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September 13, 1982

Mr. Cecil O. Thomas
Acting Director
Clinch River Breeder Reactor
Program Office
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Re: Draft Supplement to Final Environmental Statement related to construction and operation of Clinch River Breeder Reactor Plant, NUREG-0139, Supplement No. 1 Draft Report (July 1982)

Dear Mr. Thomas:

Enclosed are the comments of the Natural Resources Defense Council, Inc., on the above-referenced draft supplement to the CRBR final environmental statement.

Sincerely,

Barbara A. Finamore
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Attorney

Thomas B. Cochran (BAF)
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NRDC COMMENTS ON THE DRAFT SUPPLEMENT TO THE FINAL ENVIRONMENTAL STATEMENT RELATED TO CONSTRUCTION AND OPERATION OF THE CLINCH RIVER BREEDER REACTOR PLANT (NUREG-0139, SUPPLEMENT NO. 1 DRAFT REPORT, DOCKET NO. 50-537)

SECTION 1.3, Status of the Project

The last two paragraphs on page 1-1 should be updated to reflect the current licensing status of the CRBRP. The last paragraph on page 1-1 should be updated to reflect the latest schedule for CRBR construction, reactor criticality, and demonstration. The Staff should discuss whether this schedule is consistent with recent experience with schedule slippages for the construction and operation of commercial power reactors.

SECTION 2.1, The Site and Environs, General Description

In the second full paragraph on page 2-1, the possible construction on the Oak Ridge Reservation of the Tennessee Synfuels Associates Coal-to-Gasoline Facility should be included. The Staff should discuss the potential effects on the CRBR and on the environment of construction of the nearby synfuels plant. In particular, the Staff should discuss the impact of an accident at one plant upon operations at the other plant, and should discuss the synergistic effect of carcinogenic emissions from the synfuels plant and radioactive emissions from the CRBRP. The Staff should also indicate that

DOE proposes to construct a developmental reprocessing plant (DRP) two miles east of the Clinch River site (inside the LPZ) in order to reprocess fuel from the CRBRP. The Staff should discuss the implications of this plant for the siting of the CRBR.

In the final paragraph on page 2-1, the Staff mentions that "[w]ithin a 20-mile radius of the site, 12 public water systems and 15 industrial systems draw from surface water, including the Clinch River and the Emory River." The Staff should consider and discuss how CRBRP radioactive discharges into the Clinch River might affect the portion of the public that uses the Clinch River for its drinking water.

SECTION 2.5.1, Hydrology, Surface Water

The Staff states on page 2-5 that flow reversal of the Clinch River would occur as a result of the abrupt shutdown of Melton Hill and Watts Bar Dams and by the release of water from Fort Loudon and Tellico Dams. The Staff also states that there may be periods of zero flow of the Clinch River because of regulation at the Melton Hill Dam. The Staff should discuss the effects of Clinch River flow reversal or periods of zero release upon the liquid pathway dose calculation in Sections 5 and 7.

SECTION 2.5.3, Floodplain Effects

There are three areas in this section that are inadequately addressed, according to Executive Order 11988 and DOE Regulations, Compliance with Floodplain/Wetlands Environmental Review Requirements (10 CFR Part 1022).

A) Alternatives

This section is totally inadequate in its listing or discussion of alternatives to the existing proposal, although this is a requirement appearing throughout the regulations. 10 CFR §1022.3 says:

> DOE shall exercise leadership and take action to: (a) Avoid to the extent possible the long- and short-term adverse impacts associated with the destruction of wetlands and the occupancy and modifications of floodplains and wetlands, and avoid direct and indirect support of floodplain and wetlands development wherever there is a practicable alternative.
>
> * * *
>
> (d) Identify, evaluate and as appropriate implement alternative actions which may avoid or mitigate adverse floodplain/wetlands impacts.

The consideration of alternatives to construction in a floodplain or wetlands is a significant requirement in complying with these regulations. It is specifically referred to in Executive Order 11988 and in the definitions of an Environmental Assessment and a Statement of Findings. The procedures within the regulations (§1022.12(a)(3)) outline that a floodplain/wetlands assessment shall include:

> Alternatives. Alternatives to the proposed action which may avoid adverse effects and incompatible development in the floodplain/wetlands shall be considered, including alternate sites, actions, and no action. Measures that mitigate the adverse effects of actions in a floodplain or wetlands, including but not limited to minimum grading requirements, runoff controls, design and construction constraints, and the protection of ecology-sensitive areas shall be addressed.

The only mention of this vital issue in the section of the DES dealing with floodplain effects can be found in paragraph 5 which states:

> Construction of the plant would neither increase runoff to nor constrict flow in the Clinch River significantly. None of the plant features located in the floodplain would increase floodflows or change the flood level measurably. Furthermore, there do not appear to be reasonable alternatives to these features which, by necessity, must be located adjacent to or in the Clinch River.

There is no discussion about what alternatives, if any, were considered and why they were rejected in favor of this proposal. What is meant by "not constrict flow. . . significantly" and not "change the flood level measurably"? Would other methods create less environmental impact? There is no way adequately to assess the methodology DOE used or to determine whether in fact this requirement was fulfilled.

The Staff should discuss in detail the extent of any harm to floodplains or wetlands from the proposed project; the cost of any alternatives; the additional environmental impacts, if

any, caused by those alternatives; and the costs and benefits of all practicable mitigation measures. The Staff should, in particular, discuss whether CRBR construction at another site would result in less damage to floodplains or wetlands.

It becomes particularly difficult to understand why alternatives were not listed (much less discussed) in the DES since a Public Notice issued by TVA in cooperation with DOE (published in The Oak Ridger, Oak Ridge, Tenn. on August 31, 1982) at least contains a list of some alternatives that were considered:

> Alternative onsite rail and road routes that would avoid wetlands or floodplains would pass through adjacent steep hills and require extensive ground excavations at excessive cost, resulting in additional environmental impacts.

The DES is sadly lacking in any discussion of what alternatives, if any, were explored, as required by Executive Order 11988.

B) Statement of Applicability to State and Local Standards

The DOE floodplain regulations (§1022.25(b)(4)) state:

> For actions which will be located in a floodplain, DOE will publish a brief statement of findings which shall contain; . . . a statement indicating whether the action conforms to applicable state or local floodplain protection standards.

It is impossible to address the impact this activity will have on compliance with these standards, given that this issue was totally ignored in this section of the DES.

C) Critical Action Floodplain

The DES also fails to adequately address whether any of the proposed construction or operation activities would constitute a "critical area" (any activity for which even a slight chance of flooding would be too great; such actions may include the storage of highly volatile, toxic, or water-reactive materials). The Project Description section of the DOE floodplain regulations (§1022.12(a)(1)) states:

> For actions located in a floodplain, the high hazard areas shall be delineated and the nature and extent of the potential hazard shall be discussed.

Pursuant to that, the regulations define two separate floodplains. The base floodplain is defined as the 100-year (1.0 percent chance of occurrence in any year) floodplain. The critical action floodplain is defined as the 500-year (0.2 percent) floodplain. The first paragraph of this section of the DES states:

> The base floodplain for the purposes of this study is defined as the lowland and relatively flat area adjoining the Clinch River that is subject to a 1% or greater chance of flooding in any given year.

In other words, the Staff has determined that a base floodplain is sufficient for this study without any discussion, as required, on the potential hazards of locating portions of this project within the critical action floodplain. The maps included as part of the floodplain/wetlands assessment only indicate the 1 percent chance flood elevation. Therefore, this

section only addresses plant features located in the 100-year floodplain such as treatment ponds, river intake and pumphouse, barge ramp, the intake and discharge structure, the plant access road, and railspur. The DES doesn't address whether any hazardous parts of the plant are going to be located above the 1 percent elevation floodplain but still within the 0.2 percent floodplain. Other activities and components of the Clinch River Breeder Reactor Project should be specifically addressed according to their location in the floodplain and potential hazards.

The only mention of this issue is the closing paragraph (7) which says:

> Additionally, safety-related components of the plant are designed to withstand the effects of the probable maximum flood (PMF), a flood considerably more severe than that addressed by the Executive Order.

This in no way fulfills the nature or spirit of the abovementioned regulations.

In addition, in Figure A2.3 on page 2-8, the Staff shows the location of the proposed CRBRP barge unloading facility in the 100-year floodplain. The location of the proposed barge unloading facility is different that than shown in Figure 3.3 of the 1977 FES. The Staff should resolve this discrepancy and explain the reason for any change in location, if such a change has been made. Furthermore, the Staff should identify the location of the proposed barge unloading facility to the

nearest tenth of a river mile, for purposes of identifying the amount of radioactivity in the river sediment at that location.

Finally, the Staff should explain why rail shipment does not represent a "clear alternative" to the barge port and consequently why barging should not be avoided.

SECTION 2.6, Meteorology

In the third paragraph of this section, the Staff notes that "heavy fog may occur more than 34 days annually, since the proposed site is nearer the river than the weather office location." The Staff should indicate approximately how many days it would expect to find heavy fog at the proposed plant site, and should discuss the potential effect of heavy fog, including effects upon radiological dose asessments. The Staff should also include the latest meteorological data for the Clinch River site, rather than relying exclusively upon data collected from February 17, 1977 to February 17, 1978.

SECTION 2.7.1.1, Flora

This section identifies two plant species known to be on the CRBRP proposed site that may at some time in the future be listed as threatened and endangered, according to the U.S. Fish and Wildlife Service (FWS). The Staff should describe all efforts made by the Applicants to avoid adverse effects to these two plant species, as requested by the FWS. In addition,

the Staff should discuss the effect upon these plant species of the proposed 50% increase in land clearance.

SECTION 2.7.1.2.1, Mammals

The DES contains no discussion of any potential effects of CRBRP construction and operation upon bobcats, which have been observed several times in the Oak Ridge reservation. Such a discussion must be included. The Staff must also explain the basis for its conclusion that construction and operation of the CRBRP would not result in any significant deterioration of potential feeding habitat along the Clinch River for the grey bat, a threatened species.

The NRC Assessment of the Impacts of Clinch River Breeder Reactor Plant on Threatened or Endangered Species (August 1982) (the "NRC Biological Assessment") discusses the effects of CRBR construction and operation upon the endangered grey bat. This discussion should be incorporated into the DES, although it also contains several inadequacies. For example, Section 5.1 of the NRC Biological Assessment notes that there is evidence of a previous occupation of 500-100 (presumably 1,000) grey bats in a cave located in the northern portion of the CRBR site along Chestnut Ridge. The NRC states that the formerly occupied cave will not be affected by any construction or operational activities, and, therefore, would be available for reoccupation. It is not clear from this discussion whether the

site will be available for occupation at any time during construction or operation, or only after construction and operation are complete. If the latter, the NRC does not indicate whether loss of the use of the cave at this CRBR site for any period of time would hinder grey bat migration from summer to winter caves.

The NRC Biological Assessment also claims that CRBRP construction and operation will not affect foraging habits of the grey bat in the vicinity of the site, since there will be a 25-foot wide vegetation border along the river. The Staff makes no mention, however, of whether human presence, noise, or other construction impacts that will occur late into the evening (at times, around the clock), regardless of any vegetation border, will affect the use of the river by the grey bat for foraging. Given this potential for disruption, the discussion of impacts upon the grey bat in the biological asessment is insufficient.

SECTION 2.7.1.2.2, Birds

This section notes that five species of threatened or endangered birds have been observed on the CRBR site, including the bald eagle and four birds on the State of Tennessee threatened or endangered species list. Nowhere in the DES, however, does the Staff discuss the effects of plant construction and operation on these species. In particular,

there is no analysis of the significance of the disruption to these species' activities from excavating, blasting, digging, clearing, or burning. Nor is there any discussion of the impacts of site clearing for the CRBRP, support facilities, roads, railroads, and transmission lines. The Staff states that no nesting activities of these species has been observed on the CRBRP site, but does not explain whether a literature search has indicated that nesting may occur at this particular site. Nor does the Staff indicate the methods for and extent of the search for nesting activities of these endangered or threatened species at the CRBRP site. There is no indication in the DES that the Applicants or the Staff have conducted the required biological assessment to determine the effects of the CRBRP on these listed and proposed endangered and threatened species.

SECTION 2.7.2 Aquatic Ecology

This section notes that the U.S. Fish and Wildlife Service has notified the NRC that 11 species of freshwater mussels from the family Unionidae may be present at the proposed CRBR site or vicinity. The Staff relies on a freshwater mussel survey performed by TVA, one of the applicants, for its conclusion that only one of these species, Lampsilis orbiculata orbiculata, may be present. An analysis of the TVA's freshwater mussel survey and the NRC's Biological Assessment

reveals that, contrary to NRC's assertion, four other species of endangered mussels may also be present.

First, the sampling techniques employed by the TVA scuba divers did not permit an adequate sampling of the dromedary pearly mussel, Dromus dromas. This species is particularly noted for its tendency to burrow beneath the substrate and in fact is almost never found on the surface. Yet the scuba divers, who apparently were not trained or experienced in the collection of mollusks, were not instructed to search for mussels below the substrate. The divers only looked and felt for mussels on the surface of the river bed and, as a consequence, could easily have overlooked specimens of Dromus dromas or other burrowing mollusks. The possibility that such species were overlooked is increased by the fact that almost 50% of the Clinch River substrate is of gravel, sand, or cobble, which could easily hide these species. Since Dromus dromas was known from the Clinch River prior to the construction of the Tennessee Reservoir system and has a current range which includes portions of the Clinch River, Tennessee River, and Powell River, the Staff should assume that this species is present at the Clinch River site unless an appropriate survey program demonstrates otherwise.

Second, the fact that a specimen from the species Fusconaia was collected just downstream of the proposed CRBR site in 1978 is sufficient evidence to indicate possible presence of both

Fusconaia cuneolus and Fusconaia edgariana at the Clinch River site. The failure of the TVA survey to collect and/or identify any Fusconaia specimens is not conclusive evidence that they are not present. As mentioned above, these burrowing species may have escaped the notice of the divers, who did not conduct a prudent examination of the substrate. Also, no taxonomist was present during the survey and the samples were all returned to the Clinch River after identification by a non-taxonomist, making verification impossible. Given the difficulties of species identification for endangered mussels (the NRC Biological Assessment describes one instance of incorrect classification on pp. 17-18), it is very possible that this or other mussel species were collected but misclassified by the TVA.

Third, the rarity of this endangered species, which is neither dense nor widespread, should indicate in itself that failure to collect any specimens in one instance does not mean that such species are not present. This proposition is amply demonstrated by the NRC Biological Assessment itself. Since a specimen of Lampsilis orbiculata orbiculata was found in the Clinch River in April 1982 (and presumably returned to the river as an endangered species), why weren't that or other specimens collected in May 1982? Certainly the failure to collect L.o. orbiculata in May 1982 should not lead to a conclusion that the species is not present, given evidence of

its recent presence. Similarly, the fact that Fusconaia was collected in 1978 right near the proposed site should be sufficient for the prudent conclusion that this species is likely to be present now in that vicinity.

Finally, the weight of the evidence indicates that the rough pigtoe pearly mussel, Pleurobema plenum, is probably also present in the vicinity of the CRBR site. This species was in fact known to inhabit the Clinch River within 40 river miles of the CRBR site prior to construction of the Tennessee Reservoir system (recorded by Ortmann in 1918 under the name Pleurobema obliquum cordatum). It has also been recently collected both upstream (in Kyles Ford, above the Norris Reservoir) and downstream (near the Wilson Dam, in Mussel Shoals) from the proposed site. There is no reason to believe, given this recent evidence and the inadequacies of the TVA freshwater mussel survey, that Pleurobema plenum is not still present in the CRBR site vicinity.

SECTION 3.2, Reactor and Steam Electric System

On page 3-1, the Staff states that the Applicants expect to achieve a breeding ratio of 1.29 to 1 with the initial core and 1.24 to 1 with the equilibrium core. What is meant by the "to 1"? Is the Staff suggesting that the breeding ratio may be closer to 1 than to 1.24 or 1.29? The DES does not explain whether the Staff believes a ratio of 1.29 for equilibrium case is achievable or reasonable, nor does it explain the uncertainties existing in this breeding ratio for the initial core and equilibrium core. Quantification of such uncertainties in the breeding ratio calculations are necessary in order to enable the public to determine the likelihood that the plant will, in effect, achieve its breeding objectives. It is unclear from this description whether the breeding ratio indicated depends upon the availability of low plutonium-240 fuel. The DES should make this assumption clear. In particular, the DES should indicate whether the breeding ratio will change if recycled mixed oxide fuel is used to fuel the reactor.

SECTION 3.3, Water Requirements

The Staff states that the anticipated annual average water makeup requirement and the estimated total consumptive use of river water have increased. There is no explanation of why such increases have occurred, or the effects of such an increase upon the environmental impacts stated in the 1977 FES.

SECTION 3.4.1, Heat Dissipation Cooling System

The Staff states that a large increase has occurred in the cooling water flow rate to the CRBR cooling towers and in the heat rejection from each cooling tower. There is no discussion of the potential impact of this increased heat and moisture upon the existing and proposed roads in the site vicinity; for example, whether increased ice on roads in the winter will occur. There is also no discussion of whether the present heat rejection system will increase the number of days of heavy fog in the area and what impacts this increased fog might have upon the environment and local residents, including commuter traffic to CRBR and nearby industrial facilities.

SECTION 3.5, Radioactive Waste System

In the 1977 FES, the Staff stated its belief that the design objective levels of 10 CFR 50, Appendix I should be considered in determining whether CRBRP radioactive releases would be "as low as reasonably achievable." It is unclear from the DES whether the Staff still holds this belief. In any case, given that there are significant differences in the radioactive effluent processing systems between LMFBRs and light water reactors, NRDC does not believe that unmodified use of Appendix I for the Clinch River Breeder Reactor is appropriate. The more appropriate method for determining whether CRBRP radioactive releases would be as low as

reasonably achievable is to examine each CRBR system on a case-by-case basis. In any event, the Staff does not appear to have applied Appendix I, Section II.D. in judging the adequacy of proposed CRBR radioactive effluent processing systems. This should be done in the FES Supplement.

The first sentence in Section 3.5 states that the PWR-GALE code was modified to apply to liquid metal fast breeder reactors. This section must be expanded to discuss how this PWR-GALE code was modified, and give the reasons for such modifications. This explanation is necessary to enable the reader to determine whether or not the impacts on the CRBR are indeed comparable to those from a light water reactor.

The first paragraph in Section 3.5 states that the principal parameters used in the source term calculations are given in FES Table 3.2. The last two lines of Table 3.2 list decontamination factors for several elements in the Intermediate Activity System (IAS) and Low Activity System (LAS). This table is inadequate because it does not explain the basis for the decontamination factors used; in particular, the calculations used to derive such figures and the experience with other systems upon which factors were based. This table and Section 3.5.1 discuss systems used to washdown sodium-contaminated equipment in the IAS and LAS and are based upon an estimate of 0.5% fuel cladding defects. Neither Table 3.2 nor Section 3.5.1 contain any discussion of the activity

level the Staff expects to see in either the IAS or LAS. Furthermore, there is no discussion of how these activity levels relate to the estimate of 0.5 percent fuel cladding failure, nor is there any indication of what the estimated activity level would be given a different fuel cladding failure estimate. There is no discussion in either the Table or Section 3.5.1 of the basis for the Staff's estimates of 0.5% fuel cladding failure or the basis for Staff's assurance, if any, that this percentage will not be exceeded.

SECTION 3.5.1.3, Balance of Plant Releases

In the 1977 FES the Applicants estimated that the plant would release approximately 330 Ci/yr of tritium. The Staff said in the 1977 FES that this estimate appears reasonable and agreed with it. In the 1982 DES, the Applicants now estimate the tritium release to be approximately 2.3 Ci/yr, which is about two orders of magnitude less than their previous estimate. The Staff again states that this estimate appears reasonable and agrees with it. The Staff gives no indication for this drastic reduction in estimated tritium releases, or its reasons for agreeing with this changed estimate. Without a detailed explanation of the reason for such change, and the basis for Staff's endorsement of this change, it appears that the Staff is merely rubber-stamping whatever the Applicants propose.

SECTION 3.5.1.4, Liquid Waste Summary

In this section, the Staff presents its evaluation of the proposed radioactive liquid waste treatment systems, and calculated the release of radioactive materials in the liquid waste effluent as approximately 0.016 Ci/yr, excluding tritium and dissolved gases. This estimate is exactly the same as that presented in the 1977 FEs. The Staff also presents the Applicants' estimate of radioactive materials in the liquid waste effluent, which has risen from $6.1 \times 10^{-5}$ Cr/yr to $8.7 \times 10^{-4}$ Cr/yr, excluding tritium and dissolved gases. There are a number of problems with this very brief section. First, it is impossible to determine how the Staff reached its estimate of 0.016 Cr/yr. The Staff merely states that its estimate is based on the use of different values than used by the Applicants for assumed defective fuel, plant capacity factor, the volume of waste released from the IAS, the quantity of radioactive sodium waste input to the LAS, the decay time prior to collection in the LAS, and the evaporator decontamination factor for iodine. It is imperative that the Staff identify and discuss what these values are, how they differ from those used by the Applicants, and why those different values were used. The final FES should also explain how these assumptions led to the Staff's final result.

Second, the Staff gives no reason why the Applicants' radioactive liquid waste effluent calculations have increased

from those given in the FES. It is important to explain the reasons for this increase, and to explain whether the Staff has also recalculated its estimates of liquid waste effluent radioactivity based on the reasons given by the Applicants, or merely repeated the figure given in the 1977 estimate.

SECTION 3.5.2, Gaseous Waste

The main problem with this section, as NRDC has explained previously, is that the Staff is attempting to rely upon dose limits in 10 CFR, Part 50, Appendix I, for its conclusions that gaseous releases from the plant will be as low as reasonably achievable (ALARA). The use of these dose limits is inappropriate in the case of the Clinch River Breeder Reactor, because the cost of additional radioactivity control equipment appears to be less (in some cases, substantially less) for the CRBR than for light water reactors.

The Staff states that several changes have occurred in the design of the CRBR that, according to the Applicants, would result in a much greater release of radioactivity to the environment from gaseous waste. The Applicants now estimate a total release of 700 Ci/yr. for noble gases, as opposed to the 1977 estimate of 6.4 Ci/yr. This estimate of 700 Ci/yr is almost double that estimated by the Staff, even though it appears from the DES that the Staff has used more conservative assumptions regarding release of the RAPS noble gas storage tank inventory to the environment. The Staff must not only

explain the reason for such a wide discrepancy in estimates between the Staff and the Applicants, but must also analyze each of the proposed processing systems, the costs of such systems, and whether such systems reduce radioactivity to a level that is as low as reasonably achievable. This analysis is particularly important since it appears that the Applicants have removed from the design several features that were originally proposed to substantially reduce radioactivity levels. For example, the Applicants no longer propose to bottle the noble gases. In another example, the Applicants no longer propose that the cell atmosphere processing system (CAPS) collect and process any leakage of gases in the nitrogen or air atmosphere cells housing the RAPS and CAPS components.

SECTION 3.5.2.6, Gaseous Waste Summary

In this section, the Staff states that it uses a different parameter for defective fuel and increases the tritium release by a factor of 10 "for the reasons stated in FES Section 3.5.1.4." As noted above, Section 3.5.1.4 merely states that the Staff uses different values for factors such as defective fuel. The Staff must state what those values are and give the reasons for the differences in values between the Applicants and the Staff.

SECTION 3.5.3, Solid Waste

This section needs to be expanded to include an explanation of why the estimates of the amount of radioactivity (Ci amount)

that will be contained in the solid waste from the plant have increased. The Staff must compare these radioactivity levels from solid waste, with the range of radioactivity levels present in solid waste from operating commercial plants, and explain the conclusion that these amounts are as low as reasonably achievable.

SECTION 3.5.3.1, Solid Waste Summary

The Staff concludes that the proposed solid waste system is acceptable, but the proposal states merely that the waste would be packaged and shipped to a licensed burial site or stored on-site. It is unclear how long the waste would be stored on site; whether such storage would be temporary or permanent; the criteria that DOE would use in determining whether or not to store the waste on site, or in a licensed burial site; and whether or not these wastes would, in fact, be stored by DOE at Oak Ridge Reservation rather than at a licensed burial site. The Staff must include a discussion of these questions in Section 3.5.3.1.

SECTIONS 3.6, Chemical Effluents; 3.7, Sanitary and Other Waste; 4.4.2, Aquatic Impacts; and 5.4, Other Nonradiological Effects

The following comments on these sections are presented together since they all relate to the adequacy of the standards and requirements in the draft NPDES permit set out in Appendix H.

Our principal water quality concern regarding the draft NPDES permit issued by EPA is that it fails to comply with the provisions of Section 301(b)(1)(C) of the Clean Water Act, which states:

> In order to carry out the objectives of this Act there shall be achieved not later than July 1, 1977 any more stringent (effluent) limitation, including those necessary to meet water quality standards . . . established pursuant to any State law or regulations . . .

EPA verifies that Tennessee Water Quality Standards are applicable to this permit. "NPDES Permit Rationale, Clinch River Breeder Plant, Permit No. TN0028801," dated June 24, 1982, at Part 1.B. However, Part II of the Permit Rationale, which states the basis of the effluent limitations contained in the permit, makes no mention of those standards. Repeated references are made to federal technology-based effluent guidelines as the grounds for effluent limits contained in the permit. But it appears that none of the limits were based on consideration of state water quality standards, despite the fact that the section of the Clinch River into which the project will discharge apparently is water quality limited for at least one toxic pollutant generated by the facility, according to data provided

in the DES on the proposed facility. We believe issuance of the permit in its present form would violate the Act and 40 CFR §122.52(a) and (d).

A. Tennessee Regulations

Table A3.2 (page 3-15) of the DES entitled "Preliminary Estimates of Effluent Water Concentrations, indicates that the mean background concentration of copper is 36 ug/l and the maximum background concentration is 170 ug/l. These concentrations appear to exceed the allowable levels for Tennessee streams, such as the Clinch River, that are classified for uses including "propagation and maintenance of fish and other desirable aquatic life." (Chapter 1200-4 of the Rules and Regulations of Tennessee, Rule 3, Section (2)(a): General Water Quality Criteria for the Definition and Control of Pollution in the Waters of Tennessee.

Moreover, Section (3)(c) of the Tennessee Water Quality Criteria cited above sets forth the allowable concentrations of various pollutants in streams classified Fish and Aquatic Life. Section (3)(c)(7) states that in such waters:

> There shall be no substances added whether alone or in combination with other substances that will adversely affect fish or aquatic life. The instream concentrations of toxic pollutants shall not exceed 1/10 of the 96-hour $LC_{50}$ based upon available data using one or more of the most sensitive organisms significant to the aquatic community . . ."

Furthermore, Section (4)(b)(ii) of the regulations, which deals with mixing zones for pollutant dispersement, states that

such zones "shall not contain materials . . . in concentrations that exceed the 96-hour $LC_{50}$ for biota significant to the aquatic community in the receiving waters."

The regulations also state that references to be used in determining toxicity limitations shall include Water Quality Criteria published by the U.S. Environmental Protection Agency pursuant to Section 304(a) of the Clean Water Act. Data contained in the document Ambient Water Quality Criteria for Copper (EPA 440/5-80-036, October 1980) indicate that the levels of copper found in the Clinch River do indeed exceed the limitations on toxicity listed above.

B. Conditions in Clinch River and CRBR Effluent

Table 1, entitled Acute Values for Copper, found on pages B-16 to B-28 of the copper criteria document (cited above), lists the results of toxicity tests examining the effects of a range of concentrations of copper on a variety of organisms. This table lists toxicity data for several species which, according to Section 2.7.1 of the DES (pp. 2-11 to 2-19), are significant members of the community of organisms found in the Clinch River at the point where wastewater from the breeder reactor would be discharged. These are cladocerans (Daphnia magna and Daphnia pullcaria), carp (Cyprinus carpio), bluntnose minnow (Pimephales notatus), striped bass (Morone saxatilis), bluegill (Lepomis macrochirus), and largemouth bass (Micropterus salmoides). The following table summarizes the data for these species.

| Species | Number of Studies | Copper Toxicity | |
|---|---|---|---|
| | | $LC_{50}$--Range (ug/l) | $LC_{50}$--Arithmetic Mean (ug/l) |
| Daphnia magna | 11 | 9.8--200 | 53.6 |
| Daphnia pullcaria | 8 | 7.2--27.3 | 14.5 |
| Cyprinus carpio | 2 | 800--810 | 805 |
| Pimephales notatus | 9 | 210-340 | 236 |
| Morone saxatilis | 6 | 50-4300 | 1478 |
| Lepomis macrochirus | 7 | 660--10,200 | 4844 |
| Micropterus salmoides | 1 | 6790 | 6790 |

Comparing these data with the background concentrations of copper in the Clinch River, it appears that the mean concentration (36 ug/l) exceeds the mean $LC_{50}$ for one species, Daphnia pulcaria, and that the maximum concentration (170 ug/l) exceeds the mean $LC_{50}$ for one additional species, Daphnia magna. More significant is the fact that the mean background concentration exceeds the level established in the Tennessee Water Quality Criteria (one-tenth the $LC_{50}$) for three of the species--Daphnia magna, Daphnia pulicaria, and Pimephales notatus. Furthermore, the maximum background concentration exceeds one-tenth the $LC_{50}$ for five of the seven species listed--Dapnia magna, Daphnia pulicaria, Cyprinus carpio, Pimephales notatus, and Morone saxatilis.

Although the above experiments were performed in laboratory

water in which copper might have a different degree of toxicity than in the waters of the Clinch River due to differences in hardness and other aspects of water chemistry, the data presented above represent a substantial body of scientific evidence and no other information on the toxicity of copper is presented in the draft NPDES permit, the permit rationale, or the DES. According to these data, the maximum concentration of copper in the Clinch River (170 ug/l) exceeds the Water Quality Criteria set by the State of Tennessee--1/10 the $LC_{50}$ for sensitive resident species. (The average ambient concentration of Cu--36 ug/l exceeds 1/10 the $LC_{50}$ for three resident species.)

In addition, according to Table A3.2 in the DES, the discharge to the river from the breeder facility would contain an average of 200 ug/l and a maximum of 930 ug/l of the pollutant copper. It seems likely that this would cause a violation of Section 4(b)(i) of the Tennessee Water Quality Criteria for mixing zones, which says that concentration of pollutants shall not "exceed the 96-hour $LC_{50}$ for biota significant to the aquatic community in the receiving waters." Yet this issue is not addressed in the draft NPDES permit, the permit rationale, the DES or the June 9, 1982, letter of certification from the Tennessee Department of Health. Table 3.6 of the February 1977 FES for the breeder reactor does address the relationship between effluent concentrations and state water quality criteria, but does not list any specific criteria for copper, apparently

because none existed at the time the chart was prepared.

C. Deficiencies in the Permit and Certification

Based on the above information, it appears that the segment of the Clinch River into which the wastes from the breeder reactor would be discharged is a water quality limited stream for the toxic pollutant copper. Consequently, a Total Maximum Daily Load (TMDL) should have been estimated, and a Waste Load Allocation (WLA) performed in order to incorporate water quality-based effluents in the NPDES permit, in accordance with Section 303(d) of the Clean Water Act. No mention is made of a TMDL or WLA in the draft NPDES permit or the permit rationale prepared by EPA, or in the DES written by DOE and TVA.

Furthermore, the letter of certification for the discharge sent on June 9, 1982, by the Tennessee Department of Public Health to the Acting Director of the Breeder Project, EPA, and DOE pursuant to Section 401 of the Clean Water Act, makes no mention of specific state water quality criteria, provides no toxicity data, and gives no indication that any attempt was made to determine whether the Clinch River was water quality limited for any pollutants to be discharged by the breeder reactor, much less whether a TMDL or WLA allocation was performed.

In fact the letter of certification fails to comply with Section 401 of the Clean Water Act. At no point does it assert that the Tennessee Department of Health or any other agency of the State of Tennessee made a positive determination that state

water quality standards and criteria are not and would not be violated. Rather, the letter simply states:

> 1. Permittee is in no way relieved from any liability for damages which might result from the discharge of wastewater.
>
> 2. Permittee must additionally comply with all requirements, conditions, or limitations which may be imposed by any provision of the Tennessee Water Quality Control Act (T.C.A. Sections 70-324 through 70-342) or any regulations promulgated pursuant thereto.
>
> 3. The State of Tennessee reserves the right to modify or revoke the certification or seek revocation or modification of the NPDES Permit issued subject to certification should the State determine that the wastewater discharge violates the Tennessee Water Quality Control Act, or any of the applicable Water Quality Criteria, or any rules or regulations which may be promulgated pursuant to the Clean Water Act of 1977, Public Law 95-217.

Stating generally that the permittee should comply with all relevant sections of state law and regulation without having determined -- based on available information -- that violations will not occur (or requiring the permittee to provide evidence of compliance prior to certification) does not comply with Section 401 of the Clean Water Act. And merely reserving the right to revoke the certification or seek revocation or modification of the permit does not cure that noncompliance.

D. Other Issues

1. Re: Outfall No. 002--Sewage Treatment Unit Effluents (page I-2).

The note regarding additional units is confusing. The first sentence states, "Additional units may be added (or subtracted) provided that each individual unit does not exceed the above limitations or its individual flow. A process modification may be made during the construction phase to the existing system to allow increased flow; however, all other discharge limitations shall apply." This seems to mean that the permittee could greatly increase the flow of effluents so long as the concentration of pollutants listed in the permit are not exceeded. This could result in substantial increases in pollutant loadings in the receiving water. Such changes clearly should not be allowed without review and approval by the permitting agency. The last sentence in the note, "In either case, proper application must be made to EPA and the State of Tennessee prior to institution of any changes," seems to require the approval we believe is necessary. This note should be revised to clarify this ambiguity.

2. Re: Outfalls No. 003 through 008--Point Source Runoff (pp. I-3 and I-4).

The permit fails to set definite limits on the amount of Total Suspended Solids (TSS) contained in runoff from the facility. It simply says that if the TSS concentration exceeds 50 mg/l, the permittee "shall evaluate system performance to assure that the system is operating as designed and that on-site controls are effective. Permittee shall take appropriate

corrective action as required." The permit should clearly state that if the concentration of TSS exceeds 50 mg/l, steps must be taken to bring the concentration down below this level.

3. Re: Outfall No. 009--Waste Water Treatment System (p. I-5).

The allowed daily maximum for TSS appears to be unusually high. It should be set at 45 mg/l, as requested by the State of Tennessee in its letter of certification, with regard to Outfall 002, unless this is clearly infeasible.

4. Re: Outfall No. 012--Pre-Operational and Other Metal Cleaning Wastes (pp. I-8 and I-9).

Limits are placed on the concentration of pollutants in each batch discharge, but no limits are set for the size of any given batch discharge or the number of discharges over a specific period of time. Such limits should be set.

Since the Clinch River appears to be water quality limited for the pollutant copper, and since off-site disposal is technically and economically feasible, no discharge of copper should be permitted.

5. Re: Other Requirements, A (p. III-1).

The implication that if the permittee meets the effluent limits for the first 18 months of operation the monitoring requirements could be substantially reduced or eliminated is of concern. Considering the nature and size of the facility, frequent monitoring should always be required, particularly as

the facility ages. The proposed permit requires daily monitoring for most limited parameters, which can be accomplished inexpensively using current technology. This is by no means an onerous burden on a facility costing several billion dollars.

6. Re: Other Requirements, C (III-1).

The present wording regarding additional monitoring of the main plant discharge (001) and the plant intake (013) to assure conformance with applicable water quality standards is confusing, since such standards apply to the receiving waters, not the effluent. How and by whom will the determination of compliance be made? Why not simply require monitoring of the receiving waters?

7. Other Requirements, G (p. III-3).

Waiting 12 months after the onset of operation to obtain a priority pollutant scan seems unwise. If significant levels of toxics were being discharged, substantial amounts could accumulate in the river during the course of 12 months. A priority pollutant scan should be done 3 months after the onset of operation, followed by scans at 6 months and 12 months.

8. Other Requirements (p. III-3).

The current language requires notification of EPA and the State prior to instituting use of any additional biocide or chemical in cooling systems, other than chlorine, which may be toxic to aquatic life (emphasis added). This wording leaves the determination of potential toxicity up to the applicant, and

could result in failure to report use of a harmful chemical. The language should be changed to require reporting of the use of any new biocide or chemical, leaving the determination regarding potential toxicity up to EPA and the state.

9. Testing

A further comment regards the letter of certification sent by the State of Tennessee. Item #7 of that letter states that the permittee must submit to the State, for review and approval, a plan for toxicity screening of discharge 001. We would suggest that both acute and chronic tests be required. Acute tests should be performed at 3, 6, and 12 months after onset of operations, and the results of chronic tests should be reported by 12 months.

Given these inadequacies in the draft NPDES permit and the State of Tennessee certification, the NRC cannot adequately assure that the impacts to aquatic ecology and endangerd species from CRBR construction and operation would not be significant. Those sections of the DES dealing with water quality impacts must therefore be revised.

SECTION 4.2, Impacts on Land Use

NRDC disagrees with the statement by the Staff that the increase of approximately 50% in land use is not significant, because the entire 1364-acre site is zoned for industrial development. The criteria for determining whether an environmental impact is significant is not a comparison with any planned future use of a particular site. Rather, the criteria is a comparison of the land use proposed by the project with the existing land use, which in this case is mostly forest land, including several areas of particular ecologicl significance.

On page 4-2, Figure A4.1 does not appear to be up-to-date, particularly regarding the existence of the Indian burial mound. On page 4.4, the sentence on the last line is not complete and apparently several lines are missing.

SECTION 4.4.1, Terrestrial Ecological Impacts

We believe that the increase of 50% land clearance and the proportional increase of the amount of biota affected is a significant increase regardless of the fact that the biota affected would be less than 1% of such resources on the Oak Ridge Reservation. It is unclear from this section whether or not other areas of the site besides the 45 acres for the quarry will be restored and, if so, how long such restoration will have to occur before wildlife and habitat would be restored to their present levels.

SECTIONS 4.4.2, Aquatic Ecological Impacts, and 5.3.4, Threatened and Endangered Aquatic Species

In general, these sections must be updated to reflect the Staff's analysis and conclusions in the NRC Biological Assessment, although that assessment regarding endangered mussels is inadequate in several respects. First, as noted above, a biological assessment of impacts must also be performed for Dromus dromas, Fusconaia cuneolus, Fusconaia edgariana, and Pleurobema plenum. Second, the biological assessment for L.o. orbiculata fails to consider several important potential impacts of a zero flow condition at the Clinch River. Any zero flow condition (which the Staff estimates to occur on an average of 17-32 days per year) might cause the L.o. orbiculata glochidia to settle to the bottom, fail to attach to a host fish, and smother in the sediment. Zero flow conditions, depending on the amount of organic sediment present, might also kill the glochidia through reduction in oxygen and pH conditions. Zero flow conditions might also impact the riffle species noted above.

Third, the NRC Biological Assessment claims that L.o. orbiculata utilizes the sauger, Stizostedion canadense, as a host fish, but that the sauger is not expected to be detrimentally affected by plant operation. This assertion (which should be supported by sufficient evidence) is belied by the evidence in the DES that the sauger uses the Clinch River

for spawning and will be affected unless certain protective measures are used. As discussed below, the Staff has not adequately demonstrated that such measures will be sufficient, or even that they will be adequately implemented. The Biological Assessment should consider the effects on L.o. orbiculata and other mussel species if host fish populations are weakened.

In general, both the NRC Biological Assessment and the DES fail to present meaningful information regarding the extent and characteristics of the potential siltation load and other parameters affecting endangered mussels. For example, on page 34, it states that sediment discharge to the Clinch River will be controlled in accordance with an erosion and sediment control plan. However, no estimates are given of the amount of sediment that is expected to escape into the Clinch River from rainfall or runoff and the effect of that sediment upon the endangered mussel species. Similarly, Staff admits that the project construction will include dredging from construction of a barge unloading facility and intake and discharge structures and placement of granular film materials. The Staff states that siltation of the river bottom due to these activities will be minimal, simply because construction of these facilities will be scheduled separately to minimize impact. There is no discussion of what the impact will be, what the additional siltation will be, and what effect this additional siltation

will have upon the endangered mussels. The Staff also notes that construction of the CRBR will result in the disturbance or loss of about 1.1 acres of river bottom, yet there is no discussion of what the effects of such disturbance or loss would be upon endangered mussels.

In Section 6.2 of the Biological Sssessment the Staff discusses the impact on L. o. orbiculata due to plant operations. The Staff admits that scour of the bottom in the immediate downstream vicinity of the discharge structure could potentially affect or exclude L. o. orbiculata, but the discussion of these impacts is inadequate.

Page 37 of the Biological Assessment states that the NPDES permit limits effluent discharges to levels that will not result in any acute or chronic effect on fresh water mussels inhabiting the bottom downstream of the discharge. Yet the NPDES permit contains no discussion of the effects upon endangered mussels of nonradioactive chemical discharges.

On page 38 of the Biological Asessment the Staff states that the worst-case condition of extended zero-flow would increase the temperature of only a small area of river bottom. No estimates are given of the estimated increase in temperature or the area of river bottom concerned. No effort is made to discuss the possibility of long-term reproductive effects on L. o. orbiculata, although the Staff admits that such effects may occur. The Staff also admits that increased radiosensitivity

may result from environmental interactions with other stresses (e.g., heat, biocides). Yet the Staff has made no effort to determine whether these environmental interactions might occur at the Clinch River site, particularly interactions with chemical effluents from the proposed synfuels plant or the Oak Ridge National Laboratory.

In discussing the effects of radiation exposure to L. o. orbiculata, the Biological Assessment only discusses impacts from routine plant operations. The Staff must also consider the effects on endangered mussel species of CRBR accidents and related radioactivity.

Striped Bass

The discussion on page 2-18 of the impact statement concerning the impacts upon striped bass is also inadequate. The Staff states that it is thought that a significant portion, perhaps the major portion, of adult striped bass inhabiting Watts Bar Lake utilize the Clinch River in the vicinity of the proposed CRBR site during periods of high thermal stress in the main reservoir. The Staff also notes that water temperature is of extreme importance to the striped bass fishery. Yet the DES and the NRC Biological Assessment both fail to provide sufficient information regarding the exact amount of heat that will be discharged tothe water, the vertical and horizontal distribution of excess heat in the water body around the site, and the potential effects of this thermal discharge on the

striped bass, particularly during the late summer or early fall. Rather than analyzing these impacts in the DES, NRC and EPA merely require the Applicants to perform studies at a later date. This procedure effectively screens from public view and NEPA comment the results of the Applicants' studies and the adequacy of EPA and NRC's approval, disapproval, or enforcement of any proosed mitigation measures. NRDC believes the NRC should prepare an impact statement supplement once these studies are complete. Until such a supplement is prepared, any NRC Staff conclusions that the striped bass will not be adversely affected are speculative only and cannot be relied upon. In particular, in analyzing alternative sites, the Staff should assume until proven otherwise that some impacts to striped bass will occur at the Clinch River site.

On page 219, the Staff discusses the existence of a state endangered fish species, namely, the blue sucker Cycleptus elongtus, in the vicinity of the site. However, there is no discussion of the effects of Clinch River Breeder Reactor construction or operation upon this endangered species, nor is such discussion contained in the August, 1982 biological assessment. We believe a biological assessment should be performed for the blue sucker, particularly since specimens have been taken in Watts Bar Lake on two occasions.

Sauger

On the bottom of page 4-5 of the DES, the Staff recommends certain features to reduce impacts to the sauger. There is no requirement at this time, however, that such recommendations be imposed as license conditions. For this reason, the Staff must examine the environmental impacts of the project if this and other recommendations are not included as conditions. This same comment applies to the Staff recommendation on page 4-6, that fill material not be placed in the river during late spring when sauger are spawning. The Staff must also consider the effects of accidental radiological releases and thermal and other chemical discharges upon the sauger, particularly since the highest sauger catch rate reorted by the Staff was immediately below the roposed discharge structure.

General

On page 4-6 of the DES, the Staff concludes that aquatic life would be destroyed in the area of the barge unloading facility. The Staff must discuss the amount and types of aquatic life that would be destroyed, and examine the effects of such destruction upon other aspects of aquatic ecology. The Staff also claims that areas severely affected by soil erosion and stream siltation due to construction would be "recolonized." The Staff must include a description of the ways in which these areas will be seriously affected, the amount of time needed for recolonization, and whether full recolonization is possible.

The Staff states that about 11,000 cubic yards of material will be dredged from the river to accomodate the barge facility, and that other dredging will also be required. The Staff should also consider whether, at some later date, additional dredging will be necessary for stream channelization in order to enable barges to travel between the facility and the barge port. Furthermore, it appears that the material to be dredged from the bottom of the Clinch River contains significant amounts of radioactivity because of previous activities at the upstream Oak Ridge National Laboratory. In particular, Oak Ridge National Laboratory, "Status Report No. 5, Clinch River Study" (ORNL-3721), October 1965, reported a maximum dose measurement over stream channelization spoil deposits at Jones and Grubb Islands (within the general area of interest) that was 455 mrem, including background. ORNL-3721 at 86.) Based on this information and on the fact that the Applicants' sedimentation sampling program appears to be inadequate, NRDC believes that the potential exists for relatively high doses resulting from the dredging associated with the Clinch River Breeder Reactor. In particular, the DES is inadequate because it contains no information as to where this dredged material will be placed and no information on what the potenial doses of radioactivity from this dredged material might be.

Applicants' Environmental Report, Table 2.8-8 at page 2.8-39, indicates cesium concentrations in sediment at the intake outfall and barge loading areas as high as 10 to 15 picocuries per gram dry weight. Because the sediment sampling was not based on a fine grid, it appears that substantially greater activity levels may occur in the actual dredging areas. In any event, in order to estimate the radioation exposures over CRBR dredge spoils, these levels should be compared to the activity levels in the sediment placed on Jones and Grubb Islands following channel improvement dredging in and around Jones Island and Grubb Island in October, 1962 and June, 1963.

SECTION 5, Environmental Impacts of Plant Operation

SECTION 5.7.2.2, Liquid Effluents

The Staff does not indicate what assumptions were used in the calculations of dose to the whole body and the internal organs in Table A5.2. Presumably the Staff's calculations were based on the ICRP 2 dose conversion factors. The calculations should be updated using the dose conversion factors from subsequent ICRP publications (see, e.g., NUREG/CR-0150). The Staff should calculate the bone surface dose rather than the bone dose (right hand column of Table A5.2), given that the ICRP and other radiation standards bodies are now in agreement that the bone surface and bone marrow are the critical organs, rather than the entire skeletal bone.

On page 5-12 the Staff estimates that the total body dose to a hypothetical individual who receives all drinking water from the planned discharge region at the Clinch River was estimated to be less than .1 milligram per year. NRDC believes that this calculation and the calculation of the dose due to fish ingestion in Table A-5.2 are understated due to the failure to consider resuspension of radioactivity in the sediments associated with barge traffic and dredging and the stirring of the sediment at the outfall pipe at the discharge region of the outfall line.

SECTION 5.7, Radiological Impacts from Routine Operations

A glaring deficiency in this section of the DES is the lack of any analysis by the Staff as to whether or not the proposed operations at the CRBRP will meet the requirements of 10 CFR Part 20. Under that section the licensee must control his activities in such a manner that the total dose to an individual from his activities and exposures to licensed and unlicensed radioactive material and to other unlicensed sources of radiation, whether in the possession of the licensee or any other person, does not exceed the standards of radiation protection prescribed in Part 20. In Section 5.7 the Staff evaluates the radiation exposure from routine CRBRP operations but does not calculate the total radioactive doses when these are added to doses from activities at the Oak Ridge National Laboratory, the Y-12 Plant, the Oak Ridge Gaseous Diffusion

Plant, and the proposed developmental reprocessing plant, which is scheduled to be constructed only two miles from the CRBRP site.

SECTION 5.7.2.2, Liquid Effluents

Larsen and Holdham (Science Vol. 201, 15 Sept. 1978, pp 1008 - 1009) found that the gastrointestinal absorption factor for soluble plutonium is strongly dependent on whether the water is chlorinated. The consequence of this observation is that the current methodology used for calculation of the plutonium dose contributions associated with liquid effluents are understated by several orders of magnitude for the water ingestion pathway where chlorination treatment is utilized in water treatment plants. This effect should be examined, particularly in the calculation of the Oak Ridge gaseous diffusion plant intake pathway in Table A5.2.

SECTION 5.7.2.5, Occupational Radiation Exposure

The NRC Staff has utilized risk estimators taken from the BEIR I Report. These risk estimators are more appropriate for population exposure rather than occupational exposure. NRDC disagrees with the Staff's statement that the relative risk model values represent a reasonable upper limit on the range of uncertainty. Mancuso, et al., in a series of mortality studies of the Hanford nuclear workers, have estimated a doubling dose of 15 and 30 rads. These results are consistent with somatic

risks as much as 20 times greater than the BEIR I linear relative risk estimates, due in part to the limited population, since the data was statistically significant only for certain radiosensitive cancers and the doubling dose confidence limits are very large. Also, recent analyses related to reevaluation of the dosimetry of the individuals exposed at Hiroshima and Nagasaki suggest that the absolute risk model in BEIR I understates the risk by several fold.

SECTIONS 5.7.2.6, 5.7.2.7, 5.7.2.8, 5.7.3 and 5.8 should be revised to reflect our comments on Appendix D.

SECTION 6, Environmental Measurement and Monitoring Programs

SECTION 6.1.2, Radiological

The first problem with the Applicants' proposed offsite preoperational radiological monitoring program is that the Staff has not demonstrated that this program will be sufficient to enable the Applicants at the operational monitoring phase to distinguish between CRBR radiological effluents and baseline effluent levels. The Staff should describe the criteria contained in the radiological assessment branch technological position cited and describe the number and location of the additional dosimeters that would be required.

SECTION 6.1.3, Meteorological

This section is inadequate because of the lack of sufficient details regarding the Staff's methodology and assumptions. Why are no meteorological measurements being taken now? Where are the towers (6-1) located, and how far are they from the site? Why are all of the towers located south of the site ("south", "southeast", "southerly"), when ORGDP, ORNL and Knoxville are north and west of the site? Wouldn't the uneven terrain encourage concentration of radiological releases in certain areas?

Why are releases "assumed to be at ground level" (¶ 4 at 6-7)? Why does the Staff use the "Straight Line Trajectory Model" rather than another model? Is there another model available that includes estimates of effects of recirculation and stagnation? Why are "continuous releases only" evaluated (6-7, ¶ 4)? Does this mean that accidental releases (greater concentration -- above ground level) have not been properly evaluated relative to meteorological conditions?

SECTION 6.1.4.1, Aquatic

This section describes the baseline aquatic monitoring program that was conducted between March, 1974 and May, 1975, as well as a preconstruction effects monitoring program that was conducted between March 1975 and January 1978. NRDC believes it necessary for the Staff or Applicants to conduct an

up-to-date baseline and preconstruction effects monitoring program rather than relying upon data that is between 4 and 7 years old. This is particularly important since, as noted above, there are possibilities for significant impacts upon several important game species and endangered species in the Clinch River. On page 6-12 the Staff states that the Applicants are now modifying an erosion and sedimentation control plan. The Staff relies upon the existence of the erosion control plan and the recommended scheduling of construction activities in the river for its conclusion that it will not require the studies indicated by the Applicants in the ER. We find it difficult to understand how the Staff can rely upon an erosion control plan that is now being modified and which may ultimately be very different from the one previously submitted to the EPA. In addition, since there is no requirement at the moment that the construction activities will be scheduled as recommended by the Staff, it is unreasonable to assume that such scheduling will occur. We think it prudent for the Staff to require or at least recommend the studies indicated by the Applicants in the ELR to protect the aquatic environment.

SECTION 6.2.2, Operational Radiological Monitoring Program

The Staff states that no change has been made in this section of the FES, yet this section contained one sentence

only: "The preoperational program would be reviewed by the Staff prior to operation." The Staff should, at the very least, indicate whether it is feasible for the Applicants to develop and maintain an operational radiological monitoring program that is able to distinguish clearly between CRBRP radiological effluents and effluents from other facilities and operations. Furthermore, the Staff should indicate whether they will require such an operational monitoring program to distinguish between various effluents and, if such a requirement is not imposed, give the reasons why not.

SECTION 7, Environmental Impacts of Postulated Accidents

SECTION 7.1.1, Classification of Accidents

There are several problems with Table 7.2, which summarizes the radiological consequences of postulated accidents. First, it appears from the site suitability analysis that the bone surface dose rather than the bone dose is controlling at the boundaries of the low population zone. For this reason, Table 7.2 should report the doses to the bone surface wherever the dose to the bone appears. Second, this table only estimates the dose at the site boundary (exclusion area) in two hours and the estimated dose to the population in a fifty-mile radius for the duration of the accident. This table should also include the estimated dose at the boundary of the low population zone for the entire period of the cloud, as required in 10 CFR Part

100. Third, the estimated doses in this table appear to be based on outdated dosimetric and metabolic models rather than on the new ICRP models; for example, the models utilized in ICRP 30. Fourth, the Staff has not examined and the Table does not reflect the radiological dose consequences resulting from the release of large quantities of sodium. Fifth, with respect to the population dose commitment (man-rem) the Staff has failed to include the dose contribution from tritium, noble gases and carbon-14 beyond the fifty-mile radius. Similarly, the Staff has failed to integrate the dose contributions over the full lifetime of the long-lived isotopes such as carbon-14, iodine-129, and even the strontium and cesium isotopes. Also, the Staff has not included the dose commitment to workers at the proposed DRP.

7.2., Transportation Accidents Involving Radioactive Material

The discussion in this section is inadequate on several counts. First, the Staff has failed to calculate the actual consequences of a serious accident involving the shipment of irradiated CRBR fuel. Second, the Staff notes that ORNL has estimated that LWR and CRBRP fuels have comparable radioactivity for comparable cooling periods of up to 100 years. On this basis, the Staff concludes that previous analyses of LWR fuel transportation would be applicable to accidents involving irradiated CRBRP fuel. The Staff has

failed to recognize, however, that the cooling period for LMFBR spent fuels is necessarily shorter than the cooling period for light water reactor fuels. Otherwise the LMFBR would fail to achieve its purpose of a short fuel doubling time. With the shorter spent fuel cooling periods associated with CRBRP fuel, the radiological consequences would be larger. Third, the Staff has indicated that it has not analyzed accidents associated with sodium as the cask coolant because the Applicant has not yet proposed the use of such casks. Since this is a reasonably foreseeable application, the Staff must analyze the consequences of an accident involving sodium as a cask coolant. Again, it is well recognized that in order to achieve short fuel doubling times the out-of-reactor plutonium inventory must be minimized; consequently, the spent fuel shipped after a short cooling period would in turn necessitate the use of sodium as a cask coolant.

SECTION 7.3, Safeguards Consideration

This section should be modified to reflect our comments on Appendix E.

SECTION 8, Need for the Proposed Facility

SECTION 8.3, The Ability of CRBRP to Meet Its Objectives

It is clear that the CRBRP cannot meet its programmatic objectives without having adequate fuel supply to enable it to operate throughout its five-year demonstration period. In the

September 9, 1982, hearings on the Administration's plutonium policy, before the Subcommittee on Energy Nuclear Proliferation and Government Processes of the Senate Committee on Government Affairs, the following exchange took place:

> SENATOR GLENN: Do we not now have enough plutonium stockpiled to run Clinch River if it is built?
>
> MR. KENNETH DAVIS: No, sir.

It is clear from this and other exchanges by Deputy Secretary of Energy W. Kenneth Davis and Under Secretary of State Richard T. Kennedy that there is currently an inadequate supply of plutonium to operate the Clinch River Reactor. Furthermore, Mr. Davis has indicated that the Barnwell reprocessing plant must be operating to meet the plutonium needs for the Clinch River Reactor and the FFTF. The Staff must discuss the adequacy of fuel supplies for the Clinch River Breeder Reactor and whether or not sufficient fuel will be available to enable the CRBRP to meet its programmatic objectives.

SECTION 9.2, Alternative Sites

On April 9, 1977, NRDC and the Sierra Club filed a "Motion to Declare that the CRBR FES is Not a Legally Sufficient FES and to Require that the Aforesaid Document be Circulated for Comment as a Draft" in response to the Staff's addition of a substantial amount of new material on alternative sites in Chapter 9 and 11.9 when the final FES was published.

Due to this rewriting, much of the FES Chapter 9 has not been previously commented on. Accordingly, NRDC's discussion of DES Chapter 9, which incorporates the FES by reference, reflects these charges in the FES.

SECTION 9.2.4, Alternative New Sites in the TVA Area

The fourth criterion on page 9-2 renders the "substantially better" CRBR alternative sites test virtually meaningless. Consideration of whether the choice of an alternative site would affect the project's ability to meet its programmatic objectives would also foreclose any meaningful consideration of alternatives since the Applicants now define one of those objectives as "completion of the CRBR construction as expeditiously as possible". Under this test, the switch to another site would almost always take more time, and thus be undesirable. The last sentence under (4) at p. 9-2 should therefore be deleted.

In ¶ 2 on page 9-5, the Staff should determine whether the choice by Applicants of the second review option would bias or color the site selection process, and whether sites are "passed over" that might be substantially better under the first option.

In (2), the Applicants have the burden of showing no likely further endangerment to federally listed threatened or endangered plant or animal species. As noted above, the

Applicants' proposed CRBR site fails to meet this threshold test for several species of endangered mussels and four state endangered or threatened bird species.

Evidently, the Staff in ¶ 1, on page 9-7, relied on TVA environmental statements to determine thresholds and to decide whether that site meets the criteria. Doesn't this mean the threshold criteria may be abused by the Staff and Applicants here, in that criterion (2) is not met for CRBR (and other sites also)? The Staff's review of these 14 candidate sites does not indicate whether this review meets criteria (1) on page 9-1, that the "reconnaissance level information submitted by Applicants is sufficient to support the analyses necessary to reach reasoned conclusions." Furthermore, since the impacts upon endangered mussels were only recently evaluated at the Clinch River, and since most of the 14 candidate sites are located near the Clinch River site, it is reasonable to conclude that these sites should also be reexamined for the presence of endangered aquatic species. There is no evidence that such a re-evaluation has been made, and thus no evidence that these sites meet criterion (2) on page 9-5.

In ¶¶ 2 and 3 on page 9-7, criterion (1) calls for examination of "at least four sites" and the Applicants came up with just four, although 13 sites apparently met criteria (1) to (8). Why were only four sites examined? Regarding criterion (3), isn't selection of another site on the Clinch

River mandatory under the proposed rule? The Staff's reasons for not selecting another site on the Clinch River are inadequate. See ¶ 1, at 9-8. It is not enough to say that the aquatic impacts are likely to be greater at another site. The Staff must select and evaluate one of these particular sites in detail before reaching that conclusion, rather than using a speculative conclusion to avoid particularized evaluation.

SECTION 9.2.5, Selected Alternative Sites in the TVA Service Area

On page 9-8, note the striped bass effect during periods of no-flow, which averages 17 days/year. What is the procedure by which dam regulation would be coordinated with striped bass thermal sensitivity? The Applicants would have a "commitment" to restrict thermal discharges, according to the NPDES permit (see ¶ M, p. H-28), but what is "minimal" impact on the bass (permit, H-28) and who decides whether such "minimal" impact has occurred? Why is there no population sampling of the striped bass in the NPDES permit -- all analysis is based on temperature, stream flow, thermal plume, thermal modeling information, but not an analysis of the striped bass itself? For example, in ¶ N of the NPDES permit, only water quality and biotic conditions are examined.

The Staff rests the lack of superiority of each alternative site on this NPDES permit and its required limitations, which

appear inadequate to ensure protection for the striped bass, and which in any case do not address the effect on any species of endangered mussels.

On page 9-9, ¶ 1, since units at the Hartsville, Phipps Bend, and Yellow Creek sites have been cancelled or deferred, and since substantial work on construction already been completed, the environmental advantages of siting the plant on already cleared areas should be considered again. Regarding the Staff assertion that other future developments of the Clinch River site would have the same impacts as an LMFBR plant, this would be true only if another nuclear plant was built. The most severe impacts of the CRBRP all relate to thermal and radiological discharges, impacts which are not comparable to other industrial uses.

Given these cancellations and the limited construction already accomplished, the degree of environmental preferability of Hartsville, Phipps Bend, and Yellow Creek must now be re-examined and evaluated.

For cost escalations, won't the actual amount and kind of construction at alternative sites Hartsville, Phipps Bend, and Yellow Creek affect the estimates on Table A9.3? This table should be redone. Also, Table A9.3, superseding FES Table 9.4, is vague and lacks meaningful detail of the type found in the FES Table. The FES Table included sources and specific breakdowns of costs at three sites; the same approach should be used on Table A9.3 for the four TVA sites under review.

On page 9-10, if the computer CONCEPT approach cannot be applied meaningfully to the LMFBR, why does the Staff use it anyway? Furthermore, without an adequate independent check of Applicants' figures in Table A9.3, the Staff should not rely on those figures.

On page 9-10 of the FES, ¶¶ 4,5 seem to conclude that the TVA chose the CRBR site in order to reserve other sites for commercial power plants. Shouldn't this criteria be reexamined now?

SECTION 9.2.6, Alternative TVA Sites Outside Its Service Area and Alternative DOE Sites

On page 9-11, Table 9.5 of the FES is incorporated by reference. According to this table the Hanford site is preferable on terrestrial and aquatic impacts, nearby facilities, land use onsite, atmospheric dispersion, flooding, population within 50 miles (400,000 less) population exclusion boundary (which is 15 miles as opposed to 2200 feet for CRBR), population center distance, and site size (360,000 acres, as opposed to CRBR - 1,364 acres) (FES at 9-13).

The updated population figures show that the city of Richland has grown to 33,582, but these are 1980 census figures, and won't reflect recent layoffs and outmigration. The new 50-mile population is 830,840 (CRBRP) versus 263,000 (Hanford), or now 560,000 less for Hanford.

These site isolation factors obviously have not been given adequate weight in the Staff's evaluation regarding safety. The Staff's characterization of atmospheric dispersion and site isolation factors, both vital safety-related factors, as "somewhat more favorable" at Hanford, Savannah River or INEL, constitutes a misapplication of the proposed alternative sites rule they purport to follow, in that the differences between these sites and the Clinch River site are clearly substantial.

What does "participate extensively" mean? (next to last ¶, page 9-11) There is no evidence in either the DES or the FES that the utility groups in the vicinity of INEL are unavailable at this time to participate in the project. The FES rejects the Hanford site on the basis of the assertion that technical, managerial, and financing already allocated to other nuclear development would not permit construction of a LMFBR there. Since this situation has changed, this FES conclusion is invalid. (FES, page 9-14, ¶ 1.)

SECTION 9.2.6.1, Schedule Impacts

What does the Staff mean by "today's regulatory climate"? (¶ 1, page 9-12) Aren't these procedures actually being sped up, not delayed, by the current administration? The cost of delay and schedule impacts should accurately reflect the possibility of an accelerated effort, as has already occurred in the CRBR licensing process. Instead of revising the estimate from 27 to 36 months, perhaps less than 27 months would be more "reasonable".

SECTION 9.2.6.2, Cost of Delay

Note the larger reveneues for Hanford in the Table at page 9-12. Why is this? Is this revenue estimate still accurate given the recent deferrals at WPPSS? How can cost of delay be adequately analyzed, given the Staff's failure to estimate capital cost and review Applicants' estimate? (See page 9-10 and discussion above)

SECTION 9.2.6.3, Reduced Benefits of LMFBR Program

Applicant's surrender to the impossibility of accurately determining the costs and benefits of the LMFBR program is glossed over by the Staff, which asserts that "any attempt to update it would be speculative." If so, why would any delay mean reduced benefits? Isn't there a benefit, for example, to risk-reduction by improved reactor design, better safeguards, etc.? Such an updated evaluation of benefits by the Staff is necessary and must be performed.

The Staff has purged from this section its previous conclusion that the Hanford, INEL and Savannah River Sites are better than the CRBR site or any other alternative site. The Staff has no rational basis for the switch to its present conclusion that these sites are not substantially better than the Clinch River site.

SECTION 9.2.6.4, Radiological Risks

The Staff must update this analysis to reflect changes in CRBRP design, Commission policy regarding the increased need for site isolation, and the uncertainties in CRBRP accident risks.

SECTION 9.4, Benefit-Cost Comparison

Why would there be no "improvement in the ranking of the alternatives" because design, testing, and procurement are already done? Haven't there been any improvement in the design and testing of other alternative systems since 1977?

SECTION 10 - EVALUATION OF THE PROPOSED ACTION

SECTION 10.1.1.1, Land

The proposed increase in permanent or long-term land use is from 73.5 to 113.5 acres. This amounts to an almost 50% increase, yet it is characterized by the Staff here as "insignificant compared to the total land available on the Oak Ridge reservation." This increase is undeniably small, compared to a larger land area, but is a very large increase when properly contrasted with the area previously designated in the FES. The Staff should properly evaluate any increase in light of the absolute nature of that increased permanent land use.

SECTION 10.1.1.2, Water

Although the Staff asserted in the 1977 FES (Section 10.1.1.2) that water consumption of 8 cfs is "about 0.2%" of the annual average river flow, the Staff now asserts that the increased water consumption of 8.3 cfs is still less than 0.2% of the annual average river flow. These figures represent the Staff's attempt to characterize this 20,000 gallon per day increase as "environmentally insignificant." The true significance of this increased use is the increase in blowdown and thermal plume, and resultant environmental effects, as noted above.

SECTION 10.1.1.4, Other Abiotic Effects

Although the Staff now predicts that local taxes probably would compensate for increased public services needed for the construction work force, their reasoning here seems to omit any consideration of Public Law 81-874, which supposedly will provide federal aid to the school system (Section 4.4.5). The Staff fails to consider the socioeconomic effect of possible suspension or cancellation of these federal funds. In Section 4.5.4 (not Section 4.5.4.4, which does not exist), tax revenues are only "estimated"; here in Section 10.1.1.4, the Staff hypothesizes "additional compensation to the local communities," without any attempt to specify where this additional revenue would come from.

SECTION 10.1.2.1, Terrestrial Biotic Effects

As in Section 10.1.1.1, the Staff's use of numbers here seems designed to characterize the change as insignificant, rather than adequately to assess the change in impact. The Staff admits that permanent disruption of plant and animal life would increase "proportionately," or by about 50%. Labeling the land and biota affected as "less than 1%" of similar Oak Ridge reservation land only serves to obscure this environmentally significant increase. Additionally, it is unclear whether, by 1%, the Staff is referring to the increase or the total of the affected wildlife. How many endangered birds (see Section 2.7.1.2.2) are possibly nesting in or nearby this permanently disturbed increased area? Neither the Staff nor the Applicants can answer this question without more comprehensive data and analysis.

SECTION 10.1.2.2, Aquatic Biotic Effects

Why has the Staff changed the method for estimating the excavation impact here, from a 20,000 $m^3$ volume to a 63,000 $ft^2$ area? The Staff must state this impact in both cubic meters and square feet, or otherwise indicate the increase or change in impact here, rather than concealing the impact by this descriptive modification. Additionally, the Staff's assertion that such disruption by dredging and filling is "temporary" is supported in Section 4.4.2 only by the

speculation that aquatic life will "rapidly colonize the new rock substrate." The inadequate analysis based on insufficient data in Section 4.4.2 calls into question the Staff's conclusion that excavation impact has not significantly changed since the FES.

Regarding entrainment, if calculations cannot now be exactly made for changes in river flow, how can the Staff accurately calculate the maximum loss of plankton and drift invertebrates, or conclude this loss is not detrimental? Again, this conclusion is not supported by sufficient data in either the FES or the DES. More data must be given to justify the 2.2% maximum loss and its characterization as environmentally acceptable, especially given the destruction by entrainment of 100% of the aquatic life (Section 5.3.1.2).

The speculative conclusion that fish will be able to avoid thermal discharge is not substantiated by data in the DES. Neither has the Staff adequately analyzed the potential harm under <u>abnormal</u> flow conditions, e.g. abnormally high plume temperatures. The greatest threat of thermal discharge, to the striped bass (present in major numbers), is insufficiently explained both here and in Section 5.3.2.2. How will the Applicants' "commitment" to restrict thermal releases be enforced? What of this "commitment" during an emergency situation? How is the necessity for thermal restriction decided, and by whom? The Draft NPDES Permit only calls for

"no significant impact" and "minimal impact" (Part III, ¶M) to the striped bass, and provides for no biological sampling. Staff's reliance on this "draft" does not ensure adequate protection for the striped bass.

SECTION 10.1.3, Radiological Effects

This section must be revised to reflect our comments on relevant DES sections, including Sections 5.7, 7, Appendix D and Appendix J.

SECTION 10.2.4, Decommissioning

In Section 10.2.4.1, the Staff states that, to date "no unacceptable impacts have resulted from reactor decommissioning." What is the meaning of "unacceptable" here? At what level of risk, degree of exposure, or cost does decommissioning become unacceptable?

SECTION 10.2.4.2, Decommissioning Alternatives

Regarding the SAFSTOR alternative, the removal of assemblies and radwaste would entail similar or greater safeguard procedures, safety considerations, and costs as during plant operation. Any "safe storage" involves such high risk that every endeavor should be made to minimize that risk by careful evaluation and planning. The Staff's discussion is too speculative and conditional to allow such evaluation.

Many assumptions and conclusions are unsupported here by adequate data. What is the basis for the exposure model used in ¶2, and why is the 2000 hours assumption "conservative?" In ¶3, Staff fails to consider multiple years of exposure and the resulting cumulative effect. The deferral of evaluating disposal of long-lived radionuclides has no rational basis. The Staff admits this serious disposal issue "is being considered," but denies the public an opportunity to review and comment on this issue.

In the ENTOMB discussion, no reason is given for finding a 100- or 150-year entombment period reasonable, and no analysis is provided of the difficulties and costs of safeguarding removal of fuel assemblies and wastes as well as protecting the entombed remains. The DECON discussion is similarly vague and nonspecific. Note that no "deep geologic disposal facility" currently exists for disposal of long-lived radionuclides (¶1, page 10-6).

SECTION 10.2.4.3, Environmental Impacts

Although the Staff attempts to compare impacts here, the comparison fails due to the Staff's reliance on unknown or conjectural factors, such as the volumes of waste, amount of land needed, site and size of disposal facilities, or costs and viability of "continued security" at the low-level waste burial grounds. In fact, no provision is given for how these security

costs might be "shared with the many other users" of the grounds. No specific data is provided; the entire discussion is merely speculative. What is the actual level of exposure designated as ALARA? Does it depend on regulatory standards that may change according to the political climate?

SECTION 10.2.4.4, Experience

The most significant fact regarding the decommissioning of Fermi I is omitted from the Staff's discussion here: Fermi I was shut down due to a reactor failure that nearly resulted in unprecedented disaster.

As with the NUREG-0586 report, the Fermi I exposure data should accompany any meaningful public review and comment regarding decommissioning experience.

SECTION 10.2.4.4, Experience

This section should be updated to reflect the current disposition of the Fermi 1 primary sodium and whether or not it will be used at the Clinch River Reactor.

SECTION 10.2.4.5, Cost

The Staff has failed to provide adequate details to substantiate its discussion here. Givern the significant design differences between Fermi I and CRBRP, comparisons of costs between these plants are marginally helpful at best. Additionally, this section does not compare the costs, risks, effects, and benefits of possible alternatives.

SECTION 10.3.4, Replaceable Components and Consumable Materials

What is the significance of the "uncertainties in the fuel recycle philosophy?" Does this "uncertainty" reflect the current opinion, shared by many LMFBR experts, that CRBRP would not even "breed" fuel and thus fail as a demonstration facility?

SECTION 10.4.1.2, Benefit Cost - Electrical Energy Produced

Why does the Staff assume the Applicants' estimate of an average annual capacity factor? The Staff must provide an independent analysis of CRBRP generating capacity, not parrot the Applicants' figures.

SECTION 10.4.1.3, Research

If the Staff cannot accurately estimate the capital cost of CRBRP construction due to unknown research and development expenditures in Section 9.2.5 (page 9-10), why can it estimate research and development costs here? These assertions are unsupported by meaningful data.

SECTION 10.4.1.5, Employment and Payroll

These "expectations" do not address the real possibility of payroll being cut off by plant termination/deferral, in either the construction or demonstration (operation) period. The data in Table A10.1 and analysis here should reflect that possibility.

TABLE A10.2, Summary of Environmental Costs, CRBRP

Overall, this table does little more than summarize the Staff's foregone conclusions regarding environmental costs, based on inadequate evidence and superficial analysis, and betrays its bias towards a finding of environmental acceptability of CRBRP.

For example, this table concludes that "no nesting activities have occurred" for the bald eagle, a conclusion not supported by the mere lack of observance of nesting. No detail is provided in Section 2.7.1.2.2 to indicate the extent or method of search for nesting. Given the observance of bald eagles on the site, the impact could continue to be significant on nearby eagle nesting even if a conclusion of no nesting onsite was made later, based on as yet unperformed further studies. The same is true for the other four threatened/endangered bird species observed on the site.

SECTION 10.4.2.2, Monetary Costs

This section is inaccurate and incomplete in several respects. First, the estimated cost for the CRBRP plant is no longer current. Secondly, the Staff has failed to include the costs associated with the CRBR fuel cycle. For example, DOE has included in its proposed FY 1984 budget $250 million to purchase plutonium from the proposed Barnwell Plant to fuel the Clinch River Reactor. Estimates of the entire cost of the Clinch River Breeder Reactor program including the fuel cycle have ranged as high as $6-9 billion.

SECTION 10.4.3, Benefit-Cost Summary

The Staff's lack of understanding of true benefit-cost assessment is apparent here. Factors are not weighed and assigned reasonable cost values for comparison; instead the Staff reaches its conclusions using generalized expressions such as "significant impact," "more expensive," and "acceptably low" risks versus "detrimental effects" of relocation.

SECTION 11.1.7, Site Suitability

The Staff says there are no changes from the 1977 FES discussion on site suitability. How can this be known if the Staff has not examined new meteorological data? See DES at Section 6.1.3.

SECTION 11.2.15, Frequency of Heavy Fog

What is the effect of the increase in heat dissipation and blowdown (Section 3.4.1 at 3-5)? Couldn't this increase both the frequency and the density of the 34+ average annual days of fog in the area? What is the effect of fog on the risks associated with commuter traffic? In Sections 11.5.12 and 11.5.13 the Staff speculates about the effect of atmospheric plumes and fogging. In Section 11.5.12, Interaction with Atmospheric Plume from ORGDP (Oak Ridge Gaseous Diffusion

that CRBR has "comparable" dispersion to other nuclear power plants in the northern Appalachian region of the country. That is not the issue. The issue is whether sites with substantially better atmospheric dispersion factors are available, and the Staff must pinpoint with precision what these factors are for both CRBR and other available sites.

Discussion of dispersion in the FES is left otherwise unchanged (FES at page 11-5, ¶ 1-3), and the Staff relegates atmospheric dispersion to only "one of the factors," to be considered, denying its relative high importance. We believe this treatment of atmospheric dispersion is inadequate given the potential magnitude of radioactive releases at the plant. There is no discussion of dispersion of accidental releases here, or of how such releases would be dispersed differently than routine releases.

SECTION 11.6.7, Enforcement of Monitoring Programs

We note the continuing refusal of the Staff to discuss this critical issue. There continues to be no discussion of NRC and EPA's enforcement programs in sufficient detail to ensure adequate monitoring and strong enforcement. The need for radiological monitoring is even more important than before, given the increased awareness of the potential for accidents following TMI, the increase in number of fuel shipments, uncertainties in methods for release of noble gases, and other changes in reactor design and estimated emissions.

SECTION 11.7.12, Seismic Considerations

The Staff had "determined" the appropriate Safe Shutdown Earthquake (SSE) in the 1977 FES, but now retreats to a position where the SSE is only "proposed," and states that the "appropriateness of this earthquake characterization is under review." The decision is therefore being postponed until publication of the Safety Evaluation Report, thus denying public comment or review and avoiding evaluation of the "serious risk to the public or environment" that could result from earthquakes. (Where is the discussion of past earthquakes?) There is no change to the VIII intensity limit but, as NRDC has stated before, a horizontal ground acceleration value of 0.4 is more reasonable than the 0.25 value proposed by the Applicants.

APPENDIX D, Environmental Effects of the CRBRP Fuel Cycle and Transportation of Radioactive Materials

SECTION D.1, Introduction

There is a significant omission in the introduction which has major impacts on the environmental considerations discussed in the remainder of Appendix D. This omission is the failure of the Staff to discuss the availability of plutonium to fuel the Clinch River Breeder Reactor prior to establishment of the closed fuel cycle as described in Figure D.1, page D-3. It is NRDC's contention that there is insufficient plutonium to fuel the Clinch River Breeder Reactor even during its initial 5-year demonstration period. As a consequence, the Clinch River Breeder Reactor will be unable to demonstrate its programmatic objectives during this period. Prior to 1977, it was thought that the fuel for the Clinch River Breeder Reactor would be obtained by reprocessing commercial spent light water reactor fuel in the Barnwell facility. As noted by the Staff on page D-2, at the present time there appears to be little prospect for commercial operation which could support the CRBRP fuel cycle requirements in the near future. Prior to approximately 1981, the Department of Energy believed it could obtain the CRBR fuel requirements for the initial core and the initial reloads from the DOE fuel grade plutonium stockpile, which is now approximately 17-18 metric tons. As a consequence, the heterogeneous core was designed to be fueled with fuel-grade plutonium from this stockpile.

As a consequence of weapons demands set forth in the October 1980 and the March 1982 Nuclear Weapons Stockpile Memoranda, the Department of Energy has decided to divert as much of the 17-18 tons of fuel-grade plutonium as possible into the nuclear weapons program. As a consequence, there will be very little, if any, fuel-grade plutonium from the DOE stockpile available to fuel the Clinch River Breeder Reactor in the late 1980s and none in the 1990s. It is likely there will not be enough plutonium even to construct the initial core loading for the Clinch River Breeder Reactor. The Department of Energy is now once again looking for alternative sources of plutonium to fuel the Clinch River Breeder Reactor. See, for example, the testimony of Deputy Secretary of Energy W. Kenneth Davis before the Senate Committee on Government Affairs, Subcommittee on Energy, Nuclear Proliferation and Government Processes, September 9, 1982.

In NRDC's view it is highly unlikely that the Barnwell Plant will ever be operated; therefore this is a very unlikely source of plutonium to meet the needs of the breeder program. The Developmental Reprocessing Plant will not be available as a source of plutonium until after the scheduled five-year demonstration period of the Clinch River Breeder Reactor. It now appears highly unlikely that the necessary plutonium will be obtained from foreign, e.g. British, sources. If plutonium for the first core and initial reloads of the Clinch River

Breeder Reactor is obtained from any source, which NRDC believes is unlikely, the most likely source will be utilizing one of the existing defense program reprocessing plants, either at the Savannah River Plant or the Hanford Reservation to process commercial spent fuel. There is funding in the defense program budget to design a head-end facility for installation at one of these plants to enable DOE to utilize existing defense program processing plants to reprocess commercial light water reactor fuel.

These facts have two significant consequences in terms of the calculations and results set forth in Appendix D. First, the Staff has underestimated the dose consequences associated with plutonium release, due to their failure to utilize the appropriate plutonium isotopic concentrations associated with high-burn-up of light water reactor fuel and recycled MOX. Secondly, the emissions, particularly from the reprocessing operations assumed in Appendix D, are orders of magnitude smaller than the actual emissions experienced at the existing DOE reprocessing plants, particularly the F separations area at the Savannah River Plant (see discussion below).

Table D.1 at page D-2 understates the plutonium loading in the CRBRP if the initial core plutonium is obtained from commercial plutonium sources rather than the DOE stockpile (since DOE stockpile use seems unlikely, as indicated above). Figure D.1, page D-3, fails to indicate the source of the initial fuel loading and at least the first few reloads of the

Clinch River Breeder Reactor. Furthermore, since the facilities identified on this page are hypothetical, it is at least conceivable that the Clinch River Breeder Reactor, if it operates at all, would operate on an open rather than a closed fuel cycle. The implications of this fuel cycle alternative also should be discussed by the Staff.

On page D-4, paragraph 4, the Staff states that an analysis of the conservatively predicted environmental impact from the fuel cycle associated with the CRBR and the transportation of radioactive materials between the supporting fuel facilities is provided in this Appendix. As indicated by our comments above and below, this analysis provided by the Staff is far from conservative.

SECTION D.2, Environmental Considerations

Table D.3 on page D-6 is incorrect with regard to the plutonium and uranium loadings of the CRBR in that it is based on the use of fuel-grade plutonium rather than reactor-grade plutonium as a source of plutonium for the Clinch River Breeder Reactor. The same comment applies to Table D.4 on page D-7. In Table D.4 the radiological effluents associated with reprocessing are grossly non-conservative when compared to the effluents from the F Separations area at the Savannah River Plant. See, for example, C. Ashley and C. C. Zeigler, "Release of Radioactivity at the Savannah River Plant 1954-1978", DPSPU 75-25-1, February 1980. The Staff, for example, has assumed a

retention factor (defined as the ratio of plant input to the total environmental effluent of all plant sources) for plutonium which is one order of magnitude larger than that experiences of the F separations area for atmospheric releases in recent years, and two orders of magnitude larger than the average experience over the history of the F separations plant. Similarly, the Staff assumes zero liquid effluents whereas the F separations area at the Savannah River Plant has released substantial curie amounts to seepage basins which in turn are sources of liquid effluents streams which have produced offsite releases.

SECTION D.2.1, Fuel Cycle Impacts

Page D-8. What is meant by the term "time frame of interest" for CRBRP?

SECTION D.2.1.2, Core Fuel Assemblies

On page D-9 the Staff states "the DOE assessment conservatively used as a cleanup factor [the inverse of the retention factor defined above] of 1.25 E-8 (two orders of magnitude lower than theoretical) and the Staff finds this to be an acceptably conservative approach." These same filter banks are utilized at the Rocky Flats Plant. Since the Rocky Flats Plant is in operation, whereas the SAF is a hypothetical plant, it would appear more appropriate to use a cleanup factor that is representative of a real operating plant rather than a theoretical one. NRDC believes that the Staff's

assumed cleanup factor of 1.25 $E^{-8}$ is nonconservative in this regard, particularly in light of accidental plutonium releases which have exceeded routine releases at Rocky Flats. The isotopic concentrations in Table D.5 at page D-10 are nonconservative for reasons stated above. Similarly, the curie release assumptions in Table D.6 are nonconservative both because of the Staff's use of a nonconservative plutonium isotopic concentration and a nonconservative assumption with regard to the cleanup factor. The Staff should compare the radiological effluents associated with fabrication at the Kerr-McGee Plant of the initial core and for several reloads of FFTF fuel against the assumptions used by the Staff to estimate the effluents from the SAF lines.

SECTION D.2.1.3.1, Developmental Reprocessing Plant (DRP)

As indicated above, NRDC believes the use of the Savannah River Plant would be appropriate and more conservative with regard to estimating the environmental effects of reprocessing fresh fuel for loading in the CRBRP and recycled fuel. The Staff has failed to provide any basis for its view that the retention factors associated with environmental effluents from the developmental reprocessing plant will be orders of magnitude superior to those currently being achieved by the Applicants at the Savannah River Plant and F Processing Canyon. On page D-12 the Staff's understanding that 12% Pu-240 is the likely candidate for CRBRP fuel is no longer correct, as

indicated above. The plutonium isotopic concentrations in Table D.7 at page D-13 are in error and nonconservative for reasons stated above.

SECTION D.2.1.3.2, Alternative Reprocessing Plants

The statement at page D-14 that "the Staff understands that these design parameters would be applied to any of the DOE alternatives in the event that one is selected instead of the DRP for reprocessing CRBRP fuel" is incorrect. It is obvious from an analysis of the releases of radioactivity at the Savannah River Plant (see DPSPU 75-25-1) that this statement is false. The plutonium source term, for example, should be one to two orders of magnitude larger than the source term listed in table D.8. At page D-14, the Staff states that the impacts of all releases from these plants [Hanford and Savannah River], including atmospheric releases and liquid releases, have been very small as indicated in the reference documents. This statement is factually incorrect.

SECTION D.2.2, Waste Management Impacts

The discussion of waste management impacts associated with the CRBRP fuel cycle are incorrect and nonconservative due to the Staff's failure to consider the actual impacts from DOE defense program reprocessing plants. The Staff should examine the solid waste streams associated with the SRP F separations area. Similarly, if the fuel for the Clinch River Breeder

Reactor were reprocessed at the Savannah River Plant or the Purex Plant at Hanford there is no assurance that the noble gases would be bottled. Likewise, one would also anticipate that the iodine releases would be larger than those assumed by the Staff.

At pages D-20 and D-21 the Staff should explain fully the basis for their assumed releases from the federal repository rather than simply citing unpublished EPA criteria. The Staff has provided no analysis to support the view that the proposed EPA criteria can and will be met. The Staff should analyze the proposed action, instead of licensing criteria. For example, at page D-21 the Staff should indicate the basis for the estimate of $6 \times 10^{-5}$ Ci/yr from a repository in salt. The Staff should explain how they calculated that the release of this level is only $7 \times 10^{-5}$ person-rem. Given that much of the activity is transuranic, why has the Staff limited its examination to whole-body rather than include internal organ doses? All of the underlying assumptions behind these estimates should be set forth in the EIS.

SECTION D.2.4.3, Dose Commitments from Fuel Reprocessing

The Staff should explain more fully the underlying assumptions behind the calculations presented in this section. Given that the bone surface dose is controlling with respect to the CRBR site suitability source term analysis, the Staff

should also present the bone surface dose. In this regard it should be noted that the current Staff estimates of the bone surface dose associated with fuel reprocessing operations may be in error by many orders of magnitude. There would be a one-to-two order of magnitude error due to Staff's use of nonconservative source term assumptions with respect to the DRP rather than the Savannah River Plant F separations area. There would be another error by a factor of 5 to 6 due to the nonconservative assumption by the Staff with regard to the plutonium isotopic concentrations. There would be another error by a factor of approximately 4 or 5 due to the Staff's use of the bone rather than the bone surface as a critical organ and the use of ICRP-2 dose models rather than ICRP-30 model assumptions.

SECTION D.2.4.5, Dose Commitments from Transportation

The Staff should explain more fully the basis for the estimated 24 person rem dose commitment from transporting CRBR fuel. For example, it is unclear what the Staff assumed for the spent fuel cooling time prior to transporting the spent CRBRP fuel.

Table D.4, page D-7, footnote B refers to values which would be zero or negligible by comparison. The Staff should indicate what it considers "negligible" and what values are being compared against. The values in the table do not include

any uncertainty limits. This is particularly important with regard to the waste management entries. The Staff must discuss the uncertainties associated with the radiological impacts from management of the CRBRP fuel cycle high level and transuranic wastes.

APPENDIX E, Safeguards Related to CRBRP Fuel Cycle and Transportation of Radioactive Materials

SECTION E.1, Introduction

To begin with, NRDC does not believe that the Staff is applying the appropriate criteria to judge the adequacy of safeguards systems at the CRBR and its fuel site. Safeguards measures are of two types, physical security and material control and accounting. Physical security measures are essentially preventative. Their specific purpose, as set forth in 10 CFR 73, is to provide a high degree of assurance that there will be no theft or diversion of material or sabotage of the facility at which the material is used. The appropriate criterion in this regard is a high degree of assurance, not reasonable assurance as suggested by the Staff on page E-1 under its general safeguards criterion number 3.

The primary role of material control and accounting (MC&A) should be to provide continual cognizance of the status of nuclear material in a facility. Material control should provide a timely detection capability that activates the physical protection system to prevent a covert theft or diversion of nuclear material or that initiates response forces if theft or diversion has already occurred. Material control plays a primary safeguard role in rapid assessment of losses or alleged losses. Material control also should provide assurance

concerning the safeguard status of material during the interval between physical inventories.

The primary role of material accounting is to provide long-term assurance that material is present in assigned locations and in correct amounts. Through its measurement records and statistical analysis, material accounting should provide a loss detection capability to complement the more timely detection capability provided by material control and physical protection. Material accounting plays a primary safeguards role in the accurate assessment of losses or alleged losses. Thus effective material control and accounting is an essential component of the safeguards program designed, in part, to deter and detect diversion.

Effective material control and accounting procedures are necessary to provide assurance that physical protection systems have been effective in preventing theft or diversion. This assurance cannot be provided by the physical security system alone. In sum, to be effective, safeguards, among other things, must be capable of providing both timely and accurate information on the status of nuclear material and facilities. This cannot be provided without an adequate material accounting and control program as well as an adequate physical security program. Physical security is not a substitute for an inadequate material accounting program. Both adequate physical security and adequate MC&A are essential. The Staff is in

error in asserting the second general safeguards criterion on page E-2 that a proposed safeguards system is adequate if it is only "likely to detect attempts at sabotage, theft or diversion."

SECTION E.2, Safeguards Design Basis Threat

SECTION E.2.1 NRC-DOE Threat Comparisons

The NRC Staff has incorrectly stated that the NRC and DOE design basis threats are similar. The NRC internal threat, for example, allows for a conspiracy of insiders. This is significantly larger than the design basis threat assumed by DOE, which does not provide for collusion with regard to internal threat. More importantly, both the NRC and DOE design basis threats with regard to the external threat are smaller than that assumed by DOD for protection of nuclear weapons and nuclear weapons material. The Staff must explain in detail the similarities and differences between the NRC, DOE, and DOD threat definitions and the significance of the differences.

SECTION E.2.2, Summary of NRC Design Basis Threats

Again, the NRC Staff has understated the criterion for judging the adequacy of a physical security system by leaving out the phrase "with a high degree of assurance" in the third from the last line on page E-3 and in the third line on page E-4.

SECTION E.3, DOE Safeguards for Plutonium Conversion

SECTION E.3.1, Physical Security System Description

In the second paragraph under this section, on page E-4, the Staff states that "during the first five years of CRBRP operation, plutonium for the core fuel would be obtained from DOE stockpiles." This statement is not true, as discussed in our comments above on Appendix D, Introduction. Again we refer the Staff to the testimony of DOE Deputy Secretary W. Kenneth Davis and Under Secretary of State Richard T. Kennedy before the Senate Committee on Government Affairs, on September 9, 1982. Furthermore, in this section the Staff has failed to analyze the adequacy of the safeguards systems at the existing DOE facilities that may be involved in the CRBR fuel cycle. There is ample evidence, for example, in GAO assessments of these facilities that the safeguards programs at these DOE facilities are not adequate. A resurrection of the general types of intrusion detection systems (defenses and security clearances) does not assure that the appropriate physical security criterion is being met. The Staff cannot rely on assurances by the Applicants that the physical protection system at these DOE facilities is adequate any more than they can rely on the PSAR for assurance that the CRBRP will be built safely. The Staff must make its own independent analysis of the adequacy of these physical security systems. The Staff should identify in this section each of the independent analyses of the DOE physical protection systems including the

analyses by the Staff and discuss the types of problems that these facilities have experienced. In particular, the Staff should focus on the GAO critiques of the safeguards programs at the DOE facilities.

SECTION E.3.2, Material Control and Accounting System Description

The Staff asserts on page E-5 that "the MC&A system, in conjunction with the physical security system, would provide capability to detect and deter the illicit diversion of plutonium and would provide assurance that no diversion has occurred." The Staff has provided no supporting analysis which could serve as a basis for this conclusion. Furthermore, as indicated above, NRDC and, we might add, the NRC Staff believes that material control and accounting must be adequate in its own right and that one cannot rely on physical security as a substitute for material control and accounting, and vice versa. At page E-5 and E-6 the Staff states that physical inventories would be performed on a bi-monthly basis. DOE stated that the limit of error on a one-month material balance for facilities of this type would be about .5 % of throughput and that the limit of error for a two-month balance should be a slightly lower percentage of throughput. The Staff has provided no supporting evidence or evaluation to serve as a basis for accepting the DOE conclusion. DOE's conclusion may

be in error by a factor of 10 or more. Even if DOE's estimate were found to be correct, the Staff has provided no basis for a view that these inventory differences are adequate in light of the primary role of material accounting to provide long-term assurance that material is present in assigned locations and in correct amounts. Furthermore, there is no discussion and no basis for assuming that the material control procedures at this facility are sufficient to ensure timely detection of the theft or loss of special nuclear materials. On page E-6 the Staff states that "safeguards for the conversion facility would include a prompt accounting system . . ." There is no discussion of the feasibility of implementing such a system at the conversion facility and, equally important, no discussion of whether such an accounting system would in fact be provided. With regard to the first, it is not enough simply to note that R&D is being conducted; and with regard to the last, it should be noted that there have been studies by DOE consultants, for example by Pacific Sierra Research, that indicates that most advanced safeguards systems that have been developed by DOE and others are simply never put in place in DOE facilities due to lack of funding or desire to improve the safeguards at the DOE facilities.

SECTION E.3.4, NRC Assessment of Plutonium Conversion Safeguards

This discussion is conclusory in nature and lacks any analysis to support the conclusions. Furthermore, as discussed

above, the wrong criterion is applied, i.e., "reasonable assurance" instead of a high degree of assurance, and there are no criteria set forth that define whether the detection occurs in a "timely manner". The Staff also states that the communication systems would enable onsite and offsite forces to respond in a fashion to deter and prevent attempted adversary actions. The inference here is that the Staff believes it is acceptable to rely on the response of outside forces for determining the adequacy of a physical security system. Surely this is not the case at either Hanford or the Savannah River Plant. The Staff asserts that the safeguards systems at this facility could assure that risks from the design basis threat are no greater than at other currently operated U.S. nuclear facilities handling significant quantities of SNM. The Staff should provide a basis for this conclusion and, if it is true, a basis for the underlying assumption that the safeguards at the existing facilities, for example at the Savannah River Plant, are currently adequate. NRDC, and apparently GAO, believes that they are not adequate.

SECTION E.4, DOE Safeguard System for Fuel Fabrication Facilities

The same comments made with regard to the DOE safeguard system for plutonium conversion apply here as well and will not be repeated.

SECTION E.6, DOE Safeguard System for Reprocessing

Again the same general comments made previously about plutonium conversion apply to the reprocessing operations and will not be repeated here. On page E-12 it is stated that "for a yearly material balance, the accounting system limit of error is stated to be in the range of 0.7 % of the throughput of the DRP. This is equivalent to seven kilograms of plutonium per year based on the annual CRBRP discharge rate of one thousand kilograms of plutonium. First, it should be noted that the use of a limit of error based on a percent of throughput is not a statistically valid basis for a material control and accounting program. We are surprised that the NRC Staff has accepted this in light of the analyses that precipitated the ongoing nuclear material control and accounting rulemaking currently in progress at the NRC. Second, recording the cumulative inventory difference on a yearly basis when the inventory period is monthly, bimonthly, or semiannually, is also an invalid measure of the material accounting uncertainty. Third, the Savannah River Plant in the first half of FY 1981 had a plutonium material inventory difference of 13.8 kg, which greatly exceeds the .7 % throughput limit referenced here. Finally, as noted previously, the Staff has provided no basis for the conclusion that a prompt accounting system will actually work, that it will be put in place by DOE, or that it will meet the requirements of an adequate material control and accounting system and provide timely detection.

SECTION E.6.4, NRC Assessment of Reprocessing Safeguards

As noted previously with regard to plutonium conversion safeguards, the NRC Staff must provide an analysis of how they reached the conclusions presented here.

As a separate matter, the DRP is not scheduled to operate until 1995. The plutonium required for the initial loading and 5-year demonstration period of the CRBR cannot be provided by the DRP or the existing DOE stockpile. The Staff has provided no basis for a conclusion that a prompt accounting system will be operating and in place in time to provide adequate accounting of the fuel needed to fuel the Clinch River Breeder Reactor during its initial five-year operating period.

SECTION E.8, Transportation Safeguards

The Staff has failed to discuss the differences between the safeguards implemented by DOE and those required of NRC licensees. The Staff should discuss these differences and indicate whether the CRBR fuel cycle will be required to meet the requirements of NRC licensees.

APPENDIX J

SECTION J.1.1, Design Basis Accidents

In Table J.1, on page J-2, the Staff compares the doses associated with design basis accidents from CRBRP against those of several light water reactors. With respect to each CRBR dose calculation in Table 7.2, the Staff should explain in detail the nature of the similarities between the light water reactor accidents and the CRBRP accidents that support using the dose calculation from light water reactor accidents to validate the dose for the respective CRBR accident. With respect to each CRBR dose calculation, the Staff should identify each difference between the respective CRBR and LWR accident scenarios and explain why these differences would not significantly affect the conclusion that "the recorded values appear to the Staff to be reasonable." With respect to the doses for the CRBRP, the Staff should display all the assumptions used in these calculations. Furthermore, since bone surface is the critical organ, the Staff should report bone surface dose rather than the bone dose and should do these using current metabolic and dosimetric models rather than models based on ICRP 2.

Section J.1.2, Evaluation of Class Nine Accidents

On page J-3, the Staff states "as discussed on pages 7-2 and 7-7 of the FES, requirements for the prevention of severe accidents will be imposed on the CRBRP design to insure that

initiation of core disruptive accidents is made very improbable." The Staff should quantify what is meant by the term "made very improbable." In the preceding paragraph, reference is made to core-wide fuel failures as exemplified by propagation of local fuel faults. Is the reader to understand that the Staff's view is that core disruption requires "core-wide fuel failure," or would partial core fuel failure constitute core disruption, in the Staff's view?

At the bottom of page J-3, the Staff concludes that LOHS events have a frequency of less than $10^{-4}$ per reactor year. The Staff should set forth in detail the analyses they relied upon to reach this judgment and cite the references that were used. Furthermore, the Staff should explain why they believe that the systems in the CRBR are sufficiently similar to those of a LWR that the LWR reliability figure can be utilized here. The Staff should explain whether the numbers for the LWR were obtained from WASH-1400 or from some other analysis and should cite references. The Staff should explain fully how common cause failures and other multiple failures were factored into the Staff's determination of the $10^{-4}$ per reactor year probability. At the top of page J-5, the Staff claims that this estimate is also based on the achievement of high reliability in final design and operation through an effective reliability program. The Staff should explain where this reliability program is documented, identify each of the

components of "an effective reliability program," and explain the basis for the Staff's view that such a program can and will be effective.

On page J-4 the Staff indicates that it believes an unavailability of less than $10^{-5}$ per demand can be achieved for the overall shutdown system of the CRBR, leading to a combined frequency of degraded core accidents of less than $10^{-4}$ per reactor year. The Staff should explain what estimates it is using for the unavailability of the overall shutdown systems for a light water reactor and where this reliability analysis is documented. The Staff should set forth the basis for its conclusion in detail, indicating what documents it relied upon in reaching its conclusion that, considering common cause failures and multiple failures, the reliability of $10^{-4}$ per reactor year can be achieved for the CRBR. Staff should indicate what analysis it is relying upon for its conclusion that the systems in the CRBR design will in fact detect fuel failures and faults sufficiently rapidly and with a sufficiently high reliability to insure that fuel failure propagation will not occur.

On page J-5, the Staff concludes that the overall combined probabilities of each of the core disruption initiating events is estimated to have a net frequency of $10^{-4}$ per reactor year or less. The Staff should indicate the basis for this conclusion. Given that the Staff is summing over initiators, each of which has roughly the same event frequency of $10^{-4}$

per reactor year or less, it appears to NRDC that the sum should have a higher frequency than any of the individual contributors. In previous reliability analyses of the CRBR, the analysts have generally concluded that the sum is a factor of 10 higher that the individual components. The Staff should explain the basis for this difference.

On page J-6, the Staff should provide the basis for its conclusion that the probability of primary system failure is 0.9 per CDA for categories I, II, and III, and the probability of primary system failure for category IV is approximately 0.1 per CDA. What analyses did the Staff rely upon to reach this conclusion?

On page J-7, the Staff has estimated that the probability of failure of containment is approximately $10^{-2}$ per demand or less. The Staff should indicate the basis for this assumption and why such a small probability is used here in light of the fact that in operating LWR plants the containment is not closed during a high percentage (around 15%) of the operating period.

On page J-7, what is the basis for the Staff's conclusion that overpressurization failure occurs at about 24 hours?

With regard to Table J-2, at page J-8, the Staff should explain how the bounding estimates of containment release frequency were derived in light of common cause and multiple failures of safety systems.

In the discussion at pages J-7 through J-10, the Staff should identify the underlying documentation upon which they

rely for the estimates of the percentage of core inventory released to the environment under various failure categories. The Staff should explain, for example, the basis for their conclusion that filtered venting will be 97-99% efficient in light of the environmental conditions that the filters will be experiencing under such CDAs.

At page J-11, the Staff should explain the underlying assumptions behind Staff's conclusions, including where the analysis is documented with regard to the potential atmospheric pathway radiological consequences calculated using the same model used in the Reactor Safety Study.

In Table J-5, page J-16, the Staff presents a comparison of average values of environmental risk due to selected CRBRP accidents with those of the Midland Plant. Given that considerable information is lost in the presentation of only average risk values, the Staff should display the spectrum of consequences as a function of probability. Again the Staff must explain fully the underlying assumptions behind these calculations.

At page J-18, the Staff states that "for example, unavailability estimates for shutdown and heat removal systems have been set high enough to include allowances for potential common cause failures." The Staff should explain precisely how this was done in each case where unavailability estimates were made and provide the underlying basis for the Staff's assumption of additional margin that was included to allow for common cause and multiple failures.

Also on page J-18, the Staff states that "quantification of the frequency of this [high energy] very improbable nonmechanistic event at this time would involve such large uncertainties that the result would have no real meaning." The Staff should explain quantitatively the nature of the large uncertainties in such calculations and should also explain the basis for the conclusion on page J-6 that the primary system failure, category IV, is approximately 0.1 per CDA, if in fact no meaningful estimate of probability of high energetic CDAs can be made at this time.

APPENDIX L, Alternative Sites

INTRODUCTION

On page L-1, the Nevada Test Site was apparently rejected in the DES for the same reasons given in the FES (seismic costs and other factors). NRDC here renews its contention that this site has been inadequately analyzed by the Staff. Why are these factors the basis for rejecting NTS as a reactor site but apparently not significant with regard to siting nuclear weapon tests or high-level waste repositories?

The description of the relevant meteorology criteria is summarily given. Why was this factor, one of the most important safety-related siting factors, given only one and a half lines of explanation where most of the other factors were discussed in entire paragraphs? Other meterological factors should also be considered, such as rainfall and fog. The Section 6.1.3 discussion of CRBR meteorology is inadequate for reasons given above, such as the fact that there are no current measurements being taken, the methodology used is questionable, and only continuous releases at ground level are monitored (DES p. 6-7). Was the methodology and data as scant for other sites? Isn't this what the proposed rule warned against, as "reliance on limited data and subsequent superficial analysis" (DES p. K-4)?

Terrestrial Ecology

It is unclear from Appendix L whether the effects on terrestrial ecological and land use were adequately considered at all of sites. It is not enough to rely on possibly outdated impact statements for proposed light water reactors at these sites.

Socioeconomics

The Staff did not consider the socioeconomic effects of halting construction of the LMFBR demonstration reactor (due to Congressional action perhaps) at any of these sites after construction has begun. The Staff should also consider the potential impacts on alternative sites of the cessation of construction at other nearby facilities. Halting of either type of construction would directly affect the "labor pool" pressure, and must be regarded as a significant impact. Also, the method for evaluating the potential labor pool is questionable for areas like Hanford and Hartsville, where construction has already been halted. Shouldn't the socioeconomic effect of this stop-and-start pressure on the community be analyzed, at least for those sites where it has already occurred?

Population Density

The DES estimates of site population density could be misleading; these projections, using the 1980 census, were

relying on the continuing construction of now terminated nuclear plants. The projected population of the Murphy Hill site might also be misleading, see FES, p. 9-8 and chart, DES at 9-11, since it is unclear whether these projections are based on the assumption that the synfuels plant will be built.

Relative Cost to Make the Project Licensable

The judgment that all sites meet contention (8) is not supported by hard data. The Staff has admitted that capital costs cannot be meaningfully estimated here due to the large R&D component of the capital costs for CRBRP, and to differences between LMFBR and LWR technology (9-10). Also, what is a "significantly different sum of money" (last sentence of ¶ 1)? Is it equal to 5% of the total capital cost? If not, what range of figures are considered significant? On page L-3, ¶ 3, is it reasonable to assume that the cancelled plants will be completed? Given that the Staff assumed that CRBRP would be on "a previously undisturbed portion of each of those TVA sites," aren't all the estimates inaccurate? Elsewhere, the Staff admits that part of the already completed construction might be possibly utilized for a breeder plant. (DES at 9-9).

The proximity of the Y-12, K-25, ORNL, and the proposed DRP facilities, and the possibility of core disruptive accidents at the CRBR site which would certainly affect them, would require additional money to be spent on safety measures, e.g.,

additional safeguards onsite and for transportation. These factors must be considered in evaluating additional sites, particularly since less money would have to be spent on secondary containment and safeguards and other measures at remote sites such as Hanford and INEL.

In 11.3, the Staff lumps the meteorological diffusion differences between the sites into one category: acceptable. This technique appears to blunt the differences between sites which might otherwise show one of these sites to be substantially preferable. As noted in the discussion in sections 2.1.3 and 2.2.3, both Hanford and INEL are in Tornado Region III, and thus have preferable meteorology to the Clinch River site. (L-5,6)

SECTION 1.1.1.4.1, Aquatic Ecology

The Staff assigns no relative weights to the various factors used to judge impacts on aquatic ecology. Without any relative weighting system, the Staff's judgments regarding site preferability appear arbitrary. The Staff's discussion of the possible entrainment or impingement of paddlefish, Polydon spathula at the Hartsville site is inconsistent with their discussion of entrainment at the Clinch River site. Presumably the entrainment of sauger, which spawns near the Clinch River site, would have somewhat similar impacts as the entrainment of paddlefish at the Hartsville site. The Staff has not

considered the possible situation at Hartsville where many of the construction-related intake and diffuser-related impacts have already occurred, which might elevate the Hartsville site's preferability (L-7).

The Staff's conclusions in ¶ 2, regarding aquatic impact at the Clinch River site, are inadequate for reasons given above.

SECTION 1.1.4.2, Terrestrial Resources

The Staff's treatment of the eight state endangered species observed at or near the Hartsville site reflects the very reliance on "limited data and subsequent superficial analysis" (K-4) admonished in the proposed rule. The Staff's conclusion of "no significant effect" upon these endangered species is based solely on the unsupported assumption that these species did not appear to be using the sites for nesting activities (L-8).

The logic of the last paragraph of this section appears unreasonable. The Staff concludes that neither site is "preferable" for population density simply because neither exceeds the 500 person/mi$^2$ limit. Isn't preferability properly assessed by how far below the limit these figures are? If so, Hartsville and every other site examined is preferable to the Clinch River site, and some are substantially preferable, such as Hanford and INEL. In addition, the Staff has deliberately omitted the CRBR site data from the population tables for sites other than Hartsville, making a direct comparison more difficult. See Attachment A.

SECTION 1.2, Murphy Hill

Based on the Staff's analysis of the Murphy Hill site, it appears to be substantially preferable to the CRBR. Geology is equivalent, hydrology is equivalent, water quality, thermal impacts, and dilution flow are better, meteorology is equivalent, ecology is equivalent (although it appears to be preferable, since no threatened or endangered species have been found), socioeconomics is less preferable (but only if the coal gasification plant were built), the population density is much lower, and no industrial/military/transportation facilities are located nearby. The facility makeup flow and blowdown rates at the Murphy Hill coal gasification plant would have been 3 and 4 times, respectfully, greater than for an LMFBR, yet "no significant impacts on aquatic biota were determined." Isn't it possible that the impact on biota at Murphy Hill, with a LMFBR, would be significantly less than at CRBR? If no coal gasification plant is built, Murphy Hill is preferable regarding terrestrial impacts. The Staff is not consistent in assuming that the coal gasification plant will or will not be built (see page L-16, ¶ 5). On page L-17, if both population densities are "reasonably low," what is the point at which one might be preferable over another? Under the Staff's analysis, as long as the Clinch River site meets the population criteria, no other site, no matter how remote, can ever be considered sufficiently preferable to be selected instead. This approach makes a mockery of the alternative site analysis.

A conclusion about the environmental preferability of Murphy Hill is conspicuously absent from the DES. It appears that any reasonable balancing of the above-mentioned factors, whether or not the coal gasification plant is built, would lead to a finding that the site is substantially preferable.

SECTION 1.3, Phipps Bend

This section must be substantially rewritten now that TVA has cancelled construction of the Phipps Bend reactors.

In this section, the Staff relies on NPDES Permit controls to eliminate potential aquatic impacts during low flow conditions. Yet, as noted above, these permit conditions are not designed to ensure no adverse aquatic impacts, and indeed require only that impacts be minimal (which is not defined). Again, meteorology is summarily deemed equivalent, when actually no adequate analysis of meteorological conditions at any TVA site has been performed. The Staff, as with Murphy Hill, does not explain the significance of an estimated 3,000-person difference in the available labor pool. The population density is lower here, and should operate to increase this site's preferability.

On page L-24, the Staff identifies chlorine and acetaldehyde as toxic materials transported near the site that would require reactor control room protection. The Staff does not identify the amount of such materials transported, the type

of protection needed, the cost of such protection, and the weight to be given this factor in evaluating the Phipps Bend site.

SECTION 1.4, Yellow Creek

The Staff must reassess its analysis of the Yellow Creek site, since one of the planned TVA LWR units at this site has now been deferred. Of particular importance is a reassessment of socioeconomic effects and construction impacts. Again, the discussion of meteorology is unfavorable, for reasons stated above in relation to Murphy Hill and Phipps Bend. No endangered aquatic species appear to be present in Yellow Creek or Pickwick Lake, giving the site a substantial advantage. Comparing the "inconsequential impact to aquatic biota inhabiting Pickwick Lake," the existence of the proposed NPDES Permit conditions for the Clinch River site are insufficient to render the Clinch River aquatic impacts "comparable" to those at the obviously superior Yellow Creek site.

SECTION 1.4.4.2, Terrestrial Resources

The Yellow Creek site must now be considered preferable in terms of impacts to terrestrial resources, because of the LWR unit deferral.

SECTION 1.4.5, Socioeconomics

The Staff's conclusion that Yellow Creek socioeconomic impacts are less desirable than Clinch River must also be reconsidered because TVA plant deferral may alter socioeconomic factors in a manner not yet determined by the Staff. Could LMFBR demonstration plant location at Yellow Creek have a positive effect on the local economy through employment of workers who have been laid off from TVA plant deferrals? This entire section must be redrafted.

SECTION 1.4.6, Population

The Staff characterizes the Yellow Creek population density as "somewhat lower" than Clinch River. A fairer description would be that the Yellow Creek population density is "significantly lower."

In general, all the TVA sites considered in Appendix L are preferable to the Clinch River site in terms of population density. Three of the sites, Yellow Creek, Murphy Hill, and Hartsville, are significantly lower in population density, and any objective analysis would find these sites substantially preferable under this factor. The Staff has treated the upper limit on population density as an acceptable level, and has failed to properly assess the real risk of the high Clinch River population density as opposed to the low population density at these three sites.

Second, the meteorology of the TVA sites, as with the Clinch River site, is analyzed in a wholly inadequate manner, using minimal, outdated, or speculative data. Thus, no meaningful comparison can be made between these sites and the Clinch River sites for this extremely important parameter.

For all TVA sites, the Staff cannot accurately compare the labor pools at Clinch River with those available at sites with existing operating reactors, planned construction, or deferred or cancelled LWR reactors. The socioeconomic efects of cancellation or deferral of construction has not been assessed, and these effects must be included for plants presently or potentially deferred or cancelled.

Regarding aquatic ecology, the Staff bases its conclusions upon the existence of NPDES permit conditions which are both inadequate and misstated in the FES. The Staff completely ignores the threat to several Federal endangered mussel species in the Clinch River, including Lampsilis orbiculata orbiculata, and to the state threatened species Cycleptus elongatus. The Staff's boilerplate analysis of the threat to aquatic ecology at the Clinch River site can in no way be deemed adequate.

Additionally, terrestrial ecology is given an inadequate treatment in this comparison of alternative TVA sites. The Staff ignores the potential impacts at the Clinch River site to the endangered bald eagle and to four other state threatened or endangered species.

SECTION 2, DOE Sites

SECTION 2.1, Hanford

SECTION 2.1.1, Geology and Seismology

The Staff has not provided enough information to demonstrate whether in fact the current tectonic regime at the Hanford site is uncertain, what additional information is necessary, and what the costs would be of these additional studies. It is almost beyond belief that DOE and private utilites would have located so many nuclear reactors on the Hanford Reservation, including the Fast Flux Test Facility, without a thorough knowledge of the area's earthquake potential.

SECTION 2.1.2, Hydrology

As the Staff concludes, the Hanford site is "more favorable than the Clinch River site" with regard to hydrology. The radioactive effluent diffusion and population served downstream are dramatically superior at Hanford, by a factor of 10. Given the potential radiological effects on downstream users, hydrology should be weighted heavily as a siting factor.

SECTION 2.1.2.1, Water Quality

The Columbia River provides significant environmental advantage in water quality over the Clinch River. Yet the Staff ignores the substantially higher dilution rate by baldly

stating that "the apparent advantage does not weigh heavily in selecting among the alternatives," because the Staff has found no "significant" impacts on other Clinch River uses from the breeder plant. Here, as throughout the alternative sites analysis, the Staff avoids its duty to determine whether sites are significantly preferable. Under the Staff's approach, for example, as long as the Clinch River site meets minimum standards for hydrology, the degree to which another site has preferable hydrology can never be found significant.

Even by this convoluted analysis, the Staff concluded that the Hanford meteorology is preferable, and that lower meteorological licensing costs would be required, compared to the Clinch River site. In particular, atmospheric diffusion is considerably better and the potential risks from tornadoes is substantially less. These factors should dictate a finding of "substantially preferable" rather than merely "preferable."

SECTION 2.1.4.1, Aquatic Ecology

There are no federally or state recognized threatened or endangered aquatic species at Hanford. Hanford is environmentally preferable regarding construction impacts, and other impacts are at a minimum "comparable" to the Clinch River site, according to the Staff. However, as noted above, the Staff's assessment of the Clinch River potential impact on striped bass is inadequate. Even if the striped bass

assessment were adequate, a fair summation of the relative aquatic ecology impacts would show Hanford to be substantially preferable. Thus, the Staff's conclusion of "comparability" is wholly unjustified.

SECTION 2.1.5, Socioeconomics

The Staff's finding that the Hanford site is less desirable with regard to socioeconomic factors appears to be based almost solely on the smaller estimated labor pool at Hanford. This section must be rewritten and the conclusion reevaluated based on the changes in labor pool availability arising from the deferral of several WPPSS units nearby.

SECTION 2.1.6, Population

Although the Staff characterizes the difference in population density between Hanford and Clinch River as "somewhat lower" these differences are in fact dramatic, as shown in Attachment A.

Again, the Staff fails to recognize a substantial difference when it sees one.

SECTION 2.2, Idaho National Engineering Laboratory (INEL)

SECTION 2.2.1, Geology and Seismology

Although geology and seismology factors are considered less suitable at INEL than at Clinch River because a somewhat higher cost design may be necessary to protect against earthquakes, the Staff does not provide any estimates of what those higher costs would be. Furthermore, the difference in earthquake design costs is based on the assumption that a 0.25g earthquake ground acceleration is appropriate at the Clinch River site. Yet in the DES, the Staff now admits that it will not select the appropriate safe shutdown earthquake until after it issues its Safety Evaluation Report. The assumption of any cost difference is therefore invalid at this point.

SECTION 2.2.3, Meteorology

As with Hanford, the meteorology at INEL is vastly superior, but has been substantially underrated by the Staff.

SECTION 2.2.4.2, Terrestrial Resources and Land Use

The Staff's conclusion should be based on a thorough review of all available data and other "reconnaissance level information", rather than on the Staff's opinion. Given the paucity of important or unique terrestrial features at the INEL

site which could be impacted by the LMFBR plant, there is no rational basis for the Staff's finding of "slightly preferable" rather than "substantially" preferable.

SECTION 2.2.5, Socioeconomics

In comparing five socioeconomic factors, the Staff finds INEL preferable in two factors (historical/archeological and visual intrusion); comparable in two factors (residential and highways) and less preferable in only one factor (labor pool). Adding up those subfactors, it appears that INEL socioeconomic factors are preferable than Clinch River. The Staff's conclusion that Clinch River would have preferable socioeconomic impacts appears to result from attaching great weight to the size of the available labor pool. The Staff should explain the relative weights it attached to each of these socioeconomic factors in reaching its conclusion. Unless it does so, the INEL site should be considered preferable for this factor.

SECTION 2.2.6, Population Density

As shown by the figures given, the Staff's conclusion that the INEL population density is only "somewhat" lower than the Clinch River site but is not environmentally preferable is shocking. See Attachment A.

SECTION 2.3, Savannah River

SECTION 2.3.2, Hydrology

The Staff's failure to evaluate potential drinking water contamination outside the 50-mile zone is unreasonable. NEPA requires discussion of all reasonably foreseeable impacts, and if such contamination could occur beyond 50 miles, the use of an artificial cutoff line is arbitrary.

The Staff's statement that "[t]ransport of accidental radioactivity through the ground to the Savannah River would probably not be a problem" appears conclusory and speculative. If this conclusion is based upon actual data or analysis, the Staff should explain the basis for its conclusion.

SECTION 2.3.2.1, Water Quality

The Staff has used a superficial analysis to arrive at an initial finding of Savannah River's preferability in water quality, but negated this initial finding by asserting that the Clinch River site meets minimal water quality standards. Both parts of this analysis are inadequate.

SECTION 2.3.3, Meteorology

The Savannah River site is characterized as "slightly better" in meteorological terms, but the discussion is inadequate, since the data relied upon by the Staff is not specified, and the relative weights assigned to X/Q values and tornado risks are not disclosed.

SECTION 2.3.4.1, Aquatic Ecology

The Staff does not explain why the endangered American alligator and the shortnosed sturgeon are not likely to be affected significantly by construction and operation of the breeder plant at the Savannah River site. The discussion of Clinch River striped bass impacts is inadequate for reasons stated above.

SECTION 2.3.4.2, Terrestrial Resources

The discussion of terrestrial impacts is conclusory, lacks sufficient detail and analysis, and does not sufficiently support the Staff's conclusion of "no significant advantage" over the Clinch River site.

SECTION 2.3.5, Socioeconomics

As with the Hanford socioeconomic discussion, the Staff should explain the relative weights it attaches to various socioeconomic factors in order to reach its finding of "comparability." Without such a ranking, the Savannah River site should be considered overally preferable, since it is preferable in two factors (highways and visual intrusion), and less preferable in only one factor (size of available labor pool).

SECTION 2.3.6 Population

As shown in the chart below, the 1980 population density for Savannah River at any distance up to 30 miles is less than half that of the Clinch River site, yet the Staff arbitrarily characterizes this difference as only "somewhat lower." The Staff should admit the obvious, that the Savannah River site population is substantially preferable.

CONCLUSION

The Staff concludes that all of the alternative sites are "probably" acceptable as nuclear power plant sites but that none are substantially better. First, the Staff should explain what it means by "probably" acceptable. Second, given the fact that many of the Staff's subconclusions regarding preferability are unsupported by the DES data itself, the overall conclusion that no sites are substantially better than the Clinch River site is similarly unsupported.

Tables L.1, L.2

These tables represent little more than the Staff's method of presenting its conclusions about alternative sites. No meaningful parameters or numbers are included so that they can be compared. This arguably suits a "substantially better" test, but the other side of the argument is that a test involving broad discretion, like the "substantially better"

test, should rest as much as possible on reasonable data, not conclusory assertions. The Staff is going through the motions here, but hasn't really told us anything, except that they prefer the Clinch River site. Table L.2 does indicate that Murphy Hill and Yellow Creek, by the Staff's own analysis, would not cost any more for safety measures.

NRDC COMMENTS - ATTACHMENT A

## TOTAL POPULATION AND POPULATION DENSITY

| CRBRP SITE* | | | HANFORD SITE | | | IDAHO (INEL) SITE | | |
|---|---|---|---|---|---|---|---|---|
| | 1980 | | | 1980 | | | 1980 | |
| Distance from site (mi) | Total population | Density (persons/ $mi^2$) | Distance from site (mi) | Total population | Density (persons/ $mi^2$) | Distance from site (mi) | Total population | Density (persons/ $mi^2$) |
| 0-5 | 5,713 | 73 | 0 - 5 | 0 | 0 | 0 - 5 | 0 | 0 |
| 0-10 | 56,570 | 180 | 0 - 10 | 13,924 | 44 | 0 - 10 | 0 | 0 |
| 0-20 | 269,870 | 167 | 0 - 20 | 87,283 | 69 | 0 - 20 | 5,272 | 4 |
| 0-30 | 521,070 | 184 | 0 - 30 | 133,379 | 47 | 0 - 30 | 77,735 | 27 |

*Includes transient population for 0-10 miles.