

# UNITED STATES OF AMERICA NUCLEAR REGULATORY COMMISSION

**Title:** COMMISSION BRIEFING ON CASK DESIGNS FOR SHIPPING AND STORING  
OF NUCLEAR MATERIALS

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UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

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COMMISSION BRIEFING ON CASK DESIGNS FOR SHIPPING  
AND STORING OF NUCLEAR MATERIALS

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[PUBLIC MEETING]

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Nuclear Regulatory Commission  
One White Flint North  
Rockville, Maryland  
WEDNESDAY, OCTOBER 19, 1988

The Commission met, pursuant to notice, at 2:00  
p.m., the Honorable LANDO W. ZECH, Chairman of the Commission,  
presiding.

COMMISSIONERS PRESENT:

LANDO W. ZECH, Chairman of the Commission  
THOMAS M. ROBERTS, Member of the Commission  
KENNETH ROGERS, Member of the Commission

STAFF AND PRESENTERS SEATED AT THE COMMISSION TABLE:

S. Chilk                      W. Parler  
V. Stello                     B. Bernero  
C. MacDonald                 L. Rouse

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

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CHAIRMAN ZECH: Good afternoon, ladies and gentlemen.

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Commissioner Carr will not be present with us this afternoon, he is on official travel. The purpose of the briefing this afternoon is to discuss issues related to cask designs for shipping and storing nuclear materials. This is an information briefing which was requested by the Commissioners during the August 10, 1988 Commission meeting on the status of nuclear materials transportation.

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As many of you know, under the Nuclear Waste Policy Act, the Nuclear Regulatory Commission is responsible for reviewing and certifying DOE cask designs for shipping and storing nuclear materials. Today's briefing will cover an overview of the NRC's program for the review of casks, specifically the status of applications received and those expected.

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At the August meeting, Commissioner Carr suggested that we seize the opportunity to standardize storage cask designs and certification. The staff was requested to discuss these issues related to standardization.

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The Commission also asked to hear about any potential problems which can be foreseen in this area, specifically regarding resources to review the different cask designs. The Office of Nuclear Materials Safety and Safeguards will brief the Commission today on this subject.

1           Do any of my fellow Commissioners have any opening  
2 comments to make before we begin?

3           [No response.]

4           If not, Mr. Stello, you may proceed.

5           MR. STELLO: Mr. Chairman, we'll turn very quickly to  
6 Mr. Bernero to get on with the briefing. Your summary of why  
7 we are here is very accurate, including the comment of trying  
8 to seize on the opportunity to deal with standardization to the  
9 extent we can. We have taken that charge very seriously and  
10 are going to include in our briefing the problems that one has  
11 in trying to decide today, because of various constraints on  
12 the system, a standardized approach to using cask designs. And  
13 unfortunately, it does not appear that that is a very  
14 meaningful way to go. We will end our briefing with what  
15 proposed future actions we would suggest we take with respect  
16 to this issue.

17           We will identify through the briefing some natural  
18 forces that are in place within the utility industry which I  
19 think will produce the end results the Commission is looking  
20 for; that is, coming down on several designs. But there really  
21 is a need for a number of them, for different reasons, and Mr.  
22 Bernero will be explaining that during the briefing.

23           With that, Bob, let me ask you to begin.

24           MR. BERNERO: Thank you, Vic. Good afternoon,  
25 gentlemen. Here for the briefing today -- I will give the

1 presentation, but on my right is Leland Rouse, Chief of our  
2 Licensing Branch for the dry storage or field storage at the  
3 casks; and on Vic Stello's left is Charles MacDonald who is  
4 Chief of the Transportation Branch which handles the  
5 certification of packages for the shipping of the spent fuel.  
6 So that we have the expertise here at the table to respond to  
7 any questions you might have of a specific nature.

8 May I have the System slide, please.

9 [Slide.]

10 What we're talking about here is a System, and we're  
11 going to be talking a little bit about system engineering in  
12 the broad sense, in the sense without the "s" on the end where  
13 we're not talking about electrical systems or fluid systems.  
14 We basically have here a system for the handling, the storage,  
15 the shipping and ultimately the disposal of spent reactor fuel.

16 Now, as you will see a little later on, most of the  
17 fuel will follow this path: from the reactor into the spent  
18 fuel pool for some rather lengthy period of storage, and  
19 ultimately to the repository or the MRS. I do not separate the  
20 repository or MRS. As you recall, the 1987 Amendment to the  
21 Nuclear Waste Policy Act made the MRS so constrained to the  
22 schedule of the repository that it might be one and the same.  
23 The MRS might merely be the head end of the repository. So at  
24 this time I will repeatedly refer to the repository or MRS as  
25 if it were a single entity.

1           Later I will show you that most of the spent fuel  
2 goes to that path. Some of it separates out and goes into  
3 temporary storage for those reactors of earlier vintage which  
4 don't have as much temporary storage in their pools, as much  
5 space even with the re-racking and other means of compaction,  
6 and the result is that they need additional storage capacity --  
7 and later on I'll show roughly how much that is.

8           This system has no system manager. The Department of  
9 Energy has the jurisdiction by law now for the repository and  
10 MRS and the transportation of the spent fuel to the repository  
11 or MRS. Each utility, where it might be the owner of a single  
12 plant or someone like Duke Power that has three nuclear  
13 stations, seven reactors, each utility is the manager of its  
14 own system. And this is a crucial point to understand because  
15 their focus is different as to the system, the base of  
16 optimization that they look at and the time scale. The  
17 utilities are looking at their internal system, as they must;  
18 they are looking at the short-range time scale to a very great  
19 degree because Duke Power at Oconee in their application points  
20 out to us that in just over a year if they don't have  
21 additional storage at that site, they will not have full core  
22 off-load capability; they will begin to encroach on their  
23 operational margin.

24           In a similar way, DOE, with its responsibilities, is  
25 looking at a different system. They have the repository, they

1 have decades of responsibility, and they have the  
2 responsibility to take possession of the thousands of spent  
3 fuel assemblies that are being generated by these reactors for  
4 disposal.

5 So the result is if you look, we don't have a single  
6 system manager but oddly enough, NRC has a regulatory  
7 jurisdiction over this whole system.

8 For today's briefing what I'm going to do is talk  
9 about the fuel so that you can have a more specific  
10 understanding of the variations in fuel, and I will throw in a  
11 few words here and there about variations in plant parameters  
12 that affect handling the fuel. I will then talk about the  
13 transport of fuel. This is where we are simply trying to move  
14 the fuel from one site to another in a Type B cask, a transport  
15 certified cask. I will then talk about the separate dry  
16 storage of fuel and the applications associated with it. Then  
17 I hope to give you some ideas on final disposal considerations  
18 that affect our thinking when we look at the temporary storage  
19 or the transportation of the fuel, and the possibilities of  
20 perhaps getting it into a final form earlier in the game.

21 May I have the next slide, please.

22 [Slide.]

23 In the projections of spent fuel it is now customary  
24 and appropriate that everyone uses the DOE numbers. The  
25 central responsibility for analyzing the spent fuel generation

1 and accumulation condition rests with DOE, and we base all of  
2 our estimates on their figures and here on this slide, I am  
3 giving you the estimated storage requirements in the year 2003.  
4 That's the nominal schedule for the first repository to go into  
5 operation; this would be the Yucca Mountain year of opening.

6 Geared to that schedule -- if you look, the total  
7 fuel in storage is 54,000 metric tons of heavy metal. But of  
8 that 54,000, fully 80 percent of it, 43,000, is expected to be  
9 stored in the pools. Only 20 percent, 11,000 metric tons, is  
10 expected to be in temporary storage or dry storage as we are  
11 calling it now. These casks or bunkers or modules that are  
12 going to be in the yard.

13 It's a very important point. Not only is it only  
14 about 20 percent, the rate of generation of spent fuel in that  
15 year, 2,300 metric tons per year, means that if the repository  
16 schedule slips somewhat the picture won't change overnight.  
17 There won't be an abrupt shift to a 20/80. It would take years  
18 before the amount in temporary storage would approach or later  
19 exceed the amount in cool storage. So keep this in mind, that  
20 in the system we are dealing predominantly in spent fuel with  
21 fuel in the pool, and only a fifth or so in the temporary  
22 storage.

23 May I have the next slide, please.

24 [Slide.]

25 Let's look at some typical spent fuel, or new fuel

1 for that matter. This is what it looks like when it goes in  
2 the reactor. The first assembly, you have a photocopy of it in  
3 your handout, this is a Westinghouse 17 by 17 fuel assembly,  
4 and this unit here, if you look at it, it's 17 fuel rods or  
5 fuel pins wide and the same square, giving you over 200 fuel  
6 pins. Now, this device up at the top here is actually a  
7 cluster of control rods, and that cluster of control rods is  
8 moved as a gang, as a group, and they occupy fuel pin spaces.  
9 And this is PWR fuel, Westinghouse reactor fuel.

10 If you look at the similar or competitive fuel by  
11 other PWR vendors, by Combustion Engineering or by Babcock and  
12 Wilcox or other vendors, the hardware differs somewhat but the  
13 characteristics are basically the same. You have the control  
14 rods entering it as a group from the top, and this is what  
15 comes out of the reactor at the end of, let's say, three  
16 cycles. Typically in a PWR there are three fuel cycles before  
17 the fuel is taken out as removed.

18 If I could have the next slide, please.

19 [Slide.]

20 This is a representative boiling water reactor fuel  
21 assembly. This one here is a BWR 6, that's the latest model  
22 BWR, and it's an 8 by 8. Boiling water reactor fuel assemblies  
23 are generally smaller in size, smaller in number of pins than  
24 pressurized water reactor fuel. This is 8 pins by 8 pins,  
25 notably different from PWR fuel because over here the control

1 blade -- it's a cruciform -- it enters the core from the  
2 bottom. Boiling water reactors are built upside down, and the  
3 control blade comes in from the bottom --

4 CHAIRMAN ZECH: I'm not sure everyone would agree  
5 with that.

6 [Laughter.]

7 MR. BERNERO: The control blade comes from the bottom  
8 and therefore there are no control rods in the fuel assembly  
9 itself, and the top of the fuel assembly has a lateral tie or a  
10 bale, -- some people call it a bale, it looks like a handle,  
11 just a simple handle on the top for picking it up.

12 [Slide.]

13 To give you an idea of the variation, I made up this  
14 table where I'm using the characteristics of the fuel you have  
15 just seen in the photographs as a typical dimension. Those are  
16 the fuel elements that are typical of a large, late model PWR  
17 or BWR. And in parentheses after each dimension, whether it be  
18 the inches of width or the feet of length or the weight in  
19 pounds, I have put the range of that dimension that you will  
20 find as you go from one reactor station to the other.

21 Now that range may look awfully broad; it's not as  
22 bad as it looks. It's skewed somewhat by a few strange  
23 examples or exceptional cases. Big Rock Point is a very small  
24 boiling water reactor, a very early model, and it constitutes  
25 this short fuel here, 6.8 feet long. Similarly, if you go to

1 this very high end, the 16.6 foot length in a PWR, that's South  
2 Texas. South Texas has exceptionally long fuel for U.S. PWRs.

3 So for the most part, what you have here is the spent  
4 fuel is not quite standard. We wish it were a little more  
5 standard, but basically they are clustered near this typical  
6 range for the most part. But whoever handles the spent fuel,  
7 whoever manages either a narrow, local system or a broad system  
8 for handling spent fuel has to take into account those  
9 variations in dimension.

10 There's one other dimension I'd like to single out  
11 and that is this MTHM, metric tons of heavy metal. You will  
12 generally see spent fuel projections always rendered to that  
13 common denominator, and it's useful to you to see I think that  
14 you have less than a half of a metric ton of heavy metal in a  
15 PWR assembly and only about a sixth of a ton in a BWR fuel  
16 assembly.

17 For perspective, just recall that a large PWR, Oconee  
18 size or a little bit bigger than Oconee, something on the order  
19 of 1000 megawatts, a pressurized water reactor in its 40-year  
20 life will irradiate or generate about 2000 spent fuel  
21 assemblies. Just to give you a sense of scale. And we're  
22 talking about 100 or more reactors so we're talking about an  
23 awful lot of fuel assemblies when you recognize that a boiling  
24 water reactor generates a higher number of fuel assemblies per  
25 megawatt or per thousand megawatts.

1 [Slide.]

2 Now we have some existing spent fuel shipping casks  
3 in this country. We've made a little table here of these casks  
4 and we caught a typographical error at the last minute, you see  
5 it marked on the slide up here. That TN-8L cask weighs 80,000  
6 pounds, not 50,000. These casks are ones that are now  
7 certified, and you see there are a modest number of them in  
8 existence, but to my knowledge no more are being built.

9 COMMISSIONER ROBERTS: Who owns these?

10 MR. BERNERO: Different companies. For instance, a  
11 utility owns one of these IF-300's. Carolina Power & Light,  
12 they use it for trans-shipment. Different shipping companies  
13 and in at least one case a utility owned them. These casks are  
14 what you might call first generation casks. Notice that  
15 they're very heavy for the number of fuel assemblies they  
16 carry. Later on when we see the next table of the DOE  
17 expectations you'll see a much better weight to payload ratio.

18 The reason these casks are so heavy is they were  
19 optimized for a reprocessing cycle. This was in the days when  
20 people expected to hustle right out to a reprocessing plant and  
21 therefore they were going to carry in these casks fuel that was  
22 only four to six months out of pile. They were thermally  
23 constrained, activity constrained; and therefore, this  
24 optimization is no longer useful to us, because now we're  
25 dealing with fuel that is much, much older.

1           This is an obsolete set that is around for some use,  
2           and here's a picture of one, if we can turn to the next  
3           picture.

4           [Slide.]

5           This is an IF-300, the one I mentioned that one  
6           utility owns. It's a large cask, it holds seven pressurized  
7           water reactor assemblies or eight boiling water reactor  
8           assemblies, and here you see it on a crane hook about to be set  
9           down onto its railcar. Before shipment, that cask will be  
10          covered with an overpack and it looks basically like sort of a  
11          boxcar when it goes down the road because it has like a dirt  
12          shield and things like that, cooling box over it. And its  
13          shipping weight is 70 tons.

14          Now, I mentioned at the outset that we ought to note  
15          some differences from plant to plant. Not all plants have  
16          railroad sidings, not all plants could bring that cask in and  
17          load it at their pool. Some plants don't have a railroad  
18          siding, they have only truck cask access, or some way to move a  
19          rail cask down a road a little piece and get it on a barge.  
20          But they don't have an up-to-date railroad siding.

21          COMMISSIONER ROBERTS: But would it be fair to say  
22          that all plants either have rail or barge?

23          MR. BERNERO: No, I don't think so. I think you have  
24          some cases where they have --

25          COMMISSIONER ROBERTS: Truck is the only?

1           MR. BERNERO: Truck, rail or barge. Truck may be the  
2 only -- there's one in particular I'm thinking of like  
3 Palisades.

4           The thing is also that they don't all have 100-ton  
5 cranes. To life up one of these 70-ton casks or 80-ton casks -  
6 - and you know, they're really getting up in round numbers very  
7 close to 100 tons -- it involves a very heavy crane and not all  
8 plants have that. So there is part of the system problem.

9           [Slide.]

10          So DOE, as I said, has this long-range  
11 responsibility. They're trying to develop a transport fleet.  
12 Their focus is on the majority of the fuel. They're working 80  
13 percent of the problem first, 20 percent of the problem later.  
14 They have a competitive process going on with companies like GA  
15 Technologies, Westinghouse, Nuclear Assurance and so on, and  
16 they are developing a spectrum of casks, truck and rail/barge  
17 casks, but notice -- much higher payload to weight ratio. The  
18 weight constraints you can infer from the previous slide which  
19 gave you the scale of 50 to 100 thousand pounds. And here,  
20 what you're talking about is because it's five and ten-year old  
21 spent fuel that you're dealing with, you can get more spent  
22 fuel assemblies in because you don't have quite the shielding  
23 requirements and you certainly don't have the thermal load  
24 requirement.

25          So the optimizing for DOE is of a transport fleet

1 that can take by standardized shipping wherever possible,  
2 standard rail shipments, standard barge shipments, nothing  
3 exotic, winter or summer, optimized to be a highly efficient  
4 transport fleet so that each one of these casks can be used  
5 over and over again. It's a transport device, it's a  
6 completely different thing than when we talk about the dry  
7 storage casks that may be shipped.

8 [Slide.]

9 Now if a reactor needs additional storage capacity,  
10 there are basically only three alternatives that they can face  
11 at this time. One is trans-shipment. Now, trans-shipment has  
12 been used. At one time or another the NRC has authorized Duke  
13 Power Company to ship from the Oconee station to the McGuire  
14 station. We authorized Carolina Power & Light to ship from the  
15 H.B. Robinson station over to the Brunswick station. So if you  
16 went out to Brunswick today you would find in the boiling water  
17 reactor pool, you would find pressurized water reactor fuel  
18 from the Robinson station.

19 Now that really is a temporary solution, of course.  
20 You can just get yourself a little flexibility, but it isn't a  
21 long-range solution. A few reactors were able to ship their  
22 fuel to the G.E. Morris facility. You know, the General  
23 Electric plant in Morris, Illinois, right across the road from  
24 the Dresden station is a large spent fuel pool now virtually  
25 full.

1           So that given that trans-shipment has taken care of  
2 essentially all it can, then the reactor owner looks at  
3 consolidation. Now consolidation means to reconfigure to a  
4 more compact design. Reconstitution of fuel is going on right  
5 now at Browns Ferry. You may have been briefed on that. There  
6 have been some problems with it and they're basically re-  
7 assembling fuel assemblies at the pool. But they're not  
8 squeezing them into smaller holes; they're still trying to get  
9 the fuel to go right back in the reactor and operate.

10           Consolidation is to take it apart so that you have  
11 the fuel rods or pins in one bundle and the hardware pieces in  
12 another, in a can of some sort. A few reactors have  
13 experimented with this, PWRs, and one is authorized to do this  
14 with their spent fuel but it's a rather slow operation, it's  
15 rather tedious, and in the long range I doubt very much that  
16 you'll see this as a standard solution because of the inherent  
17 difficulty, and I'll talk about that a little later.

18           And the last solution is dry storage, and here we see  
19 the basic solution for that 20 percent of the spent fuel  
20 between now and the beginning of the next millennium.

21           [Slide.]

22           So let's go into the dry storage. We are reviewing  
23 dry storage by means of topical reports so that licensees can  
24 apply referring to these topical reports, and we would have  
25 then a basis for our safety evaluation and findings. It's a

1 much more efficient way to do our licensing work and a more  
2 efficient way for them to do their applications. Now I'm going  
3 to talk about three samples and give you a perspective on the  
4 Castor V, which is a potentially dual-purpose cask, not only  
5 storage but later shipment; a NUTECH NUHOMS-7 which is a small,  
6 concrete bunker with a small canister in it, relatively small  
7 canister; and the Foster-Wheeler modular vault. Now all of  
8 these are approved safety evaluation reports with an SER.

9 [Slide.]

10 The first one we'll look at is at the Surry Nuclear  
11 Station, it's called the Castor V and it is a large cask. Here  
12 you see one on a transporter. It's basically a cast iron cask,  
13 sealed up so that the spent fuel is dry, blanketed with inert  
14 gas and held for storage over a 20-year period and you could  
15 renew that another 20 years. We've got confidence that this is  
16 very stable storage.

17 You see that it is packaged at the reactor, moved  
18 with this transporter and merely standing on a concrete pad.  
19 This is a security-covered area, there are security fences  
20 around it, and the reactor guard force is easily able to cover  
21 this. It's about a half a mile away from the plant. And with  
22 these robust casks, the spent fuel is amply protected from any  
23 mishap whether it be natural or a small plane crashing or  
24 something like that. The stuff is really solidly held in this  
25 cask. This is a cask that holds 21 PWR fuel assemblies, and

1 it's filled, sealed, stored all at the site, at the Surry site.

2 [Slide.]

3 This next one is a variation where the cask is not a  
4 single piece, it's not a single device; it is basically a  
5 concrete bunker or module and you build that somewhere in a  
6 flat spot in your yard and you put into it a canister holding  
7 spent fuel. Now this one here actually exists at the H.B.  
8 Robinson site, a PWR, and each one of those holes accepts a  
9 metal canister in which would be sealed seven PWR fuel  
10 assemblies. And the design that goes in it is called the  
11 NUHOMS-7 for the 7 PWR assemblies.

12 Now, that canister is just about the size of the  
13 filler that goes into a rail cask, and in fact, this company  
14 owns a rail cask, the GE IF-300 that you saw hanging on the  
15 crane, and they use it as a handling device here.

16 [Slide.]

17 In your slides you have a depiction, a cartoon series  
18 that shows you how these devices are filled and transferred,  
19 and I'll just very quickly walk through that. Basically, a  
20 shielding cask starts out at the pool and you put the spent  
21 fuel in it; in this case, seven fuel assemblies. The next  
22 thing that's done is to take that shielding cask, which is  
23 strictly temporary, and evacuate the water and all residual  
24 moisture and fill and seal that cask so now the spent fuel is  
25 dry and under inert gas cover; it's a sealed case.

1           Now that you've sealed it, you put it on some sort of  
2 local transporter -- in this case you can use a truck or if you  
3 have a railroad siding and access to the module you could use  
4 that. But for a local movement you can handle this with a big  
5 earth-moving truck. And then you take it out to the module.

6           You take it out to the module, on the bottom side of  
7 that cartoon you can see it, where you park next to the  
8 concrete module and there is a hydraulic ram actually that  
9 reaches through the module and pulls the canister into the  
10 concrete bunker. And you can re-use the transfer vehicle then;  
11 you just close the bunker up and you've got the canister in  
12 there.

13           At the end of the storage period when you take it  
14 out, you use the same ram assembly and push it out into a  
15 shipping vehicle or a transfer vehicle and you're prepared to  
16 go off either back to the reactor for rehandling into a  
17 conventional shipping cask or to have this be a shipping cask,  
18 and later on we'll talk about that for this particular model.

19           For your perspective I have also included an  
20 isometric drawing of the modular vault. This is the Foster-  
21 Wheeler design. There's no need to put that up on the screen.  
22 It's basically a spent fuel pool without the water in it. It's  
23 dry storage and one would transfer spent fuel from the wet pool  
24 at the reactor over to the dry pool, store it for the needed  
25 length of time and then at the end of that period transfer it

1 out into a cask and ship it to the repository or MRS.

2 May I have the next slide, please, on topical  
3 reports.

4 [Slide.]

5 Now we will still have some under review and I want  
6 to single out one of them because it's very important to a  
7 couple of applications we have. This is another NUHOMS design,  
8 only look at the number on this one, it's 24. This is what is  
9 called the NUHOMS-24P.

10 [Slide.]

11 And that 24-P you see is a canister that holds 24  
12 pressurized water reactor fuel assemblies, and it's large. In  
13 fact, it's close to being a little too large to ship.  
14 Certainly one can debate that. There's no existing cask that  
15 accepts this envelope as there is for the NUHOMS-7. The  
16 NUHOMS-7, as I said, physically fits into an IF-300 cask.

17 This one here has a shielded plug on the end, and  
18 that might make it a little too long when you look at the total  
19 weight of shielding and the total shipment weight, so later on  
20 we'll talk about this one. But for the time being let's  
21 consider this one as not shippable. That's not a guarantee but  
22 right now there's no known solution.

23 [Slide.]

24 And if you look at this slide, you will see the  
25 module into which it goes is a variation on the same theme. It

1 is an air-cooled, concrete bunker, typically built in an  
2 assembly of four. So four canisters per bunker or per module,  
3 but everything works from one end. There's a blind end and an  
4 active end, and the whole hydraulic ram business works from one  
5 end only. And this is the Duke Power Company Oconee  
6 application; this is basically what they have applied for.

7 [Slide.]

8 We have talked about these license applications and I  
9 think it important -- in fact, the status even changed today  
10 for us. We have an application from Oconee and we received  
11 that in April of '88. We're on the verge of completing our  
12 environmental assessment. Oconee has formally asked us in  
13 writing if they can proceed with earth-moving starting next  
14 Monday without prejudice to their application. This is not  
15 construction. Oconee is not a prairie site, and they have to  
16 do some landscaping in order to prepare the flat areas for  
17 this. So Oconee has an application before us and I would  
18 expect our final licensing action will probably be just after  
19 the first of the year, although the environmental assessment  
20 should be done even this week.

21 Calvert Cliffs has told us they're coming in very  
22 shortly and we just received a press release today which  
23 indicates that they have selected a virtually identical design;  
24 the NUHOMS-24 modified only to fit their fuel, which is a  
25 Combustion Engineering reactor rather than a Babcock & Wilcox

1 reactor. So there would be five reactors would be dealing with  
2 basically one design.

3 We also have, for these two indicated here, Robinson  
4 2 and Brunswick, Carolina Power & Light, the same company owns  
5 them, and they are proposing to resume licensing or use of the  
6 NUHOMS-7, that smaller one you saw earlier. That's the one  
7 they've used already. And at first, they will go to their  
8 Brunswick site and pick up the PWR fuel that's there and make  
9 more room in the BWR pool, and then later on they intend, we  
10 believe, to use the same design for the BWR assemblies,  
11 although you'll get more of them per canister because they're  
12 smaller fuel assemblies.

13 So all of these cases are very active, and we expect  
14 to be dealing with these licensing cases in the coming year as  
15 we proceed.

16 [Slide.]

17 Let me go away from the dry storage for a minute and  
18 talk about permanent disposal considerations. Remember  
19 ultimately, this stuff is going to go to a repository or MRS,  
20 and this is the end of the system path. Now there are some  
21 basic considerations here that are very important to any  
22 attempt to standardize or regularize what you do in the storage  
23 and transport end.

24 First of all, the final waste form has not been  
25 selected. It's not clear whether it will be fuel assemblies in

1 some sort of matrix that are buried, or it will be consolidated  
2 fuel rods which are buried. Most people think it will be  
3 consolidated fuel rods but it hasn't been selected yet, and  
4 there is concern about effective use of the repository space.

5 In some of the briefings on Yucca Mountain you may  
6 have heard that there are potential geometric limitations to  
7 the use of space because of different geological barriers and  
8 things like that.

9 In the use of that repository space it's a major  
10 consideration to look at the thermal loading. Basically,  
11 you're going into a long time scale process, you're going to  
12 let this fuel sit there in the ground with potentially alien  
13 chemicals around it, and there is a great need to control  
14 corrosion or reaction rates with other materials by careful  
15 design of the waste package to be as compatible as possible  
16 with the geologic materials.

17 Now there's a phrase that comes right out of our  
18 regulations, 10 CFR 60.113. It is that there shall be  
19 "substantially complete containment." One of the key elements  
20 of disposal safety -- and you go into our regulations and  
21 you'll find it, that whatever you put in that can should be  
22 trusted; we should have the confidence that it's going to be in  
23 that can, substantially contained, for 300 to 1000 years. So  
24 the confidence of safe disposal is what is at stake here.

25 Now, they will probably consolidate this fuel into

1 some bundles. The next slide, please.

2 [Slide.]

3 I just want to give you a little comparison of at-  
4 reactor consolidation versus at-repository or MRS  
5 consolidation. They are quite different. These operations are  
6 not alike.

7 If you go to a reactor, they've got a pool, they  
8 don't have a hot cell. You have an open pool underwater, and  
9 the people are working with some sort of grapples or  
10 manipulators in that environment, and what they've done so far  
11 is they've taken -- remember they're dealing with a rack that  
12 has square holes in it -- they've taken two holes and put cans  
13 in them. So they have empty cans in two of the rack holes, and  
14 then they go to two fuel assemblies somewhere adjacent to it  
15 and start breaking the latches, breaking the hardware apart so  
16 that they can pull out the fuel rods one or two at a time, and  
17 then you can fit all the fuel rods into one can and all the  
18 bits and pieces will about 10 percent fill the other can. This  
19 is at-reactor consolidation. It gets you roughly a factor of  
20 two in space utilization. It's unsealed for cooling in the wet  
21 pool, it's a canister necessarily shaped to fit the fuel rack.

22 At the repository or MRS, DOE is talking about a  
23 wholly different operation. They're talking a hot cell  
24 operation, and they're talking about something where you might  
25 take -- in fact some of their studies have drawn pictures of

1 this -- as many as 12 fuel assemblies into 1.1 cans, only the  
2 cans don't look alike. They're big, probably cylindrical, very  
3 large containers for spent fuel. They would be sealed for  
4 being the ultimate disposal package, and of course their  
5 design, their materials would be optimized for final disposal  
6 for that substantially complete containment.

7 So consolidation at a reactor pool is a temporary  
8 measure; it doesn't stand as a solution for the repository.

9 I'll skip the next slide, it's merely a list of the  
10 six alloys that are being considered right now for us in the  
11 final can by DOE. May I have the next slide on the staff  
12 analysis, please.

13 [Slide.]

14 In doing the environmental assessment for the Oconee  
15 application, we were trying to explore the environmental impact  
16 of requiring shipping certification of some sort. So what we  
17 did is we took the facts from the Oconee application and  
18 available information from other sources and we said, Let's  
19 take this application and look at two alternatives; a shippable  
20 dry storage container and an unshippable dry storage container.  
21 So we used the three Oconee plants, and it so happens their  
22 temporary storage requirement is just over 2000 fuel assemblies  
23 in their application, and we assumed ten-year old fuel before  
24 you pull it out, which is reasonable, and storage for 20 years,  
25 which is also reasonable.

1           We selected the IF-300 shipping cask because it  
2 exists, it's a known quantity, and it is of a fair size, and we  
3 did our risk analysis -- and this is risk of handling heavy  
4 loads in the reactor pool. There was a generic issue, A-36,  
5 that looked at this heavy load handling and we relied entirely  
6 on the analytical method and techniques of that so that we  
7 could have a common basis to understand how much extra risk is  
8 there suffered if you have an unshippable container and have to  
9 go back in the pool to reconfigure.

10           We took the Carolina Power & Light design, NUHOMS-7,  
11 and since it fit in the IF-300 cask we asserted that this thing  
12 is shippable. Now, Charles MacDonald here hasn't certified it  
13 and he'd be the first to tell you that, but for purposes of  
14 analysis we assumed it. We also assumed that the 24-P, that's  
15 the one that Oconee asked for, that Duke Power asked for, we  
16 said we assume it's unshippable, even though that's not yet  
17 established either.

18           So then we said, what is the impact difference  
19 between the two. And if you go to the next slide --

20           [Slide.]  
21 -- you see the results again asserting that one is shippable  
22 and the other is not shippable, and what you find is that the  
23 unshippable one actually results in less personnel exposure,  
24 and if you go through the detailed analysis, and believe me  
25 this is down to the step-by-step analysis of what fraction of a

1 person rem do you get for putting the fuel in it, for seal  
2 welding it and so on, there is an economy of scale that you  
3 actually save dose -- although these are small numbers for over  
4 2000 fuel assemblies -- from 532 person rem down to 204. And  
5 the risk figure -- and this is a rather artificial figure, it's  
6 very low -- if you look at this little symbol here, it should  
7 be P greater than 6.25 rem. That NUREG-0612 which did the  
8 heavy load analysis calculated the probability of exceeding a  
9 fraction of the Part 100 dose at the site boundary. Just a  
10 technique of analysis. And to have a 2 in a million or a 3 in  
11 a million chance of doing that is a very, very small risk. And  
12 so a 50 percent increase is not really particularly significant  
13 because the level of risk is so small, and this 50 percent  
14 increase comes from the additional handling.

15 The key variable is the cost. The NUHOMS-24P just  
16 about cuts the cost in two, and here again it's economy of  
17 scale. These dry-sealed canisters are stainless steel and  
18 they're rather ornate; you save a lot of money by going to a  
19 24P. So in the Oconee case, the result indicates to us that it  
20 is not worth our pursuing the case with Duke Power saying hey,  
21 you'd better ship this thing, or, revert to the NUHOMS-7 or  
22 something like that.

23 The real message is that the process is already  
24 fairly ALARA, fairly close to as low as reasonably achievable.  
25 There is not a large health and safety risk at stake here;

1 there is a big cost risk, a big cost factor. So with that in  
2 mind, we looked on and we tried to draw some conclusions.

3 [Slide.]

4 If we look at what we see about the whole spectrum of  
5 activities in this system, the first conclusion we would draw  
6 is, as I said at the beginning, most of the spent fuel is going  
7 to go from the reactor pools to the repository, so it won't  
8 even get into the dry storage question. The majority of it is  
9 strictly going to be transported in a straight cask.

10 The fuel variety and site variety is going to dictate  
11 cask variety. Now, DOE is keenly aware of that and so are the  
12 utilities and they're working that end of the problem. That's  
13 why you see more than one truck cask and more than one  
14 rail/barge cask, and the fact that there is a truck and a rail  
15 barge.

16 In dry storage options, there are only modest safety  
17 ALARA benefits available. Not a whole lot from our  
18 jurisdiction, you know, health and safety, not a whole lot to  
19 be gained.

20 In the final disposal, there's a lot at stake from  
21 our health and safety point of view. Confidence in best  
22 disposal. The 300 to 1000 year substantially complete  
23 containment. It's probably going to be repository-specific.  
24 Now, we don't know that we're going to license Yucca Mountain,  
25 but the decision on what kind of a can and what alloy of the

1 can and so forth for that repository shouldn't be rushed.  
2 There is a health and safety stake there.

3 So we conclude that NRC ought to review a variety of  
4 cask designs, that just in the interest of the taxpayers and  
5 ratepayers, we ought to seek some modicum of standardization to  
6 have compatibility to a reasonable degree between storage and  
7 shipment wherever possible. But there isn't the stake there  
8 for us to force it.

9 [Slide.]

10 So if we look at the range of future actions, we've  
11 got three rulemakings that are involved here -- these are  
12 existing regulations -- only one of which is active with  
13 respect to these issues. Part 71 is the transport  
14 certification. This is for the transport casks and all the  
15 requirements thereto.

16 Part 72 is the separate storage licensing, the dry  
17 storage options, and that covers the MRS as well you know. We  
18 have a revision in process, in staff development, for a general  
19 license. By that I mean that the Congress told us that we  
20 should go out to get a better regulatory process for this  
21 additional storage, that we shouldn't end up with these  
22 cumbersome petitions for amendment to an operator, a Part 50  
23 license, and that very cumbersome procedure. And what we are  
24 preparing and have essentially complete now is a technique  
25 whereby the staff would have reviewed a topical report in the

1 light of a Part 50 licensee using that device, that dry storage  
2 cask, and provided that you're a present Part 50 licensee with  
3 the necessary health physics staff, security staff, et cetera,  
4 et cetera and provided that you meet the constraints specified  
5 in the general license, you've got a license. You register and  
6 use that certified design, if you will. We have an amendment  
7 that we haven't yet brought forward to you that goes in that  
8 direction.

9 Now Part 60, we have a whole bunch of rulemaking in  
10 process on that and you know we just sent up a paper on that  
11 subject, the rulemaking strategy for sharpening and clarifying  
12 that, but none of those rulemakings speak to this compatibility  
13 or standardization issue.

14 And then of course we have these licensing cases that  
15 we've spoken of. Now what I would suggest that will stand as  
16 our range of future actions is we will bring forward to you  
17 this Part 72 license where acceptable designs for temporary or  
18 dry storage can be regulated in an effective way, and we will  
19 proceed with these licensing cases with the appropriate  
20 dispatch. But put simply, we won't force standardization.

21 That completes my presentation.

22 CHAIRMAN ZECH: All right, thank you very much.

23 Questions from my fellow Commissioners. Commissioner Roberts?  
24 Commissioner Rogers?

25 [No response.]

1           CHAIRMAN ZECH: Well let me ask you a little bit more  
2 about standardization. First of all, why couldn't we have in  
3 those -- on the last slide I think it was you showed us the  
4 range of future actions. Why couldn't we have those  
5 rulemakings discuss standardization?

6           MR. BERNERO: Yes, we can. The Part 72 as presently  
7 drafted actually makes -- we use the term compatibility, as I  
8 recall, in the draft -- that the applicant for the design must  
9 make a showing that the issue of compatibility has been  
10 addressed to the extent achievable. Sort of as compatible as  
11 reasonably achievable.

12           Remember, DOE casks are not fixed designs yet and  
13 they won't be for about two or three years at a minimum, and  
14 the situation is still very fluid. We now have Oconee 1, 2 and  
15 3 and Calvert Cliffs 1 and 2 coalescing into what I would call  
16 a single design. The natural economic forces are sort of  
17 bringing standardization, and so I would expect to see some  
18 sort of substantial progress toward developing a shippable  
19 container for this NUHOMS-24P or P prime, whichever, you know,  
20 this thing.

21           And we would intend in the Part 72 licensing to  
22 pursue it in that spirit, as compatible as we can make it in  
23 the taxpayers' and ratepayers' interests.

24           CHAIRMAN ZECH: Well, it seems to me that -- have you  
25 looked at the advantages and disadvantages of standardization?

1 It would seem to me that you've presented in your presentation  
2 a number of the problems. We all recognize the different sizes  
3 of fuel elements and so forth, but have you looked very  
4 carefully to see if there are others, at the advantages and  
5 disadvantages of standardization?

6 Frankly, it looks to me like we're suffering from the  
7 custom-built plants that we've been living with for a number of  
8 years, and a lack of standardization. Here we have at least an  
9 opportunity, even though it may be very difficult, to gain the  
10 advantages of scale and other advantages of standardization,  
11 and I just think that it's something that should be seriously  
12 considered.

13 But I'd like to hear a little bit more about what  
14 you've considered as far as the advantages and disadvantages of  
15 standardization.

16 MR. BERNERO: Let me ask for the third slide from the  
17 end, the one with results on a shippable and unshippable  
18 canister. We're pursuing a line in this regard that may  
19 illuminate the subject for you.

20 This one here, if we go back to these results, it's  
21 the one that gives the person rem and the risk and cost  
22 results. Number 24 I believe. If you look at those results  
23 and you say I recognize that the dose goes down with the larger  
24 cask or canister. If I look at that and then I say, what if  
25 someone developed a shipping capability for this canister. Now

1 think about it for a moment. The transport fleet that DOE is  
2 working on is a transport fleet that has to go summer, winter,  
3 spring and fall; it ought to go in regular trains not special  
4 trains, it ought to have all the bells and whistles that make  
5 it standard transport.

6 But these things if they are ever shipped are only  
7 shipped once. That big cask in the yard at Surry, the so-  
8 called dual-purpose cask. It's not intended to be shuttling  
9 back and forth between the repository and the reactor. No. It  
10 would be filled for storage and shipped once, if ever.

11 In that vein, we have been talking to people in  
12 industry who are working on this toward the possibility of  
13 standardizing at least a dual purpose cask, and maybe one of  
14 these large shipping devices or two of them, toward a possible  
15 certification for limited shipment. Could be special train,  
16 could be special season or something like that. And that's  
17 part of the "as compatible as reasonably achievable" initiative  
18 we would like to pursue.

19 But we can see in this particular case if you just  
20 take the numbers up there and certify a shipping container for  
21 the NUHOMS-24P, you would cut this person rem by another factor  
22 of two. You would cut this risk by a factor of two by  
23 eliminating certain handling. You won't change that cost  
24 necessarily because now you're in a different cost regime --  
25 what does it cost to develop that shipping container and how

1 many times will it be used, there are other factors we don't  
2 have a handle on, -- but it will probably be a benefit. So  
3 that if there are some ways to ship this one as well as this  
4 one [indicating], we will have achieved a good deal of  
5 standardization for the power industry and we would have saved  
6 a fair amount of money.

7 But again, the health and safety, we're down in the  
8 tail of the curve, we're essentially ALARA.

9 CHAIRMAN ZECH: It would seem to me, though, that  
10 with a little imagination and innovation that we could perhaps  
11 come up with a better rationale that would show that for  
12 standardization there are significant advantages.

13 For example, if you design a cask for your longest  
14 and your widest fuel assembly, naturally that can fit them all.  
15 Now that's not necessarily practical because you'd have too  
16 much empty space, but you could maybe put fillers in it. So in  
17 other words, if we really force standardization, and from a  
18 safety standpoint in particular I think, we could say it's  
19 going to be safe. But maybe that's not the right thing to do  
20 because we're going to take it from the spent fuel pool perhaps  
21 to an MRS and then eventually to the repository; and of course  
22 the ideal situation would be something that would fit right  
23 into the repository.

24 So if you start backwards, if we knew what the  
25 repository was like -- and we don't. Is that correct?

1           MR. BERNERO: Yes. And that's where the most safety  
2 is at stake.

3           CHAIRMAN ZECH: I understand. But that I think is  
4 the problem we have. So if we could put a logic sequence that  
5 way and start from the repository, building backwards to the  
6 power plant, and if we could design a cask that would be  
7 transportable, I presume you'd have to have an outer cask, the  
8 transportable cask --

9           MR. BERNERO: A sleeve or something.

10          CHAIRMAN ZECH: -- which would enclose the inner  
11 cask. But in any case, what I'm trying to say is it seems to  
12 me that with that kind of a logic train we should do what we  
13 can to make, first of all, the cask safe -- that's the ultimate  
14 and prime consideration -- but in addition to that, make sure  
15 that it could be fit in the transportation cask and also fit,  
16 of course, the different reactor sizes. Now that doesn't mean  
17 we need one and only one cask, I don't have that in mind at  
18 all. And we might need several kinds. That means, though,  
19 that we'd have to have a repository that could accept the  
20 various sizes that we might accept.

21                 So I just feel that if we allow all kinds of  
22 different cask sizes and shapes and forms at this stage, --  
23 we're still making decisions on this -- if we allow that to  
24 happen, then down the road a piece several years from now we're  
25 going to have a real problem at the repository and have to

1 design the whole repository for custom-built plants. I'm  
2 trying to see if we can't avoid that. I think we'd end up with  
3 a better repository, a safer repository really, if we have a  
4 lesser number of different combinations and permutations.

5 MR. BERNERO: Mr. Chairman, let me respond to you.  
6 You recall we discussed this issue on August 10th at this very  
7 table, and judging from the telephone conversations, meetings,  
8 letters and everything else we've seen since, I think that 80  
9 percent of the U.S. industry has read the transcript of that  
10 meeting -- the DOE, the various appropriate industry groups and  
11 the individual utilities involved, they have not only read the  
12 transcript, they have heard us, they understand the issue, they  
13 understand the question, and some of them are even here in this  
14 room listening to this meeting because of that intense  
15 interest.

16 We met with the Electric Power Research Institute and  
17 two utilities just last Friday on this subject. We have a very  
18 active dialogue not only with the license applicants but with  
19 the other agents that can and I believe will bring around this  
20 standardization, this minimization of designs. We don't want a  
21 proliferation of solutions. And I was quite pleased. I just  
22 received that press release today as I came into this room on  
23 the Calvert Cliffs selection, which basically says, we want to  
24 standardize to the same thing Duke Power has.

25 And I think the forces are there. The interest of

1 this Commission and the willingness to pursue the subject has  
2 them listening and has them acting. And there has even been  
3 specific dialogue between the Department of Energy on their  
4 transport fleet and this NUHOMS-24P. Remember I mentioned the  
5 big shield plug at the end? If there's a way to noodle with  
6 that design a little bit and still serve a good, solid,  
7 reliable dry storage function and yet fit the transport cask  
8 and minimize one further step, minimize one further  
9 proliferation of design.

10 CHAIRMAN ZECH: Well, I appreciate the interest of  
11 the utilities and other parts of the industry in this regard  
12 and what I would like to do is to challenge them to assist us  
13 in trying to come up with standardized casks. It seems to me  
14 that they have talent to bear on this that could perhaps assist  
15 us in making a better decision perhaps than we made 30-some  
16 years ago when we just didn't think of standardization at all  
17 apparently, or if we did it didn't turn out that way.

18 So I think it is good, and I would encourage the  
19 utilities and the industry to give any thoughts that they could  
20 to this very important problem because we're really involved in  
21 storage for very long periods of time, as you've mentioned.  
22 The public health and safety is involved.

23 I think if we come up with a cask or casks that have  
24 the confidence that we want, that we demand and that the public  
25 wants, we're going to be an awful lot better off. And I would

1 rather not see a proliferation of design applications for  
2 casks.

3 First of all, it's not only going to task your  
4 ability to review all those applications, and our resources are  
5 involved to a degree and that's important of course, but more  
6 importantly I think if we can come up with a cask or casks that  
7 show some discipline and trying to come up with casks that can  
8 be used by different types of reactors hopefully, I think we'll  
9 be simplifying the whole process. And again, I think that if  
10 we can simplify it, standardize it, we will be contributing to  
11 safety factors because it will at least preclude us from making  
12 a completely different design at the far end -- by that I mean  
13 at the repository.

14 I think there are advantages to it, and I would hope  
15 that we can continue to pursue those.

16 COMMISSIONER ROBERTS: May I ask a question that  
17 relates to that? Slide No. 7, existing spent fuel cask, you  
18 said one of them was owned by CP&L. These different model  
19 numbers, I'd like to know who designed and manufactured these,  
20 or if two different entities, one designs and somebody else  
21 manufactures -- what entity would you identify Model NL-1/2  
22 with, and IF-300 and so forth?

23 MR. BERNERO: Chuck, could you answer those?

24 MR. MacDONALD: The NL-1/2 and the NL-10/24 were  
25 designed by NL Industries, and they were designed to service

1 the Agnes, the Barnwell facility. They are now operated on  
2 lease to Nuclear Assurance Corporation.

3 The TN-8L and the TN-9 were designed by Transnuclear  
4 in New York. They also have companies in Europe and outside  
5 the United States. Those casks were fabricated in France by  
6 Robotelle. During the fabrication the NRC did inspect in  
7 France the fabrication of those casks. The NLI casks were  
8 fabricated in Wilmington, Delaware.

9 The IF-300 was designed by the General Electric  
10 Company, and its design was primarily to serve the G.E. Morris  
11 facility which was an early reprocessing facility which is now  
12 used for storage. Three of those casks were sold -- well, all  
13 four have been sold. One a utility owns, the other three are  
14 owned by Pacific Nuclear Systems. These casks were fabricated  
15 by I believe Stearn Rogers in Denver, Colorado.

16 COMMISSIONER ROBERTS: That answered my question,  
17 thank you.

18 CHAIRMAN ZECH: Commissioner Rogers?

19 COMMISSIONER ROGERS: Well, just one point. It seems  
20 to me that one could separate the question of standardization  
21 of those casks which are to be shipped and which might be the  
22 actual cask that is stored in a repository -- standardization  
23 of that type of device from standardization efforts for on-site  
24 storage to meet the temporary needs of a particular situation  
25 such as apparently is developing, where the utility is willing

1 to take the risk that that particular design may not be  
2 certifiable for transport or useful beyond on-site storage.  
3 And it seems to me that perhaps we could separate the priority  
4 of standardization, the degree of priority we assign to  
5 standardization, in those two different applications.

6 I agree with the Chairman very much that it seems to  
7 me that those casks which we look forward to being used to  
8 transport and ultimately store the spent fuel, it would seem to  
9 be very desirable to try to push for standardization as much as  
10 possible there. Obviously, you're hampered by all the factors  
11 that you've mentioned of the particular site and fuel designs;  
12 also, that nothing is known really about the other end, the  
13 final resting place in the repository.

14 But I am a little concerned that we hold up any  
15 consideration of on-site storage to meet acute needs for  
16 standardization of those if the utility is willing to say  
17 they're prepared to accept the fact that they may have to use a  
18 totally different cask for transport and ultimate storage and  
19 would bear the cost of that.

20 MR. BERNERO: The utility in question, for instance,  
21 Duke Power, their application actually is based on the  
22 inability to ship the NUHOMS-24P. All of their analysis, and  
23 that was part of our Environmental Impact Assessment, -- their  
24 analysis all assumes it goes in the yard for the 20 years and  
25 then comes back into the spent fuel pool, is cut open and the

1 stuff is transferred to a transport fleet cask.

2 Nonetheless, they are interested and they have  
3 already had some dialogue with DOE on it. Now, DOE is  
4 interested; they have an economic incentive (a) to have a  
5 standardized shipping fleet or transport fleet, and (b)  
6 wherever possible, to pick up, now that there are five reactors  
7 using this 24P, it just accelerates that incentive.

8 You may be aware, we have a letter coming forward to  
9 you for the Chairman's signature. It's our comments on the DOE  
10 dry cask study, and that letter -- I've lost track, it's either  
11 up to you or will be up to you in a day or so -- in that letter  
12 we single out this issue and we say, you know, the system  
13 engineering, you really ought to accelerate or increase your  
14 system engineering here because that is the case. Their dry  
15 study didn't go into this quite as much as it should have. But  
16 we think they're listening.

17 Now as far as holding up the utility, we are not  
18 doing that. We're conscious of the operational safety  
19 considerations with the Oconee plant and with the others as  
20 they come up, and the utility is keenly aware of that, and  
21 there is every priority being given to avoid any such  
22 constraint. We don't want to impact on operational safety at  
23 all.

24 But I think, as I said before, 80 percent of them are  
25 going to read this transcript, too, and they're listening.

1 It's abundantly clear that they're listening.

2 The waste management group that the industry uses to  
3 follow this, we've had a letter from them asking for a  
4 conference on this; they're prepared to meet to pursue this,  
5 and again, it's toward the common interest of -- you can call  
6 it standardization or compatibility or optimizing of system  
7 management. That's really what it is. There is no single  
8 system manager, but everyone recognizes now the benefit of  
9 optimizing system management. So I think we all have the same  
10 objective now.

11 COMMISSIONER ROGERS: Are there any mechanisms in  
12 place to help to assist that approach?

13 MR. BERNERO: Well, the utility nuclear waste  
14 management group, which is the one that handles all of this,  
15 they have an annual capacity report process and you'd never  
16 guess that that is a subcommittee that looks at things like  
17 this; you know, where are we going and how are we getting  
18 there. And they have the mechanism by which to do this. Now  
19 they've got some sort of an affiliation through the NUMARC  
20 activity, but basically, on waste handling or waste management  
21 activities, these are the people we talk to.

22 And then they have activity going on through the  
23 Electric Power Research Institute and, the Electric Power  
24 Research Institute in turn has a link to the Japanese research  
25 program on dual purpose casks and things like that. And so the

1 mechanisms do exist and we're tied into those mechanisms.  
2 We're following this closely. And as I say, I think the  
3 general interest and the general objective is the same;  
4 optimize the system.

5 COMMISSIONER ROGERS: Is there any possibility that  
6 settling on a cask design would -- if any particular fuel  
7 designs just didn't quite fit that, -- is there any possibility  
8 that future fuel fabrication could tailor in any way, trim a  
9 little bit here or there? Is that totally frozen, fuel design,  
10 for each reactor, or is there no accommodation -- ?

11 MR. BERNERO: I would say as a practical matter it  
12 is. Actually, the South Texas plant didn't expect to be a  
13 maverick; it expected to be the first of a new set of standard  
14 plants. I think if you cut two and a half feet off the length  
15 of that fuel you'd pay in megawatts some way or another.

16 COMMISSIONER ROGERS: I wasn't thinking of anything  
17 quite that extreme, but you know --

18 [Laughter.]

19 MR. BERNERO: Well, in that case it's two and a half  
20 feet too long to fit in the can. No. I think the cases like  
21 South Texas or Big Rock Point at the other extreme --

22 COMMISSIONER ROGERS: We're talking about a couple of  
23 inches.

24 MR. BERNERO: Well, I honestly don't know whether --  
25 they all differ in length by a couple of inches one way or

1 another, and I suspect you can exercise a certain amount of  
2 flexibility. I would be very reluctant to go into that.

3 We and DOE would both like to see an envelope that  
4 could take all of that variation or go to the outside, but  
5 whether you can take South Texas remains to be seen. But there  
6 will be some off-optimum shipments. You know, Big Rock Point  
7 is going to rattle in a big can, no question about it.

8 CHAIRMAN ZECH: Maybe I'll ask the General Counsel if  
9 he had a comment.

10 MR. PARLER: Mr. Chairman, thank you. This dry cask  
11 storage report by DOE that Mr. Bernero referred to is a  
12 requirement of the National Waste Policy Act as amended a  
13 couple years ago. The report was due October 1st, 1988, but if  
14 the Commission has any thoughts or suggestions, et cetera, that  
15 would be one of the places where the views could be expressed.

16 The other thing that perhaps I commented on at the  
17 August meeting, at least from my perspective, I've heard  
18 several times now that there's not one system manager, et  
19 cetera. I always thought that in the area of nuclear power and  
20 nuclear materials, if there was guidance, direction, strong  
21 suggestions, those things were supposed to come from this  
22 agency. That's one of its main reasons for being.

23 And it seems to me that if there is something like  
24 that to be given; that is, guidance, suggestions or direction,  
25 that we can do a little better than forcing people to read

1 transcripts of Commission meetings to make up their own minds.

2 Those are my thoughts. I thank you for letting me  
3 express them.

4 CHAIRMAN ZECH: Appreciate that. I, too, would just  
5 like to make a brief comment on that, it seems like nobody is  
6 in charge. I would like to think that at least we are taking  
7 the lead, and certainly in our area of public health and safety  
8 responsibilities. And one of your first slides shows the  
9 system and describes that. I recognize that utilities are  
10 involved, DOE is involved, other folks are involved, but I'm  
11 inclined to agree with the General Counsel that if it involves  
12 nuclear materials and involves public health and safety, that  
13 at least we'll take charge until somebody else does. So I'd  
14 like the staff to feel like you have the charge to take charge  
15 and to make sure, unless we're told that someone has the  
16 authority and has the cohesive intent to bring it all together,  
17 that we take the lead. And I think that's certainly something  
18 that should not prohibit us or inhibit us from making the  
19 decisions we think are necessary in accordance with the  
20 National Waste Policy Act.

21 It also just occurred to me that you know, you  
22 mentioned the waste management group in the industry. Is that  
23 a part of NUMARC or not?

24 MR. BERNERO: As I understand it, not exactly.  
25 NUMARC is closely coupled with them but they're not exact a

1 part of NUMARC.

2 CHAIRMAN ZECH: Well, it seems to me this is kind of  
3 a natural for NUMARC unless there's another waste group that  
4 they have deferred to in this area. But I would hope that we  
5 would get some utility group, some industry group perhaps that  
6 would be a focal point to assist us in this area. And I think  
7 they, too, could contribute to our responsibilities as far as  
8 public health and safety is concerned.

9 MR. BERNERO: Mr. Chairman, the staff has been  
10 assertive in this matter in the recent past and will continue  
11 to be assertive. Hugh Thompson and I have personally talked to  
12 NUMARC about this, to make sure that we have the full attention  
13 of the industry authorities on this.

14 We have talked repeatedly to DOE and as we said, we  
15 are now responding to DOE's comments. I might add that on that  
16 dry cask storage study, DOE got an extension of some sort, and  
17 our comments are due on October 28th, and not long thereafter,  
18 about two or three weeks later I believe you are going to have  
19 a briefing from Charles Edward Kay, Ed Kay of the Office of  
20 Civilian and Radioactive Waste Management, and it might be an  
21 appropriating thing to discuss with him at that time.

22 But rest assured the staff will press and will  
23 continue to be assertive in this to provide the leadership  
24 necessary to make sure that the system is optimized.

25 CHAIRMAN ZECH: All right, fine, that's exactly what

1 we should do until we've decided otherwise, as far as I'm  
2 concerned. Take the leadership role and pull the threads  
3 together, ask the utilities, the industry for their  
4 recommendations and others who may be involved and interested  
5 in it. I think we're trying to make an important decision  
6 regarding casks.

7 I do think if Commissioner Carr were here today --  
8 and I know he regretted missing this meeting -- because of his  
9 keen interest in standardization, I think he would have echoed  
10 some of the comments and perhaps have made some other thoughts  
11 that he may have on standardization. He has a keen interest in  
12 it, too.

13 And my interest is really, I guess, kind of in a  
14 generic sense because we seem to do so many custom-built  
15 decisions and custom-built certifications that when we have a  
16 chance to get the benefits of standardization, to discipline  
17 our own system as well as perhaps contribute in a more  
18 significant way to a better product, better public health and  
19 safety, then we should do so.

20 So I think it would be useful also to have the staff  
21 provide the Commission a paper about the resources that you're  
22 intending to use for this subject of handling the license  
23 applications. I think that would be useful for us to see. The  
24 concern I have is that frankly, if we don't discipline our own  
25 system we'll find ourselves trying to certify a great number of

1 designs and get away -- not only get away from standardization  
2 but be a very great tax on our own resources.

3           So I hope that our review material that we have out  
4 that shows the criteria that we're expecting to have is  
5 explicit enough to give the guidance necessary for those  
6 interested in applying for the certified design, to show that  
7 we're looking for rather specific type criteria and perhaps  
8 that will help in standardization. If that's not the case I  
9 would ask the staff to take another look at that to be sure  
10 you're satisfied.

11           Any other comments?

12           [No response.]

13           CHAIRMAN ZECH: Thank you very much, appreciate it.  
14 We'll stand adjourned.

15           [Whereupon, at 3:20 p.m., the Commission meeting was  
16 adjourned.]

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**CERTIFICATE OF TRANSCRIBER**

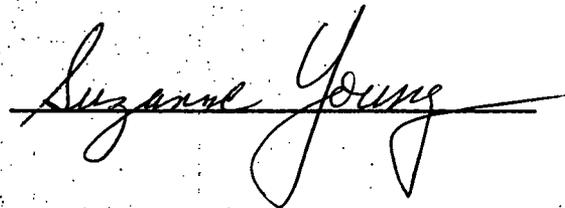
This is to certify that the attached events of a meeting of the U.S. Nuclear Regulatory Commission entitled:

**TITLE OF MEETING:** COMMISSION BRIEFING ON CASK DESIGNS FOR SHIPPING AND STORING OF NUCLEAR MATERIALS

**PLACE OF MEETING:** Washington, D.C.

**DATE OF MEETING:** WEDNESDAY, OCTOBER 19, 1988

were transcribed by me. I further certify that said transcription is accurate and complete, to the best of my ability, and that the transcript is a true and accurate record of the foregoing events.

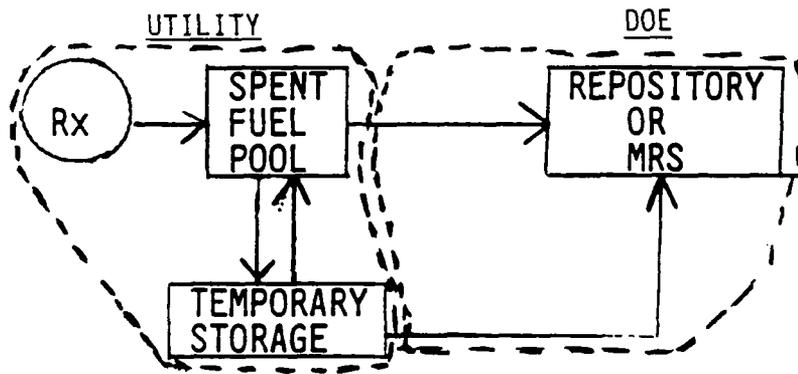
A handwritten signature in cursive script that reads "Suzanne Young". The signature is written in black ink and is positioned to the right of the main text block.

**Ann Riley & Associates, Ltd.**

*Revised*

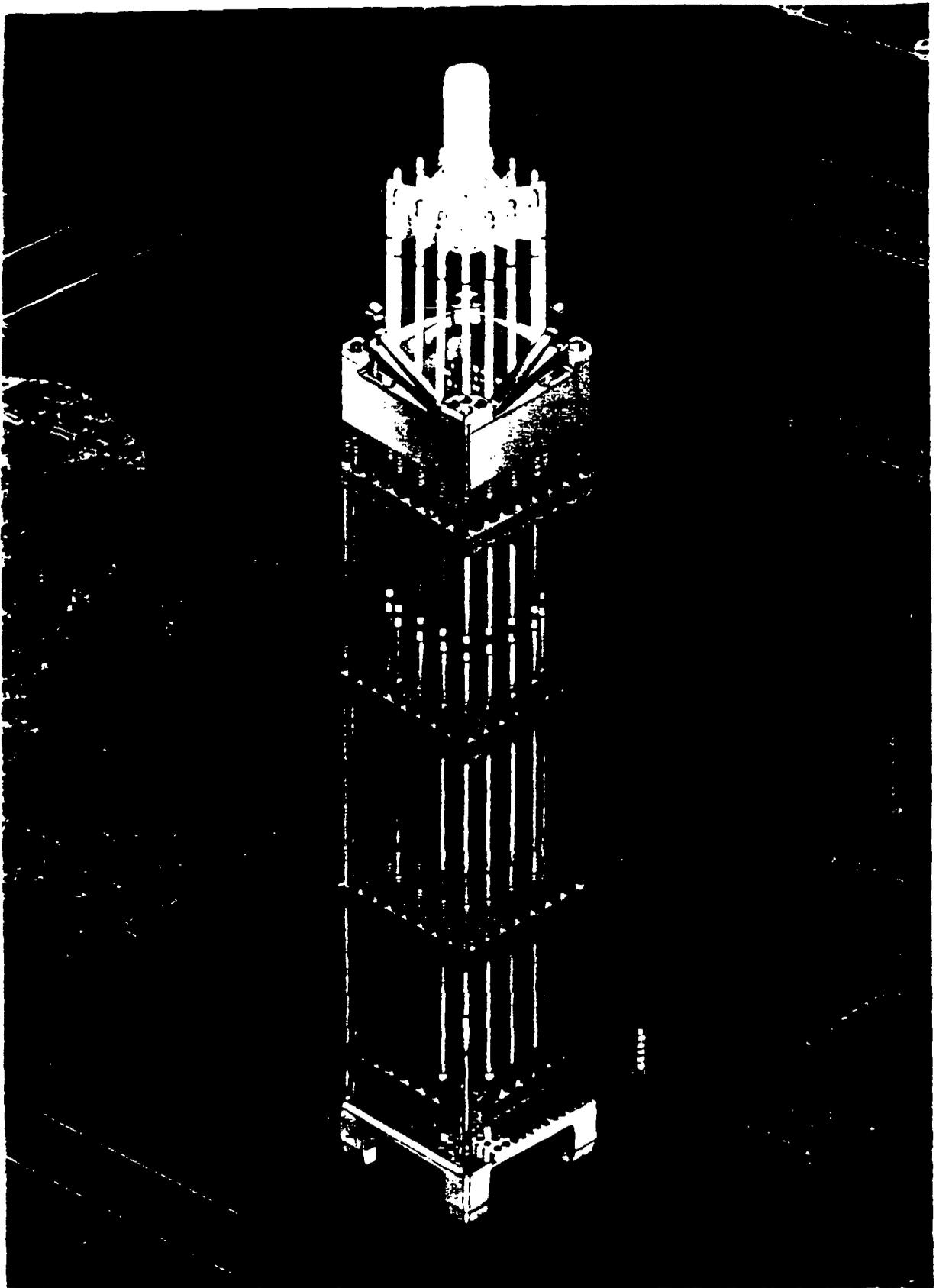
COMMISSION BRIEFING  
ON  
CASK DESIGNS FOR  
SHIPPING AND STORING OF NUCLEAR MATERIALS  
OCTOBER 19, 1988

THE SYSTEM



SPENT FUEL STORAGE REQUIREMENTS  
IN YEAR 2003

- 0 TOTAL SPENT FUEL DISCHARGED:  
54,000 MTHM
- 0 MAXIMUM REACTOR POOL STORAGE CAPACITY  
(WITH RERACKING): 43,000 MTHM
- 0 ADDITIONAL STORAGE CAPACITY  
REQUIRED: 11,000 MTHM
- 0 SPENT FUEL DISCHARGE RATE:  
2,300 MTHM/YR



Westinghouse 11x11 FUEL ASSEMBLY

# BWR/6 FUEL ASSEMBLIES & CONTROL ROD MODULE

- 1 FUEL GUIDE
- 2 CHANNEL
- 3 FASTENER
- 4 UPPER TIE
- 5 PLATE
- 6 EXPANSION
- 7 SPRING
- 8 LIFTING TAB
- 9 CHANNEL
- 10 CONTROL ROD
- 11 FUEL ROD
- 12 SPACER
- 13 CORE PLATE
- 14 ASSEMBLY
- 15 LOWER
- 16 TIE PLATE
- 17 FUEL SUPPORT
- 18 PIECE
- 19 FUEL BALLETS
- 20 WIND PLUG
- 21 CHANNEL
- 22 SPACER
- 23 PLENUM
- 24 SPRING



GENERAL  ELECTRIC

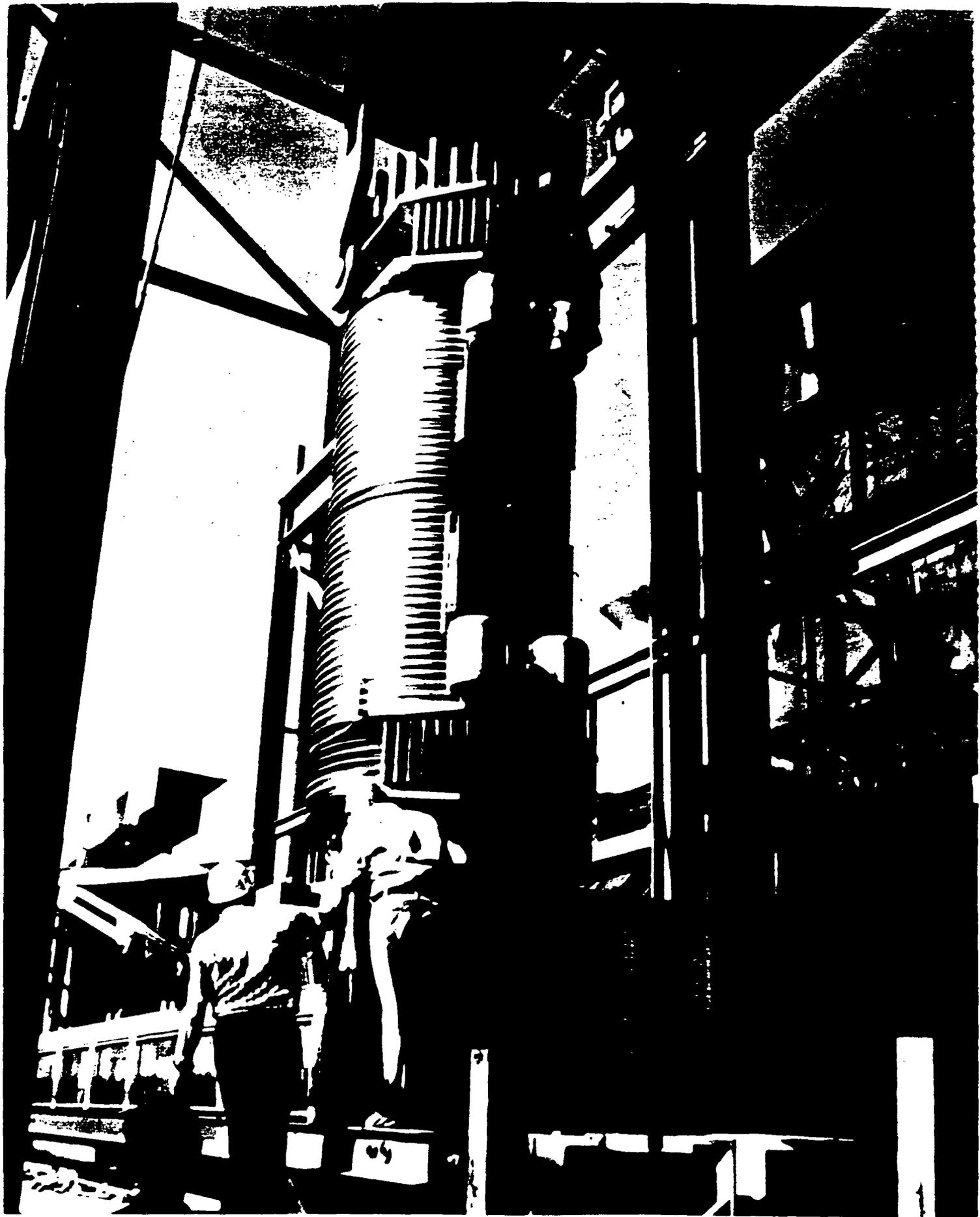
LWR FUEL ASSEMBLIES

<u>PWR</u>	<u>TYPICAL DIMENSION (RANGE)</u>
WIDTH	8.4 INCHES (7.6 - 8.5)
LENGTH	13.3 FEET (11.4 - 16.6)
WEIGHT	1,482 LBS (1,096 - 1,515) (0.464 MTHM)

<u>BWR</u>	
WIDTH	5.2 INCHES (4 - 6.5)
LENGTH	14.3 FEET (6.8 - 14.7)
WEIGHT	562 LBS (328-619) (0.174 MTHM)

EXISTING SPENT FUEL CASKS

<u>MODEL</u>	<u>CAPACITY</u>	<u>WEIGHT-LBS.</u>	<u>No. BUILT</u>
NL-1/2	1-PWR OR 2-BWR	50,000	5
TN-8L	3-PWR	<sup>8</sup> <del>70</del> ,000	2
TN-9	7-BWR	80,000	2
IF-300	7-PWR OR 18 BWR	140,000	4
NL-10/24	10-PWR	195,000	2



DOE OCRWM CASKS

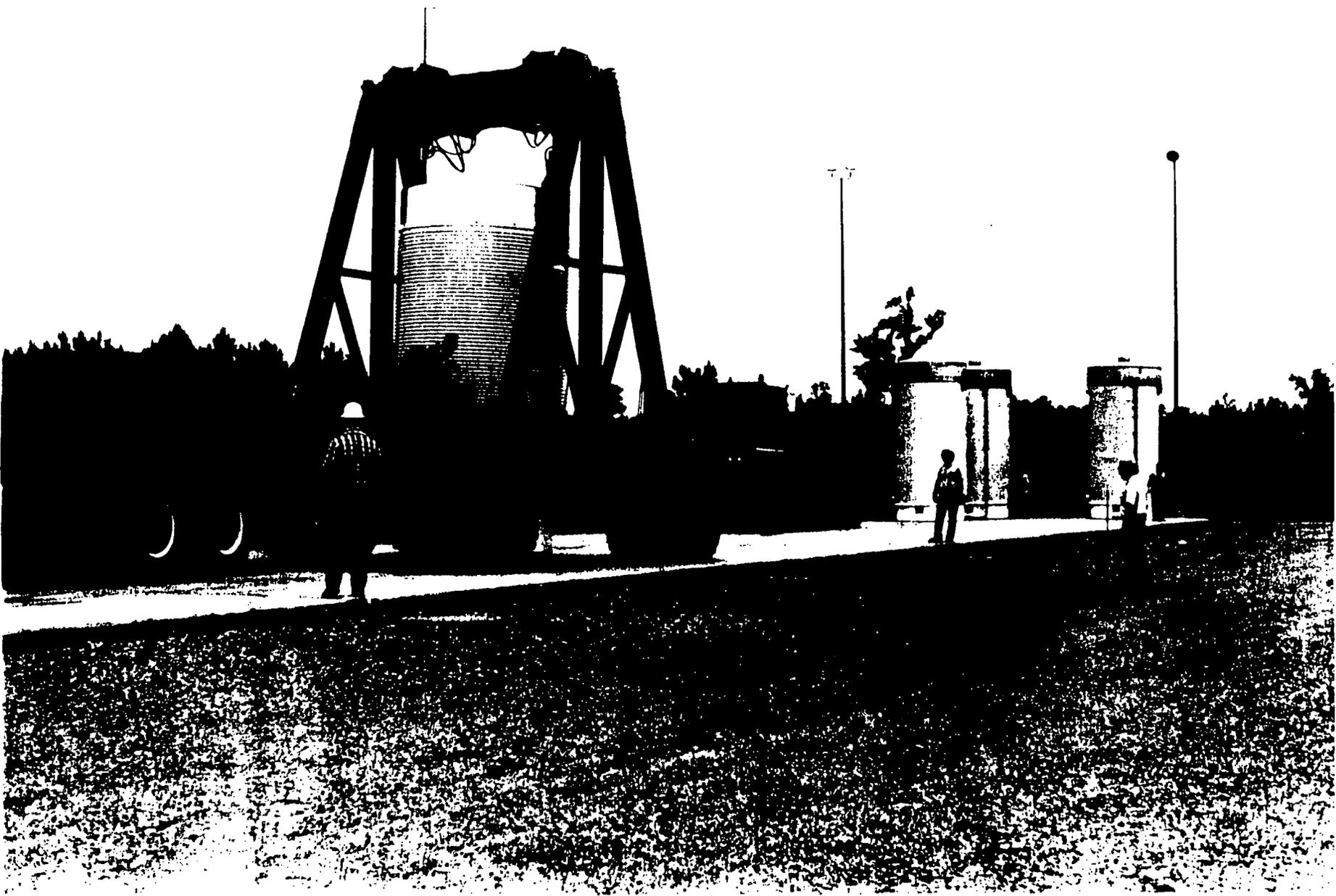
<u>COMPANY</u>	<u>MODE</u>	<u>CAPACITY</u>
GA TECH	TRUCK	4 PWR 9 BWR
WESTING.	TRUCK	4 PWR 9 PWR
NUC. ASSUR.	RAIL/BARGE	26 PWR 52 BWR
NUC. PKGG.	RAIL/BARGE	21 PWR 48 BWR
B&W	RAIL/BARGE	24 PWR 49 BWR

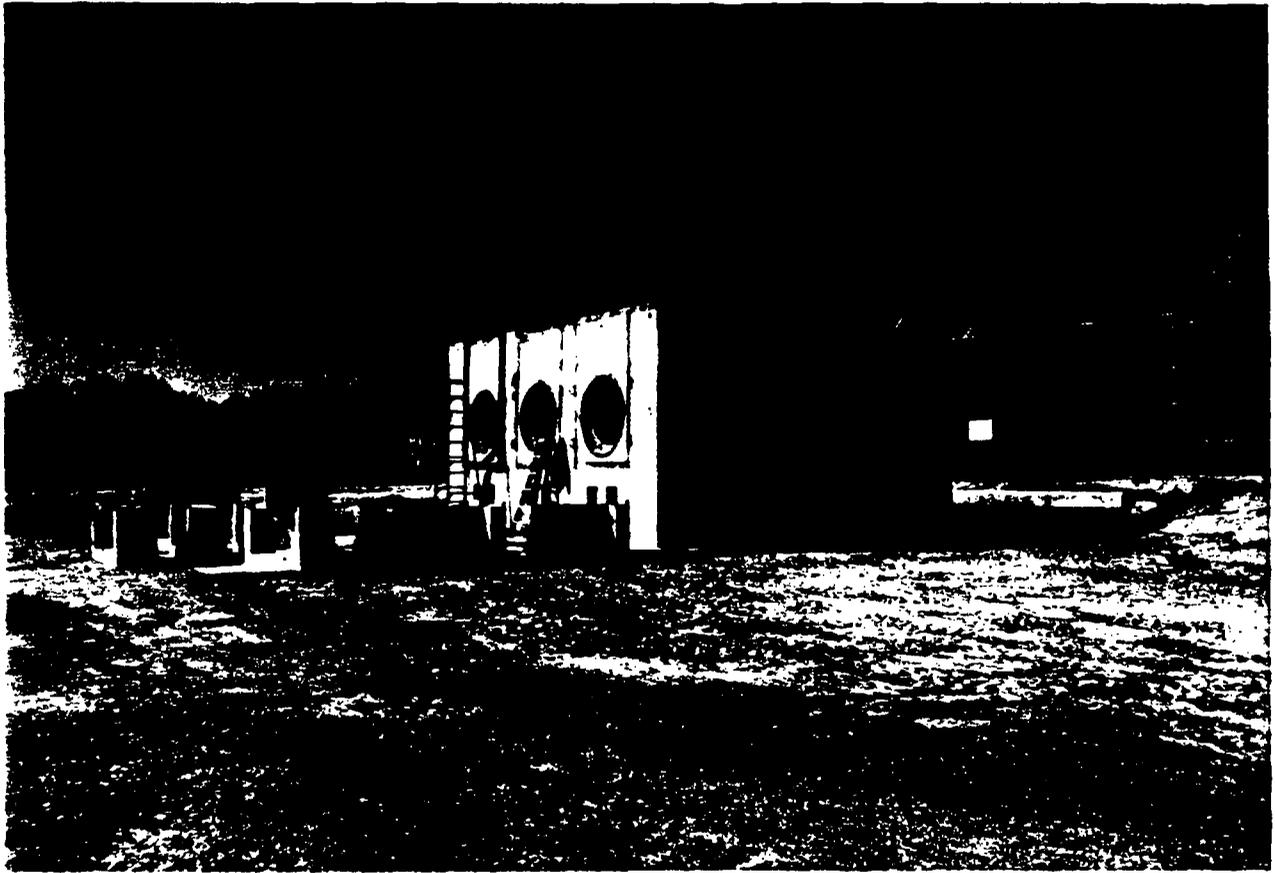
ALTERNATIVES FOR ADDITIONAL CAPACITY

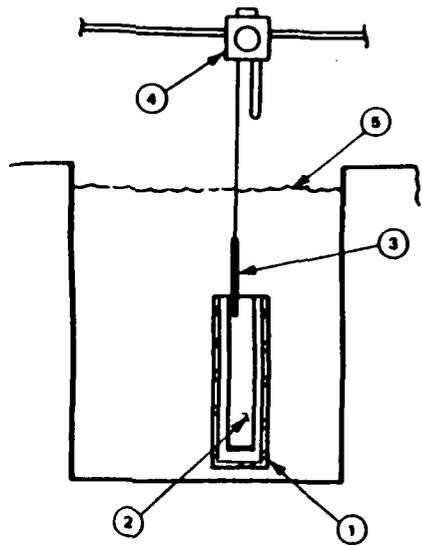
- 0 TRANS-SHIPMENT (INTRA-UTILITY)
- 0 FUEL ROD CONSOLIDATION (STORAGE IN REACTOR POOL)
- 0 DRY STORAGE

DRY STORAGE TOPICAL REPORTS APPROVED  
WITH SER

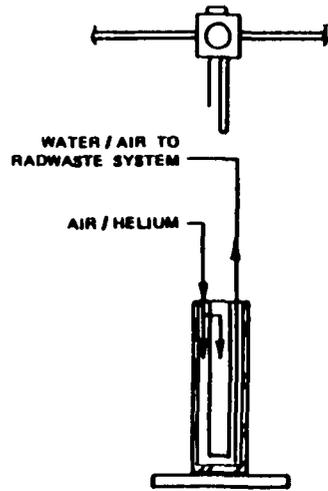
- 0 GNSI CASTOR V/21 NODULAR CAST IRON  
CASK DESIGN; 21 PWR ASSEMBLIES
- 0 WESTINGHOUSE MC-10 FERRITIC STEEL  
CASK DESIGN; 24 PWR ASSEMBLIES
- 0 NAC, S/T STAINLESS STEEL  
CASK DESIGN; 26 PWR ASSEMBLIES
- 0 NUTECH, NUHOMS STAINLESS STEEL  
CANISTER/CONCRETE MODULE DESIGN;  
7 PWR ASSEMBLIES/CANISTER
- 0 FOSTER-WHEELER MODULAR VAULT DRY  
STORAGE, CONCRETE STRUCTURE; 83 PWR  
OR 170 BWR/MODULE



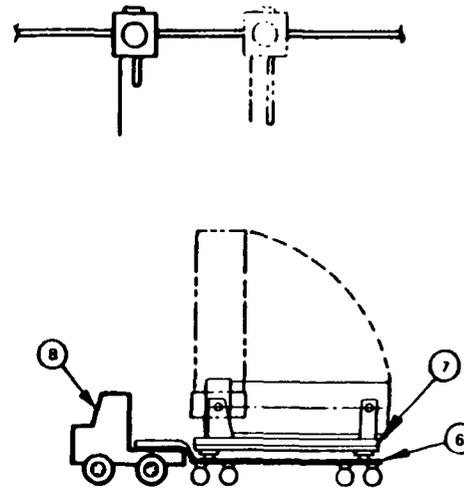




CASK LOADING

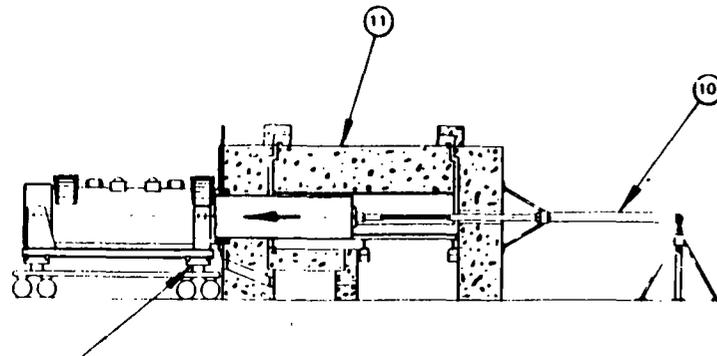
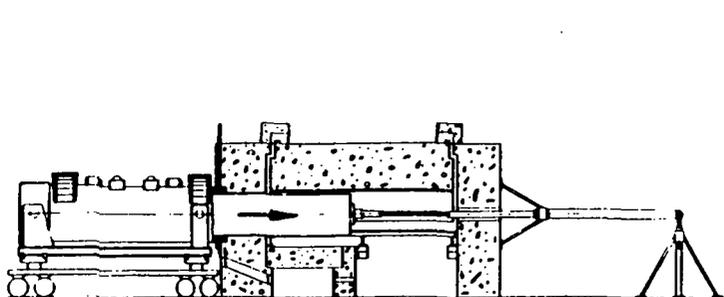


CASK / CANISTER DRYING AND SEALING



SKID LOADING

1. TRANSPORT CASK
2. DRY SHIELDED CANISTER
3. IRRADIATED FUEL ASSEMBLY
4. OVERHEAD CRANE
5. IRRADIATED FUEL STORAGE
6. TRANSFER TRAILER
7. SKID
8. TRUCK
9. HYDRAULIC POSITIONERS
10. HYDRAULIC RAM
11. HORIZONTAL STORAGE MODU
12. HORIZONTAL ROLLERS



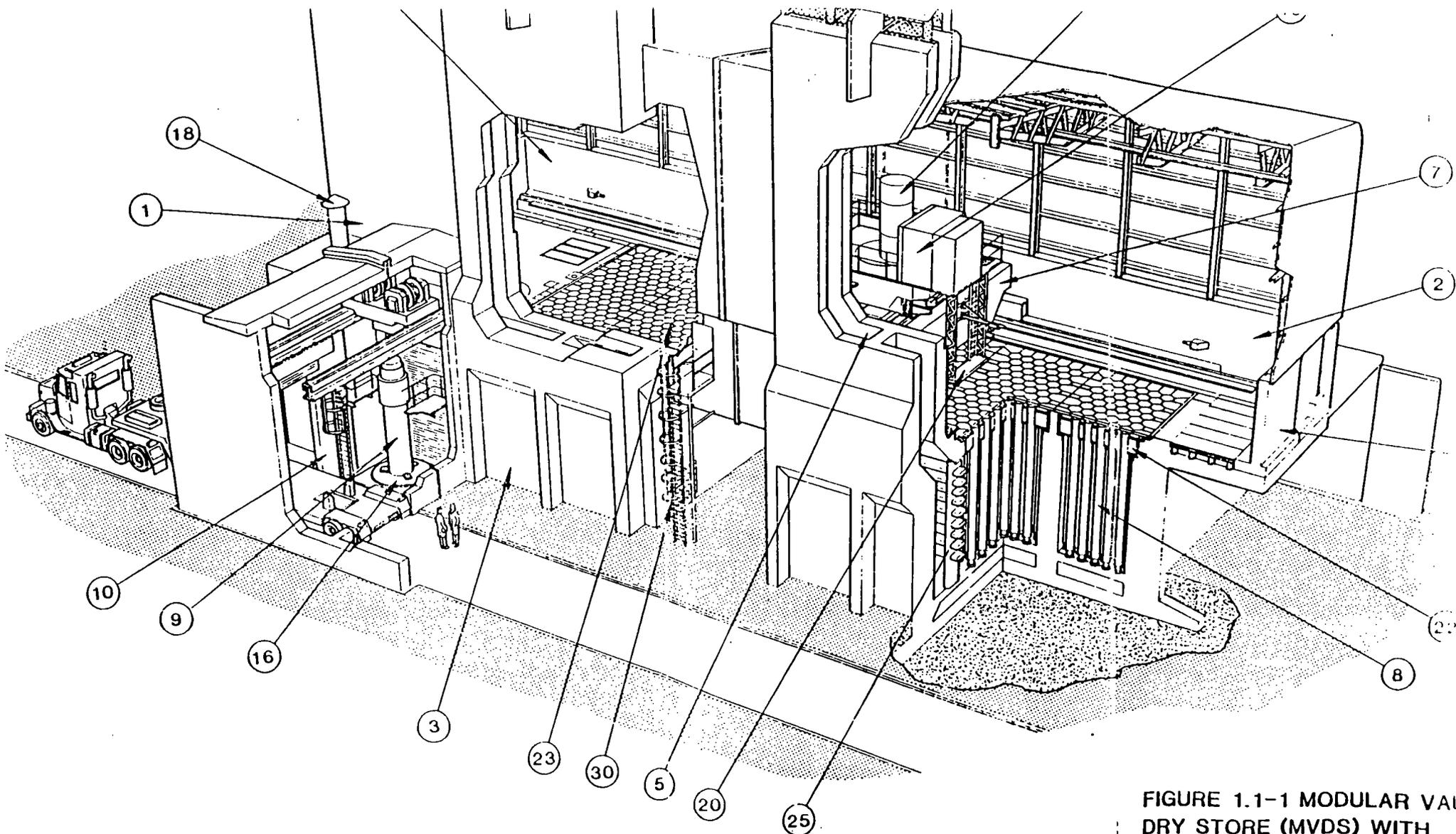


FIGURE 1.1-1 MODULAR VAL  
 DRY STORE (MVDS) WITH  
 EXTENSION BUILDING

REVISION 1

DRY STORAGE TOPICAL REPORTS UNDER REVIEW

- 0 COMBUSTION ENGINEERING, DRY CAP  
FERRITIC STEEL CASK DESIGN; 24 PWR OR  
60 BWR ASSEMBLIES
- 0 TRANSNUCLEAR, TN-24 FERRITIC STEEL  
CASK DESIGN; 24 PWR ASSEMBLIES
- 0 NUPAC CP-9 CONCRETE CASK DESIGN;  
9 PWR ASSEMBLIES
- 0 NUTECH NUHOMS - SS CANISTER/CONCRETE  
MODULE DESIGN; 24 PWR ASSEMBLIES/CANISTER
- 0 OTHER: NAC CONSOLIDATED FUEL CASK  
DESIGN; 28 CANISTERS (RODS  
FROM 56 PWR ASSEMBLIES)

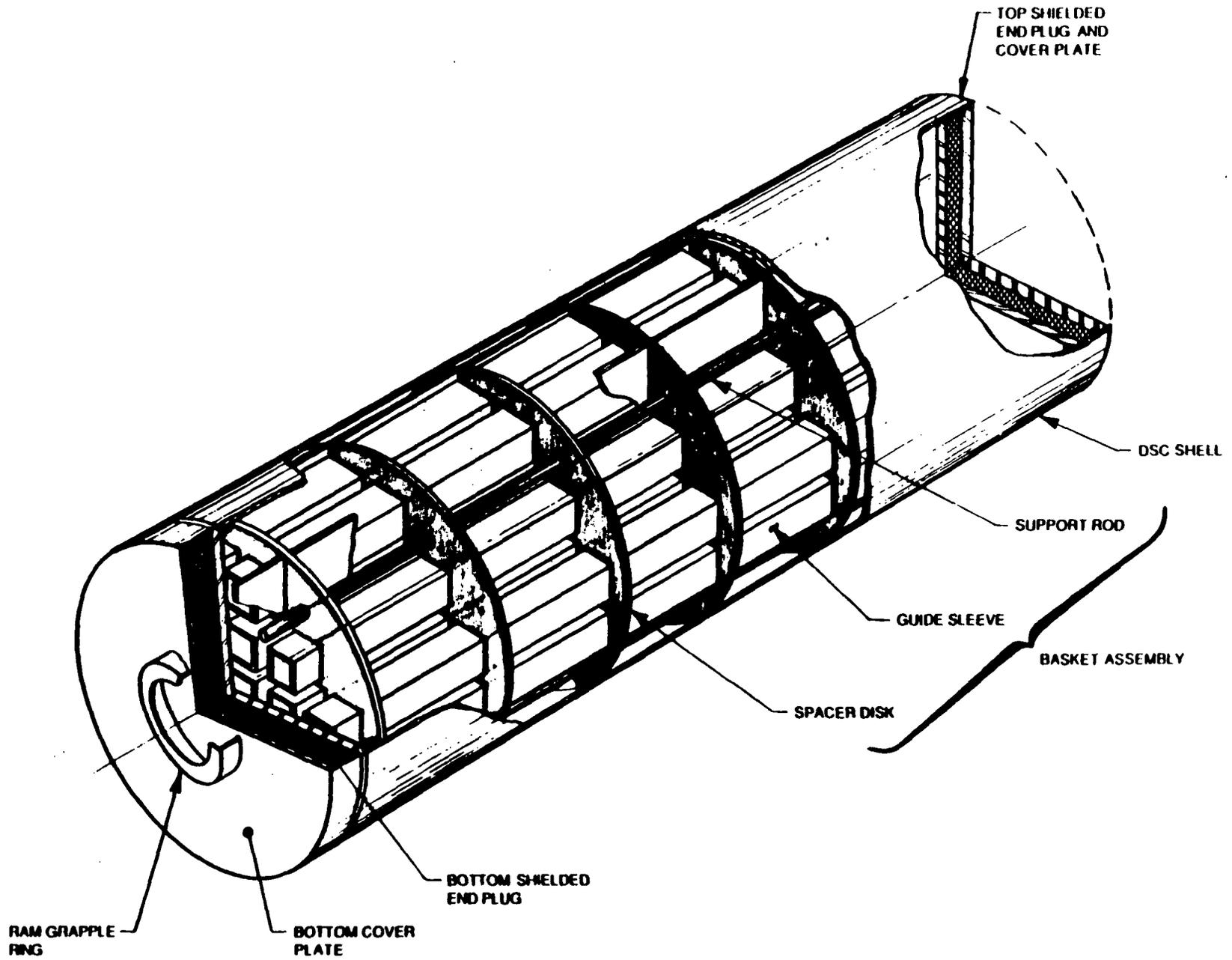


Figure 1.3-1

NUHOMS-24P DRY SHIELDED CANISTER ASSEMBLY COMPONENTS

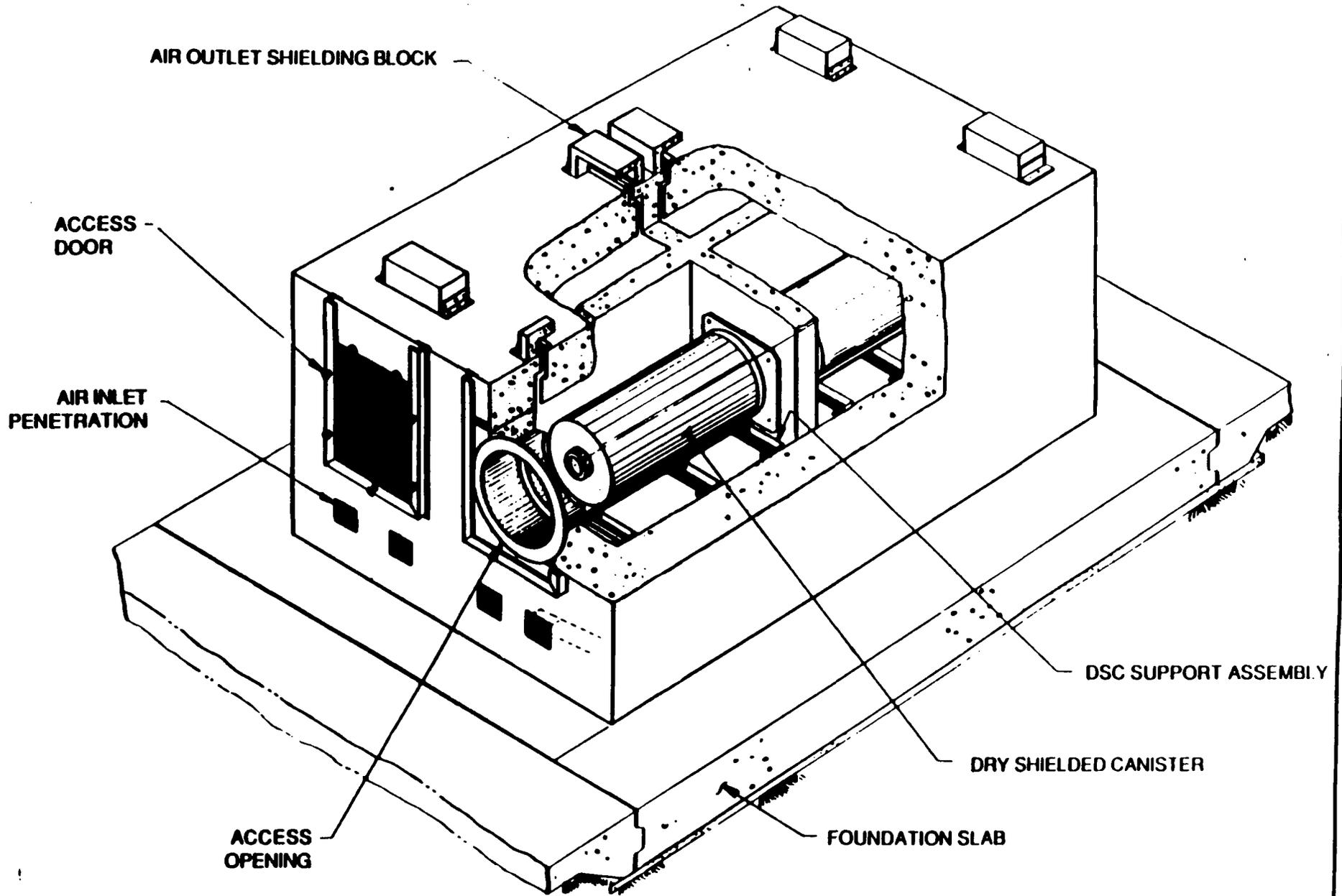


Figure 1.3-1a

NUHOMS-24P HORIZONTAL STORAGE MODULE COMPONENTS

LICENSE APPLICATIONS

<u>SITE</u>	<u>RECEIPT</u>
OCONEE (DPC)	4/88
CALVERT CLIFFS (BG&E)	1/89
ROBINSON 2 (CP&L)	EARLY 89
BRUNSWICK (CP&L)	EARLY 89
PALISADES (CP)	1989
SEQUOYAH (TVA)	1992

## PERMANENT DISPOSAL CONSIDERATIONS

### 0 WASTE FORM

- FUEL ASSEMBLIES
- FUEL RODS
- EFFECTIVE USE OF REPOSITORY  
SPACE (70,000 MTHM AT YUCCA MTN.)

### 0 THERMAL LOADING

- CONTROL OF CORROSION/REACTION
- WASTE PACKAGE
- GEOLOGIC MATERIALS

### 0 SUBSTANTIALLY COMPLETE CONTAINMENT

- FUNDAMENTAL ASSURANCE OF  
SAFE DISPOSAL
- PACKAGE MATERIALS
- PACKAGE DESIGN

### CONSOLIDATION COMPARISON

- 0 AT REACTOR
  - DONE IN OPEN POOL UNDER WATER
  - 2 INTO 1.1
  - UNSEALED FOR COOLING
  - CANISTER SHAPED LIKE FUEL ASSEMBLY TO FIT POOL RACK
  
- 0 AT REPOSITORY/MRS
  - DONE IN HOT CELL
  - ABOUT 12 INTO 1.1 (LARGE)
  - SEALED FOR DISPOSAL PACKAGE
  - PACKAGE DESIGN AND MATERIALS OPTIMIZED FOR DISPOSAL CONTAINMENT

CANDIDATE MATERIALS FOR  
HLW DISPOSAL PACKAGE

- 0 TYPE 304L STAINLESS STEEL
- 0 TYPE 316L STAINLESS STEEL
- 0 IRON-NICKEL ALLOY 825
- 0 CDA 102 (OXYGEN-FREE, HIGH  
CONDUCTIVITY COPPER)
- 0 CDA 613 (8% ALUMINUM BRONZE)
- 0 CDA 715 (70 CU-30NI)

STAFF ANALYSIS OF TWO ALTERNATIVES

- 0 BASED ON OCONEE APPLICATION
- 0 3 PLANTS/2112 PWR ASSEMBLIES
- 0 10 YEAR COOLED FUEL, STORED  
FOR 20 YEARS
- 0 IF-300 SHIPPING CASK
- 0 RISK BASED ON NUREG-0612 (GI A-36)
- 0 NUHOMS-7 ASSUMED SHIPPABLE
- 0 NUHOMS-24P ASSUMED UNSHIPABLE

RESULTS	SHIPPABLE CANISTER	UNSHIPPABLE CANISTER
	<u>NUHOMS-7</u>	<u>NUHOMS24P</u>
DOSE	532 MAN-REM	204 MAN-REM
RISK (P 6.25 REM)	$2 \times 10^{-6}$	$3 \times 10^{-6}$
COST	\$58M	\$34M

## CONCLUSIONS

- 0 MOST SPENT FUEL WILL TRAVEL FROM REACTOR POOLS TO REPOSITORY/MRS
- 0 FUEL VARIETY AND SITE VARIETY DICTATE CASK VARIETY
- 0 ONLY MODEST SAFETY/ALARA BENEFITS AVAILABLE IN DRY STORAGE OPTIONS
- 0 FINAL DISPOSAL CASK WILL PROBABLY BE REPOSITORY-SPECIFIC, RELIABLE COMPLETE CONTAINMENT AT STAKE
- 0 NRC SHOULD REVIEW VARIETY OF CASK DESIGNS - AS COMPATIBLE AS REASONABLY ACHIEVABLE

## RANGE OF FUTURE ACTIONS

### RULEMAKING

- 0 PART 71 - TRANSPORT CERTIFICATION
- 0 PART 72 - SEPARATE STORAGE LICENSING
  - COVERS MRS ALSO
  - REVISION FOR GENERAL LICENSE AT REACTORS IN PROCESS
- 0 PART 60 - HLW DISPOSAL

### LICENSING

- 0 DUKE POWER COMPANY - OCONEE
- 0 CP&L - H. B. ROBINSON, BRUNSWICK