 think we need it. I worry about the current effort in  
6 some places to remove it, to increase a few megawatts  
7 because we ran the slide rule again and we've got it  
8 down. That motion worries me. So I applaud the  
9 efforts in that direction and I think they are good  
10 for the country.

11 Having said that, I think I've covered all  
12 my issues.

13 Any further questions?

14 COMMISSIONER ROGERS: Just that I think this  
15 has been very helpful.

16 COMMISSIONER CURTISS: Excellent briefing.

17 COMMISSIONER ROGERS: Good meeting. And I  
18 think this has been helpful to us all.

19 CHAIRMAN CARR: I'm not sure how far it got  
20 us along to what we wanted to do, but I think it was a  
21 necessary meeting.

22 COMMISSIONER ROGERS: Well, it got us a lot  
23 further than we would have been if we hadn't had it.

24 MR. TAYLOR: I hope we'll be hearing from  
25 the staff more rapidly.

1                   CHAIRMAN CARR: We may need another meeting  
2 with the staff now, but -- well, anyway, I would like  
3 to thank the representatives of both EPRI and NUMARC  
4 for coming in to brief the Commission on the EPRI  
5 Design Requirements Document for Advanced Light Water  
6 Reactors. The information you presented will help the  
7 Commission in making a decision as to the priorities  
8 to be applied in performing NRC's reviews of specific  
9 plant designs and the requirements document itself.

10                   Thank you very much. We stand adjourned.

11                   (Whereupon, at 11:55 a.m., the above-  
12 entitled matter was concluded.)  
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CERTIFICATE OF TRANSCRIBER

This is to certify that the attached events of a meeting  
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DOCUMENT FOR ADVANCED LIGHT WATER REACTORS

PLACE OF MEETING: ROCKVILLE, MARYLAND

DATE OF MEETING: SEPTEMBER 20, 1989

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EPRI

## **ALWR is an Outstanding Plant**

- ALWR builds on success
- It employs the bulk of existing regulations, regulatory guidance, industry standards
- It incorporates major, utility-initiated improvements

EPRI

## **Important Safety Issues should be Resolved Generically**

- Top-tier safety issues apply to all future plants
- Regulatory Stabilization demands:
  - early resolution
  - consistent resolution
  - involvement of the user
- Generic resolution of key safety issues enhances industry, user, and public confidence

EPRI

## **Generic Issue Resolution is Achievable:**

- Within the current Law/Regulatory Framework, and without generic rulemaking
- Within U.S. Commercial (i.e., competitive) Industry Structure
- At Requirements Document level of engineering detail

## The ALWR Requirements Document

- A directive to the designer, from the customer
- Addresses key user needs - including regulatory
- Covers whole plant, in substantial detail
- A comprehensive hierarchy of information
  - Policy and design principles
  - Performance requirements
  - Design requirements (conceptual P&ID level, materials, etc.)

## **In Many Respects, The Process is Working**

- Evolutionary Plant requirements (RD Volume II) production is essentially complete
  - 12 Chapters finalized, submitted to NRC
  - Man Machine Interface Chapter in final form
- Consensus achieved on most key issues among Utilities, Vendors, A-Es
  - Over 6500 comments resolved
- Certification designs incorporate most ALWR requirements
- Passive Plant RD production is well underway

EPRI

## **Intended Regulatory Significance (and Use) of the Requirements Document**

The Requirements Document is intended to be a basis for:

- Agreement in principle on safety design of future Reactors
- Resolution of safety/regulatory issues for future Reactors
  - USI's & GSI's
  - Optimization Issues
  - Other
- Direction taken by applicants in certification submittals and by NRC in reviewing/approving those submittals

## What's Really Happening

- Requirements Document submittals are sidetracked in NRC's house
  - DSERs far behind schedule
  - Important issues not being closed
- Meanwhile, NRC Certification actions are proceeding
  - Issue resolution being effected on a plant specific basis, with little utility involvement

## **Main Contributors to the Problem**

1. The Requirements Document lacks the regulatory "stature" of an application under 10CFR52
  - it is a new idea, without precedent or established practice
2. For the Evolutionary Plant, there is a timing complication
  - EP RD issues not resolved prior to certification submittals
3. ABWR Certification has apparently been assigned higher NRC priority and resources than the Requirements Document
4. The Requirements Document covers areas outside traditional regulatory jurisdiction

## **Our View of the Problem and Its Solution**

### **Re: Regulatory "Stature"**

- NRC has full authority to join issues outside of certification arena
- NRC can and should endorse agreed-upon positions via SER
  - stature equivalent to SRP or Reg Guide
  - can be used as baseline criteria for certification decisions
- This approach does NOT require rulemaking

## **Our View of the Problem and Its Solution**

### **Re: Evolutionary Plant Timing and Resources**

- Agreement is needed among NRC, Utilities, and Certification applicants to resolve key safety issues jointly and contemporaneously, through the ALWR Program.
- For the process to work, NRC must apply resources to ALWR, consistent with the needs of the job

## Our View of the Problem and Its Solution

### Re: Requirements Outside of NRC Scope

- The complete, integrated set of utility requirements should be a basis for increased NRC confidence in the ALWR
  - the whole plant is covered
  - As examples, the "Beyond-Regulatory" Requirements:
    - improve ALWR reliability
    - reduce frequency of initiating events
    - increase time for operator diagnosis and response
- Utility Requirements should not become Licensing requirements, and need not complicate NRC's review of the RD

## The Composite Solution

- NRC renew its commitment to support ALWR with resources, priority attention
- NRC, ALWR Utilities, and certification applicants address and resolve issues jointly
- NRC Issue ALWR SERs
  - which endorse the agreed-upon set of ALWR requirements
  - which have stature equivalent to Reg Guides

EPRI

## What We Can Do to Help

- Improve technical dialogue with the Staff
- Identify and propose workable solutions to Key Issues
- Provide prompt response to Staff positions

## Our Product

### A Requirements Document which Provides:

- Safer Plants
- An integrated design, covering the entire plant
- Full-scope coverage of design, construction, operation and maintenance
- A fundamental step in standardization
- The incorporation of two decades of operating and licensing experience worldwide
- A basis for the certification process, in close coordination with the ALWR Requirements effort

## Our Plans

### Evolutionary ALWR

We will continue our work on the Evolutionary Plant, to the point of a completed, utility-endorsed and NRC-approved Requirements Document.

We intend to submit the final ("rollup") version of the document to NRC in April 1990.

## Our Plans

### Passive Plant

We have already begun development of Utility Requirements for Passive Plants, building on the foundation of the Evolutionary Plant Requirements Document and on the past three years of Passive Plant study work at EPRI and DOE.

We intend to submit the Passive Plant Requirements Document to NRC for review and endorsement, via SER, over the next 12 months

EPRI

## Our Concerns

The ALWR Requirements Document is largely complete, but it is not yet being used by NRC as a basis for Industry and NRC agreement on safety and regulatory requirements for future U.S. reactors.

We cannot afford to let this opportunity pass.

## What We Need from NRC

- Renewed commitment to apply resources
- Renewed commitment to address and resolve issues:
  - generically
  - conclusively
  - with the utilities
- Renewed commitment to use the Requirements Document:
  - as a vehicle for Safety/Regulatory Issue Resolution
  - as a basis for Certification actions

Byron Lee, Jr.

Statement  
Before the

Nuclear Regulatory Commission

on the  
Advanced Light Water Reactor Program

September 20, 1989

Thank you, Mr. Chairman, for asking NUMARC to be a part of this program discussing the industry's Advanced Light Water Reactor Program and representing a major segment of the nuclear industry in the U.S.

I believe I can safely say that the vast majority of the nuclear industry in this country is still committed to nuclear power and believes that nuclear units can be designed, constructed and operated safely with minimal impact upon the environment and, if we continue to proceed along the course started by this program and your new Part 52 Rule, they can be built economically. I say that based upon my discussions with the leadership in the nuclear utilities, vendors and architect/engineers. I don't believe any utility is ready now to step up and order the next reactor, and I can't say with any more certainty than anyone else when that will be. However, I do believe that there are three major prerequisites that will be necessary before that happens:

First and foremost, of course, is a need for power.

Secondly, there will need to be a licensing process in place that will give some reasonable assurance that a plant, once licensed and construction started, can be completed in about five years. This will require stability in that process during that period.

And lastly, that there is a standardized design that has progressed through the certification process. I believe the approach the industry and the NRC have taken, as will be described to you today, coupled with the efforts related to the new Part 52 Rule, are major steps in the proper direction.

The industry's position on the proper approach was described by James J. O'Connor, Chairman and Chief Executive Officer of Commonwealth Edison Company, and Chairman of NPOC, the Nuclear Power Oversight Committee, in his testimony before the Senate Energy and Natural Resources Committee on Advanced Reactors in May of last year, when he said, "It is my judgment and that of the majority in the nuclear power industry that the light water reactor (LWR) will remain the dominant nuclear power technology over the next several decades. Over 25 years of favorable operating experience worldwide, along with extensive development and testing programs, support the LWR and provide a sound basis for confidence in this technology.....It would be unrealistic to look for a utility to order, in the near future, a reactor based on a technology that has yet to be proven commercially viable, when an advanced version of a technology proven and accepted world-wide will be

available. To this end, a major program has been undertaken in the past several years to develop an advanced light water reactor (ALWR) for deployment as this next increment of nuclear power generation capacity. This program, supported by the utilities, vendors, DOE, and EPRI has shown exceptional promise in providing standardized advanced LWR designs." Although that testimony is over a year old, I can say from recent first-hand discussions with the utility and vendor leadership that that position still holds true.

The industry is committed, and continues to believe it is important, to finish the review of the evolutionary plant Requirements Document, even though it may now be close to being parallel with the review of individual certification efforts. We say that because we believe that the process is extremely important at this point in time and the resolution of some of the major issues in that process is essential. We believe that this can and should be done through the Requirements Document.

Most of the major problems facing us are generic and really require policy input to reach decisions on the part of both the NRC and the industry. It seems only logical to resolve those issues as quickly as possible and the Requirements Document is the best vehicle. As Jim O'Connor indicated, there is a high level of confidence on the part of the utilities that the advanced light water reactors can be built and operated successfully. But there is far less confidence that any design can get through the licensing process with the same degree of probability. The utility-sponsored EPRI ALWR Program, coupled with the DOE-sponsored vendor Certification programs, will provide

the first step in developing that confidence. This logical and rational program that was embarked upon several years ago is still a favored program by the industry. We believe the Requirements Document reviews should continue along with the design certification reviews currently in progress.

The Commissioners have discussed and asked for suggestions on how to establish priorities to most effectively use your staff resources. Once again, I would suggest there are three criteria:

- 1) The first criteria, which is discussed in your Statement of Considerations from Part 52, is the demonstrated interest in the U.S. by potential users, which at this time are the utilities. Demonstrated interest should be judged by financial support and involvement of senior level people from the potential user's organization. I don't believe it is necessary or practical to require a commitment to a specific design on the part of a utility or a group of investors. In fact, it seems that would be counter to the whole philosophy of standardization.
- 2) The second criteria is completeness of design.

Here I believe your own rule, Part 52-47, defines a rather complete set of requirements when filing an application for certification. Those requirements are extremely extensive and require a major commitment on the part of an applicant.

For the initial reviews prior to the actual certification application filing, I believe the Commission would have to analyze the commitment an applicant has made to that design. The level of commitment would be obvious from the degree of completeness of the design. Your resources required would be proportional to the commitment made by the proposed applicant.

- 3) If those two criteria do not give adequate guidance, familiarity with that design on the part of both the NRC Staff and the potential U.S. market could be analyzed to assist in your prioritization.

I would like to add that NUMARC in its new form as a council has been actively involved in the ALWR program through our Technical Division Director, Bill Rasin. Bill was an active participant in the program while at Duke Power and has continued that participation as our Technical Director. In addition, our Standardization Oversight Working Group has played a lead role in developing the responses to the Part 52 Rule and continues with a major program to try to assist the Commission and the industry in developing the mechanisms that will be necessary to make that rule work. Our Working Group was chaired until earlier this year by Richard Priory, Senior Vice President of Duke Power, and is presently chaired by William Council, Vice Chairman of Texas Utilities. It includes membership from major utilities with recent experience in design, construction and licensing, as well as EPRI, the three major nuclear steam supply vendors involved in the ALWR program and several of the architect/engineers.

The industry through the EPRI ALWR program, the NUMARC Standardization Oversight Working Group, and the NSSS Design Certification programs has dedicated a considerable number of dollars and a large number of extremely experienced manhours to this effort. We believe that is a strong indication of the high priority given to these efforts by the U.S. nuclear industry.

I thank you, once again, for this opportunity to participate in the briefing and I would now like to turn the meeting now over to Ed Kintner, Executive Vice President for GPU Nuclear and the Chairman of the ALWR Utility Steering Committee. He will be followed by Karl Stahlkopf, Jack DeVine and John Taylor from EPRI.

SEPTEMBER 20, 1989

EPRI UTILITY STEERING COMMITTEE

PRESENTATION TO THE NUCLEAR REGULATORY COMMISSION

ON THE ADVANCED LIGHT WATER REACTOR PROGRAM

We are pleased to have this opportunity to meet with you again to bring you current with the Advanced Light Water Reactor Program. We met with the Commissioners on two previous occasions on October 15, 1986, and June 16, 1988. We believe we are making good progress in preparation of the central product of our effort, the Advanced Light Water Reactor Requirements Document. We have completed 12 of the 13 chapters for the Evolutionary 1100-1300 mWe Plant. While the NRC Staff is reviewing those Chapters, we are in the process of insuring self-consistency throughout. Beyond that, we are engaged in preparation of similar chapters covering the 600 mWe so called Passive Plant which is fundamentally different from other LWRs in that it incorporates natural circulation decay heat removal, as well as other important safety improvements. We expect that the Passive Plant effort will take several more years, but the work done on the Evolutionary Plant will establish a good base for the Passive Plant.

We believe if there is to be a potential for reinauguration of large-scale nuclear power plant construction in this country it must be inspired by a fresh look at how nuclear utility plants are designed and built.

The Advanced Light Water Reactor Program is an attempt to provide such a fresh look. It differs from the previous history of development of light water reactors in this country in two significant ways. First, this is a utility initiative carried out through the Electric Power Research Institute, a creature of the utilities. Its intent is to digest the lessons of more than 1300 reactor years of experience in light water reactors and apply those lessons deliberately and thoughtfully, so as better to adapt an available and proven technology to the needs of large-scale electricity generation. Unlike the circumstances in the early days of commercial nuclear plant design and construction, the utilities now have the experience--some of it quite painful--of the early learning process. The utilities have borne, and will bear, the costs of the learning process in applying nuclear energy to commercial use. The utilities now know the risks and incentives of reactor plant operation. If there is to be another commercial power reactor committed in the United States, the utilities will have a leading role and bear much of the responsibility for that initiative.

Much of the work in this ALWR Program is carried out by the NSSS suppliers--Combustion Engineering, Westinghouse, and General Electric--and the nuclear architect-engineers--Bechtel, Stone & Webster, and Sargeant & Lundy. The Department of Energy recently has awarded \$50M multi-year contracts to both GE and Westinghouse to further detail the 600 mWe Passive Plant BWR and PWR designs.

Oversight for the total ALWR Program is provided by the Utility Steering Committee made up of senior and experienced nuclear executives from U.S. utilities, including some of the major ones like Commonwealth, Duke, SONOPCO, and Consolidated Edison. The U.S. members of the Utility Steering Committee are shown on Figure 1.

Each chapter of the Requirements, in draft, is reviewed and criticized by staffs of the supporting utilities. Six thousand five hundred and eighty-nine comments or suggestions have been made by the utilities and other industry reviewers and resolved in the process of preparing the Requirements Documents, so that the experience which has been generated in the utility industry is, in fact, incorporated in the Requirements Document.

This effort, which began as a solely U.S. activity, has been joined by six foreign utility participants, including Electricite de France, Taiwan Power, Korea Electric Power, Kansai Electric Power, ENEL, and KEMA. These foreign participants are providing additional funding, wise counsel, and different perspectives from those of U.S. utilities. In addition to financial assistance, several of these foreign utilities have sent experienced engineers to work at EPRI in the preparation of the Requirements Documents. The non-U.S. members of the Utility Steering Committee are shown on Figure 2.

Thus the ALWR is a knowledgeable customer effort, not a vendor effort.

A second way in which the ALWR Program differs from the early development of nuclear commercial power is that we are attempting to bring to the design process a different way of looking at nuclear safety. In the early days of nuclear energy there was commercial competition in size, thermal efficiency, and initial capital cost. That competition resulted in reduced margins and rapidly increased component ratings, which in turn led to rapidly increased system complexity to protect against accidents. We all know the latest reactor plant designs are overly complex and present unnecessary challenges to operators and maintenance personnel.

Utilities know that for future reactors it is essential to reduce risk to investment and to ease the burden of operations and maintenance. Furthermore, improvement in these areas have a direct positive effect on safety. If accident probability is reduced so that core damaging incidents are much less likely, then the public is automatically protected as well. In fact, some of us believe the best way to protect the public is to first of all protect the plant, and that disproportionate emphasis on mitigating severe accidents versus avoiding accidents or their precursors may be counterproductive, even with regard to public safety.

We are not, in the ALWR Program, avoiding severe accident considerations, but we want to do our best first to prevent accidents and precursors by sound engineering for safety, and then apply rational severe accident considerations.

In other words, the utilities have a selfish interest in safety distinct from the interest of suppliers which we are trying to emphasize in the ALWR Program to the benefit, we believe, of the public's interest as well.

These two differences from the historic development of reactor plant design and regulation lead to differences in the way we are approaching the conceptualization of the next generation of ALWRs. We are concentrating on simplification throughout the plant, not only in the reactor systems but in the plant as an entirety since the secondary plant plays a vital role in ensuring safety. And, in addition, we are emphasizing significant additional engineering margins. We believe this is sound because thermal efficiency, which is a major part of the cost of any fossil-fired generating station, is far less important in a nuclear plant in which fuel costs are a much smaller part of the total economics, and operations and maintenance costs, as well as initial capital costs, are relatively far more important.

The ALWR Requirements Documents are filled with design improvements for safety made on that basis. Those shown on Figure 3 are included in the Requirements Document Chapters already submitted to the Staff.

- A. Increased thermal margins.
- B. Strengthened negative reactivity requirements.
- C. Lower maximum reactor coolant temperatures.
- D. Natural circulation through steam generators for decay heat removal.
- E. Greatly improved man-machine interfaces; that is, control rooms which are much easier to operate safely.
- F. Improved resistance to embrittlement in reactor vessels.
- G. Higher pressure decay heat removal systems.
- H. Increased coolant inventories.
- I. Separation of safety system functions from normal operating system functions.
- J. Reactor vessels made of ring forgings so that vertical welds are not necessary.
- K. Alternate on-site AC power source.
- L. Larger, more robust containments.
- M. Conscious attention to maintenance requirements, such as accessibility.

The 600 mWe Passive Plants will have even further safety improvements of a fundamental nature. These are shown on Figure 4.

- A. Natural circulation decay heat removal dependent only on gravity.
- B. Canned rotor pumps in the PWRs thus avoiding the pump seal Loss of Coolant Accident.
- C. No recirculation pumps or pipes in the BWRs.
- D. No penetrations in the bottoms of PWR reactor vessels.
- E. We are working to, and believe we can, get rid of boron in the primary coolant of PWRs because boron is not only a complexity in operation but also reduces the negative temperature coefficients of reactivity. When it leaks, it can be very corrosive to pressure boundaries.

These steps towards safety have not been achieved easily. They are the result of several years of methodical engineering work and debate leading to consensus building among utilities, engineering firms, and suppliers. The willingness of these parties to reach these agreements is based in part on our collective expectation that NRC will join with us in using the Requirements Document as a basis for meaningful resolution and stabilization of regulatory requirements. Our concern that this is not happening is an important topic for discussion today.

Let me touch here on the matter of the respective roles of the Evolutionary and Passive Plants. We have elected to work on both in the ALWR Program because we believe there is potential for both to play important roles in the nation's energy future. The Evolutionary Plant, as we see it, is a clear improvement over today's designs, one which can be available in the relatively near term if circumstances demand, and one which provides an opportunity to address safety issues on a generic basis. The Passive Plant is an exciting concept which offers the promise of further fundamental advances in safety, economy, constructibility, and reliability.

Our objective for the ALWR is to improve core damage frequency by at least a factor of 10 compared to existing plants. I personally believe when we are through we will be able to show a factor greater than that, especially if human factors are recognized. But we will also include severe accident protection in every reasonable and practicable way.

Our expectation is that by this means we will arrive at a reconceptualization of light water reactors which will provide the basis for regulatory stability, plant standardization, shorter construction times, greater reliability, readier maintenance, and resultant improved economics, to the end that the United States will once more have a rational nuclear capability available to it, and the painful experiences of the last 20 years of commercial nuclear development in the United States will not have been in vain. In fact, if we want to arrive at a more stable regulatory framework, a rationalization of important "engineering for safety" issues, and a sound basis for standardization, the ALWR effort, led by the nuclear utilities through EPRI, is the best, if not the only, vehicle available. But achieving those goals will require the active participation in the process by the NRC.

**EPRI ALWR UTILITY STEERING COMMITTEE  
U.S. MEMBERS**

**H. E. BLISS - COMMONWEALTH EDISON**

**W. J. CAHILL, JR. - TU ELECTRIC COMPANY**

**M. R. EDELMAN - TOLEDO EDISON COMPANY**

**C. W. FAY - WISCONSIN ELECTRIC POWER COMPANY**

**C. W. JACKSON - CONSOLIDATED EDISON COMPANY**

**E. E. KINTNER - GPU NUCLEAR CORPORATION**

**R. P. McDONALD - ALABAMA POWER COMPANY**

**T. C. McMEEKIN - DUKE POWER COMPANY**

**R. MITTL - PUBLIC SERVICE ELECTRIC & GAS**

**G. H. NEILS - NORTHERN STATES POWER COMPANY**

**H. G. O'BRIEN - TENNESSEE VALLEY AUTHORITY**

**J. RHODES - VIRGINIA ELECTRIC & POWER COMPANY**

**E. E. VAN BRUNT, JR. - ARIZONA PUBLIC SERVICE COMPANY**

**FIGURE 1**

**EPRI ALWR UTILITY STEERING COMMITTEE  
NON-U.S. MEMBERS**

**H. ARNOLD, NV GKN - THE NETHERLANDS**

**A. BROGGIATO, ENEL-DSR - ITALY**

**E. LIN, TAIWAN POWER COMPANY - REPUBLIC OF CHINA**

**M. MORI, KANSAI ELECTRIC POWER CO. INC.- JAPAN**

**L. REYNES, ELECTRICITE DE FRANCE - FRANCE**

**C. S. SHIM, KOREA ELECTRIC POWER CORP. - KOREA**

## **ALWR DESIGN IMPROVEMENTS**

- A. INCREASED THERMAL MARGINS.**
- B. STRENGTHENED NEGATIVE REACTIVITY REQUIREMENTS.**
- C. LOWER MAXIMUM REACTOR COOLANT TEMPERATURES.**
- D. NATURAL CIRCULATION THROUGH STEAM GENERATORS FOR DECAY HEAT REMOVAL.**
- E. GREATLY IMPROVED MAN-MACHINE INTERFACES; THAT IS, CONTROL ROOMS WHICH ARE MUCH EASIER TO OPERATE SAFELY.**
- F. IMPROVED RESISTANCE TO EMBRITTLEMENT IN REACTOR VESSELS.**
- G. HIGHER PRESSURE DECAY HEAT REMOVAL SYSTEMS.**
- H. INCREASED COOLANT INVENTORIES.**
- I. SEPARATION OF SAFETY SYSTEM FUNCTIONS FROM NORMAL OPERATING SYSTEM FUNCTIONS.**
- J. REACTOR VESSELS MADE OF RING FORGINGS SO THAT VERTICAL WELDS ARE NOT NECESSARY.**
- K. ALTERNATE ON-SITE AC POWER SOURCE.**
- L. LARGER, MORE ROBUST CONTAINMENTS.**
- M. CONSCIOUS ATTENTION TO MAINTENANCE REQUIREMENTS, SUCH AS ACCESSIBILITY.**

**FIGURE 3**

## **ALWR SAFETY IMPROVEMENTS**

- A. NATURAL CIRCULATION DECAY HEAT REMOVAL DEPENDENT ONLY ON GRAVITY.**
- B. CANNED ROTOR PUMPS IN THE PWRs THUS AVOIDING THE PUMP SEAL LOSS OF COOLANT ACCIDENT.**
- C. NO RECIRCULATION PUMPS OR PIPES IN THE BWRs.**
- D. NO PENETRATIONS IN THE BOTTOMS OF PWR REACTOR VESSELS.**
- E. WE ARE WORKING TO, AND BELIEVE WE CAN, GET RID OF BORON IN THE PRIMARY COOLANT OF PWRs BECAUSE BORON IS NOT ONLY A COMPLEXITY IN OPERATION BUT ALSO REDUCES THE NEGATIVE TEMPERATURE COEFFICIENTS OF REACTIVITY. WHEN IT LEAKS, IT CAN BE VERY CORROSIVE TO PRESSURE BOUNDARIES.**

**FIGURE 4**