ORIGINAL

OFFICIAL TRANSCRIPT
PROCEEDINGS BEFORE

NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

DKT/CASE NO. 50-537

TITLE UNITED STATES DEPARTMENT OF ENERGY
PROJECT MANAGEMENT CORPORATION - TENNESSEE VALLEY AUTHORITY (Clinch River Breeder Reactor)

PLACE Bethesda, Maryland

DATE January 4, 1983

PAGES 6732 thru 6912

TR01

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440 FIRST STREET, N.W.
WASHINGTON, D.C. 20001

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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ATOMIC SAFETY AND LICENSING BOARD

In the Matter of:	
UNITED STATES DEPARTMENT OF ENERGY	
PROJECT MANAGEMENT CORPORATION	Docket No. 50-537
TENNESSEE VALLEY AUTHORITY	
(Clinch River Breeder Reactor Plant)	

5th Floor Conference Room

4350 East-West Highway

Bethesda, Maryland

Tuesday, January 4, 1983

The hearing in the above-entitled matter was convened, pursuant to notice, at 9:05 a.m.

BEFORE:

MARSHALL E. MILLER, Chairman

GUSTAVE E. LINENBERGER, JR., Member

CADET HAND, Member

APPEARANCES:

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ELDON GREENBERG, Esq.

THOMAS B. COCHRAN

APPEARANCES: (Continued)

On behalf of the Nuclear Regulatory Commission:

DANIEL SWANSON, Esq.

ROBERT DUBE, Esq.

U.S. Nuclear Regulatory Commission

Washington, D.C. 20555

C O N T E N T S

C O N T E N T (cont'd)

PROCEEDINGS

JUDGE MILLER: Good morning, ladies and gentlemen. We are resuming the closing arguments in the Clinch River matter. I think that we have covered Roman numerals I and II and that we are now therefore ready to start on Roman numeral III, which is a portion or all of contention 5.B; is that correct?

MR. EDGAR: There was one other modification that the parties had agreed upon. Mr. Greenberg has a trial commitment and we have no objection to taking what is item VI, contention 4 and 6.B.4, safeguards, on the front end to accommodate his schedule.

(Discussion off the record.)

JUDGE MILLER: We have no objection, of course, to the parties by agreement changing the order of the argument. As I understand, we are going into Roman numeral VI, which involves contention 4 and 6.B.4, dealing with safeguards. You wish to start with that first, all right.

MR. EDGAR: In regard to --

JUDGE MILLER: Well, I guess we should have the record show those present here today. It might not be quite the same as we've had on other days.

MR. EDGAR: George Edgar, attorney for Project Management, speaking for the Applicants.

MR. LUCK: William Luck, Department of Energy.

MR. VIGLUICCI: Ed Vigluicci, Tennessee Valley Authority.

MS. FINAMORE: Barbara Finamore for Intervenors, Natural Resources Defense Council and the Sierra Club.

MR. GREENBERG: Eldon Greenberg for Intervenors, Natural Resources Defense Council and the Sierra Club.

MR. COCHRAN: Thomas B. Cochran with the Intervenors.

MR. SWANSON: Daniel T. Swanson, counsel for Staff. And with me for the first issue at the counsel table is Mr. Robert Dube.

JUDGE MILLER: Is there anyone else now who should be identified for the record, who is present and intends to participate in any fashion?

(No response.)

JUDGE MILLER: All right. You may proceed, Mr. Edgar.

ORAL ARGUMENT OF GEORGE EDGAR, ESQ.,
ON BEHALF OF APPLICANT,
PROJECT MANAGEMENT CORPORATION

MR. EDGAR: In terms of the safeguards

contention, in our judgment the basic issue is whether the environmental effects of safeguarding CRBRP and its fuel cycle facilities have been adequately analyzed. This broad question in turn breaks down into two subissues.

The first can be expressed as, is it feasible to design a safeguards system for CRBR and its fuel cycle facilities such that the risk of theft and sabotage can be made acceptably low. The second element of that broad question consists of the following: what are the costs of such systems?

Turn to issue one, that is the feasibility of designing the system. It should be noted by way of introduction that both CRBRP and its fuel cycle facilities can and will draw on the latest methods and technology for designing safeguards systems through the overall DOE safeguards program. The reference here would be Applicants' Exhibit 39, TR. 3479 through '96.

There are three basic elements to the safeguards program which are of importance here. The first is the program involving threat assessment; the second, the program involving effectiveness evaluation; and the third, the program involving technology development. These elements are discussed in Applicant's Exhibit 39, TR. 3480 through '89.

Through application of these programs to CRBR and the fuel cycle facilities, the Applicants can show and have shown in this record that the safeguards risk for CRBR and its supporting fuel cycle facility are extremely small.

To consider how these programs are and have been applied and will be applied at CRBR first and then the fuel cycle facilities, let us first consider CRBR. The initial point of reference for consideration of safeguards risk at CRBR, particularly in terms of theft or potential theft of material, must consider the inherent plant design characteristics, in particular consider the fuel handling system as described in Exhibit 39 at TR. 3497 through '54.

The theft of fuel at CRBRP, that is fresh fuel, is highly unlikely even without regard for the physical security system. The fresh fuel is first delivered in 3,000-pound containers. Once delivered and received in the facility, the fresh fuel will be stored in molten sodium at temperatures between 400 and 500 degrees Fahrenheit.

Each fuel assembly itself weighs more than 400 pounds. The assemblies are intact during their entire lifetime in the plant and require remote handling through sophisticated computer systems to obtain

access.

If one examines the paths for fresh fuel within the facility, it is readily apparent that even without regard for specific systems for safeguards, that there is a high degree of inherent protection against theft within the Clinch River plant. The reference for those discussions would be contained at TR. 3493 through 3500.

As for irradiated fuel, the irradiated fuel is both radiologically and thermally hot. And as Intervenors have conceded, it is an extremely unattractive theft target. See TR. 3252.

Notwithstanding this, CRBR will have and has a preliminary design for a physical security system that will meet all NRC requirements. See Staff Exhibit 10, TR. 3738.

In addition, during the past several years and continuing into the future this safety system will undergo a continuing review to assure its effectiveness. See TR. 3467 through '69.

It should not go unnoticed by this Board that this plant has undergone a series of detailed analytical programs to consider the safeguards system and to evaluate its effectiveness without regard for the NRC regulations. It is not being designed merely to meet

the NRC regulations, but rather it is being designed as an effective system, and then in addition compliance with NRC regulations is assured.

Based on this, that is the physical security system and the inherent protection provided for fresh fuel within the plant, it is clear that theft is a highly unlikely event and that the risk of theft within the CRBRP is extremely low. See Applicant's Exhibit 39 at 3500 through -- and 3251, Staff Exhibit 10, TR. 3742 through '43.

After considering theft, one should also consider sabotage at CRBRP. As with theft and due to the plant design, and without regard for the security system, initiation of a transient and a resultant severe accident requires manipulation of complex electronic equipment, and any mistake by a would-be saboteur would result in scram shutdown of the reactor and placement of the reactor in a safe condition. See TR. 3505, TR. 3444 through '45.

It is not only the case that automatic equipment would deter the saboteur, but in addition any saboteur would have to manipulate equipment at two or more locations within the plant in close proximity in time. See TR. 3283 through '84.

The CRBRP safeguards system, aside from the

inherent protection afforded by plant systems, provides an effective additional overlay on the plant inherent features to ensure that the risks associated with safeguarding CRBRP against sabotage are extremely low. CRBR has undergone and has continuing at least four detailed analyses of the safeguards system in terms of sabotage. These have included black-hatting exercises by safeguards experts and fault tree analyses. See TR. 3506 through 3510.

The plant itself is built such that the individual components are housed in reinforced concrete cells which are subject to an inerted atmosphere. The compartmentalization within the plant itself eliminates in major part the prospects of access by a would-be saboteur to two or more locations within the plant. Even then, the plant is broken into the four classes of areas contemplated by the NRC regulations, each of which has increasingly more stringent layers of safeguards.

Vital areas in particular, which are the most sensitive areas within the plant, have the highest degree of security measures, because those areas have equipment important to safety. And it should not go unnoticed in the record that no one has unlimited or uncontrolled access to vital areas within the plant. Computer systems for keycard access and controls will

assure that access will be strictly limited to those who have a need to be in the area and that that access is controlled. See TR. 3518 through '19.

The plant security system uses the most advanced proven safeguards technology which is available today. This includes sophisticated communications systems, access control systems, perimeter alarm systems and the like. See TR. 3516 through 3521.

In addition, this system has been designed with flexibility to allow changes which may be needed because of future changes in perception of the threat or advances in technology. This system is modular in concept, that is, it can be modified by changing elements of software if there is a need which arises from future analyses.

The project did experience the fact that after performing vulnerability analyses and fault tree analyses, the experience taught that any changes which were warranted as a result of those analyses were indeed changes in software. They may, for example, have been in the interlock or a circuit which would preclude certain elements of vulnerability within the plant.

The significant fact about the software changes is that their cost is rather small. One does not have to consider major changes in the layout of the

plant or in the concept of the plant design by virtue of safeguards. See TR. 3522 through '33.

Lastly but by no means a less important matter, the Applicants are firmly committed to implement effective statements at CRBRP. The Applicants have already gone beyond the regulations. The Applicants intend to continue their programs in place to ensure an effective system, and there is a total management commitment to that end. See TR. 3451 through '52.

Finally, the cost of CRBR safeguards. Having shown that the risk of CRBR safeguards are low, what are the economic costs? Are they significant? Are they so large that they will affect the cost-benefit balance for this plant?

The capital costs for CRBR safeguards have been estimated at $3.8 million, while the operating costs are estimated at only $2.5 million per year. I say "only" because that should be compared in context to the $3.2 billion cost of the plant.

As previously indicated, any future changes in requirements would not contemplate major items of expense. Rather, we are speaking at this stage of software changes which are of relatively modest cost. See TR. 3523 through '24.

In conclusion, as to the Clinch River breeder

reactor plant, it is clear on this record that the risk of theft and sabotage is extremely low. The costs are a small percentage of total plant costs. We believe, therefore, that the Board can and should make affirmative findings that the risks of safeguarding CRBRP are acceptably low.

Turning now to the supporting fuel cycle, the first item of reference is that all fuel cycle facilities will in fact be DOE Government-owned facilities subject to DOE safeguards. There are three types of facilities or activities of interest in regards to safeguards in the fuel cycle.

The first involves fuel fabrication. This will be accomplished at the SAFF line, that is the Secure Automated Fabrication Facility, at Hanford. See TR. 3530 through '32. This facility is now under construction and should be operating in the mid-1980's. Check that. It should be operating within the next three years.

The second facility of importance would be reprocessing. At the present time DOE contemplates reprocessing would be undertaken at a proposed developmental reprocessing facility which has been described in the testimony at 3541. The fuel fabrication facility, I might add, is described at TR.

3530 through '32.

Transportation is planned using the existing DOE transportation system for strategic special nuclear material. See TR. 3532.

It should be emphasized that all of these facilities, that is fuel fabrication and reprocessing, will have both physical security and material control and accounting systems as required by existing DOE orders. See TR. 3309, 3525 through '30, 3541 through 3550.

All of these facilities having safeguards systems in accordance with DOE orders will in fact include requirements and have a level of effectiveness which is comparable to the requirements and level of effectiveness contemplated by NRC regulations. We believe that this will assure that there is an extremely low risk of sabotage or theft within the fuel cycle. See TR. 3627 through '32.

The cost of these statements are indeed, as with the Clinch River breeder reactor plant itself, quite modest. For fuel fabrication initial cost would be $1.5 million, annual cost would be $.8 million per year. For reprocessing the initial cost would be $4.0 million, the annual costs would be $1.1 million. For transportation, as I had previously indicated, there is

an existing system which is operational today. Thus the annual cost which one can attribute to that system would be $.2 million per year.

The pertinent citations for fuel fabrication, reprocessing and transportation respectively are found at TR. 30 -- strike that -- TR. 3532, fuel fabrication; TR. 3551, reprocessing; and TR. 3541 for transportation.

As with the plant itself, DOE is committed as a matter of policy to assuring effective safeguards within the fuel cycle. By virtue of DOE orders which are binding and mandatory upon its facilities, effective safeguards systems will be in place which are comparable to those meeting NRC requirements. See TR. 3455, 3464, 3472, and 3307 through '09.

Thus, on the basis of the affirmative evidence we conclude and we urge the Board to find that the risk and cost of safeguarding fuel cycle facilities is very low, both on an absolute basis and a relative basis. Similarly, the risk and cost of safeguarding CRBRP is low, both absolutely and relatively. The affirmative evidence clearly supports favorable findings as to NRDC contentions 4 and 6.B.4.

Now, let us turn to what we regard as NRDC's central arguments and what might be best characterized

as the major disputed issues raised in the record. There are five of these.

The first involves NRDC's argument that the empirical evidence shows a very significant theft and sabotage threat for CRBRP in its fuel cycle facilities. The second argument involves NRDC's position that the diversion of plutonium from CRBRP in the fuel cycle is "possible." The third involves NRDC's argument that there are shortcomings within the material control accounting systems contemplated for CRBRP in its fuel cycle facilities.

The fourth involves the argument that there are significant civil liberties risks associated with safeguarding CRBRP fuel. And the final argument is that the fuel cycle facilities in question do not yet exist and therefore one cannot validly analyze the risks.

Given these five issues, let us begin with the question of empirical evidence. So the argument goes, the theft and sabotage from CRBRP and its fuel cycle are extremely significant risks, based on a series of incidents which they describe in Dr. Cochran's testimony as "empirical evidence."

Let us just go down this list of incidents and discuss the evidence in the record as a whole as to each of these incidents. The first involved a theft or

diversion, and on the record it is unclear whether it is either or simply material unaccounted for in the statistical sense, at the NUMAC facility in Apollo, Pennsylvania, in the early 1960s.

We do not regard that as any significant evidence. It is certainly not reliable probative evidence of today's threat or risk. At that time safeguards and security were virtually nonexistent within the fuel cycle. See TR. 3800 through 3801.

The next incident involved the possible theft of uranium at the General Electric Wilmington, North Carolina, facility. It should be noted, however, that that facility handles only low-enriched material. It does not handle formula quantities of strategic special nuclear material, including plutonium. See TR. 3801.

The security and statements at that facility are not the same as one would have at CRBRP and its supporting fuel cycle facilities. In fact, the standards for safeguards and security for CRBRP and its fuel cycle facilities are much more stringent than those of a low enriched facility. Thus, this evidence, such as it is, bears no relationship to the issue at hand. See TR. 3801.

The next incident which is cited as empirical evidence involves the VEPCO Surrey reactor. In that

incident several plant workers damaged some fuel, fresh fuel which had been sitting in a storage area. Several points of importance here should be emphasized.

The first is that no release of radioactivity resulted. In fact, radiological sabotage was not intended. The fuel involved was low enriched uranium, which was not stored in a vital area and which was not stored in an area subject to statements. The security system at Surrey was not designed to meet current NRC safeguards requirements and the storage area in question was not subject to those regulations which one would see imposed on Clinch River.

We are not dealing in the Surrey case, again, with strategic quantities and kinds of special nuclear material. Thus, the Surrey incident again provides no empirical evidence suggesting an undue safeguards risk. See TR. 3804 through 3806.

The next incident which is cited as experience or empirical evidence concerns the sabotage of components for an Iraqi reactor while those components were under fabrication in France. The first thing is that that facility was not subject to safeguards. See TR. 3807.

There is no evidence in the record which would suggest that this facility, which is a manufacturing

plant not for fuel but for reactor components, would have security requirements which even approached those contemplated for Clinch River and its fuel cycle.

One, however, must concede, as Dr. Cochran did, that the safeguards and security for that facility were not as stringent as those to be imposed on Clinch River and its fuel cycle. See TR. 3808. What we have here is simply a case of industrial sabotage. It is not radiological sabotage, and it represents no evidence whatsoever which gives any credence to a substantial threat at CRBRP.

The next incident cited as empirical evidence involved an attack by Basque terrorists in Spain on a reactor under construction. It was not an operating plant. There were no safeguards imposed on the facility at the time, and again there was no possibility of radiological release in that instance. We think it is a wild jump of logic to transpose that incident into a finding that there is an undue risk of safeguards threat at CRBRP. See TR. 3808.

The same thing can be said for the attack by terrorists on the Super-Phoenix facility in France. Here again we were dealing with a facility under construction. We are not dealing with breach of safeguards systems. The damage which was incurred was

to the side of a concrete building and there was no breach or significant damage to containment which related to radiological risk. See TR. 3814 through 3816.

Another important point of perspective here is that if one examines these incidents as a whole and one examines the state of the record as to the threat, it should be emphasized that since 1977, after NRC underwent a substantial review and upgrade of its safeguards requirements, there has been only one incident in the U.S. which could be considered a substantial threat to a facility. I use that term advisedly because the incident in question involved placing an explosive device outside a plant and it caused damage to a visitors center off the site.

In fact, the same evidence in the record indicates that since 1977 there is no increase in perception of the threat in regard to domestic reactors. See 3812 through 3813.

On the basis of this evidence, we believe that NRDC's so-called empirical evidence is entitled to no weight whatsoever. It attempts to prove too much, yet it says too little, and indeed fails to support the proposition asserted.

Let's turn now to the second argument, which I

will treat rather briefly. This concerns the NRDC argument that, in addition to the so-called empirical evidence, the point is made that diversion of plutonium from CRBR and its fuel cycle facilities is "possible" in the sense of not being impossible. TR. 3896.

We submit that this information and this evidence is entirely speculative and entitled to no weight whatsoever. This is based on the possibility of a threat from an insider or an outsider. But the statement is made and the evidence is presented without regard to the fact that NRC will require substantial stringent safeguard requirements for CRBR and that DOE will impose similar requirements for the fuel cycle facility. See TR. 3896.

We believe that Intervenors' possibility argument is simply that. It is a hypothetical, it is speculative, and it should be dismissed summarily by the Board.

The next point for consideration by this Board is NRDC's assertion that material control and accounting systems will be inadequate for CRBRP and the supporting fuel cycle facilities. The apparent thrust of this argument is that the material control and accounting systems are not independently sufficient means for detection and prevention of diversion, that the idea is,

well, they've got to be stand-alone.

Well, the fact is that these systems were never intended and are not now intended to perform that stand-alone function. The material control and accounting system --

JUDGE MILLER: Off the record.

(Discussion off the record.)

MR. EDGAR: In regard to MC&A, just to backtrack, the argument is apparently that it's got to be an independently sufficient stand-alone means for detection of diversions. There are several elements of the material control and accounting system which should be clarified here.

The first is that new real time accounting systems which are under development and which will be implemented and proven on CRBR and the supporting fuel cycle facilities have the ability to detect diversion in a matter of hours. See TR. 3339 through 3344.

The normal material control and accounting system refers to a periodic physical inventory. It is not real time accounting per se. That is TR. 3361 through '63.

Material control and accounting and physical security are designed to work together as an integrated system. The information provided through physical

inventories, the information provided through new real time accounting, and the protection afforded by the physical security system must be evaluated as an integrated whole. Each has a role to play, and there is no contention advanced by either the Staff or the Applicants that each in and of itself is independently sufficient. See TR. 3363 and TR. 3695.

We believe, therefore, that the Board should consider material control and accounting systems in that context, in the real physical sense of how they will be implemented and find that those systems are not only available, feasible and effective in context, but in addition that the availability of near real-time accounting will provide a significant additional layer of detection to reduce safeguards risks.

The next point raised by NRDC concerns the so-called risk that one could attribute to civil liberties violations in the context of CRBR safeguards and security risks. As we understand it NRDC's argument is that if fuel or material were diverted from the Clinch River fuel cycle, one could have warrantless search, one could have no-knock, one could have other civil liberties violations.

That may be the case. It is possible, to use NRDC's phrase. However, we believe that is highly

speculative. Applicants have stated, and Dr. Cochran conceded on cross that this was the case, that this is in fact highly unlikely. See TR. 3838. We do not believe that the Board should base its opinion and the Board should base its findings on the presumption that the laws of the United States will be violated.

We believe that this is a nation of laws, that such laws as exist will be enforced, and that this Board need not go beyond that and assume that the laws will be violated in evaluating safeguards risks.

The final point concern's NRDC's argument that the fuel cycle facilities for Clinch River are not now in existence, and for that reason one cannot perform a valid analysis. The first answer to that is that the transportation system is in existence. The second answer is that the fabrication facility is now under construction and will be completed in the near future.

As for the reprocessing facility, that seems to be the bone of contention. However, the Applicant's analyses assume that the developmental reprocessing facility would be in place. See TR. 3495.

It should also be recognized that the alternative facilities to DRP can be easily upgraded as necessary to meet the DOE orders and to provide statements which are equivalent to those of NRC, and

that DOE is committed to that end. See TR. 3495 and TR. 3680.

It should also be recognized that any alternative facilities to DRP can be easily upgraded as necessary to meet the DOE orders, and to provide safeguards which are equivalent to those of NRC, and that DOE is committed to that end. See TR. 3495 and TR. 3680.

In summary, as to each of NRDC's arguments, the empirical evidence that the version is possible, the role of material control and accounting, civil liberties, and future facilities, there is simply no reliable, probative evidence in the record in support of those arguments.

On the other hand, and most importantly, applicants have clearly shown by the overwhelming weight of the evidence that costs and risks of safeguarding CRBR in its fuel cycle are extremely small.

JUDGE MILLER: I think we have asked the staff and the intervenors to alternate in following and hence in closing, in the closing arguments. Whose turn is it?

MR. SWANSON: I think it is the staff's turn to go first.

JUDGE MILLER: You may proceed, Mr. Swanson.

ARGUMENT OF DANIEL SWANSON, ESQ.,

ON BEHALF OF THE STAFF,

NUCLEAR REGULATORY COMMISSION

MR. SWANSON: I will continue the practice I followed down in Oak Ridge of not repeating the details that have been stated prior to the staff's argument, so I will not get into a description of the safeguards specifics, nor will I address any further the detailed arguments raised by intervenors outside of the specifics of the contention, because I believe they have been addressed already.

I would, however, like to clarify and summarize the staff position with regards to the safeguards issue. Now, the basic issue raised in Contention 4 and 6-B-4 can be summarized in terms of the staff's position in terms of an argument that the staff has not adequately analyzed in its environmental impact statement and the supplement the environmental impacts of acts of sabotage or theft directed against Clinch River and its related fuel cycle.

The staff position is set forth in the prefiled written testimony of Mr. Dooby and others -- that is Staff Exhibit 10 -- and in Appendix E of the staff's final environmental supplement, statement supplement -- that is Staff Exhibit 8. The staff position is that it believes that the consequences of successful acts of sabotage or theft could be severe.

That point is conceded by the staff in its Exhibit 10, at Page 5. That is Transcript Page 3,737.

As a consequence, the staff has addressed this environmental impact by conducting an analysis to determine that the applicants have committed to a safeguards system which is sufficient to provide reasonable assurance that acts of sabotage or theft will not be successful.

The staff, as is detailed in its Exhibit 10, and in the final environmental statement supplement, Exhibit 8, Appendix E, concluded that there is reasonable assurance that the applicant's safeguards sysetm will be effective in protecting against theft and sabotage, and that the environmental effects of possible theft and sabotage have therefore been adequately addressed by the applicants and reasonably assessed by the staff for the purposes of its NEPA review.

This conclusion is set forth in greater detail at Transcript Pages 3,744 through 3,746.

In looking at the appropriateness of the staff's approach, it is helpful to begin by looking at the staff's analysis premise, which is that safeguards which meet the NRC design basis threats and other NRC regulations and standards are adequate to effectively prevent theft, and to protect against sabotage, and

thereby successfully addressing the environmental impact of such acts.

The staff position is that to argue otherwise would be to challenge the regulations. The design basis threat is defined in 10 CFR Section 73.1, Section (a), and this is discussed further in staff testimony at Transcript Pages 3,573 and 3,582 through 83.

A system is in effect to continually review the design basis threat, and related to address and assimilate information and to semiannually determine the adequacy of the design basis threat. This is discussed at Transcript Pages 3,849 through 59.

And finally, regulatory mechanisms are available to respond as quickly as is necessary in the event that the perceived threat would change. This is discussed at Transcript Pages 3,849 through 59.

For an environmental review, and in particular for an environmental report for which another agency such as DOE has primary responsibility, and this would now address the fuel cycle facilities not regulated by NRC, the staff need only conclude that there is reasonable assurance that DOE's assessment of impacts is reasonable. The staff does not have to conduct a crystal ball inquiry into this type of an analysis, but merely assure itself by taking a hard look that this

reasonable assurance exists.

Support for this conclusion can be found in the D.C. Circuit Court case of NRDC versus Morton. That is 458 Fed 2nd 827, and specifically at Pages 834 through 838. For Clinch River, which is required to meet regulations, NRC regulations, a detailed review of the safeguards and security plans is not required until the operating license stage.

Therefore, the staff's analysis of Clinch River appropriately conducted a systems level analysis to determine and provide the requisite reasonable assurance for the staff to be able to conclude that the applicant's safeguards system will be effective in protecting against theft and sabotage. This is discussed in the staff testimony at Transcript Page 3,739, and the regulatory support for that conclusion can be found at 10 CFR Section 50.34(c) and (d).

The details of the staff methodology for the environmental analysis appear at Pages E-1 through E-4 of Appendix E to the FES supplement. That is Staff Exhibit 8. And it is also described in Pages 6 through 8 of the staff testimony. That is Transcript Pages 3,738 through 3,740, as well as at Transcript Page 3,682.

Turning again to the balance of the fuel

cycle, that is, those portions of the fuel cycle not subject to NRC safeguards requirements, the staff concluded that DOE 1976/1978 threat guidance which applied to those facilities is comparable to NRC threat levels, and will provide comparable protection to NRC requirements. This is discussed at Transcript Pages 3,627 through 3,642.

The staff's analysis also resulted in a conclusion that the impacts, both dollar and other environmental costs of the preventive systems proposed would be negligible. This can be found in staff testimony at Transcript Page 3,740.

With respect to subpart D of Contention 4, which addresses the Clinch River plant itself, the staff specifically addressed the issue of sabotage initiated accidents. The staff concluded that sabotage could initiate an accident, but that the NRC regulations, and specifically 10 CFR Section 73.55, are specifically designed to ensure that compliance with the regulations will provide the requisite assurance that sabotage threats can be deterred. This is discussed at Transcript Page 3,745.

Since Clinch River will be required to meet that regulation and other safeguards regulations, the environmental effect discussed is therefore adequately

addressed.

Turning to some of the other specific issues raised in those contentions, I will turn first to the clandestine fission explosives and dispersal devices argument raised by intervenor, or concern raised by intervenors. In conducting its analysis, the staff, in order to be conservative, has not allowed any credit for the difficulties that a sub-national group may encounter in trying to construct a clandestine fission explosive device, although both the staff and outside experts believe that such difficulties may be substantial.

This is discussed in staff testimony at Transcript Page 3,741, and it was discussed elsewhere in the record at Transcript Pages 3,579 through 3,580, and again at Pages 3,700 through 3,704, and in Staff Exhibit 11.

Thus, this possibility is considered within the context of the staff's assurance that safeguards can adequately prevent the theft of formula quantities of plutonium, and was encompassed within the staff's overall and broader review of that aspect of safeguards.

With respect to dispersal devices, the staff noted, first, that safeguards instituted to prevent theft of nuclear material for use in a clandestine fission explosive device would also provide protection

against theft from manufacture of a dispersal device. This is discussed in staff testimony at Transcript Page 3,741.

Secondly, the staff noted that there are other radiological, chemical, and biological agents which could cause more widespread death and would be more easily obtained. This means that widespread use of plutonium would not significantly increase the risk to the public health and safety from dispersal of toxic materials, since other such materials are already more readily available. This is discussed in greater detail in staff testimony at Transcript Page 3,741, and also at Transcript Pages 3,663 through 3,664.

I will not repeat the arguments that have already been made in response to specific concerns raised by intervenors during the hearing. I think each one has been addressed thus far, and I would simply refer the Board again to the overall conclusions set forth in staff testimony at Transcript Pages 3,744 through 46. That is set forth in greater detail at that transcript location. The staff has concluded that there is reasonable assurance that the applicant's safeguards system will be effective in protecting against theft and sabotage, and that the environmental effects of possible theft and sabotage were adequately addressed by the

applicants and reasonably assessed by the staff in compliance with NEPA, and that the Board should so find in response to intervenor Contentions 4 and 6-B-4.

That concludes the staff's arguments.

JUDGE MILLER: NRDC?

ARGUMENT OF ELDON GREENBERG, ESQ.,
ON BEHALF OF THE NATURAL RESOURCES DEFENSE COUNCIL

MR. GREENBERG: Mr. Chairman, Judge Linenberger, as Mr. Edgar pointed out, the essence of Contentions 4 and 6-B-4 is that neither the staff nor the applicants have adequately analyzed safeguards, risks, and consequences for the Clinch River Breeder Reactor plant and its supporting fuel cycle facilities.

In our judgment, this case presents largely legal issues relating to the proper nature and scope of the analysis which we believe should have been undertaken in this licensing proceeding. There are relatively few factual disputes, although there are some of importance, and I will point them out as I proceed. We believe that the evidence in this matter demonstrates, first, that the use of plutonium in a commercial demonstration plant is a new venture that poses a new and different set of safeguards risks, risks that are greater than those associated with a conventional light/water reactor fuel cycle.

It is undisputed that this is the first plutonium demonstration reactor associated with a power system, a civilian power system. It is the first time that significant quantities of separated plutonium will be used in a power reactor system. The amount used is equal to the amount used in the military fuel cycle in a single year.

It is also, I think, conceded that plutonium can be readily converted into weapons, both clandestine fission explosives and plutonium dispersal devices.

Now, in our judgment, the safeguards, risks, and consequence have not been adequately analyzed, and there are two points of major significance which I will get into in some detail.

First, the three criteria used by the NRC staff to assess the reasonableness of safeguards are in our view insufficient in that they do not provide a high degree of confidence that risks will be acceptably low, and secondly, the staff in conducting its analysis did ot go substantially beyond information contained in applicant's environmental report. It essentially accepted the Department of Energy assertions with respect to the nature and scope particularly of the fuel cycle and risks associated with the fuel cycle, and did not look at other analyses of the DOE programs, did not

take an independent look at R&D efforts or current operations at other DOE facilities.

The effect of the staff's approach is that it cannot properly conclude that risks at the CRBR and its supporting fuel cycle facilities are comparable or no greater than other facilities currently handling special nuclear material.

Our final point is that there is a lack of assurance that the fuel cycle facilities will meet NRC licensing criteria. Now, as a practial matter, how the NRC has proceeded in this matter is to look at DOE regulations to determine if they are as stringent as the NRC's own regulations, and that determination becomes a shorthand for conclusion that there is a low risk associated with the fuel cycle facilities.

Our problem with this approach is that merely undertaking an analysis of the comparability of regulations is not enough, and that there is substantial uncertainty with respect to the actual safeguards programs which may or may not be applied at DOE facilities in the future, particularly those facilities such as a development reprocessing plant, which are not yet in existence.

Now, turning to the nature of this venture, we believe that it is clear that the Clinch River Breeder

Reactor plant and its supporting fuel cycle involves the utilization of materials which pose grave safeguards risks, that there are real threats which exist and which may be directed against those facilities, and that the consequences of a successful theft would be severe in the extreme.

The ultimate conclusion is that contrary to the position taken by the NRC staff in Appendix E of the final environmental statement, that is, Staff Exhibit 8, there are significant risks above those encountered in the conventional light/water reactor fuel cycle.

First of all, in this fuel cycle, we are dealing with plutonium as a fuel. There is no dispute that substantial quantities of plutonium, approximately 1,000 kilograms per year, will be available at the CRBR and other fuel cycle sites. That is found in the transcript at 3,847, 3,892, and 3,893.

The applicants have also conceded that because of the nature of this fuel, the risks of theft are greater than in the conventional LWR fuel cycle. See Transcript 3,434 and 3,435. Indeed, the greater risks associated with plutonium as a fuel are reflected in the stringency of the NRC's own regulations.

It is also true that the amounts of plutonium at issue in this case are unique in the context of

commercial power. If one excludes the fast flux test facility and the weapons program, one simply does not find equivalent quantities of plutonium in use today. See transcript at 3,730, 3,433, 3,437, and 3,440.

There is no dispute in this case that plutonium is weapons usable. Plutonium can be utilized to manufacture explosive devices or dispersal devices, though there is some debate about the difficulty to actually manufacture such devices. However, what is critical for purposes of this proceeding is that the operating assumption which the NRC uses, and that is reflected in the final environmental statement at E-4, is that a CFB could be manufactured from stolen plutonium and could be successful. In other words, we have to operate on the assumption for purposes of analyzing safeguards that it is possible if plutonium were stolen to manufacture a device which would have severe environmental consequences.

There is also no dispute that fresh mox fuel is preferable to anything in a light/water fuel cycle for elicit weapons purposes. See transcript at 3,894 and 3,895. With respect to the consequences of diversion, it is undisputed that a CFE could produce substantial yields, and that the environmental consequences would be severe. See Transcript 3,902 to

3,904.

During the course of testimony at the hearings, NRC staff conceded that the consequences of the use of either a CFE or a plutonium dispersal device are "unacceptable." See transcript at 3,586 and 3,591. Contrary to the statement made by Mr. Swanson, moreover, we do not believe that the record evidence indicates that other materials are more readily available for elicit weapons purposes. We believe the record indicates that there are other materials which are found in this country which might be used for weapons purposes, but the record with respect to the safeguards or physical security surrounding those materials is unclear.

Now, in addition to environmental consequences, there may also be civil liberties consequences associated with the theft or diversion of special nuclear material. Transcript at 3,849, 3,905, and 3,906. I would emphasize in this context that we are not talking about violations of laws. We are talking about civil liberties restrictions which might be imposed on society as a whole or on certain areas of society, consistent with existing law resulting from a discovery of theft of plutonium.

Mr. Edgar has suggested that the threat of

theft or diversion is insignificant or not realistic. I don't intend to run through the list of incidents which Mr. Edgar mentioned this morning. Our point is a simple one. It is that there is a history of attacks on nuclear facilities, albeit not attacks on facilities that are equivalent to the CRBR or its supporting fuel cycle.

Our purpose is to demonstrate that there is a threat to nuclear facilities, and the possibility of that threat cannot be ruled out. Whether attacks have been successful or not in the past, whether they have been directed at one aspect of a facility or another aspect of a facility is in our judgment not relevant, nor is the nature of the security requirements and safeguards at those other facilities.

The question is, are nuclear facilities the kind of facilities which might be subject to a terrorist attack. In our judgment, the evidence indicates that this is the case.

We further believe that because of the use of plutonium at Clinch River, and its supporting fuel cycle, and because of the high visibility of this project, Clinch River and its fuel cycle represent attractive targets to terrorists. See transcript at 3,901 and 3,902.

Now, how do the applicants and the staff go about analyzing the risks, the safeguards risks at Clinch River and its supporting fuel cycle facilities? Let me first focus on the criteria which the staff used. The staff used three basic criteria to look at safeguards, risks, and consequences, and those are set forth in the FES at Page E-1. Essentially, those criteria are whether the safeguards have a potential for deterring theft or diversion, or whether they are likely to detect such theft or diversion, and whether there is reasonable assurance that attempts would be unsuccessful.

Those three criteria were the core of the staff's safeguards analysis. See transcript at 3,644 and 3,645. In contrast to these criteria, both the staff and applicants have stated that their goal, their ultimate goal in the safeguards area is to obtain a high assurance that material would not be diverted or stolen. See applicant's environmental report at Page 5.7-37. The three criteria used, however, do not provide high assurance or high confidence that safeguards will be effective.

Secondly, comparability is at the heart of the staff's analysis. See final environmental statement at E-9. As I mentioned earlier, the basic approach of the

staff was to compare NRC regs with DOE regs in examining fuel cycle facilities. If the DOE regs were comparable to the NRC regs, in essence, that was the end of the staff safeguards analysis for the fuel cycle facility.

In our judgment, NEPA requires something more. This is not just an exercise in licensing the Department of Energy safeguards regulations. It is an exercise that involves the assessment of the risks at DOE fuel cycle facilities. It is undisputed, however, the staff did not go beyond the DOE orders and look at the facilities in detail or the risks which might be directed against those facilities. See transcript at 3,604 and 3,605.

Neither did the staff examine critiques of safeguards at DOE facilities, such as those prepared by the General Accounting Office, and further, the staff did not look at fuel cycle alternatives other than those presented by the Department of Energy. See transcript at 3,605.

In our judgment, this approach was insufficient as a matter of law. Deciding whether DOE regs are comparable to NRC regs is not the same as deciding whether the risks at DOE facilities are comparable to the risks at NRC licensed facilities, and the basic conclusion that risks associated with the CRBR

and its fuel cycle are not greater than other licensed facilities, and that is a conclusion that is contained in the FESS at 1,234, is not supported. While the staff has stated that it has made a comparative analysis -- see FESS at 1,234 -- this analysis is limited in the extreme.

Not only is the comparability analysis of the NRC staff flawed, but the NRC staff did not engage in the kind of searching, independent assessment of DOE's submissions which is required under NEPA. Dr. Cochran in his testimony pointed out the number of areas in which the staff simply accepted DOE assertions with respect to such critical issues as limits of error in material control and accounting. See transcript at 3,911 and 3,912.

In effect, what the staff did was rely upon DOE representations with respect to the nature of the facilities in the DOE fuel cycle and the ability of those facilities to meet safeguard goals. Transcript at 3,601, 3,642 and 43, and 3,684.

We believe that NEPA requires something more, that it requires a hard, independent analysis. That analysis was not undertaken in this case. And we would cite to the Board the cases of Green County versus Federal Power Commission, 455 F 2nd 412, and

Conservation Society of Southern Vermont versus the Federal Highway Administration, 508 F 2nd 927, both Second Circuit cases.

Turning to the last aspect, or rather the penultimate aspect of our differences with the approach taken by the staff and the applicants, let me focus on the assurances with respect to the future safeguards at these supporting fuel cycle facilities.

Mr. Edgar stated quite rightly that the most severe, the most serious bone of contention in this case relates to reprocessing. In our judgment, that really is the Achilles heel of the entire CRBR fuel cycle. What we have proposed for reprocessing in this fuel cycle is a plant which has at this time only a conceptual design, not an actual design. See transcript at 3,387, 3,678, and 3,679.

At this point, the applicants have not quantified goals for inventory differences or errors in inventory balances. See transcript at 3,387. And at the very best, there is substantial uncertainty whether the design goals for this facility can be met. See transcript at 3,379, 3,381, 3,387, and 3,407 to 3,408.

Furthermore, the staff at least conceded that if one considered the entire throughput of the development reprocessing facility, and not just the

contribution of the CRBR, then there is no assurance at this time that two kilogram diversions, that is, diversions of formula quantities of plutonium, could be reliably detected. Transcript at 3,682.

I would add in this context that the development reprocessing plant represents applicant's best case. It is a model reprocessing facility. However, the DRP may never be built. See transcript at 3,389. And when one looks at alternative fuel cycle facilities, there is even greater uncertainty with respect to the ability of those facilities to achieve safeguards goals. See transcript at 3,601, 3,642 to 43, 3,680.

The staff, as we noted earlier, did not look at those alternative fuel cycle facilities, and it admits that the technical capabilities of those facilities are uncertain. See transcript at 3,909. Even with respect to the BRP, if the design goals are to be met, certain research and development programs must be successful. There is no dispute that the measurement capability of the safeguards -- excuse me, of the material control and accounting system at the BRP has not yet been demonstrated. See transcript at 3,417, 3,690 to 91, and the final environmental statement at 12-70.

Whether those measurement capabilities will be demonstrated remains to be seen. Budget contraints may have the needed research. It is impossible to predict with certainty that R&D will in fact pay off, and the Department of Energy must acknowledge that the scope and direction of its entire safeguards research program for reprocessing facilities has been subject to substantial criticism such as that directed against it by the General Accounting Office. See transcript 3,314 and 3,325.

If there are uncertainties with respect to R&D payoff, there are also uncertainties with respect to future compliance by DOE with its own safeguards orders. It was pointed out during the course of the proceedings that there are no specific written assurances that the Department of Energy will incorporate specific items of technology as they are developed at its fuel cycle facilities. See transcript 3,307.

Conceding for purposes of argument that DOE will comply with its own orders, what does that mean? Those orders are general. They do not provide, for example, for incorporation of best available technology. See transcript at 3,308 and 3,309.

Furthermore, under the DOE orders, the

operations office will make the final decisions. See transcript at 3,309. Just what those decisions will be cannot be predicted with any degree of certainty at this point in the licensing process. In fact, what will or will not be incorporated at DOE facilities in the future will depeni very much on who is most persuasive in the budgetary process. See transcript at 3,467, 3,455.

Before concluding, I would like to make one short point with respect to the consideration of costs by both applicants and staff. Concededly, initial investment in operating costs are not enormous numbers in comparison to the overall cost of the CRBR and its supporting fuel cycle facilities. Our point here, however, is that neither applicants nor the staff made any effort to assign costs to certain other aspects of the program.

For example, earlier we mentioned civil liberty restrictions which might be associated with theft or diversion of special nuclear material. There may be civil liberties restrictions associated with safeguarding these plants absent theft or diversion. Our point is that no costs have been assigned to the social consequences of the safeguards programs, nor has any effort been made to assign costs to the environmental consequences of diversion or theft should

diversion or theft be successful.

In conclusion, what we see here is a house of cards built by the applicants and the staff, filled with assumptions with respect to the future which may or may not be proven to be correct. In our judgment, the risks have been understated, and the effectiveness of the safeguards programs have been overstated. We do not believe that the conclusion can reasonably be reached that there is any high assurance today that DOE facilities will be effectively safeguarded, and under NEPA, there is no basis for reaching the conclusion that the benefits outweigh the safeguard costs in this licensing.

JUDGE MILLER: We will take about a ten-minute recess.

(Whereupon, a brief recess was taken.)

JUDGE MILLER: All right. NRDC had concluded, Mr. Greenberg?

MR. GREENBERG: Yes.

JUDGE MILLER: Is there any brief rebuttal by applicants?

REBUTTAL BY GEORGE L. EDGAR, ESQ.,
ON BEHALF OF APPLICANT,
PROJECT MANAGEMENT CORPORATION

MR. EDGAR: Yes. The first point raised in Mr. Greenberg's argument was that the risks associated with safeguarding the Clinch River reactor and its associated fuel cycle is greater than that which one would associate with a light/water reactor fuel cycle. We think that is somewhat beside the point. NRDC has conceded that this risk is reflected in the greater stringency of the applicable NRC and DOE regulations.

We do not believe that this Board can and should evaluate the safeguard risks in a vacuum. It is vitally important to consider the nature of that risk in light of the safeguards which will be provided for Clinch River and its associated fuel cycle.

This brings us to a related point. Counsel characterized our position as that the threat is insignificant or not realistic vis-a-vis the Clinch River plant and the fuel cycle. What we did say was not

that, but rather that the empirical evidence, if you can call it that, advanced by NRDC is simply without merit. It is simply not applicable to the case at hand. What NRDC is arguing here is that the kind of facility in question and the nature of the attack are not important. It is only important, as their argument goes, that the facilities in question are nuclear facilities.

We submit that the mere labeling of a facility as nuclear, we can paste a red label on it, or a green label if it is red, then certainly that is significant. We believe it is important to look behind the superficial assertion that these are nuclear facilities, and ergo the threat is substantial. In fact, NRDC's argument concedes the superficial nature of the evidence advanced.

If one examines below the surface the empirical evidence cited by NRDC, it does not show that there is no risk at all. It rather shows that the evidence in question indicates that the safeguards risks are not so substantial that they cannot be handled and accommodated within the limits of existing technology and existing systems.

The next point that we think is of great importance for this Board's decision relates to NRDC's

argument concerning the assurance of future safeguards. NRDC indicates that because the facilities do not exist because one must project into the future, that one cannot have a high degree of assurance that safeguards will be effect and that the environmental effects associated with the safeguards have been adequately analyzed.

We would suggest as the Board's point of reference that we are not licensing the fuel cycle facilities in this case. We are not going through an in-depth total examination of each facility to be sure that it will meet all applicable licensing requirements. Rather, we are guided here by a rule of reason. There is no need to undertake a crystal ball inquiry. There is no need to foresee the unforeseeable.

Calvert Cliffs and the Morton case clearly indicate that within the ambit of NEPA one can adopt a rule of reason, and one can apply the best tools available to analysis and attempt to reasonably assess the risks and costs associated with safeguards. Significantly, NRDC stated in its argument that they and we and the Board cannot know what DOE will do in the future. It will depend upon who is most persuasive in the budget process, and be that as it may, we believe

that that goes far beyond the range of reasonable inquiry within the rule of reason, and under NEPA.

We believe that the risks and the costs and the environmental effects of safeguards for Clinch River and its fuel cycle have been within the limits of human understanding reasonably estimated and reasonably stated.

JUDGE MILLER: We now proceed to Woods' next cluster of contentions.

MR. EDGAR: I believe we would go to Contention 5 Baker.

JUDGE MILLER: Which roman numeral?

MR. EDGAR: That would be subject area III. And by my count, we have completed I, II, and VI as of this time.

JUDGE MILLER: All right, Mr. Edgar. When you are ready, you may proceed.

ARGUMENT OF GEORGE L. EDGAR, JR.,
ON BEHALF OF APPLICANT,
PROJECT MANAGEMENT CORPORATION

MR. EDGAR: Contention 5-B relates to the effects of Clinch River operations and the risks posed by Clinch River operations to nearby industrial facilities. In particular, the contention attempts to make the argument that evacuation of Y-12, the gaseous

diffusion plant, and the Oak Ridge National Laboratory would result in unacceptable risk to the national security and to the national energy supply.

It is our position that the risks, such as they are, to those facilities have been shown by an overwhelming weight of the evidence in the record to be low and acceptable in terms of national energy supply and national security.

There are two important points of evidence on the affirmative side in this case which we commend to the Board's attention. The first is applicant's direct testimony concerning Contention 5-B. That is Applicant's Exhibit 47. The second is Staff Exhibit 18, the staff's direct testimony on the same subject.

Related testimony which has a bearing on the analysis in Applicant's Exhibit 47 and Staff's Exhibit 18 are found in Applicant's Exhibit 46 and Applicant's Exhibit 17 respectively. Let's consider in sequence the state of the record and the analysis which has been presented in regard to the effects on the Oak Ridge National Laboratory first, and then second turn to consider the effects on Y-12 and the Oak Ridge gaseous diffusion plant, otherwise known in shorthand as K-25.

As to ORNL, the record clearly shows that there would be no effect either in the short term or

long term if evacuation were required, in terms of either national security or national energy supply. The citations which are of importance here are Applicant's Exhibit 47 at 4, TR. 5,424, the Staff's Exhibit 18 at 4 and at 15, TR. 5,686, 5,697.

In addition, consider TR. 5,197 and TR. 5,272 through 3. We do not believe that there is any serious dispute, nor is there any information or evidence to the contrary in the record that there is no significant effect on ORNL or effect if ORNL were evacuated.

Turning now to Y-12 and K-25, there are two levels of analysis which the applicants performed which are of importance to assessment of these risks. The first level of analysis considered the effects on the nearby facilities, Y-12 and K-25, assuming a release of fission products from the core to the containment in amounts as defined by the so-called site suitability source term.

The site suitability source term is an extremely important point of reference here, because in our judgment -- and our basis for that is found primarily in Applicant's Exhibit 1 -- the site suitability source term produces consequences which bound the consequences of design basis accidents, that the site suitability source term represents under 10 CFR

.11A, Footnote 1, a release of fission products which results in hazards not exceeded by any accident considered credible.

Using conservative meteorology for that calculation, it is seen through Applicant's Exhibit 47 at 5 through 6, and at TR. 5,425 through 6, that the doses at the Oak Ridge gaseous diffusion plant from the site suitability source term would be well below existing DOE standards for occupational exposure. Evacuation, if it were required at all, would consist merely of evacuating non-essential personnel.

However, if that occurred, production would continue, that one can operate the facility with a reduced staff on a mode of recycling the material. See Applicant's Exhibit 47 at 7 through 8 and TR. 5,427 through 8.

Thus, if one examines the condition at the Oak Ridge gaseous diffusion plant in light of an accident which is more severe than any accident considered credible, the bottom line is that there is essentially no risk to national energy supply.

Consider now the effects at Y-12. Y-12 is located at a greater distance from the Clinch River plant than is the Oak Ridge gaseous diffusion plant. As with the site suitability source term analysis for the

diffusion plant, at Y-12, one would find doses which are even smaller fractions of DOE occupational standards, and even a short term evacuation which might be undertaken for non-essential personnel out of an abundance of caution should not be necessary.

If there was a short term evacuation, it would be extremely limited, and there would be no impact on production schedules. See Applicant's Exhibit 47 at 9 through 10, TR. 5,429 through 30. See Staff Exhibit 18 at 7, TR. 5,689.

Now, having established that point of reference, that the risks of an accident which are more credible or which are more serious than any accident considered credible for the Clinch River plant are quite small and indeed would not result in evacuation of any significant moment for either the diffusion plant or Y-12, both staff and the applicants went beyond that point to consider what the effects would be on those plants if one had an accident which is even more severe. That is, if one had an event which went well beyond the design basis for the facility.

The applicants, and the relevant citation here is Applicant's Exhibit 46 at 37, TR. 5,413, also Applicant's Exhibit 46 at 39, TR. 5,415, the applicants have analyzed four HCDA cases which vary in severity and

vary in terms of the assumptions made regarding primary system leakage and failure of equipment. The applicants chose for the purposes of analysis their CDA Case Two, which resulted in the highest releases and the highest doses at the facilities in question.

From a functional standpoint, Applicant's Case Two is similar in terms of its mechanics to the staff's HCDA Class 1, which is found in Appendix J, Staff Exhibit 8, Table G-2.

Now, it is important to put in perspective what these cases assume. The staff has analyzed several more severe CDA cases. This would be Classes 2, 3, and 4. But let's examine what is involved in CDA Classes 2, 3, and 4, and this is expressed in Appendix J of Staff Exhibit 8. For the Clinch River Breeder Reactor, in order to get to a Class 2, 3, or 4, what has to happen is that all features within the design basis fail. That is, the reactor shutdown system, the shutdown heat removal system, features for preventing primary system pipe breaks and features for preventing fuel failure propagation.

Assuming that to be the case, then one must have a failure of all containment safeguards systems. Now, that does not end the matter, because, unlike any reactor with which one can associate existing

experience, Clinch River has an additional set of features to those found in conventional containment safeguards, the so-called third level, the thermal margin design basis and structural margin beyond design basis features.

These features provide an additional set of safeguards to control releases and to control containment integrity in the event of an accident beyond the design basis. Among these one would include a filtration or cleanup system for the containment and an associated vent, also an annulus cooling system. The plant thus has the capability so that if everything failed and one found oneself beyond the design basis, and there was a substantial release within containment, the plant has the capability to vent that containment through a cleanup system and thus control containment integrity and, significantly here, control radiological effects.

Now, how does this all go into the analysis? Well, in order for a CDA to be more severe than applicant's Case Two or the staff's Class 1 CDA, one must assume that not only is the design basis exceeded, not only are all design basis containment safeguards defeated, but in addition the third level additional features for beyond design basis events are not

available.

I will return and address the significance of that extremely improbable series of events in terms of the risk, but first, consider what the effects are at Y-12 of the Class 2 CDA or the Case 2 CDA as calculated by applicants at Exhibit 47 at 11 through 14, at TR. 5,431 through 4. The effect here that under these conditions one might have a short-term evacuation of non-essential personnel for the first few days of an initial release, the doses would be quite similar to those calculated for the site suitability source term case. No long-term evacuation would be required, and there would be no significant impact on production.

In terms of K-25, again, that would be a short-term evacuation of non-essential personnel, and no long-term evacuation would be required, and there would be no impact on production. Hence, as to both Y-12 and K-25, there is no effect on national security or national energy supply. In regards to K-25, the relevant citations are Applicant's Exhibit 47, 11 through 14, TR. 5,431 through 4, also Staff Exhibit 18 at 4, TR. 5,686.

The applicants believe that a long-term shutdown of Y-12 would be undesirable. There is a "possibility," to coin a popular phrase, of more severe

consequences than those associated with the HCDA Case Two analyzed by applicants. However, one cannot stop there. There are some very important points of perspective on that analysis.

The first thing that the doses calculated for the CDA Case Two, which is a beyond design basis event, represent small fractions of the allowable occupational doses. This is found at Applicant's Exhibit 47, at 8, 11, 13 through 15, TR. 5,428, 31, and 33 through 5. The point here is that there is a large margin to spare in terms of consequences, that there is, in doing a realistic environmental analysis, nevertheless a wide margin between the occupational standards and the expected dose.

Now, I mentioned earlier the effect of assuming failures of the design basis features, the containment and in addition the third level beyond design basis features. More serious consequences than the HCDA Class 2 or Case 2 assume failure of the beyond design basis features. The significant fact here is that if one looks at the staff's cases in Table J-2 in Staff Exhibit 8, Appendix J, and if one looks at the probability and consequences of going from their Class 1 up through Classes 2, 3, and 4, one does see an ascending level of consequences.

However, by the same token, the probability of those events goes down. If one multiplies the probability times the consequences for each such event, one sees an interesting pattern in terms of the risk. The risk is indeed flat. One does not see an increase in probability times consequences as one goes from Class 1 all the way up to Class 4. See Applicant's Exhibit 46 at 38, TR. 5,413, see Staff Witness Sopher at TR. 5,664.

We believe that the overall risk of HCDA's is low for the Clinch River Breeder Reactor. See the staff's Appendix J to Staff Exhibit 8. Because of this, the risk to Y-12 from a prolonged shutdown is also low. Notwithstanding that, from a programmatic standpoint, this risk is acceptable to DOE. See Applicant's Witness Hibitz, TR. 5,274.

In summary, the applicant's position can be simply stated as follows, that under the most reasonable frame of reference for analysis of environmental risk, that is, the site suitability source term, that there will be no effect whatever on national security or national energy supply. If one as a matter of prudence goes beyond that reasonable standard to consider the effect of more severe accidents beyond the design basis, the fact remains that the risk is nevertheless acceptable, and indeed we believe that the Board should

make and can make affirmative findings as to Contention 5-B.

That concludes our affirmative argument.

JUDGE MILLER: NRDC? Mr. Cochran?

ARGUMENT OF THOMAS B. COCHRAN, ESQ.,
ON BEHALF OF NATURAL RESOURCES DEFENSE COUNCIL

MR. COCHRAN: There are two major areas on which the Board should focus with respect to Contention 5-B. The first of these is whether there is a national security risk or implications from a CDA at the Clinch River reactor due to the proximity of Y-12, and whether these risks have been adequately addressed, and the second major aspect that we ask you to focus on is the implications of both staff and applicant's analysis of Contention 5-B of CDA's, the implications this has on our other contentions, namely, 1, 2, and 3.

Now, with regard to the first of these two aspects, the national security aspect, staff and applicants both agree or at least the applicants agree, and I believe the staff does also, but in any case, they have not disputed it, that Y-12 is vital to national security. TR. 5,243, Hibbitz. Applicants have also said that the consequences of long-term evacuation of Y-12 would be unacceptable. TR. 5,193, Hibbitz. Staff did not know what the impact of evacuation would be.

TR. 5,657, 5,667, Thadani. Both staff and applicants assert the risks are acceptably low because the probabilities are so low, and that is TR. 5,274, Hibbitz, and TR. 5,668 to 69, Sopher.

I will return to that point subsequently, because in both cases the staff and applicants are relying on the validity of the Appendix J analysis of probabilities to make that claim. I believe you just heard Mr. Edgar make that claim himself.

The applicant's claim that evacuation would only be for a short term, during a short duration of the release and curtailment of operations would not significantly impact production schedules. That is TR. 5,429 to 30. No impact if there were a two-week evacuation. There would be some impact but the applicants didn't know the magnitude of the impact if the evacuation were for six months. That is at TR. 5,244 to 45, Hibbitz.

I should note in passing that the staff has a different definition of short and long. Short-term to the staff means perhaps hours or perhaps a few days. Long-term means many days or months. TR. 5,662, Sopher. So one must be careful in jumping back and forth between their conclusions with regard to long and short-term. The applicants have calculated dose and

gram contamination levels at Y-12 associated with a CDA. TR. 5,433 to 35.

And I would point out that they did not do any sensitivity analysis. They simply provided you one sort of set of numbers, one for the source term, the site suitability source term calculation, one for the HCDA. They reduced the PU definition by a factor of approximately 100 using some new gas parging assumption from what they would have gotten had the applicant used their analysis in their evidence in the first week of hearings with respect to Contentions 1, 2, and 3.

They didn't look at wet deposition or rainfall. That is TR. 5,233 to 34. They didn't consider more energetic CDA's or containment failures, and as Mr. Edgar noted, they used HCDA Class 2. That is at TR. 5,234. They didn't use plutonium from recycled LWR fuel, which is another issue of disagreement. That is at TR. 5,236 to 37, 5,163 to 65, Hibbitz and Strawbridge. They used applicant's filter efficiencies, which are much less conservative than staff's by a factor of 14 or so. This is the difference in the numbers you get between the staff and applicant's analyses due to filter efficiencies and to some extent meteorology.

They didn't consider doses and releases with

respect to ground deposition beyond seven days. That is at TR. 5,210, 5,433. And the reason I bring all of these to your attention is that the plutonium deposition or ground contamination levels that they report in their single value have a large uncertainty associated with them. There is a factor of four with respect to the fuel, a factor of 60 to 80 with respect to containment failure, whether or not it is included. You can see that from the Appendix J numbers. A factor of 100 with regarding to sparging, some unknown factor with regard to wet deposition, a factor of 14 or so with respect to filter efficiency, and so forth.

And when you consider these ranges of these uncertainties, you can see that you can get ground deposition levels that are several orders of magnitude higher than they report, and in fact can exceed the EPA guidance with respect to ground contamination, acceptable ground contamination level. There is another -- the EPA report that we discussed with regard to previous contentions.

Furthermore, there is no analysis by the applicants of the implications of the total, and I am now not speaking of the plutonium contamination levels, but the total contamination levels in the period, in, say, the period of time from a week or two to six

months, and what is the implication of this deposition level. They report a value of, I think, 8.7 microcuries per square meter at the Y-12. That is TR. 5,434.

And I would simply point out that 8.7 microcuries per square meter is approximately 2,000 EPRM per 100 square meters, which is the way the health physicist with the smears would like to see the data, and that exceeds the limits for removable contamination in cold areas, and therefore whereas the applicant did some occupational exposure calculations, their analysis in my view, in our view, is inadequate, because it does not really look at the implications for getting to and from the facility and removing smearable contamination and tracking it home, and so forth and so on, that are going to affect decisions with regard to evacuation. So it is not, in our view, sufficient just to look at the change in the occupational dose. You have to look at the effect of the ground contamination and the contamination on the automobiles, and personnel clothing, and so forth and so on, and how you are going to cope with that.

And there is nothing in the applicant's analysis with regard to that issue. In fact, the staff has ignored ground contamination altogether, because they have eliminated the issue on the basis of

probabilities, looking at the Appendix J probabilities. And the staff assuming evacuation will be triggered by the EPA limits, that is, TR. 3,489 to 90, and in effect reported only the thyroid and whole body doses, but staff and the applicants both admit that evacuation could be triggered at projected dosages, or less than the tags. That is TR. 5,221, 5,276 to 77, Hibbitz, TR. 5,661, Sopher.

So they admit that the tag limits are not the limits that would necessarily trigger evacuation to begin with, so the fact that the dosages are below the tag limits is not the sole basis that should have been examined. The tags apply only to whole body and thyroid dose. That is at TR. 5,689. There are no tags for bone dose, which, as we have seen throughout this proceeding, is an important and often controlling organ dose. That is TR. 5,296, Hibbitz.

In fact, applicants state that bone dose would be controlling. That is at TR. 5,297, Hibbitz. Staff, as I may have mentioned earlier, admits that long-term evacuation of Y-12 may result from a more severe CDA or site suitability source term accident, but ruled this out on the basis of probabilities of such accident. That is at TR. 5,691.

One of the bases for our view that this

analysis is inadequate is that in effect the staff and applicants are applying their old Class 9 philosophy to avoid looking at the consequences of evacuation due to more severe accidents, more severe CDA's. In other words, they are saying because the probabilities are lower, they don't have to look at those consequences, and it is the same sort of philosophy that was rejected by the Commission in their policy statement on the Class 9 accidents. It basically said, you can't use that procedure any longer. You have to discuss consequences of Class 9 accidents, even though you view the probabilities as sufficiently low as to not merit -- previously as to not merit the discussion.

Well, all they have done is sort of shift the line a little higher, and now they are saying they will look at an HCDA but they won't look at one a little bit bigger, because that probability is sufficiently low. So, in our view they should have looked at the consequences of long-term evacuation that would be triggered for more severel HCDA's, and in any case we believe the analysis for the HCDA's that they examined was insufficient because of the inadequate analysis that was performed both with regard to the sensitivity and with regard to the treatment of ground contamination.

Now, the second point is one that I have made

previously, or at least touched on previously, namely, how does the 5-B analysis impact on Contentions 1, 2, and 3, and I want to remind the Board that one of the themes that has run through these hearings is that one must look beyond the labels. In fact, Mr. Edgar just brought that theme up again with respect to his criticism of Mr. Greenberg's discussion of safeguards at nuclear facilities, and he complained about labeling it a nuclear facility and said, you have to look beyond the label, and you recall in the discussions we had over explosions, there was -- statements were made that the relevance is not in the name or the label. This is at TR. 5,011. It doesn't matter what you call it. What it does is significant. Let's get past the terminology and down to realities. TR. 5,119.

Well, that theme or philosophy, I think, must be applied to the applicant's labeling of systems as beyond the design basis, because that is a fundamental issue in dispute, and they labeled this vent purge filter system as a system, as a part of the enlargement beyond the design basis, and I think you have to look at what that system does and model it and look at the implications of a system that takes radioactivity from within the containment and blows it outside through a filter, and you cannot ignore that filter system either

in your site suitability analysis, which is a point I made earlier.

And this second point with regard to the implications 5-B has on these earlier contentions, there are three parts of it, three issues I wish to address.

First, we showed that it is remarkable that the staff did not do an HCDA analysis at the LPZ in the worst case direction. And of course, the reason is because the doses exceed the 10 CFR 100 guide line values, and we discussed how you can -- I discussed earlier in the summary while we were at Oak Ridge -- how you can show that you would exceed the 10 CFR 100 limits. That was what Mr. Edgar referred to as the tortuous calculation involving taking a ratio and multiplying it by a third number; somewhat less tortuous, I would suggest, than finding his reference, that tortuous procedure he gave you for looking up one of his references in some of their exhibits while we were in Oak Ridge.

The main point in this first part is an HCDA performed with the staff's assumptions is the worst case, worst sector direction of the LPZ, exceeds 10 CFR 100 limits. Now, this says you should go beyond the label of calling it -- well, let me defer that.

When this is considered in conjunction with Appendix J; namely, the probability of this CDA, 10^{-4} times 10^{-1}, to get it in the worst sector direction, you see that by the staff's own analysis the CDA should be the design basis accident. So we believe that the staff's and applicant's 5B testimony, in conjunction

with Appendix J, proves our case on Contention 1. And you should, for reference to the test that we are applying, you should see Staff Exhibit 6 at page 2.2.3-2; that is the standard review plan and procedure for determining whether an external event should be considered a design basis event, applying the 10^{-6} or 10^{-7} probability to the test of whether you exceed the 10 CFR 100 guideline values.

The third of this three-part point is the same analysis. When you look at the CDA analysis compared to the site suitability analyses and you discover that lo and behold, the "more realistic" calculation gives you larger consequences that the "conservative site suitability source" calculation, it tells you that there's something wrong with the way they are labeling this "vent/purge filter system." They are labeling it as something beyond the design basis and, therefore, something you should ignore in modeling the site suitability analysis.

And our point that I've made previously is that this demonstrates that you must consider the vent/purge system in your site suitability analysis and the impact as simply another filter system, just like the annulus filtration system except it blows the activity out of the containment instead of taking

activity that is already out of the containment and blowing it back in.

Both are filters; two different filter systems, and the only distinction is that applicants and staff have labeled one. Remember the Abraham Lincoln joke I gave you about calling a leg a tail, or calling a tail a leg and pretenting it's a leg. Well, let's get away from the labels and just do the modeling.

Well, I think that concludes my discussion of 5B.

JUDGE MILLER: Staff?

ARGUMENT OF DANIEL SWANSON, ESQ.

ON BEHALF OF NRC STAFF

MR. SWANSON: Again, I will try to avoid repeating the detail that has been stressed before and keep my comment as nearly focused as possible.

Briefly, the staff position on the likelihood of accidents -- and again, the basis of the staff's 5B testimony -- can be found in the staff's FDS supplement at Appendix J -- that is Staff Exhibit 8 -- and in Staff Exhibit 17. That is the test by Dr. Morris et al.

These matters have already been argued by the staff and I won't repeat them again, but the basis for the assumptions and the likelihood of recurrence of accidents, particularly the core disruptive accidents,

is discussed in those exhibits and serves as the basis for the staff's testimony on 5B. The staff's primary testimony on this issue, 5B, is contained in the testimony, Staff Exhibit 18, looking at the three primary facilities of concern.

Starting first with K-25, the K-25 facility, the gas diffusion plant, provides enriched uranium for LWRs and for military applications. This is discussed briefly at staff testimony transcript page 5693. The staff does calculations regarding K-25.

When compared with the EPA's protective action guidelines, the tags show that protective measures such as evacuation would not be necessary following a site suitability source term accident, but would be necessary following a hypothetical core disruptive accident, as discussed at transcript page 5689.

The staff calculations referred to are conservative since they do not account for topography or plume depletion, as discussed at transcript 5656. The staff concluded that it would not expect any impact on national energy supply because of the operational flexibility of the remaining two gas diffusion plant cascades and the construction and operation of the Portsmouth gas diffusion plant. That is discussed at transcript 5695.

Regarding national security, the staff would expect little impact on national security since all national security needs for highly enriched uranium are provided by the Portsmouth gas diffusion plant, as discussed at 5696. In other words, regarding K-25, the staff conclusion is that there would not be a non-acceptable risk to national security or the national energy supply from Clinch River.

Turning to the Oak Ridge National Laboratory, the staff, as it discussed at transcript 5695, points out that ORNL is twice as far from Clinch River as is K-25, and the atmospheric dispersion would be lower in ORNL's direction. The staff based its dose calculations for ORNL on doses that it had calculated for K-25. The staff concluded that the site suitability source term accident would not require evacuation of Oak Ridge National Laboratory, but that a hypothetical core disruptive accident may require evacuation. This is discussed at transcript 5696 through 97.

The staff conlcuded it would not expect evacuation of ORNL to result in an impact on the nation's energy supply since Oak Ridge National Laboratory does not play any role in the fuel cycle for the energy modes. This is discussed at transcript 5695 and 5272 through 73.

Regarding national security, applicant witness Hibbits testified he knew of no significant impact on national security that would result from losing Oak Ridge National Laboratory for a period of months, as discussed at transcript page 5197 and then again at 5274. Applicant has testified that the risk of evacuation on national security is acceptable.

Regarding Y-12, the staff described Y-12 as a weapons production facility which does not play any role in the national energy supply, as discussed at transcript 5272 and 5693. We are thus limited to our concern of the national security aspects of Y-12. The staff testimony indicated that dose calculations for Y-12, when compared with EPA's protective action guidelines, showed that protective measures would not be required for Y-12 following the occurrence of a site suitability source term accident, or a hypothetical core disruptive accident of the Class 1 variety, as discussed in staff testimony starting at page 5690.

The staff evaluated the probability risk of Y-12 evacuation on the nation's security and factored that into the NEPA cost-benefit analysis. This is discussed at transcript 5681 to 82, and 5667 through 69. The staff did not evaluate the consequences of an accident beyond the site suitability source term

accident or the hypothetical core disruptive accident, Class 1 for the following reasons:

First of all, as was indicated, we're now getting into national security matters and the information simply was not available, nor did it seem prudent to -- or probably even available to have this information exposed in a public forum such as a hearing. However, the staff did fulfill its NEPA obligations by factoring in the probability risk of a long-term evacuation of Y-12 on the nation's security.

The staff found that it was acceptable to limit its consideration to the site suitability source term accident and the hypothetical core disruptive accident, Class 1, based on first, as explained in Appendix J to the staff's final environmental statement -- that is, Staff Exhibit 8 -- the risk of occurrence of accidents greater than the two mentioned is the same as or in excess of 10^{-6} per year. When you factor in the added dimension of such an accident and additional factors which would require long-term evacuation of X-25 or Y-12, the probability drops to 10^{-7} per year. That's discussed at transcript 5691 through 92.

The staff was therefore able to take a reasonable look at the impacts of accidents at Clinch River on these facilities and was able to conclude that

the environmental risk of long-term evacuation of nearby facilities was acceptable in terms of both national security and the national energy supply.

Now turning to the arguments raised by intervenors today, -- and I will limit myself to those that are applicable to the staff's analysis -- the first point was that the staff and applicants didn't look at rainfall and wet deposition. However, if you will look at transcript page 5656, staff witnesses Thadani and Sofer testified that the staff methodology was conservative, not to use wet deposition or assumed rainfail because if they were to assume rainfall such an occurrence would deplete the inventory of the radioactive cloud and would reduce the dosage to the affected facilities.

Therefore, in fact, if we were to accept intervenors' suggestion and utilize wet deposition, you would find that doses would decrease, not increase.

A second point raised was the failure to consider recycled LWR fuel. This is a point that arose in consideration of the fuel cycle issues, and the staff will address that in greater detail at that time.

I will leave it to say, however, that the staff did do a fuel cycle sensitivity analysis to consider alternate cycles, and we also have testimony on

the record to indicate that it is extremely unlikely that there will be a need to use recyclable LWR fuel because of the availability of ample quantities of plutonium during the first five years, and then after that five-year period the Clinch River facility will be breeding its own supply of plutonium.

The details of that argument will be put off to the fuel cycle issue where it properly arose.

The intervenor, Dr. Cochran, raised concern about the evacuation, when it would begin, what the protective action guidance limits should be, et cetera. And I would simply respond that the details of an evacuation plan, what the requirements must be, what the limits must be, are matters which really go beyond the scope of Contention 5B.

What 5B addresses is what the impacts would be, the environmental consequences, of having nearby facilities in proximity to Clinch River, and whether or not a long-term evacuation of those facilities is likely, and if so, whether or not that would result in unacceptable consequences or risks to the national security or the national energy supply.

The staff testimony does address that issue, and as I previously indicated, concluded that the existence of these facilities did not present an

unacceptable risk to national security and national energy supply.

With regard to Y-12, as I previously pointed out, the staff didn't just simply take the old Class 9 philosophy, but did, in fact, look at the various accidents beyond the site suitability source term. This was done not in connection with this issue, but in connection with the accident issues 1, 2 and 3. And in Appendix J to the staff's final environmental statement, there is a probabilistic look at these various accidents.

The staff did conclude, with respect to Y-12, as I previously mentioned, that at least as to the first level of Class 9 accidents, the site suitability source term and the hypothetical core disruptive accident, Class 1, the risks are acceptable. And that if you go into the more remote types of accidents, that in fact their likelihood of occurrence is sufficiently low that it's not necessary to probe into the national security matters and take a detailed look at the impacts of these accidents. But that the staff could merely look to the extremely unlikely occurrence of such an accident and find that acceptable risks do occur with respect to those types of accidents -- do occur from Clinch River on the Y-12 facility. In other words, the risks are acceptably low under NEPA for the Y-12 facility.

Dr. Cochran finally I think attempted to reopen the argument for the third time on the hypothetical core disruptive accident and site suitability source term analysis and the impacts of these accidents in terms of site suitability analysis and the environmental analysis. We have argued this matter twice already, and I am not going to engage in a detailed response to this reference to his argument made at Oak Ridge.

I will simply point out that, of course, in our opportunity to respond to that issue, accident contentions 1, 2 and 3, the staff will show that the accident scenario pointed out by Dr. Cochran is flawed, the methodology is flawed, that it's based on assumptions which are contrary to the record and that the conclusion he reaches simply does not stand up to scrutiny.

But in addition to the argument at this point to Contention 5B, the one under consideration, I would simply conclude that the staff analysis demonstrates that the environmental risk to accidents at Clinch River to nearby facilities were considered by the staff and that the risks of such accidents are acceptably low in terms of the national security and national energy supply.

That concludes staff's argument.

MR. COCHRAN: Mr. Chairman, I mentioned in the beginning of my statement that there was a point I wanted to return to, and I overlooked it. Is it too late to bring it up?

JUDGE MILLER: All right.

MR. COCHRAN: It is a short point. It goes to this issue of the application of Appendix J to the various contentions, and the staff and applicants rely on Appendix J not only to meet the Commission's Class 9 policy requirements, NEPA requirements, but as we have seen in Contention 5-B, to exclude consideration of the national security implications of larger CDA's, and also, as we will see when we get to the alternate siting contentions, the staff relied on Appendix J to exclude consideration of alternate sites, in effect saying the risks of CRBR at this site were sufficiently low.

And the point I want to make is, they can't have it both ways. If Appendix J and the probability calculations in Appendix J have validity for purposes of use by the staff and applicant, as I have just mentioned, then it also has validity with respect to testing whether the CDA is a DBA and the test under Contention 1 that I mentioned earlier. Thank you.

JUDGE MILLER: Do you care to respond?

MR. SWANSON: I am not sure I can make an immediate response right now. I think I would have to read over the statement again. My point was simply that I didn't think it was appropriate now to reargue our position on Contentions 1, 2, and 3. To the extent that a response will be forthcoming, it would be done in a

written response. My point was simply that Appendix J served as the basis for staff assumptions in other issues such as 5-B, and that in Appendix J the staff did do the required NEPA analysis of accidents, including those beyond the design basis, and that it was the result of this analysis and the resulting frequency or likelihood of occurrence that allowed the staff to make certain assumptions as to the likelihood of occurrence of accidents with respect to Y-12.

And again, the details of that staff analysis on the likelihood of occurrence will be addressed, and it was addressed previously orally, and it will be addressed in writing in the response to findings.

JUDGE MILLER: Mr. Edgar?

MR. EDGAR: Several points. First, Dr. Cochran indicated that applicants and staff had considered the risk of Y-12 to be acceptably low, because the probabilities are low, and that both rely on Appendix J for that. That is part of the answer. It is not only that. The point is that, one, and the applicants indeed have considered more than simply probabilities, they have considered risks. Applicant's Exhibit 46 at 38, TR. 5,414, provides an analysis of the probabilities and consequences that one can associate with other increasing severity of CDA cases, and shows

that the risk is flat, as measured by that calculation, so that the representative case for measuring risk is in fact applicant's CDA Case 2.

So, the short answer to that is, more than probabilities were considered, that risk was considered, and it has been properly accounted for in the analysis. A similar answer applies to the point made by Dr. Cochran that sensitivity analyses were not done. Well, clearly, they were. Applicant's Exhibit 46 at 38, at 5,414 includes consideration of more severe cases in the context of risk. There is a point of severe confusion now that has come up in the record concerning the role of the containment engineered safety features for annulus venting and purging and the role of the vent purge system, which is provided in the case of an accident beyond the design basis.

Now, Dr. Cochran made a big point about labels. Let's talk about it in terms of physically what it does, what the respective purposes are, and try to understand it. If that approach is taken, you will see that Dr. Cochran does not understand the difference between the two features in terms of the functions and the statement that one cannot ignore the third level vent purge system on the site suitability analysis is in a word not physically a meaningful statement.

The first reference here would be Applicant's Exhibit 1 at 50, TR. 2,039, Figure 4.1 -- excuse me, 4-1. This shows a diagram of the annulus filtration and recirculation system. CRBR has a single steel shell containment surrounded by a concrete confinement building. The space between the steel shell containment and the concrete confinement building is an annulus. The system pulls the suction on the annulus. It then passes through a filter. Part of the stream is vented off, and the major part of the stream is vented or is recirculated back to the annulus. The effect of that is to establish a negative pressure in the annulus. This system is a part of a conventional engineered safety feature system for a containment confinement concept as one might find it on a PWR.

Now, assuming that one has the containment intact and not subject to challenge from pressure buildup because of a severe accident, that system will provide protection in terms of assuring that the containment does not create any excessive pressure, and there is always a negative pressure in the annulus. Now consider the other system in question. Look to Applicant's Exhibit 17, Section 2.1, for a description of that system. What you see there is that there is a vent pipe inside the primary containment or steel

shell. That pipe passes through a cleanup system which is inaccurately described by Dr. Cochran as a filter system. It actually consists of venturi scrubbers. That passes directly to the environment. It is not passing through the annulus.

All right. Let's assume that one has pressure buildup in the containment, and that one has a condition where containment integrity is threatened. This system gives one the ability to vent containment so as to reduce pressure while maintaining radioactive releases within control. It has an entirely different physical purpose than the annulus filtration system which I have previously described.

Now, Dr. Cochran suggests that you ought to include the vent purge system which goes from the primary containment to the outer atmosphere in the site suitability analysis. That makes no sense at all. If the containment is intact, if the containment engineered safety features are functioning, which is the appropriate setup of functions for site suitability analysis, there cannot be a challenge to pressure in the containment. One would be foolish then to open the vent from the primary containment and increase releases while one has containment integrity and no threat to containment. It does not make any physical sense.

The next point is one that we think should have a matter of attention for the Board. It is not a point which we think is dispositive in the context of Contention 5-B. But Dr. Cochran raises the proposed EPA guidance on ground contamination. This has been discussed previously in the record. See TR. 2,908 through 13, 2,887 through 96.

Several points are pertinent to this EPA guidance. The first is that it is a proposed set of guidance. It is not effective. It is not a matter of federal law. Secondly, the ground contamination levels which are contemplated by that guidance are merely screening levels. They are not standards. What it says is that if ground contamination is at the screening level, that one should go farther and look at monitoring or other means to see if doses are exceeded.

What it says is that if you don't exceed, or rather, if your contamination level is below the screening level, no further action is required. We do not believe that this guidance has any pertinence to the question of site suitability dose term calculations or for the context of Contention 5-B in terms of measuring an unacceptable level of risk. This guidance was developed for existing sites which are contaminated and provide a cleanup standard.

We have no further response at this time.

JUDGE MILLER: Thank you.

We will take our lunch recess, and reconvene at 1:00 o'clock, please.

(Whereupon, at 11:56 a.m., the Board was recessed, to reconvene at 1:00 p.m. of the same day.)

AFTERNOON SESSION

(1:00 p.m.)

JUDGE MILLER: Are we ready to proceed with another contention or part thereof? What would that be? IV?

MR. EDGAR: Yes. By my count it is Roman IV, which is Contention 2-A, which in turn incorporates Contention 11-B(1) and (2).

ARGUMENT OF GEORGE L. EDGAR, ESQ.,
ON BEHALF OF PROJECT MANAGEMENT CORPORATION

MR. EDGAR: In connection with Contention 2-E and 11-B(1) and (2) the issue is presented or relates to the validity of the dose guideline values recommended by the NRC staff. For the purpose of site suitability analysis in regard to Clinch River. The major points of affirmative testimony on this subject can be found in applicant's Exhibits 25 and 28, which are applicant's direct testimony concerning NRDC Contention 2E.

The NRC staff's testimony contained in staff Exhibit 3 and the NRC staff's site suitability report that is staff Exhibit 1, pages 10 through 13, the dose guideline values have been derived by a relatively straightforward process to provide values which include consideration of organs of importance to plutonium exposure.

As the Board well knows, 10 CFR.11.A footnote 2 contains values incorporated in the NRC regulations for whole-body exposure of 25 rems and thyroid exposure of 300 rems.

In order to provide some means of developing guidelines which would cover plutonium exposure and organs of interest to plutonium exposure, the staff derived a set of additional guidelines, using, however, the existing 25-rem whole-body value and 300-rem thyroid value, which are codified in 10 CFR 100.1. The derivation of those values can be found at staff Exhibit 3 at 27 through 38 at TR. 2,510 through 12, also applicant's Exhibit 25 at 3 through 7, TR. 2,077 through 2081.

Essentially, what has been done is to take the 25-rem whole-body value and the 300-rem thyroid value, apply weighting factors from ICRP 26, which provide relative radiosensitivities for the various organs. The staff scaled from the whole body and from the thyroid values the 25 rem and 300 rem, respectively, and then selected the lowest set of values for each organ, which as it turns out is the set of values which are based on scaling from the 300 rem thyroid value. The staff then reduced the values completed from the existing values in the regulations and ICRP 26 weighting factors by a

factor of 2 to account for uncertainties. See staff Exhibit 3 at 30 TR. 2,513.

The approach taken is not only reasonable, it is entirely consistent with the existing values in 10 CFR Part 100 and reflects the explicit purpose of the does guideline values in Part 100. See TR. 2,077 through 8 and applicant's Exhibit 25 at 3 through 4; also, Staff Exhibit 3 at 29 and TR. 2,912.

It should be emphasized that according to the regulations themselves -- that is, footnote 2 to 10 CFR.11.A -- the values in question are not intended to imply that these numbers constitute acceptable limits for emergency doses to the public under accident conditions.

Rather, the 300-rem whole-body and the 300-rem thyroid values have been set forth in Part 100 as reference values which can be used in the evaluation of reactor sites with respect to reactor or potential reactor accidents of exceedingly low probability of occurrence and a low risk of public exposure to radiation. So thus, under the very express purpose of the regulations, they are not intended as limits on emergency doses.

We believe that the affirmative evidence just cited clearly demonstrates that the values selected by

the staff are well founded in terms of technical support and well founded in terms of consistency with the regulations. We believe that the Board should find that these values are adequate and should be applied to the site suitability analysis in Clinch River.

Now, NRDC has advanced an array of arguments in an attempt to avoid the force of the affirmative evidence in favor of the dose of the guideline values. The major arguments presented by NRDC are, first, that one should apply the stochastic limit of 50 rems per year given an ICRP 26.

The next argument is that the ACRS once recommended 25 rems to both bone and lung and that the higher values which are encompassed within the staff's recommended set of does guidelines should therefore not be applied.

The next involves the argument that the EPA occupational standards for the fuel cycle contemplate 25 rem to the whole body, millirem to the whole body, and 25 millirems for any other organ. Therefore, the dose guideline values should use the 10 CFR 100 whole-body value and then for every other organ they should use the same value, again resulting in a lower array of numbers.

Then the argument proceeds to consideration of uncertainties. And at that point let me now double back

and address each one in turn.

The first argument concerns the application of the so-called stochastic limit in ICRP 26 of 50 rems per year to the derivation of the does guidelines. This argument is addressed and/or is presented in Intervenors Exhibit 4 at 29 through 29 TR. 3,078 through 9.

The argument is answered dispositively in Applicant's Exhibit 25 at 8 TR. 2,082. And the argument is rather simple. The stochastic limit is a limit which is imposed on occupational exposures or recommended for imposition on occupational exposures to limit health effects which show a threshold phenomenon. In other words, doses below the stochastic limit would not show a health effect, those above would. Nonstochastic effects which are normally things such as cancer are those which do not show a threshold.

Now, there are three important points in relation to the arguments that one should use the stochastic limits. First, the stochastic limit is an annual occupational dose limit. It talks of 50 rems per year. This bears no relation to the purpose and intent of Part 100 dose guidelines. If indeed one were to carry the logic out consistently, the 50 rem per year annual limit over the 30-year lifetime at Clinch River would result in a dose guideline value of 1,500 rems.

Direct application, however, and probably the more telling point is this: that if one scaled from the whole-body and thyroid values in Part 100 using ICRP 26 dose guideline values -- excuse me -- ICRP weighting factors and then computed as did the staff a set of dose guidelines and then took the next step urged by NRDC and applied the nonstochastic limits, the 300-rem-to-the-thyroid value now found and codified in Part 100 would have to be reduced to 50 rems to the thyroid because the stochastic limit would apply across the board.

This merely means one thing: that application or acceptance of Intervenor's argument for application of the stochastic limit necessarily challenges and invalidates the 300-rem-to-the-thyroid value set forth in 10 CFR Part 100.11.A, footnote 2.

Therefore, for all of those reasons, we urge the Board to reject that argument.

The second point raised by NRDC is that at one point the ACRS had recommended dose guideline values of 25 rems to bone and 25 rem to lung. Applying this argument to the facts at hand, one would have a reduction in the values recommended by the NRC staff. However, examination of the record indicates that the ACRS simply did not so recommend.

Consider Intervenor's Exhibit 4 at 29 TR. 3,079. Compare Intervenor's testimony at TR. 2,985 through 2,990 with Applicant's Exhibit 33. Applicant's Exhibit 33 is the document relied on by the Intervenors for this argument, and if you read it, you will see that the ACRS did not recommend 25 rems to the bone and 25 rems to the lung. Their own reference does not support the proposition asserted.

The next argument advanced concerns the point that one should apply or use as a frame of reference for derivation of the dose guideline values the EPA occupational standards which were developed for the uranium fuel cycle. These standards contemplate 25 millirems to the whole body and 25 millirems to any other organ.

If one assumes a 25-rem whole-body dose under Part 100 and applies consistent logic using the EPA standards as an analogy, one would then set all other organ doses at 25. This would have the immediate effect of challenging and invalidating the 300-rem thyroid value set forth in Part 100, but, in addition, would lower all of the other values recommended by the NRC staff.

It is interesting to note here two things about the EPA standards. The rulemaking notice, which

is found at 39 Fed Reg 16906, May 10, 1974, indicates that these values are in fact based on cost-benefit principles. And, more importantly, the rulemaking notice explicitly states that, "Although the standards will encompass abnormal but anticipated releases of radioactivity to the environment associated with effluent control measures, potential releases associated with the possibility of accidents involving the nuclear safety of facilities are beyond the scope of the proposed rulemaking, which is limited to environmental radiation due to normal operations."

We thus believe that not only does application of the EPA standard argument invalidate the existing Part 100 regulations but, in addition, the use of that argument runs directly counter to the basis and purpose of those EPA regulations.

The next consideration that NRDC has raised is that there are considerable uncertainties associated with the state of the art or state of technology in regard to health effects and the underlying information upon which the dose guideline values are based.

NRDC in Intervenor's Exhibit 4 at 32 through 33 TR. 3,082 through 83 raises three points which relate to uncertainty. They first argue that the hot particle theory engenders considerable uncertainty. They then

argue that Morgan's bone dose hypothesis engenders considerable uncertainty. And finally, they argue that the so-called polonium-210 argument, the so-called warm-particle theory, engenders uncertainty. In fact, the record shows that none of these three theories are a significant source of uncertainty.

As to the hot particle, even NRDC concedes that theory is not widely accepted. Indeed, it was thoroughly considered by both the staff and applicants and disposed of in the following discussion:

First, Staff Exhibit 3 at 29 through 32, TR. 2,512 through 15, Applicant's Exhibit 25 at 9 through 10, TR. 2,983 through 4, Applicant's witness McClellan, TR. 1,916 through 1,920. In a word, the hot-particle theory has been rejected by virtually every authoritative scientific body in the world. Furthermore, the Nuclear Regulatory Commission and the Environmental Protection Agency have issued denials of petitions for rulemaking based on that theory.

The next theory advanced by the Intervenors in the area of uncertainty is the so-called Morgan hypothesis concerning the fact, and Morgan's thesis is essentially that the existing plutonium maximum permissible body burdens which had their source in ICRP 2 and form the basis for the 10 CFR Part 20 limits for

plutonium, are a factor of 240 too high.

If one looks at Applicant's Exhibit 25 at 10 through 12, TR. 2,084 through 86, one can see that if you change the ICRP 2 values but not the dose guideline values, that is logically consistent. The derivation of the dose guideline values for site suitability were not dependent on Part 20 or ICRP 2, they were based on a derivation which starts with Part 100 as given and then weights with ICRP 26 weighting factors. So the import of the first point is simply that the Morgan theory is not relevant to the question of the dose guidelines.

In any event, the review of the available scientific information contained in ICRP 30 indicates that considering all of the available information, which includes the Morgan theory, that at the most one would see justification for a factor of 2 change with respect to ICRP 2.

If the NRC should someday change the Part 20 standards to reflect that line of thinking, that is fine. But in any event, that would not change the dose guideline values since they are not dependent upon the derivation in ICRP and 10 CFR Part 20.

I see here Applicant's Exhibit 25, TR 2084 through 86; also see Staff Exhibit 3 at 32 through 33, TR 2515 through 16.

Third and last in regard to uncertainties, the polonium 210 argument or one-particle theory, was raised as the source of an uncertainty. Here again, we are dealing with a speculative theory which is not well supported by the scientific evidence, and which we believe the Board should not credit. See applicant's witness McCollum, TR 4043.

Your Honor, we submit that in regard to the dose guideline values, the dose guideline values on an affirmative basis have a sound foundation in terms of the NRC regulations. The dose guidelines values recommended by the NRC staff are predicated on those regulations and include the best available scientific information for the purpose of assigning weighting factors. We believe that the Board should adopt those guideline values in its decision and affirm their validity for the purpose of site suitability analysis.

We think, by the same token, that the Board should consider and reject the arguments presented by NRDC concerning the stochastic limit of ICRP 26, the ACRS recommendation, the EPA occupational standards and the three theories which purportedly engender

uncertainty.

In sum, we believe that the Board should make affirmative findings in regard to the staff's recommended dose guideline values under contention 2E. That concludes our affirmative statement.

JUDGE LINENBERGER: Mr. Edgar, I may have heard you incorrectly. Could you check your notes and tell me what you think you said with respect to the EPA occupational values?

MR. EDGAR: I have it right here. I said that they contemplate 25 millirem to whole body, 25 millirem to any other organ.

JUDGE LINENBERGER: I thought that is what I heard you say, and I think it should be rem rather millirem.

MR. COCHRAN: If I may correct both of you, I am not sure but I don't believe they are referring to occupational exposures, and that is the difficulty.

MR. EDGAR: Let me make it entirely clear. This is 40 CFR 190. I misspoke myself when I said occupational. These are normal operations of activities in the uranium fuel cycle. That is 25 millirem, by the way.

The important point here is that examination of the rulemaking notice, which is 39 Fed Reg, 16,906,

May 10, 1974, clearly indicates that these regulations provide no reasonable basis for use as an analogy in the dose guidelines. Thank you for the correction.

JUDGE MILLER: I believe the staff goes next.

ARGUMENT OF DANIEL SWANSON, ESQ.

ON BEHALF OF THE NRC STAFF

MR. SWANSON: Yes. As stated by Mr. Edgar, the basic staff position on this issue is set forth in Staff Exhibit 3 and particularly, that portion of Staff Exhibit 3 that is attributed to Dr. Brannigan in that testimony. I again will not repeat the matters raised already by counsel for applicants.

The staff derivation of dose guidelines I think was correctly summarized by Mr. Edgar. I would like to point out just a couple of conservatisms which support the appropriateness of the analysis which had not been mentioned thus far, or perhaps were not gone into in quite as much detail.

First, the staff used the dose to the thyroid as a reference point for developing dose guidelines, rather than whole body. This was altered in dose guidelines which were three times more limiting, and then the whole body dose limits were used as a reference point. Discussion of that centers around transcript page 2511.

The staff considered mortality risk weighting factors from other sources than really ICRP 26. The staff concluded that ICRP 26 mortality risk weighting factors yielded more conservative guidelines. This is discussed at transcript pages 2511 through 2512.

The staff specifically reviewed the Beir-I and III recommendations and concluded that the mortality risk weighting factors which went into the staff analysis were consistent with values from the major radiation protection agencies such as the Beir-I and III committees, the NCRP and the UNSCEAR committees. This is discussed at transcript pages 2511 through 2512; that is, pages 28 through 29 of Staff Exhibit 3.

As stated by Mr. Edgar, it is very important to understand that these guidelines are not intended to be limits of acceptable doses to the public. That's a point which I think has been confused somewhat in this area. Rather, these doses are used for comparing sites and determining site suitability. This point is presented at transcript page 2512.

As indicated, the hot particle theory has been discredited and there is not a major national or international group which has supported this point. This is discussed at transcript page 2514 through 15. The somewhat related warm particle theory raised by

intervenors we think similarly has been discredited, as discussed at transcript pages 4042 through 4044.

The collective judgment of the scientific community supports the staff's use of the linear dose response model in developing guidelines for Clinch River. This is discussed in staff testimony at pages 33 through 34; that is, transcript pages 2516 through 17.

Dose guidelines for additional body organs which are not specified by Part 100 were based upon the mortality risk weighting factors recommended by one of the major radiation protection organizations. That is ICRP 26. This is discussed in the pre-filed testimony, Staff Exhibit 3 at page 34, that is transcript 2517.

The testimony presented by Dr. Morgan I think was addressed, to a large extent, by Mr. Edgar already. There was a point raised by Dr. Morgan, however, that we would like to point out is inconsistent with the record, and that is, his assumption of doses based on the use of recycle of LWR fuel. The staff in presenting its analysis addressed only the fuel, as proposed in the application, and I think that you can find numerous cites to the transcript which support the proposition -- the assumption of the staff that, in fact, recycled LWR fuel would not be used, and that the resulting doses from such use would not be as projected by Dr. Morgan.

The staff's choice of the use of plutonium isotopic composition is discussed at transcript page 3128. The applicants also discuss that at page 3130, as far as the applicant's choice of plutonium isotopic concentration. The applicants testified they do not propose to use any high-burnup LWR fuel such as the 33,000 megawatt base per metric ton of fuel proposed by Dr. Morgan. This was stated at transcript 1833 by Mr. Strowbridge.

The record indicates that if, in fact, the applicants sometime in the future chose to use some other kind of fuel, as are proposed or relied on by Dr. Morgan, that would be a change in the application and such a change would have to go through the normal licensing reviews at that time. Staff witness Holman addressed this at transcript page 2348. Applicant witness Strowbridge also agreed to this point at transcript page 1833.

As a conclusion, the use of four-year or two-year recycled LWR plutonium, as Dr. Morgan relied on in his testimony, would be precluded under the current application. Applicants conceded this at transcript page 1834 by Mr. Strowbridge.

Another aspect of Dr. Morgan's testimony that I would like to briefly mention is Dr. Morgan argues for

a lower limit on body doses but fails to recognize that these limits he's talking about are not permissible occupational exposures, but are reference values which can be used in evaluating reactor sites with respect to potential reactor accidents of low probability of occurrence and low risk of public exposure.

In other words, again, we're talking about doses which are not used for absolute limits under Part 100 but are used for evaluating sites. And I think Dr. Morgan simply fails to recognize in his testimony the proper use of these guidelines. This matter is discussed in staff testimony at transcript 2515, and also, at page III-9 of the site suitability report, Staff Exhibit 1.

Moreover, unlike Dr. Morgan who concentrated on the dose contribution of plutonium 239, the staff dose guidelines considered the whole spectrum of radionuclides, which includes plutonium 239. This is discussed in greater detail at page III-8 of the site suitability report, Staff Exhibit 1.

Dose guidelines which are used to evaluate the consequences of the site suitability source term release at the exclusionary boundary and the LPZ boundary are specified in Part 100, and as I indicated before, those additional organ dose guidelines which are not found in

Part 100 were derived using ICRP 26, as pointed out in III-9 of the site suitability report.

As an additional conservative measure, the staff added the guideline that mortality risk equivalent to whole body dose from postulated design basis accidents for Clinch River must be no greater than the mortality risk equivalent to whole body dose value for Part 100 for an LWR. This is discussed in staff testimony, Exhibit 3 at page 34.

The staff concluded after considering the various aspects of issue 2E, that the guidelines for evaluating doses from postulated accidents for Clinch River are appropriately conservative and are appropriate for use in the site suitability analysis. This is discussed on page 34 of Staff Exhibit 3; that is, transcript page 2517. We believe that the record adequately supports this conclusion, and that the Board should find similarly.

That concludes our argument.

JUDGE MILLER: NRDC?

ARGUMENT OF THOMAS B. COCHRAN, ESQ.

ON BEHALF OF NATURAL RESOURCES DEFENSE COUNCIL

MR. COCHRAN: Mr. Edgar hit upon the major points at issue. I would like to present them in a little different frame of light.

In the 1977 site suitability report, the staff used a factor of 10 to reduce the dose guidelines to the lung and bone dose at the CP&LW stages. This factor of 10 was the product of two factors; a factor of 2 to take into account uncertainties in the final design detail of meteorological new data, and calculational techniques that might influence the final design of engineered safety features or the dose reduction factors or allowed for those features. And also, a conservative factor of 5 to take into account uncertainty in the dose and health effects models. This is transcript 3081, Cochran.

Now, in the 1982 site suitability report, Staff Exhibit 1, page 3-9, the staff reduced the uncertainty factor from 10 to 2, in effect reducing to zero the factor to take into account uncertainties in the dose and health effects model, or folding that into the remaining factor of 2, claiming that the factor of 5 to take into account the uncertainty in the dose and health effects models was no longer needed. TR 2513 to 14, Brannigan.

Now, the major or principal thrust of our contention here is that the reduction or elimination of this additional factor of 5 for plutonium is not warranted at this time, based on the events that have taken place between 1977 and 1982.

First, it should be noted that with respect to these remaining factors, the meteorology and design details and so forth, there's already a factor of 2 uncertainty in these alone. So in fact, by reducing the uncertainty factor from 10 to 2, you, in effect, are allowing for zero uncertainty with respect to the dose and health effects modeling for plutonium.

And we gave one example of this. Staff witness Spickler testified that the meteorologicl pi over Q values differed by a factor of 2 from the 1977 SSR and the 1982 SSR. That's TR 2394. I don't have the cite but I believe Spickler indicated that that was primarily due to a change in the calculational procedure for this particular example.

It is intervenor's position that the uncertainty with regard to the risks associated with plutonium exposure, the modeling of those risks for lung and bone surfaces which are controlling, are in fact larger than a factor of 10 and that a factor of 10 -- or even certainly larger than a factor of 5, and that that factor of 5 or 10 is really not a conservative assumption to begin with.

Now as indicated by the other parties, we gave several examples, and I will just go through these so we can find the appropriate references in the transcript.

The adequacy of current federal radiation standards for plutonium and other transuranic elements has been a matter of considerable debate for a number of years. TR 3081, Cochran. And in this regard, there are several examples which evidence the uncertainties and the risk associated with plutonium and transuranic exposure.

The first example we gave was based on the argument set forth by Dr. Carl Morgan in the American Journal of Industrial Hygiene, August 1975.

The current plutonium 239 standard, based on ICRP-2, was established at a tenth of a microcurie -- established using one-tenth a microcurie of radium 226 as the reference standard. That's TR 3142, Morgan. TR 2084, McClellan, Healey and Thompson.

Deriving the bone surface dose directly from the radium 232 standard based on the approach by Morgan in the American Journal of Industrial Hygiene, August 1975, TR 3141, Morgan, is a preferred methodology for estimating the bone surface dose due to plutonium exposure and for establishing the maximum permissible bone and bone surface exposure levels. TR 2960, 2961, 3139, 2314, Morgan.

This is a matter of dispute, and the other parties have indicated other experts that don't agree with Morgan on this matter.

Applying Morgan's approach would increase the staff's estimated bone dose by a factor of 240, TR 3141, Morgan. By the same token, the current NRC standards for the plutonium exposure are too high by a factor of 24. TR 3141, Morgan. TR 3140, Cochran.

Now, Mr. Edgar mentioned that going from ICRP-2 to ICRP-30 models results in a change by a factor of 2 overall. And his factor of 2 comes from a sort of best memory estimate by one of the applicant witnesses. I believe it was Thompson, I'm not sure. But it's really more like a factor of 3, but that's really neither here nor there. But you can get the actual factor right out of the record by comparing bone surface doses versus bone doses as given by the staff in the two calculations in the site suitability analysis.

But the point is that there are experts, principally Morgan, that don't believe that the ICRP-30 models are adequate in this regard and that there are other approaches that are preferred. And that the bone dose, -- if you use the Morgan approach, the bone dose or bone standard, I should say, the permissible body burden based on bone exposure would change by a factor of 240. And if you discard the factor -- if you take into account the factor of 3 from ICRP-2 to ICRP-30, there is still a resulting sort of difference of opinion

of a factor of 80 between the different experts in this regard.

I have found the reference to the factor of two that Mr. Edgar was referring to. It's TR. 2085, McClellan, Beyea and Thompson.

A second example of the potential nonconservatisms in the current limits that the Staff is using, which are based on this ICRP 26 weighting factor approach, is evidenced by the hypothesis of Markell that the principal cause of tobacco-related carcinoma is a result of the inhalation of plutonium-210, an alpha emitter, in cigarette smoke. It is often referred to, as Mr. Edgar indicated, as the warm particle hypothesis, and is described at TR. 2082 to '83, Cochran.

With regard to Markell's hypothesis, it is noted in a series of letters to the editor appearing in the "New England Journal of Medicine," volume 307, 29 July, 1982, at pages 309 to 313, that the localized distribution of plutonium-210 in the bronchial region of the lung now appears to be a thousand times more carcinogenic than gamma radiation, as compared to the factor of 10^{20} currently assumed. TR. 3083, Cochran.

There is an Applicant response to the plutonium-210 hypothesis at TR. 4042 to '44 by McClellan, in response to some questions by Mr. Swanson. The Staff witness indicated he had virtually no familiarity with this work. That is at TR. 2336,

Branigan.

Witness Cobb cited the plutonium-210 work as part of the basis for his view that the present and proposed standards of guidelines for plutonium and other alpha emitting radionuclides, like amoretium and uranium, may be seriously inadequate to protect the public. TR. 3101 to 3102, Cobb.

A third example of possible nonconservatisms in the Staff's approach is the evidence presented by Dr. John Cobb, TR. 3101 to 3109, Cobb, to the effect that the present and proposed standards or guidelines for plutonium and other alpha emitters, like amoretium and uranium, may be seriously inadequate to protect the public. TR. 3101, Cobb.

Cobb's concern was based on the findings of recent research in four related areas: the findings of his EPA-contracted study of plutonium in tissue of people who live near Rocky Flatts plutonium weapons facility; the findings of several epidemiological studies showing an excessive cancer mortality and incidence in the areas near and downwind from Rocky Flats; the findings of animal experiments suggesting that at very low dose rates alpha emitters like plutonium-239 and polonium-210 are very much more carcinogenic than had previously been suspected, perhaps

by as much as a hundred times; the findings of animal experiments showing that plutonium and other alpha emitters caused mutations and genetic defects, as well as cancers. Transcript 3102, Cobb.

Cobb concluded, based on his findings, at TR. 3103 to 3105 that we may have underestimated the toxicity of plutonium by a large factor and we probably overestimated our ability to control it, as shown by the experience at the Rocky Flats plutonium weapons facility, TR. 3109, Cobb. The plutonium burden on humans near the Rocky Flats plutonium nuclear facility, TR. 2284 to '85, Cobb, and the cancer incidence in that period, TR. 2898, Cobb, suggests that the quantity factors for alpha radiation may be too high -- may have to be as high as a thousand if indeed the cancers which have been observed in the area near Rocky Flats are caused by the plutonium which is found in humans in that area, TR. 2888 and 2919, Cobb.

Now, the fourth example we gave for the possible nonconservatism was the hot particle hypothesis, and we will stipulate that there is not much support beyond the authors of that document in the written literature. So I won't dwell on that.

The point of these examples -- well, there is one more. I'll add a fifth example, and that was, Dr.

Carl Johnson challenged the adequacy of the scientific basis for the existing plutonium standards, namely ICRP-2 and proposed EPA guidance, the EPA 520/4-77-016, for plutonium soil contamination, and citing several studies in the literature which supported Dr. Johnson's opinion in this regard, TR. 6026 to '27, 6029 to '30, 5859, 5922 to '25, 5941 to '42, all Johnson.

The point of this evidence is that there remains substantial uncertainties with regard to the dose and health effects associated with alpha radiation, particularly from the trans-uranics. And that's not to say that ICRP has not taken a different position as of its latest reports as to whether one should -- as to what sort of quality factors or dose distribution factor one should assume in estimating the dose or, said in another way, what assumptions they make with regard to how one calculates the risks associated with plutonium exposure.

It is just that there are other experts that disagree, and we have cited a number of examples and brought, in fact, the experts in to so testify, namely Dr. Morgan and Dr. Cobb and Dr. Johnson. So, citing the -- taking the ICRP 26 weighting factors as the best estimate of relative risks of whole body dose and thyroid dose and so forth is not the same as suggesting

that there won't be changes in these weighting factors during the next decade, as evidenced by the fact that there is a major debate in the scientific community over the adequacy of these standards.

And you simply, in our view, can't set aside one hypothesis with another hypothesis. I mean, you can say that, yes, we'll take the ICRP 26 weighting factors today, but I think any reasonable examination of the evidence would indicate that there is substantial uncertainty there and that these things are subject to change in the future.

Therefore, it's our position that it was improper to knock out the factor of five that was used in the 1977 site suitability report to account for these uncertainties. Now, it's interesting that the Staff in 1977 included that factor of five, I think in large measure because of the debate surrounding the hot particle report. I can't cite anything in the record to support that, but they gave in their evidence several -- cited several studies to in effect claim that the issue had gone away.

And one of those, of course, was the critique of the hot particle analysis by Kaplan and Cochran. The other was the BEIR III. Well, BEIR III is very interesting, because if you look at the -- you read the

section on lung dose in the BEIR III report, and it's in the record at TR. 3084 to '85, Cochran. You will see that even the BEIR III report recognizes that the evidence is still insufficient to determine whether aggregates of radioactivity that remain localized in specific regions of the lung give a greater or smaller risk of lung cancer per average lung dose than uniformly deposited radiation.

Preliminary experimental data indicates that a small fraction of inhaled insoluble particles may remain in the bronchial epithilial layer for long periods, but the significance of this local exposure on lung cancer risk is still uncertain. The BEIR III report acknowledges the fact that there is still uncertainty in this area.

It is not in the record, but that was written by Dr. Radford, who happened to be an advocate of the warm particle hypothesis. So it's not -- but just take the BEIR III report on its face. There's still uncertainty, and the uncertainty factors applied by the Staff should recognize that.

Now, what is the range of the uncertainty? Well, we would say the uncertainty ranges something on the order of a factor of 80 or 100 or so, depending on which study you want to use to define the outside limits

of the uncertainty range. But clearly the uncertainty is much larger than a factor of five, which the Staff has dropped altogether.

Now, the Applicants in their summary responded to several other pieces of evidence that the Intervenors have raised. The application of stochastic limits, the ACRS recommendations, the EPA fuel cycle limits are examples. I want to sort of put those in perspective.

There are now no dose guideline values for bone and lung in 10 CFR Part 100. I don't think that's in dispute, but that's TR. 3013, Cochran. And there are several alternate ways of selecting guideline values for bone and lung. That is TR. 3013, Cochran, TR. 2511, A-53, Branigan.

Now, the Staff has adopted -- well, in fact they adopted one procedure in the old 1977 site suitability report, and in the intervening years they have adopted another procedure using the ICRP 26 weighting factors. At Tr. 3078, Cochran, and TR. 2511, A-53, Branigan.

Now, Intervenors offered evidence to show that there is more than one way to skin a cat in this, trying to pick some sort of appropriate value for guideline value for bone and bone surface, and that there wasn't -- and that part of the purpose of that exercise was

simply to show that there are a variety of ways to approach this problem and that some are more conservative than others.

Now, it's sort of interesting that Mr. Edgar in responding to evidence on the ICRP stochastic limits said, well, look at what happens if you apply this. This is a direct challenge to the 300 rem to the thyroid value. Well, in fact, what one finds is there's no way you can do anything without challenging either the 25 rem, the existing 25 rem number for the whole body, or challenging the existing 300 rem thyroid value, because the two are not consistent using any approach that anybody here would recommend.

And in fact, the Staff as much as said that. They just kind of twist the words around. Instead of saying it is a challenge to the existing standard, they say, well, we had two alternatives and we applied it here and took the more conservative alternative, which means if you applied it there it's a challenge to the other one.

Well, everybody here recognizes that anything that you do is going to challenge either the 20 -- I mean, when you try to come up with a number for the bone surface and the lung, you're going to challenge either the thyroid or the whole body. There's no way, in the

existing standards, there's no way you can get around that. So that is hardly a basis for rejecting the ICRP stochastic limits.

Now, Mr. Edgar raised another objection to it when he said, the stochastic limits are an annual limit, and he suggested if you really added up the annual limits over 30 years you would end up with 1500 rems. Well, that is true, but I think that is inappropriate. I think the stochastic limits are meant to limit the amount of exposure in any one annual period, to prevent the effect.

I in the last few minutes misspoke. I am referring to the non-stochastic limit of 50 rems per year, not the stochastic limit. So the previous statements should be so corrected.

With regard to the ACRS statements, well, the ACRS statement is in the record and we can all read it and see what it says. I won't get into a debate on how they worded it.

Now, there is another sort of argument against some of these alternative ways you could obtain a more conservative limit for bone or bone surface, and that is the reference to the fact that in 10 CFR 100 there's a statement that these values are not meant to imply that these are acceptable values for emergency conditions,

they are reference values, and so forth.

I interpret that the same way I do the admonition that runs throughout virtually every recommended standard put out by a radiation protection organization, and that is, you know, the limit, even the 5 rem occupational exposure limit, is not an acceptable limit of exposure. You must go on to ensure that all exposures are kept as low as reasonably achievable.

I mean, they're saying the same thing here, that 25 rems whole body is not an acceptable limit for whole body exposure. You have to do as better than that as you can. And I don't think you should read any more into that than the admonition that none of these limits were meant to constitute acceptable levels of exposure.

Now, in this same regard, the original intent behind 10 CFR 100 dose guidelines was to ensure that siting of the plant would not result in serious injury to individuals offsite if the unlikely but still credible accident should occur. And I mean, I'm just reading 26 Federal Register 1224, February 11, 1961, TR. 3079, Cochran.

Therefore, I think it's inappropriate to say one should just look at these levels as reference levels and not imply that there is some intent there to protect the public health and what level you are establishing,

and therefore that because of what Intervenors believe is still substantial uncertainty with regard to the appropriate levels, if the -- we believe if the ICRP weighting factors are taken as the Staff's best approach of establishing what the bone surface and lung guideline values should be, we think they should continue to recognize the significant uncertainties in that and apply the uncertainty factors as before.

In fact, we believe they should an even much larger uncertainty factor, instead of 5 something closer to 80 or in that neighborhood.

With regard to the arguments that these annual dose equivalent limits are not applicable, we Intervenors believe the annual dose equivalent limits, such as in the EPA and 40 CFR 190 standards, can be used to give some indication of where one should properly establish dose guideline values for lung or bone or bone surface from plutonium exposure in order to provide adequate public health under 10 CFR 100. That is TR. 3004, Cochran.

And the effect of this, of applying these, is given at TR. 3080 by Cochran and TR. 2991 to '92, Cochran. And with regard to the proposed guidance on the dose limits for persons exposed to trans-uranic elements, the EPA report, I refer you to TR. 3139,

Morgan, TR. 2884, 2890 to 2893, Cobb, TR. 2913, Cobb, and 3139, Morgan.

While there's no proof that the EPA-proposed limits and guidance are inadequate, there is indication that they may be seriously inadequate to protect the public health, TR. 3101, 2907, Cobb, and TR. 6029 to '30, Johnson. And I should also say TR. 2098 and 3103, Cobb, and TR. 6029 to '30, Johnson, in this same regard.

That concludes my summary.

JUDGE MILLER: Any rebuttal?

REBUTTAL ARGUMENT OF GEORGE EDGAR, ESQ.,
ON BEHALF OF APPLICANT,
PROJECT MANAGEMENT CORPORATION

MR. EDGAR: Yes, Your Honor.

Initially a point of clarification, before Judge Linenberger catches me. I gave an incorrect cite at the very beginning of my argument. I had cited a series of four documents as the primary source of affirmative evidence, one of which was Staff Exhibit 1 at Roman II-10 through 13. That is incorrect. It should be Roman III-9 through 11. The exhibit number was correct. The page numbers were confused or incorrect.

Several points we think the Board should take

into account. The first is, the argument has been presented concerning ICRP 2 versus ICRP 30 and the apparent factor of two difference between the two. If true, the question remains, what is the significance of that in the context of the dose guideline values?

The important point here is that the derivation of the dose guideline values is in no way dependent upon ICRP or 10 CFR Part 20. Applicant's Exhibit 25 at 10 through 12, TR. 2084 through '86, points out that irrespective of what may happen in regard to ICRP 2, that will not affect the dose guideline values. The dose guideline values have their origins in the existing Part 100 values for thyroid, plus the ICRP 26 weighting factors.

Thus, the conclusion can be drawn directly that argument about ICRP 2 versus ICRP 30 is irrelevant to the dose guideline values. Granted, Dr. Cochran and Dr. Morgan do not agree with the existing Part 20 values in ICRP 20, and they believe that they should be lowered by a factor of 240. That is not in issue here. That challenges another set of regulations which are not under contention. Thus the point is simply irrelevant.

Another minor factual point. Dr. Cochran asserted in argument, as he has in the past, that lung and bone are always the controlling organs. The

evidence does not suggest that that is true. See Staff Exhibit 1 at Roman III through XI.

A point that I had not considered significant enough to identify as a major issue in dispute concerned Dr. Cobb's testimony. It was raised on oral argument. I will respond very briefly.

Under cross-examination Dr. Cobb admitted that he did not know whether or in what way his testimony related to the dose guideline issue. That is TR. 2897 through '98. Secondly, Dr. Cobb's testimony addressed the adequacy of the EPA-proposed guidance for contamination in soil, the so-called screening guidelines for cleanup. TR. 2884 through '5.

The EPA guidelines which are proposed for screening on cleanup of contaminated areas are simply not applicable and are simply not relevant to the dose guideline issue. See the discussion, Applicant's Exhibit 25 at 8 through 9, TR. 2082 through '83.

In the same vein, Dr. Johnson's testimony, which Dr. Cochran described in argument this afternoon as "challenging the scientific basis for ICRP 2," for the same reasons previously stated in rebuttal, this testimony is irrelevant to the dose guidelines. See Applicant's Exhibit 25 at X through XII, TR. 2084 through '86.

We have heard a great deal about uncertainty. We have heard a great deal about the hot particle hypothesis or the Morgan hypothesis and the polonium-210 warm particle hypothesis. We submit that the evidence in the record sponsored by qualified experts demonstrates that none of those three theories are significant sources of uncertainty.

JUDGE MILLER: We'll take about a ten-minute recess. We're ready to go on, I assume, to the next subject, are we not?

MR. EDGAR: My count says, subject Roman V, 11B and C, health effects.

JUDGE MILLER: We'll resume there.

(Recess.)

JUDGE MILLER: Are we ready?

ARGUMENT OF GEORGE L. EDGAR, ESQ.

ON BEHALF OF PROJECT MANAGEMENT CORPORATION

MR. EDGAR: The next subject is Contentions 11B and C, which deal with the genetic and somatic effects of operation of the Clinch River breeder reactor plant. There are two points that I would like to make by way of introduction in terms of scope.

The first is that this contention was admitted on the basis of the so-called residual risk theory; that is, the residual risk theory contemplates that assuming operation in accordance with existing regulatory requirements, that there nevertheless is some irreducible or residual health effect; that therefore, it is appropriate to undertake a calculation or analysis of these health effects. And this is precisely what applicants and staff have done in connection with Contention 11B and C.

The major sources of affirmative evidence here consist of applicant's Exhibit 42 and Staff's Exhibits 12 and 13. Applicant's Exhibit 42 is the direct testimony of Dr. Preston, Dr. McClellan and Dr. Thompson and Mr. Healey; whereas Exhibit 12 and 13 are the testimony of Dr. Binder and Dr. Brannigan for the NRC staff.

There was another fundamental point on scope, and that is by its terms and consistent with the Board's rulings, this contention deals with the effects of operation of the plant; that is, the Clinch River Breeder Reactor plant, and not other facilities including fuel cycle facilities.

The contentions have the thrust that the genetic and somatic effects of Clinch River operation are not adequately assessed. The answer to that is that the genetic and somatic effects have been evaluated and properly analyzed by highly competent scientists. Applicant's expert's qualifications appear at Applican't Exhibit 42 at 30 through 37, TR 4296 through 4303. The staff's expert's qualifications appear first at Staff's Exhibit 12, TR 4125, Staff's Exhibit 13, TR 2527.

The analyses performed by the applicants and staff respectively can be compared and the basic assumptions used can be compared, and perhaps it would be of aid to the Board to have in the record in one place a comparison of these calculations with detailed record citations. It struck me in preparing the argument that an assemblage of the information in one place enables one to capture the meaning of the information a little more fully.

In terms of first the genetic effects

category, which is Contention 11B, the NRC staff and applicants used several different bases for risk estimation. The applicants used the BEIR III values. That is stated in Applicant's Exhibit 42 at 5. Dr. Binder for the staff used risk estimators from the BEIR III report; that is in Staff's Exhibit 12 at 6. In the staff's FES supplement, BEIR I risk estimators were used; that is, Staff's Exhibit 8 at 5-15.

In terms of results, the applicant's results appear at Applicant's Exhibit 42 at 24. The applicants computed genetic disorders per million live born for the general public as a result of CRBR operation. The applicants computed a range of 0.06 times 10^{-3} to 0.29 times 10^{-2}. By comparison, the calculated current incidents in the population due to background causes is 107 per million live born.

In terms of occupational exposure, the applicants computed a range from 0.19 times 10^{-3} to 1.3. By way of comparison, the calculated current incidents per million live born in the population is 106.

The staff calculated values in the FES for combined occupational and general public. Those values are given at FES supplement; that is, Staff Exhibit 8 at 5-21, as 0.3 per million live born per reactor year. Dr. Binder in Staff Exhibit 12 at 10 calculated combined

occupational and general public value of 1.8 to 33 genetic disorders per million live born over all time. This would translate into approximately 0.06 to 1.1 per million live born per reactor year.

Both Dr. Binder at TR 4095 and Dr. Preston in Applicant's Exhibit 42, considered the countervailing arguments and the expertise offered by Dr. Goffman in connection with the genetic effects and the bases for estimating genetic effects of ionizing radiation. I would commend to the Board in particular the discussion in the first section of Applicant's Exhibit 42 by Dr. Preston which addresses in complete detail the contrary views expressed by Dr. Goffman and shows that those views have been accounted for and, indeed, are incorrect.

In terms of somatic effects, the comparisons which involve Contention 11C can be stated first in terms of the bases for analyses. In terms of risk estimators, that would be cancer mortality per million person rems. The staff in Staff Exhibit 13 used a risk estimator from the BEIR I report. That model used from the BEIR I report was the absolute risk model which had a linear non-threshold dose-response model.

The applicants, in Applicants Exhibit 42 at 27, used BEIR III risk estimators. They used both an absolute risk and a relative risk model to show a range

of values, and as with the staff, used a linear non-threshold dose-response model.

Both staff and the applicants have applied the linear no-threshold model since it is more conservative than the lineal quadratic estimator, which is an alternate expressed in the BEIR report.

In terms of calculations, the dose times the risk estimator, the staff in Exhibit 13 calculated for the public 6.7 times 10^{-7}. That appears at page 7 of Staff Exhibit 13. For the plant workers, the staff calculated 0.14, and that appears at page 8 of Staff Exhibit 13.

The applicants in Applicants Exhibit 42 at 28, calculated for the public a range of values from 1.5 times 10^{-4} to 5 times 10^{-5}, and for the plant workers a range from 0.07 up to 0.2.

The basic thrust of this affirmative evidence is that the staff's and the applicant's calculations are consistent; they differ in respect to some of the assumptions made, but the range of values reported are essentially the same. The methodologies are clearly stated and the health effects are conservatively estimated.

In terms of the real issues in dispute in the record, I must confess some difficulty in discerning

just what they are. The intervenors did not file testimony in this subject area, and having searched rather carefully the cross examination, we must go to some length to define a set of contested issues.

The first issue -- and I use the term charitably -- is that there were questions raised concerning the validity of using the linear non-threshold model. See TR 4022. The linear non-threshold dose model was used because it is the most conservative model. Applicant's Witness Thompson, TR 4030, Staff Exhibit 13 at 6. Dr. Brannigan, TR 4119, Applicant's Exhibit 42 at 26, TR 4292.

The applicants also used both the absolute and relative risk methods to calculate a range of somatic effects. That appears in Applicant's Exhibit 42 at 27, TR 4293. Having used this range, it is the applicant's opinion expressed by Dr. McClellan that it is very unlikely that the upper bound values would be exceeded. That is TR 4033.

There was also a possible issue concerning the uncertainty inherent in the BEIR III risk estimators. There was at least one subissue that seemed to revolve in the cross examination and that is the question of whether the somatic risk estimators are likely to be significantly affected by re-examination of the data

from Hiroshima and Nagasaki. That point was directly addressed by applicant's witness, Dr. Thompson, TR 4029. The answer is straightforward; the answer is no.

Secondly, in terms of the uncertainty in the genetic effects model, the record is quite clear. There was some questioning as to whether the BEIR III genetic effects estimators constituted an upper limit. According to staff witness Binder, an eminently qualified geneticist, sthey do, in effect, constitute an upper limit. That is TR 4069.

Dr. Binder went on to emphasize that he believes that represents the highest plausible or credible estimate. TR 4071.

Furthermore, Dr. Binder went on to say that it's highly unlikely that there are significant unknown effects which may exist in the risk estimators for genetic effects. See TR 4092.

We thus submit, Your Honor, that the affirmative evidence in the record clearly demonstrates that the somatic and genetic effects of operation of the Clinch River Breeder Reactor plant have been adequately analyzed and, indeed, have been extremely conservatively analyzed. We submit that the Board should find that that analysis is both adequate and conservative.

JUDGE MILLER: I guess it's NRDC's turn.

ARGUMENT OF THOMAS B. COCHRAN
ON BEHALF OF NATURAL RESOURCES DEFENSE COUNCIL
AND THE SIERRA CLUB

MR. COCHRAN: The estimate of somatic and genetic risks associated with ionizing radiation are generally performed by multiplying a risk estimator or risk estimators times the whole body or some appropriate organ dose. And this is, in fact, the approach that was used by the staff in the FES, and it's also the approach used by the applicants, and there's no dispute on sort of the -- in regard to the general technique that was taken.

The somatic and genetic risk estimators assumed by the staff in the NEPA analysis were based on BEIR I and are given at pages 5-14 to 5-15 of the FSFES.

The issue here is a rather straightforward one; that is, whether the staff's NEPA analysis is adequate if they selected estimators from a document in the literature or one or more documents, without discussing the uncertainties in those estimates as represented by the range of expert opinion with regard to the appropriate value or range of values.

Now the issue is not over whether one should assume a linear non-threshold model or even whether the absolute or relative risk model is better or worse.

Intervenors recognize that there is debate in the literature on those matters. But whether or not the staff in its NEPA analysis is obligated to discuss the full range of expert opinion with regard to, in this case, the somatic and genetic risk estimators.

Now, Cochran in Appendix J testimony, Part 4, indicated that expert opinion on cancer risk coefficients differs, in some cases markedly, from the upper limit BEIR III estimates. For example, the estimates by Morgan and Goffman -- and this is at TR 6229 to 30.

Applicant witness McClellan said in determining the uncertainties in the BEIR III data and the adequacy of BEIR III models, it would be prudent to consider the views of other experts in the field. That's at TR 4022 to 25. And applicants admitted that the Nagasaki dose re-evaluations may indicate one of the models used in BEIR III is not appropriate; a linear quadratic model. That, however, was not the model that applicants used in their own testimony, but that is at TR 4029 to 31, Thompson.

The staff -- our difficulties are more with the staff's representation than the applicant's representation -- the staff's representations principally in the NEPA document, rather than the

applicant's representations in their own testimony, because the staff used a point estimate value for the cancer risk coefficient; namely, a geometric mean between two values, two BEIR I limiting values.

The applicant, more appropriately, looked at a range of values but failed to consider expert opinion beyond that given by the BEIR committee, as indicated by Mr. Edgar. Their calculations were based on BEIR III, which are -- with respect to the ranges, they are not terribly different from the ranges in the BEIR I estimates that are found in the FES at page 5-15, TR 4147 to 48.

Applicant's testimony indicated that a range of values is more appropriate than a single estimate, which is the approach that the staff took because of the substantial uncertainty in the actual effects.

Staff witness Binder I believe felt that generally, it's prudent to use a range of estimates in determining genetic effects, and intervenors feel the same applies to the cancer risk coefficients. That is at TR 4083. Staff witness Binder also stated that the findings of the BEIR III committee are still subject to evaluation change based on new information and analysis -- TR 4076 -- and that a single estimate does not give the reader any real feeling for the possible variance

about that estimate. That is at TR 4084.

The staff admitted that the BEIR III report genetic estimates in terms of overall health are subject to great uncertainties and that the range of plausible values are broad and that there's no assurance that the true values are within these ranges, and that future information will necessitate revisions. That's TR 4092. Yet, the staff failed to discuss the uncertainties in the cancer and genetic risk coefficients in any meaningful way in the FES.

So in summary, our criticism is directed toward the treatment of uncertainties and with regard to both staff and applicant, their failure to acknowledge in the NEPA analysis that there is expert opinion that ranges beyond the limits defined by the BEIR I and BEIR III dose estimates.

That concludes my statement.

JUDGE MILLER: Staff.

MR. SWANSON: Yes.

ARGUMENT OF DANIEL SWANSON, ESQ.,

ON BEHALF OF NRC STAFF

MR. SWANSON: I think it is possible to keep my comments relatively brief. Most of the detailed conclusions have already been discussed by Mr. Edgar. But I would simply point out that Intervenors did not offer testimony specifically addressed to Contentions 11-B and C. They asked no questions of Dr. Branigan when he testified don 11-C. And I think, though I can treat that testimony briefly, I will spend a little more time on Dr. Binder's testimony 11-B.

Dr. Binder, reference has already been given for his qualifications. Let me briefly state, he is a member of the National Academy of Sciences Committee on Radiation Effects on Human Health, the BEIR III Committee's Panel on Reassessment of Atomic Bomb Dosimetry, and others.

He indicated that his analysis was done using as a basis the staff FES supplement dose estimates and BEIR III report recommendations. This is discussed at transcript page 4,113. Dr. Binder indicated that he utilized the BEIR III linear hypothesis for its genetic effects estimations for populations exposed to low-level

radiation. He indicated that this hypothesis was supported by experimental evidence and radiobiological theory. This is discussed at transcript page 4,117.

Dr. Binder testified that this hypothesis is likely to overestimate the genetic effects. The bases for this conclusion are provided on transcript page 4,118. That is page 7 of Dr. Binder's prefiled written testimony, which is Staff Exhibit 12.

Briefly, though, the bases for his conclusion that his use of the hypothesis recommended by BEIR III is likely to overestimate actual effects are, first, that the linear hypothesis itself is likely to overestimate effects as described in his testimony on that page and previously; and secondly, that a paper since the BEIR III report suggests that the sensitivity of humans to the induction of genetic effects by radiation may well be less than the BEIR III estimates. Again, this is summarized on transcript page 4,118.

Nonetheless, Dr. Binder adopted the BEIR III hypothesis as upper credible limit to be anticipated with the operation of Clinch River. This is set forth on transcript page 4,119. He concluded that genetic effects from the operation of Clinch River are so small as to constitute a negligible impact on human health and welfare. This conclusion is set forth in greater detail

at transcript page 4,124.

He indicated that the expected increase in genetic exposures among the 1 million live births expected over the operation of the plant is not only very small but would certainly not be detectable.

Furthermore, he concluded the actual incrase to be expected from the actual operation of Clinch River is likely to be smaller, possibly much smaller than the upper-limit estimates that he presented in his testimony. Again, this is set forth in his conclusion on transcript page 4,124.

Intervenors, although they do not present affirmative testimony, attempted to get Dr. Binder to endorse the opinions of Dr. Goffman on genetic effects. However, the uncontroverted testimony in this record by Dr. Binder is that Dr. Goffman was not an expert on genetic effects, that he misunderstands some issues and that the conclusions referenced by Intervenors were wrong. This is set forth in transcript page 4,095.

I believe that the uncontroverted evidence in this record supports the staff and applicant conclusions that genetic effects were adequately considered and that they are likely to be so small as to constitute a negligible impact on human health and welfare.

Turning briefly to 11-C, as I indicated in

testimony that was presented by Dr. Branigan -- that is, Staff Exhibit 13 -- there was no cross examination of Dr. Branigan and there was no prefiled written testimony by the Intervenors.

I will briefly just state the conclusions by Dr. Branigan. They are found on transcript page 4,153; that is, page 10 of Staff Exhibit 13. That is, that Dr. Branigan and the staff adequately assessed the potential cancers that may occur from exposure of plant employees and the general public. The staff considered and specified the impacts that we presented in section 5725 and 573 of the supplement to the Final Environmental Statement that is Staff Exhibit 8, and concluded and described the potential fatal cancer risk estimators that were used were based on models described in the National Academy of Sciences BEIR I report and are consistent with the recommendations of other radiation protection organizations such as ICRP, NCRP, and UNSCEAR -- the U-N-S-C-E-A-R. These are described at Table 1, page 12 of Dr. Branigan's testimony at transcript page 4,155.

A range of risk estimators by the various groups was presented in the FES supplement, Staff Exhibit 8 at page 5-15, as well as on page 12 of Dr. Branigan's testimony. That would be transcript page

4,152.

These organizations represent the views of the overwhelming majority of the members of the scientific community and are consistent with the assumptions made by Dr. Branigan. That statement is set forth in transcript page 4,153. Dr. Branigan concluded that the staff's estimates of potential cancers that may occur from exposure of plant employees and the general public are appropriately conservative. That conclusion is set forth on the same page.

The staff compared these conclusions -- in other words, the effects on the maximally exposed individual and the public from Clinch River for one year of routine operation with other sources of radiation -- and concluded that the risk is much less than exposure to any of the other major sources of radiation, such as medical exposure and natural background radiation. This was discussed at transcript page 4,153 and in Table 2 of Dr. Branigan's testimony at transcript 4,156.

For a plant worker, the risk of exposure from Clinch River is a small fraction of the estimated normal incidence of cancer fatalities in the exposed work force. That conclusion is set forth on transcript page 4,152.

In conclusion, I would simply state that in

response to the argument put forth by Intervenors, a full range of expert opinions was considered by the two staff witnesses, that the assumptions made, the hypotheses relied upon by these gentlemen were fully supported by the major radiation protection organizations and that a full range of expert opinion was considered and is in fact supportive of the staff conclusions.

And the Board is fully justified and should conclude that staff and applicants did adequately assess the impact of operation of Clinch River on the effects of somatic and genetic instances and in fact these effects are negligible.

That concludes the staff argument.

JUDGE MILLER: Any rebuttal?

REBUTTAL ARGUMENT OF GEORGE L. EDGAR, ESQ., ON BEHALF OF PROJECT MANAGEMENT COPPORATION

MR. EDGAR: Very briefly, in response to the question of addressing the whole range of expert opinion, the relevant inquiry here is the range of expert opinion in this record. If you look at the somatic issue, Dr. McClellan testified that it is very unlikely that the upper-bound estimates computed by Dr. McClellan and his colleagues would be exceeded. TR. 4,033.

With respect to genetic, Dr. Binder testified that the highest plausible credible estimate had been given. TR. 4,069, TR. 4,092.

With respect to the Nagasaki data and the uncertainty reportedly associated with the reexamination of that data, applicant's witness Thompson testified that the somatic estimates are unlikely to be changed by reexamination of this data. TR. 4,029.

We submit, Your Honor, that the full range of credible expert opinion has been considered, that the calculations in question provide upper-bound estimates.

JUDGE MILLER: That bring us now, I believe, to Roman numeral VII, fuel cycle. Is that correct, or do you have something different?

MR. EDGAR: Yes, sir.

In regard to the fuel cycle contention, which is 6.B.1 and 6.B.3, we think in this instance there are clearly discernible disputes in the record. The affirmative evidence is found principally in the following sources: first, Applicant's Exhibit 36; that's Chapter 5.7 of the applicant's environmental report; second, Applicant Exhibit 43 and the applicant's direct testimony on fuel cycle issues. Next, Staff Exhibit 14, at Staff's Exhibit 14, the staff's direct testimony on fuel cycle issues; and finally, Staff's

Exhibit 8, the Final Environmental Statement Supplement Appendix D, as in "dog."

Examination of the record indicates that the issues under these contentions have been substantially narrowed and the disputes which go to the adequacy of the Appendix D analysis of the environmental effects of the fuel cycle have been distilled to four basic points.

The first issue, and it's one that has been alluded to on several occasions in previous arguments, is the question of isotopic concentrations and the effect, if any, that that has on the analysis.

The second issue has to do with the argument that one should consider alternative plants for reprocessing in addition to the developmental reprocessing plant assumed by the applicant and the staff in their analyses.

The third issue has to do with the confinement factors which the applicants and NRC staff used for their analyses of fuel fabrication and reprocessing impacts or indeed radioactive releases from those facilities during normal operations.

And a fourth and final issue concerns the dose values which one should properly associate with waste management activities. It should be noted in testing that a portion of this contention, in particular the

B.6(b)(2) portion which dealt with transportation, was dropped out and as a result of a mootness finding by the Board in connection with the Board's ruling on the staff's summary judgment motion or summary disposition motion.

But in addition, 6.B.4, which is a safeguards subelement of Contention 6, has been addressed by all parties in conjunction with Contention 4 on safeguards. So the remaining two pieces of the original contention have been disposed of, one through summary disposition and mootness, the other by joining in connection with the safeguards testimony.

So I will proceed then to address what we perceive to be the four basic contested issues which have arisen in connection with NRDC Contention 6.B(1) and 6.B(2).

The first is that involving isotopic concentrations. The basic argument presented here by Intervenors is that it is possible that the applicants might use plutonium with higher isotopic concentrations of the isotopes plutonium-238 and plutonium-241 than is currently contemplated in the application and than is currently used by the applicants and staff in their analyses of the environmental effects of fuel cycle operations.

The fact is that the application contemplates the use and specifies the use of the so-called FFPF grade fuel and all analyses which have been conducted are enveloped by using assumptions appropriate to that case or assumptions which bound that case. See applicant's witness Strawbridge TR. 1,751.

Indeed, in its analysis of the fuel cycle, the staff took the higher values of isotopic concentrations for each isotope that one could associate with high burn-up LWR fuel and FFTF isotopics. They laid each set of isotopics side by side and for each isotope they picked the highest value, the worst of all possible cases. See in this regard Staff Exhibit 8 at 10 through 16 -- excuse me -- at page D-16 staff witness Lowenberg TR. 4,383; Dr. Cochran, Exhibit 13 at 22, TR. 4,539.

Now, the apparent thrust of the NPDC argument is that if one examines the recycle of mixed oxide fuel in an LWR, the evidence suggests that plutonium-238 and plutonium-241 will build up in relative concentrations. See in this regard Dr. Cochran's Exhibit 13 at 25, TR. 4,538 through 39.

This, however, is totally beside the point. We must look at CRBRP. Clinch River is not a light-water reactor. It is a liquid metal fast breeder reactor. A light-water reactor carries with it a

thermoneutron spectrum while Clinch River carries with it a fast-neutron spectrum. As a result of this difference, recycle of plutonium mixed oxide fuel in Clinch River will burn up 238 and 241.

In fact, the relative concentrations of 238 and 241 will diminish as a function of time upon recycle in Clinch River. Dr. Cochran admitted this on cross-examination, TR. 4,539. Affirmatively, on this point see the testimony of Dr. Sherwood, TR. 4,265, and see Applicant's Exhibit 36, Volume 3, the 14.4(a) amendment to section 5.7.

In any of that, aside from this basic physical difference and the fact that the cause of this physical difference the isotopic concentration issue is of little moment. There is a significant amount of LWR-grade fuel with low burn-up which is within the envelope of the staff's analysis. See Dr. Sherwood, TR. 4,313; see staff witness Mr. Lowenberg, TR. 4,360.

The other point to consider in the same regard is what is the significance of this argument that if we have higher concentrations of 238 or 241 and thus the plutonium will have a greater effect, how does that really matter in the fuel cycle analysis? The answer is it doesn't. If one looks at the dose contributions of the various isotopes released in the fuel cycle, the

fact is in terms of whole-body dose, tritium and carbon-14 represent more than 99 percent of the total dose. See staff witness Branigan, TR. 4,411; Staff Exhibit 14 at 4,465; Applicant's Exhibit 43 at 4,324 through 25; applicant's witness Yarborough, TR. 4,266.

Even if, for the sake of argument, plutonium were underestimated, and let's just assume that we take Dr. Cochran at his word and we increased the plutonium concentration or the total hazard from plutonium by a factor of 4, the effect here is to multiply by a factor of 4, a total dose which is less than 1 percent of the total dose commitment from the fuel cycle. So you're dealing with an insignificant argument. See applicant's witness Yarborough, TR. 4,265 through 66; staff witness Clarke, TR. 4,434.

In terms of bone dose, Dr. Cochran's testimony is instructive here. Dr. Cochran's testimony, see TR. 4,594, indicates that there is an 875-rem-per-person total dose commitment. Of this, 90 percent is due to carbon-14, 9 percent is due to tritium, and less than 1 percent is due to plutonium.

So that is you examine the problem in terms of bone dose as well as whole-body dose, Dr. Cochran's own testimony shows -- let's multiply it by a factor of 4 for the sake of argument, and you are multiplying a dose

which is less than 1 percent of the total dose by a factor of 4, and it still isn't significant.

We submit that the argument as to isotopic concentrations is simply misplaced. There are three reasons for that. One, in an LMFBR isotopic concentrations of more hazardous isotopes of plutonium will not build up, they will burn up. Two, the real dose contribution in the fuel cycle is due to carbon-14 and tritium, and you can try to manipulate the numbers to increase plutonium, and it's not going to make a difference.

And the final point is that, so what? If indeed there is a need to put in fuel with higher values, that may require a license amendment, but that is not the subject of the application at this time. It is highly unlikely, however, that that would occur, since the uncontradicted evidence in the record is that there is no shortfall in the availability of the low burnout LWR fuel. We thus submit that the isotopic concentration argument is simply not a significant point.

Turning now to the question of the alternative reprocessing plant. The argument as it is expressed at TR. 4,171 through 72 is that if the reprocessing operations for Clinch River were conducted at Hanford or

Savannah River, the impacts which the staff estimates in Appendix D based on the developmental reprocessing plant, may indeed be different, they may be exceeded.

Now, it is important to consider the evidence in the record on that point. The first point is that, let's just assume for the sake of argument that reprocessing were conducted at Hanford or Savannah River rather than the DRP.

The first thing is that at both facilities it would be necessary to construct a new head end of the facility. See applicant's witness Yarborough, TR. 4,185. Virtually all of the impacts in the reprocessing plant are in the head end, and more importantly, they are attributable to tritium and carbon-14. See applicant's witness Yarborough, TR. 4,250 through 51.

Now, carbon 14 is or represents 47 percent of the dose from the fuel cycle, and more importantly, all of the carbon 14 is assumed to be released from the environment in the Staff Exhibit 8, Appendix D fuel cycle analysis. Likewise, tritium is 52 percent of the dose, and all of the tritium is assumed to be released in the fuel cycle analysis. So let's suppose we go to Hanford and Savannah River. Let's suppose we build a new head end. How can you release more than 100 percent? How could the staff's analysis possibly be non-conservative in view of that fact?

We submit that as a matter of necessary implication, and the uncontradicted evidence in the record, that you cannot have higher releases than those contemplated in the staff's analysis. I should also note in this respect that on a realistic basis, carbon 14 should be a factor of three lower than the 100 percent suggested by the staff, because a good deal of that will stay in the cladding, and another portion of that will be removed by the crypton 88 removal system. See Applicant's Exhibit 43 at 14.

Furthermore, in regard to tritium, 90 percent of the tritium will diffuse through the cladding and the reactor and will be removed in sodium coal traps, so realistically the tritium source term should be a factor

of ten lower. See again Applicant's Exhibit 43 at 13. Thus, the analysis assumed or undertaken by the staff which assumes 100 percent release of all of the carbon 14 and tritium is clearly conservative.

Now, the bottom line conclusion is that because virtually all of the dose, that is, more than 99 percent, is tied up in carbon 14 and tritium, and because 100 percent of both are assumed to be released, one cannot get higher impacts, no matter what alternative reprocessing plant one assumes. See Applicant's Witness Yarborough, TR. 4,251.

Let's turn now to the third issue of confinement factors. In Dr. Cochran's testimony, Exhibit 13, at 29 through 30, in Dr. Cochran's testimony, Exhibit 13 at 29 through 30, he displays calculated values for confinement factors assumed for the fabrication plant and for the reprocessing plant. The NRC staff and applicants in the analysis assume a value of $1.25 \times 10^{-11\text{th}}$ for the fabrication plant overall and a factor of $5 \times 10^{-10\text{th}}$ for the reprocessing plant overall.

The staff and applicants then purposefully degraded the confinement factors to make them less favorable and more conservative. You will see discussion of this point in Applicant's Exhibit 36.

That is the environmental report, Chapter 5.7, at Pages 22 and 79.

Now, Dr. Cochran in his Exhibit 13 at 29 argues that the values assumed by the staff and the applicants for the reprocessing plant should be a factor of ten lower than those assumed. The basis for that statement is calculations performed by Dr. Cochran first for the Savannah River plant during the period 1975 through '78, where he calculated 4×10^{-9th}, and then for the Purex plant during the year 1972, when he calculated a value of 3×10^{-9th}.

Now, it is important to put this difference in values in perspective here. One additional HEPA filter placed in series on the reprocessing plant will give one a 10^{-3rd} additional factor. See Dr. Cochran, TR. 4,548, and see Mr. Lowenberg at TR. 4,431. The use of the HEPA filter to achieve a reduction which is much greater than ten is easily achievable within the state of technology. See Staff Witness Lowenberg, TR. 4,431 through 32.

And I would not go without mentioning the fact of Mr. Lowenberg's experience in this regard. If you read his resume, and his statement of professional qualifications attached to Staff Exhibit 14, you will see that he has more than 30 years of hands on in the

field engineering experience. So I would suggest to the Board that that testimony should be credited very highly.

Mr. Lowenberg also testified during the same passage in the transcript at 4,431 through 33 that factors of ten reductions such as those that we are arguing about here can be achieved without going to a HEPA filter. One can merely expand a duct size or put in a deflector or simple straightforward techniques that don't even require the addition of equipment.

Now, there is a residual issue here about the question of bypass leakage around filters, and I commend to the Board's attention here the testimony of Messrs. Lowenberg and Clark at TR. 4,436 through 37, that there is a considerable base of experience with filter performance under accident conditions, under abnormal conditions. If a filter is bypassed, it doesn't affect the remaining stages of filtration. In fact, the filter trains will pick up the difference, and the confinement factor does not degrade precipitously.

Now, getting back to Dr. Cochran's calculations, we've got two calculations suggesting a reduction of a factor of ten presented in the direct testimony. Exhibit 13 and 29. However, upon cross examination and then on redirect, Dr. Cochran admitted that his own calculations are not complete, and a more

thorough analysis should be done. That is TR. 4,565. We submit that on the weight of the evidence in the record, there is no issue here, that at most the argument revolves around a factor of ten difference in confinement factor. Clearly, that is achievable either by HEPA filters or by, as Mr. Lowenberg would testify, by very simple, straightforward manners.

Turning to the last issue, Issue 4, waste management, the intervenors here have proposed or advanced an argument which relies upon the EPA proposed standard, and the study accompanying the proposed EPA standard. The argument goes as follows. The EPA standard is designed to limit long-term risk from waste management to 1,000 health effects over 10,000 years after closure of the repository. See Intervenors' Exhibit 13 at 35 through 36.

The intervenors then, however, take these numbers and perform an unusual calculation. They assume that CRBR is 1/100th of the repository volume, and therefore ten health effects could be attributable to CRBR. That is Intervenors' Exhibit 13 at 36. Okay so far. No argument. Staff Witness Boyle at TR. 4,422 through 23. However, the next step causes the problem.

Then Dr. Cochran takes 30 years' operation and calculates 3/10ths of health effect per year. That is

Intervenors' Exhibit 13 at 37. This is simply incorrect testimony, and for several reasons it is a gross overestimate of the health effects.

First of all, our testimony indicates that the CRBR share of repository impacts is in fact less than 1 percent. It is more like .36 percent. Applicant's Exhibit 43 at 16. Moreover, and more importantly, the correct basis for this analysis would involve spreading the risk over the repository lifetime of 10,000 years, so that logically the health effects are more realistically 3.36 health effects per 10,000 years, and thus we would have a range from .0003 health effects up to a maximum of .001 health effects per year.

In addition, however, if the intervenors choose to rely on the proposed EPA standard, one should consider two points which underlie that standard. The standard for the EPA analysis is predicated upon several things. First of all, it is an upper bound estimate. See TR. 4,551. Secondly, it is developed as a measure of relative risk, and the standard includes a caution that it should not be used to provide any absolute estimates of risk or health effects. See TR. 4,551, TR. 4,425.

Accordingly, we believe that on the basis of the evidence in the record, the impacts of waste

management have been reasonably assessed and are indeed small. To recapitulate, there are four basic arguments raised within the ambit of the fuel cycle Contention 6-B-1 or B-3. Isotopic concentrations, alternative reprocessing plants, confinement factors, and waste management. As to each of those contentions, the overwhelming weight of the evidence in the record indicates that each is invalid.

MR. SWANSON: I believe it is staff's turn.

(Pause.)

MR. EDGAR: Judge Miller, before we break today, could we take five minutes at the end of the day and discuss the Comanche Peak order? I would like to hear some discussion on that.

JUDGE MILLER: I would rather we do it tomorrow.

MR. EDGAR: That will be fine.

JUDGE MILLER: When do you want to take it up?

MR. EDGAR: I would like to take it up after we conclude this segment of the argument, if that is okay.

JUDGE MILLER: Fine. All right.

ORAL ARGUMENT OF DANIEL SWANSON, ESQ.,
ON BEHALF OF STAFF,

U.S. NUCLEAR REGULATORY COMMISSION

MR. SWANSON: The staff testimony on the fuel cycle issues is concentrated primarily on Staff Exhibit 14, the prefiled testimony of Messrs. Lowenberg, Branigan, Clark, and Boyle, and in the FES Appendix D, Staff Exhibit 8. Mr. Edgar has presented a number of points and addressed some major arguments by intervenors. We would like to bring up just a couple of others and just touch on one that he mentioned.

Basically, the intervenors are challenging the adequacy of the assessment of the impacts of spent fuel reprocessing and mixed oxide fuel fabrication. The intervenors are challenging the appropriateness of the staff analyses, and as Mr. Edgar indicated, they are also challenging the adequacy of the assessment of the impacts of waste management and disposal.

The staff has addressed these issues by utilizing the rule of reason, which is legally mandated to apply to facilities which are not subject to NRC licensing, but are considered for their environmental effects that they may contribute to the fuel cycle related to the Clinch River facility which is under consideration for licensing.

The staff requested from applicants a description and assessment of the specific facilities

that would be used by DOE to carry out the Clinch River fuel cycle activities. This information was provided to the staff in the form of Amendments 14 and 16 to the applicant's environmental report. The staff reviewed and independently assessed the facilities proposed by DOE, whether they be specific, conceptual, or generic in nature, and concluded that the environmental effects related to all contemplated steps and aspects of the projected Clinch River fuel cycle are not significant when compared to natural background radiation or even to normally expected variations in the level of background radiation.

This conclusion and discussion can be found at Transcript Page 4,457.

With regard to the reprocessing operation, which was brought into question by intervenors, applicants indicated the use of four possible alternatives. They stated that at this time, that DRP represents the primary alternative for carrying out this operation, and regardless of which alternative is eventually utilized, the environmental effects for the DPR presented in Amendment 14 to the environmental report will bound the environmental effects of whatever alternative is ultimately chosen.

This conclusion is set forth on Page 15 of

Staff Exhibit 14. That is Transcript Page 4,458.

Staff reached this conclusion in light of the following factors, some of which have been touched on already by Mr. Edgar, and I will just briefly recount them. First of all, a major contributor to radiological dose from the reprocessing plant is the release of tritium and carbon 14, and that is set forth on Transcript Page 4,465.

The applicant assumed 100 percent of the radio nuclides to be released from those isotopes at the reprocessing plant. The radio nuclides that are the major contributors to radiological dose from plutonium emissions are the isotopes of plutonium 238 and 241. The applicants have assumed a plutonium composition of 20 percent of plutonium 240 at this plant which has higher levels of these two plutonium isotopes than would be encountered using the 12 percent plutonium 240, which is the planned composition of plutonium for the Clinch River operation.

Thus we have a conservative estimate of 12 percent of 240 versus the expected -- excuse me, an assumed amount of 20 percent. The applicants have assumed a plutonium content of 20 percent plutonium 240 versus the contemplated or planned 12 percent concentration, which is built into the Clinch River

application. This is discussed in the staff's final environmental statement supplement at Page D-10 and at Transcript -- the transcript citation was mentioned by Mr. Edgar in his presentation.

In light of these important considerations, the staff has concluded that the DRP can realistically be considered to bound the environmental effects of any alternative that may be used for reprocessing Clinch River spent fuel. Accordingly, the staff performed its analysis of this operation based on an assessment of the DRP. This is discussed at Transcript Page 4,405.

In this analysis, the staff analysis, and also in the staff's review of the fuel fabrication operation, the staff added further conservatism to its assessment of plutonium effects by considering aged plutonium, which accounts for a grow-in of americium 241 and for each isotope of plutonium used the higher value developed from either the DOE assumptions or the staff assumptions was used. This is discussed at Transcript Page 4,415.

Based upon all of these factors, the staff concluded that the impacts, social and radiological, resulting from the reprocessing of spent Clinch River fuel would be insignificant. This conclusion and discussion can be found at the staff testimony, Exhibit

14, at Pages 14 and 15, and 22 and 23. That is Transcript References 4,457 and 8 and 4,465 and 6.

The second major area of intervenor's concerns is the management and disposal of radiological wastes. This matter was described in some detail by applicants, and I will not -- I will try not to repeat what they have said. I will simply point out that the staff considered wastes and evaluated them with regards to wastes that have been produced in the commercial sector.

Staff found that the waste expected from Clinch River and the fuel cycle are quite similar in nature and content to those that are produced by the commercial nuclear utility industry. The wastes of most radiological significance are the high level wastes from the reprocessing of spent Clinch River fuel. These were compared in detail with the wastes resulting from the LWR fuel cycle and were found on an individual isotope by isotope basis to be very much alike as discussed in the staff's final environmental statement supplement at Page D-22.

Having concluded that wastes from the Clinch River fuel cycle were basically similar to LWR wastes, the staff considered the significance of Clinch River waste with regard to commercial LWR wastes, and this is discussed in the FES supplement at Page D-22. In this

regard, the staff found that Clinch River wastes represent a very small fraction, that is, less than 1 percent, of the comparable waste management needs of the commercial nuclear fuel cycle. This is discussed at Transcript 4,419 and 20 and 4,422.

Thus, the addition of Clinch River wastes would not significantly perturbate the waste management plans for the nuclear industry. This is discussed on Pages 16 and 17 of Staff Exhibit 14. That is Transcript Pages 4,459 through 60.

In regard to the appropriateness of the analyses, of the staff's analyses, the third major point raised by intervenors, it is easiest to consider this point by briefly reviewing the processes used by the staff. The staff reviewed applicant's submittals to determine, first, that the applicant had used a reasonable approach in its plan and analysis, and second, that the applicant's assessment methods were credible and adequately conservative. The staff then performed its own assessments based on its independent judgments of appropriate analytical techniques. These points are made at Page 10 of Staff Exhibit 14. It is Transcript Page 4,453.

The staff analyses took several forms based on the nature of the facility or operation involved. When

the facility proposed for use by applicants existed or was firmly planned, the staff relied upon existing DOE environmental information and based its assessment on an evaluation of such information using a reasonableness or hard look standard. This is discussed in the FES supplement, Page D-10.

When facilities were less firmly established or in a proposal stage, the staff used either a model or generic facility concept as well as site conditions considerations, plus utilization of the staff's related experience and information which the staff possessed. This is discussed in the FES supplement at Page D-7, D-10.

Some of the specific aspects of intervenor's concerns with regard to appropriateness of staff evaluation can now be addressed. Mr. Edgar already addressed the reduction. He indicated that particular emissions of plutonium could be released by factors of ten, and by a number of measures by the addition of additional HEPA filters which would result in reductions of several orders of magnitude in releases. This was a concern raised not only by, I think, Dr. Cochran, but Dr. Johnson, but this matter is discussed at Transcript Pages 4,430 through 4,433.

As an indication of the independence of the

staff fuel cycle analysis, the staff considered simplified open fuel cycle proposed by DOE and determined that a more logical representation of Clinch River operations would involve a closed fuel cycle after the first five years of operation. This is discussed at Transcript Pages 4,359 through 60.

Accordingly, the staff conducted a qualitative analysis of such alternatives by means of a sensitivity analysis, and by alternatives, I mean alternatives to the proposed fuel cycle. This analysis considered the isotopic compositions of plutonium previously discussed, and any change of material quantities or transportation activities from the proposed fuel cycle.

This discussion is at Section D-2, 4, 7, of the FES supplement.

The Staff concluded that its analysis qualitatively covered the environmental effects of alternatives based on Applicant's amendment 16 to the environmental report, performed a qualitative assessment of the alternative to the fuel cycle which confirmed -- excuse me -- performed a quantitative assessment of this alternative which confirmed the qualitative assessment presented in the FES document. The results of the quantitative assessment discussed are discussed at Transcript page 4356.

The issue of the multiple LWR recycled plutonium at Clinch River was already discussed by me in connection with an earlier issue and was addressed again by Mr. Edgar in his argument now. Simply put, though, there are no current plans in the application for a program which would use multiple recycles of LWR fuel at Clinch River, nor does there appear to be any need for such fuel at Clinch River since it is not needed for the first five years and Clinch River will generate more plutonium than it requires during the latter 25 years of its operation.

Based on these points, the Staff believes the Intervenors' so-called plutonium hazard indices, which go as high as 4.3, are completely outside the scope of the Clinch River proposal and are not relevant to this

proceeding.

Intervenor's witness Johnson also testified on limited aspects of the fuel cycle issues. In response to questioning, he raised two major concerns: that he was not given assumptions for Staff fuel cycle dose estimates on which to base his analysis; and secondly, that the Staff failed to consider bone dose in its analysis of effects of the reprocessing plant.

Regarding the assumptions for Staff fuel cycle dose estimates, I would simply point out, first, that Appendix D to the FES supplement does contain assumptions for both the fuel fabrication facility, at section D.2.4.2, and for the reprocessing facility, at D.2.4.3.

Secondly, with regard to the same point, on the providing of assumptions, Staff assumptions to Intervenors, in the FES supplement at page 12-63 the Staff pointed out that it did provide computer printout to Intervenors in response to interrogatories, specifically Interrogatories 14 through 18 of NRDC twenty-seventh set of interrogatories.

In addition, the Staff had provided information in deposition to Intervenors, the details of which are outside the record, but I can simply point to page 12-63, as I mentioned, of the FES volume 1, where

it was pointed out that Intervenors were given the specific computer printout on this matter, which contained the analyses complained of by Dr. Johnson.

Regarding his second point, that the Staff somehow failed to consider bone dose for a reprocessing plant, I would simply point out that Mr. Johnson admitted that he had not done an analysis which permitted him to disagree with the following points: First, the Staff made statements in Table D-17 of the FES supplement, which contains a footnote A which specifies specific organs that were considered by the Staff, including bone, lung, kidney, and GI tract, with annual population doses expected to be less than one person-rem, he indicated. This is discussed at Transcript page 5903 through 5904.

In that same area, Dr. Johnson indicated that he did not perform an analysis which would allow him to disagree with the Staff's assessment of doses expected from the Clinch River fuel cycle facilities, which are set forth in the FES supplement, Table D-17. In that table the Staff established that the fuel reprocessing plant was the dominant facility with respect to doses, and that the Staff did consider other critical organs. This is set forth in section D.2.4.2.

On the establishment of impacts from core fuel

fabrication, the FMEF, Dr. Johnson admitted he did not have an analysis which would permit him to disagree with Staff Exhibit 14, specifically the Branigan testimony at page 22, where Dr. Branigan concluded that for the core fuel fabrication facility and the fuel reprocessing plants over 99 percent of estimated dose is due to exposure from tritium and carbon-14.

In other words, at this point we've established that Dr. Johnson did not have a basis for disagreeing with the Staff conclusion, number one, that specific organs were in fact considered; secondly, that the dominant facility in terms of dose was the fuel reprocessing plant; and thirdly, that the dominant dose of concern from that facility was tritium and carbon-14. The latter point again is discussed at Transcript 5901 through 5903.

Finally, of these two elements of concern, tritium and carbon-14, Dr. Johnson concluded that the tritium and carbon-14 are of concern to the whole body. He stated that at Transcript page 5901. Therefore, Dr. Johnson conceded, despite his argument, that the Staff had considered the effects of concern with tritium and carbon-14 for the whole body, and that that was appropriate to do that. He had no basis for disagreeing with the Staff's analysis or conclusions.

In comparing Rocky Flats with other facilities, Dr. Johnson in his written testimony drew comparisons calling Rocky Flats a fuel reprocessing facility and claimed that he based his expectations on the impacts of the Clinch River fuel facilities from those that he found at Rocky Flats. That was the tenor of his entire prefiled written testimony.

Staff witness Lowenberg, who testified based on his qualifications and experience with Rocky Flats, said he was very familiar with the facility, set forth at Transcript 6075, testified that Rocky Flats is not a reprocessing facility, as Dr. Johnson had claimed. This is set forth at Transcript page 6076.

At that page and the following page, Mr. Lowenberg testified that the processes, products and releases at Rocky Flats were not at all comparable with those of the proposed DRP, the FMEF, or Savannah River. Further, Mr. Lowenberg testified that DOE orders since the Rocky Flats fire included fire detection, prevention and protection measures as well as filter protection devices, and that the Clinch River fuel cycle facilities would be required to comply with these DOE orders. Transcript page 6078 through '9.

Thus, the concerns raised by Dr. Johnson regarding the Rocky Flats fire simply are not applicable

to the Clinch River fuel cycle facilities, and the conclusions and concerns raised by Dr. Johnson do not apply.

Regarding genetic effects of plutonium raised by Dr. Johnson, in response to concerns raised by Dr. Johnson I would simply refer to Staff witness Dr. Bender, who is a geneticist, where he stated in his testimony at page 12 that genetic effects that he assumed quite conservatively accounted for estimates -- let me back up a second.

That genetic effects were quite conservatively accounted for in Dr. Bender's testimony, and that the use of whole body in lieu of the gonad dose recommended by Dr. Johnson resulted, in Dr. Bender's, in an overestimate of genetic effects from plutonium and other trans-uranics. This matter is discussed by Dr. Bender in page 12 of his testimony.

One final point by Dr. Johnson. His claim -- and it's advocated by Dr. Cochran again this morning -- that somehow there should be a different toxicity value assigned to plutonium, was attributed in part to Dr. Johnson's testimony. Dr. Johnson apparently relied on an article attached to his testimony, a Cross article, an article by a fellow by the name of Cross. Dr. Johnson conceded that the Cross article is based on an

analysis done of 69 dogs. That's at Transcript 5916.

It can be readily seen from the Cross article that Cross himself cautions against extrapolating the effects that he derives from dogs to humans. That page of the article can be found at Transcript page 6057.

Dr. Branigan's conclusions, on the other hand, were based on BEIR estimates, and Dr. Johnson conceded that the BEIR estimates were based on experience with thousands of humans. He conceded that at Transcript page 5917.

I think it can be readily seen that the very bases that Dr. Johnson relied on for drawing his conclusions regarding the incorrect use of toxicity factors for plutonium simply don't support his conclusion, and thus indirectly they fail to support Intervenors' conclusions that plutonium toxicity was incorrectly considered by the Staff and Applicants.

I would simply conclude that the fuel cycle impacts were adequately considered by the Staff and Applicants, that the Staff took the appropriate review of Applicants' proposals, and that the environmental impacts measured in a sense by the Staff were adequately small and that they were adequately reported by the Staff in its final environmental statement and in the prefiled written testimony; that Intervenors' contention

6 regarding fuel cycle impacts simply does not -- is not supported by the testimony presented in this record.

JUDGE MILLER: Thank you.

Dr. Cochran, we'll hear from you in the morning. Would you rather come at 8:30 or 9:00 to start? We don't care.

DR. COCHRAN: 9:00.

JUDGE MILLER: Okay.

Now, you asked for five minutes, Mr. Edgar. So you've got exactly five minutes.

MR. EDGAR: I wanted to ask for a clarification, if I could, on page 3 of the Comanche Peak order. It is really the top two sentences there. What I am looking toward is proposed findings that would essentially provide the format of an initial decision, and what I'm thinking of --

JUDGE MILLER: We didn't ask for that, though, did we?

MR. EDGAR: I guess that's what I'm asking.

JUDGE MILLER: Proposed findings is really proposed findings of fact, conclusions of law and briefs. The only thing that we have requested that should be mandatory would be proposed findings of fact. We have not asked for it in the form of an initial decision, although if you want to do it you can. We

haven't asked for conclusions of law. We haven't asked for briefs, but you may if you wish.

We have asked for proposed findings of fact in writing. We have asked also for this closing argument in depth in order to expore mutually, to advise the Board of what the gut issues are, and to advise all of you ladies and gentlemen for your own purposes in your proposed findings of fact.

Now, that is the scope which we had considered.

MR. EDGAR: Okay.

JUDGE MILLER: You know, the last six months or so the Licensing Boards have been using a somewhat different format. They've been using a part one which is more like an appellate decision or opinion, let us say, where you are dealing more with ultimate facts, and that way you get into some factual matters, but keyed or footnoted, really, to findings of fact which are the subsequent second part, where you go A, B, C, D, E and you spell out the facts and give your references and so forth.

Now, we realize that where you are dealing with factual evidence which consists in substantial part of opinions of expert witnesses, as we have here, we realize these are not necessarily sharp distinctions.

But we think they're reasonably significant, unless you ladies and gentlemen persuade us otherwise.

That's what we had in mind. We consider that now is when you're having your best chance, really, at argument, because we don't think the proposed findings of fact should be really essentially arguments. You're making your argument now. You may want to go and raise that. I don't know. It's up to you.

But on the proposed findings of fact we want your own. It's like you win the case on the strength of your own entitlement, not on your opponent's weaknesses. We view it in a similar fashion.

Does this cause a problem to people?

MR. SWANSON: If I could just give an example. If findings were filed in conformance with the most recent model proposed by the Chairman of the Board panel, would that be consistent, then, with the range of alternatives that you are suggesting?

JUDGE MILLER: Yes. That would be your option. We're not requiring that of you.

MR. SWANSON: I understand that.

JUDGE MILLER: We intend to come out with something similar to the new format in the sense that we're going to have an opinion, really, and then we're going to have Roman II or whatever the number is going

to be, the findings of fact, keyed in and numbered. The opinion will not be in numbered paragraphs. It will be as you've done here, really.

You've gone to the issues or clusters of issues that you deem significant, which are in controversy and which need to be assessed, analyzed and decided by the decisionmakers. We will be doing much the same thing.

As far as format, we're not concerned about it, but to the extent that you wish to do so, fine. We realize that all of us are on a short time schedule, inasmuch as the Commission seems to be expecting something from us in the middle or the latter part of February. That doesn't give us a lot of time, so we are working, too, like you, Mr. Edgar. And we are working before the findings are submitted, but with them and with briefs if you want, and so on.

But that is the reason that we did not give you a reply, because we were considering everything to be simultaneous. Does that put you at a significant disadvantage?

MR. EDGAR: I suppose I don't know. I suppose if it does I'll howl.

JUDGE MILLER: If you can make a showing on good cause, we're not totally inflexible, but we think

maybe this will move things along for both the Board and parties and counsel.

Is there anything else?

MS. FINAMORE: I have one request for a clarification. The second sentence on page 3, "Proposed and proven facts do not depend upon what other parties assert, but upon the record of it and cited by the proponent."

In that sentence are you talking about the affirmative evidence put on by a party?

JUDGE MILLER: Yes, essentially.

MS. FINAMORE: The reason I am asking is that for a couple of the contentions the Intervenors did not produce any affirmative testimony, but are relying on cross-examination.

JUDGE MILLER: Well, that is record evidence. If you think that you fatally wounded someone by cross-examination, you would be citing that and the results of your effective cross-examination and the finding of fact which should go your way.

We don't care how you do it. We don't insist you put on your own witnesses. The whole record is evidence, and if somebody has left a hole for you you can use it. You're welcome to it, and you would perfectly well fulfil what we've asked for. Only give

us the record citation, so we know what your contention and what your findings of fact are based on.

Now, if you really have a serious problem -- let me say, a lot of things are new and different sometimes and they strike us, we worry about it, and so we keep worrying and worrying and embroider it to where we hypothesize all sorts of things that never happen. If it turns out that someone really believes that he or she is significantly put to a disadvantage, then we will certainly entertain an appropriate motion or other request to the Board to consider or show good cause, and we will try to be reasonable. We think this should cover nine tenths and we're hoping for ten tenths.

Okay, nine and one.

(Whereupon, at 4:04 p.m., the hearing in the above-entitled matter was recessed, to reconvene at 9:00 a.m. on Wednesday, January 5, 1982.)

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NUCLEAR REGULATORY COMMISSION

This is to certify that the attached proceedings before the

ATOMIC SAFETY AND LICENSING BOARD

In the matter of: UNITED STATES DEPARTMENT OF ENERGY PROJECT MANAGEMENT MANAGEMENT CORPORATION - TENNESSEE VALLEY AUTHORITY
(Clinch River Breeder Reactor)

Date of Proceeding: Washington, D. C.

Docket Number: 50-537

Place of Proceeding: Bethesda, Maryland

were held as herein appears, and that this is the original transcript thereof for the file of the Commission.

ALFRED H. WARD

Official Reporter (Typed)

Official Reporter (Signature)