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STATEMENT BY DR. THOMAS B. COCHRAN
ON BEHALF OF THE
NATURAL RESOURCES DEFENSE COUNCIL
AT DEPARTMENT OF ENERGY PUBLIC HEARINGS
ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
FOR PROPOSED L-REACTOR OPERATIONS

Beaufort, South Carolina

November 3, 1983

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Table M-2. DOE responses to comments on Draft EIS (continued)

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Introduction

My name is Dr. Thomas B. Cochran. I am a Senior Staff Scientist at the Natural Resources Defense Council, Inc. (NRDC). NRDC is a public interest environmental protection organization with extensive technical and policy expertise on nuclear matters, representing over 43,000 members and contributors in the United States and abroad.

I have been a consultant to numerous government agencies on matters related to nuclear energy, including the Department of Energy's (DOE) Energy Research Advisory Board (ERAB), DOE's Nonproliferation Advisory Panel, and the Energy Research and Development Administration's (ERDA) LMFBR Review Steering Committee. I currently serve on ERAB's Technical Panel on Magnetic Fusion, which was established by the Magnetic Fusion Energy Engineering Act of 1980 (P.L. 96-386). I am also a member of the Three Mile Island (TMI) Public Health Fund Advisory Board, the Nuclear Regulatory Commission's (NRC) TMI Advisory Committee, and the NRC's Special Study of Nuclear Quality Assurance. I am the principal technical expert on behalf of NRDC in the licensing proceedings for the Clinch River Breeder Reactor.

I am the author of The Liquid Metal Fast Breeder Reactor: An Environmental and Economic Critique (Johns Hopkins University Press, 1974), co-editor of the Nuclear Weapons Databook series and co-author of Volume I: U.S. Nuclear Forces and Capabilities (Ballinger, 1983, in press).

I have a Ph.D. degree in physics, an M.S. degree in physics, and a B.E. degree in electrical engineering from Vanderbilt University. I was a Health Physics Fellow under the Atomic Energy Commission's radiation training program.

While there are several important issues related to the proposed start-up of the new L-reactor, my statement will be limited to two issues: First, is the L-reactor safe -- does it meet the minimum safety standards imposed by the NRC on licensed commercial power reactors? Second, can the operation of the L-reactor be delayed long enough to incorporate needed environmental and safety technologies without risk to national security?

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| | 1. The L-Reactor Safety Issue<br><br>Turning first to the safety issue, it must be recognized that DOE facilities, such as the new L-reactor, are not licensed by the NRC. It is DOE's policy, however, to conform where appropriate to all NRC environmental and safety regulations, or, at a minimum, to meet the intent of these regulations. In DOE's own words:<br><br>> Although DOE production facilities are not subject to regulation by the Nuclear Regulatory Commission (NRC), DOE and its contractors conform to internally promulgated guides that, where appropriate, parallel or meet the intent of those of the NRC.[1]<br><br>For reactors licensed by the NRC, the fundamental regulations that determine the adequacy of the site and the design of the containment/confinement system for limiting exposure to the public in the event of a severe accident are embodied in 10 CFR Part 100, Reactor Site Criteria (27 Fed. Reg. 3509 (1962)). These regulations, which were developed prior to the separation of the Atomic Energy Commission (AEC) into ERDA (now DOE) and the NRC, have been used for two decades to judge the adequacy of both NRC and DOE facilities and sites. There is no debate over whether the purpose and intent of these regulations apply to DOE facilities. In fact, DOE and its contractor, DuPont, have used 10 CFR Part 100 on numerous occasions to judge the adequacy of a wide variety of containment/confinement | |

[1] E. I. duPont de Nemours & Co., "Safety Analysis of Savannah River Production Reactor Operation," DPSTSA-100-1, Revised Sept. 1983 (hereafter "1983 SAR"), p. 5.

Table M-2. DOE responses to comments on Draft EIS (continued)

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alternatives for the production reactors at SRP.[2] Less than three years after 10 CFR Part 100 regulations were promulgated, SRP officials noted with respect to 10 CFR Part 100 dose limits,

"These values do not constitute legal limits....It may be expected, however, that dose limits greater than those shown in the regulation will meet with AEC opposition."[3]

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[2]Memorandum from W. S. Durant to E. C. Nelson, "Proposed Containment Shell for Building 105-C," Tech. Div. Savannah River Laboratory (SRL), DPST-64-423, Jan. 29, 1965.

Roger E. Cooper and Bernard C. Rusche, "The SRL Meteorological *Program and Off-Site Dose Calculations*," SRL, DP-1163, Sept. 1968.

Memorandum from S. P. Tinnes to G. F. Merz, "Airborne Activity Confinement System Base Case Design Basis Accident," Tech. Div. SRL, DPST-79-441, July 19, 1979.

Memorandum from S. P. Tinnes to G. F. Merz, "Airborne Activity Confinement System Performance First Five Hours After Reactor Accident," Tech. Div. SRL, DPST-79-555, Nov. 1, 1979.

Memorandum from S. P. Tinnes to D. A. Ward, "Airborne Activity Confinement System Performance More Than Five Hours After DBA," Tech. Div. SRL, DPST-80-588, Oct. 3, 1980.

Memorandum from A. G. Evans, J. B. Price, and S. F. Petry to D. A. Ward, "Proposed Airborne Confinement System," Tech. Div. SRL, DPST-81-596, July 23, 1981.

Memorandum from W. L. Pillinger to T. V. Crawford, "Radioiodine Releases from Carbon Filter Desorption for Dose Calculations in Reactor SAR," Tech. Div. SRL, DPST-82-960, Oct. 29, 1982.

[3]Memorandum from W. S. Durant to E. C. Nelson, DPST-64-423, op. cit., at p. 3.

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In my statement below, I will demonstrate that the L-reactor does not comply with the requirements of 10 CFR Part 100 as interpreted by the NRC in over 20 years of application. I will then explain how DOE in its draft environmental impact statement has attempted to obfuscate the L-reactor's failure to comply with 10 CFR Part 100 requirements.

A. Requirements of 10 CFR Part 100

The requirements of 10 CFR §100.11 are reproduced in Appendix A to this statement. These guidelines specify reference values for the maximum radiation dose an individual is permitted to receive at the outer boundaries of the plant and the so-called "low population zone." The reference dose values for both boundaries are 25 rem to the whole body and 300 rem to the thyroid. In assessing compliance with 10 CFR Part 100, DOE assumes that the boundaries for the SRP site and the low population zone are identical. Thus, at SRP all doses are computed at the site boundary. The doses are calculated for a 2-hour exposure and for a 120-hour exposure, the latter intended to cover the time period for the entire passage of the "radioactive cloud," as required by the regulation. Since the reactor locations and site boundary are already specified at SRP and thus cannot be altered, this dose assessment is used to test whether the containment/confinement technology at the production reactor is adequate, or whether it must be upgraded to meet minimum safety requirements.

B. Computation of the Maximum Site Boundary Doses

There are three procedures necessary to evaluate compliance with 10 CFR Part 100 requirements. First, the source and amount of radioactivity released to the containment by a particularly severe accident (referred to as the "source term") must be specified. Second, the atmospheric dispersion of radioisotopes, as they are carried by the wind to the site boundary, must be computed. Third, the amount of radiation absorbed by an individual at the site boundary must be computed. In each case, the methodology has been established by two decades of reactor licensing experience and regulatory guidance.

Table M-2. DOE responses to comments on Draft EIS (continued)

| Comment number | Comments | Responses |
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| BL-1 | The 10 CFR Part 100 source term for light water reactors (LWRs) assumes a full core meltdown with the release to the containment building of 100% of the noble gases, 50% of the iodine (half of which is assumed to plate out within a short time), and 1% of the remaining fission products (specified in the NRC guidance document, TID 14844). We will concentrate on the noble gases and iodine since these are the most troublesome in terms of the existing L-reactor confinement technology. | The regulations in 10 CFR 100 do not assume or require the assumption of "a full-core meltdown." Rather, the footnote to 10 CFR 100.11(a) clearly indicates "accidental events, that would result in potential hazards not exceeded by those from any accident considered credible. Such accidents have generally been assumed to result in substantial meltdown of the core with subsequent release of appreciable quantities of fission products" (emphasis added). "Full-core meltdown" is not equal to "substantial meltdown"; the 10 CFR 100 reference to TID-14844 particularly notes that: "The calculations described [in TID-14844] may be used as a point of departure for consideration of particular site requirements which may result from evaluation of the characteristics of a particular reactor, its purpose and method of operation (emphasis added). Thus, the source-term assumption cited is not mandated for use, either in 10 CFR 100 or in TID-14844.<br><br>The NRC licensing of the Fort St. Vrain reactor is an example of a reactor licensed with recognition of the differences between its design and the design of light-water reactors (LWRs). This reactor does not have a containment dome, but has alternative safety features that the NRC considers to be adequate. Recognizing the high heat capacity of this graphite-moderated reactor, no fuel melting was assumed when specifying the source term for use with 10 CFR 100. Release of gases as a result of core heatup (not melting) was assumed over a period of hours, not instantaneously as is commonly assumed for LWRs. Furthermore, release of only 5.5 percent of the halogens in the reactor core was assumed, rather than the 50 percent commonly assumed for LWRs. |

Table M-2. DOE responses to comments on Draft EIS (continued)

| Comment number | Comments | Responses |
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| BL-2 | An immediate question is raised: Is this LWR source term appropriate for the SRP production reactors given their differences in design? The answer is yes. As noted above, DOE has adopted the identical source term for judging the adequacy of the confinement system for existing SRP production reactors.[4] As shown below, however, DOE has responded to recent controversy by attempting to change this source term for the L-reactor, with only the thinnest of justifications.<br><br>The second step in the calculation--atmospheric dispersion--is calculated according to NRC Regulatory Guidelines. Since the maximum individual dose calculation is intended to be conservative, the specified meteorology has a low probability of occurrence. At SRP, less favorable meteorology and higher doses are expected only 0.5% of the time.[5] | Although early safety systems analyses did adopt a 100-percent core-melt accident as a basis for assessing SRP reactor confinement systems to assure a conservative upper bound during development of a comprehensive accident analysis program, DOE has never adopted a 100-percent core-melt source term as a requirement for assessing the adequacy of SRP production reactor confinement systems in terms of 10 CFR 100. Furthermore, if subject to NRC licensing requirements, DOE would not necessarily be required to do so (see the response to BL-1). The 1983 Safety Analysis Report (DPSTSA-100-1) compares the consequences of four types of accidents that bound the consequences of credible accidents to 10 CFR 100 reference doses assuming meteorological 95 percent conditions, consistent with those typically used to assess conformance to 10 CFR 100. Of the four accidents, the one yielding the maximum consequences (the accident resulting from a reloading error) is the appropriate accident for comparison with 10 CFR 100 criteria.<br><br>Previous SARs and other studies, including the cited references, reviewed a spectrum of accidents ranging from the credible to the not credible, including a 100-percent core melt, in assessing the safety of SRP reactor operations. This same approach, including consideration of an 11-percent core melt and a 100-percent core melt was used in the preparation of the 1983 SAR to present again the totality of risks, not just the risk of accidents prescribed by regulations applicable to commercial reactors. Although the types and severity of accidents considered did not change, the method of presenting the results was changed to improve clarity and readability of the report and to put the results in perspective relative to risk. |

[4] See references cited at page 3. For licensing the Clinch River Breeder Reactor, DOE and NRC have adopted the usual LWR source term (100% of the noble gases, 50% of the halogens, and 1% of the fission products) plus 1% of the plutonium in the core (NRC, "Site Suitability Report in the Matter of Clinch River Breeder Reactor Plant," NUREG-0786, June 1982, p. III-8). Even for this radically different reactor design, the assumed noble gas and iodine source terms are identical to those for the LWR and the production reactors at SRP.

[5] According to the 1983 SAR, "Doses are computed by two methods. The first method computes, for the entire site (all 16 sectors), a dose (either inhalation or whole body) that would be exceeded only 5% of the time. The result is referred to as the 95th percentile value. The second method computes for each sector a dose value that would be exceeded only 0.5% of the time (a 99.5th percentile procedure). The maximum dose for all sectors is then compared to the 95th percentile dose for the whole site, and the higher of the two values is reported.

For the SRP site, the second method (99.5th percentile worst sector) gives doses (both thyroid and whole body) at the site boundary that are about a factor of two higher than the value obtained with the first method (95th percentile whole site)." Id. at p. 15-74.

Table M-2. DOE responses to comments on Draft EIS (continued)

| Comment number | Comments | Responses |
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| BL-3 | Using data presented in the 1983 SRP Production Reactor Safety Analysis Report (1983 SAR), one can compute the maximum individual whole body and thyroid doses at the L-reactor site boundary to test compliance with 10 CFR Part 100. Table 15-4 of the 1983 SAR, reproduced in Appendix B to this statement, reports the whole body and thyroid doses associated with 1% and 3% core damage at the L-reactor. These doses are based on the assumption that 1% core damage would result in airborne release of 1% of the noble gases and tritium and 0.5% of the iodine (1983 SAR, p. 15-69). This source term value for 1% core damage need only be scaled up to 100%, or full core damage, to be consistent with the appropriate 10 CFR Part 100 source term--release of 100% of the noble gases and 50% of the iodine. The resulting doses for the new L-reactor would be: | Consistency with 10 CFR 100 does not require consideration of the release of 100 percent of the noble gases and 50 percent of the iodine. See the responses to comments BL-1 and BL-2. |

| Accident | Meteorology | Calculated Dose(rem) Whole Body 2-hour | Thyroid 120-hour |
|---|---|---|---|
| 10 CFR Part 100 source term (100% noble gas & 50% iodine release from fuel) | 99.5th percentile | 220 | 1050 |
| 10 CFR Part 100 Reference Values | | 25 | 300 |

As can be seen, the new L-reactor does not meet minimum safety requirements for the control of radioactivity releases in the event of a severe accident. If Congress said tomorrow, "This reactor must be licensed by the NRC," DOE would have no choice but to improve the confinement system in order to trap about 90% of the noble gases released from the reactor core after a severe accident.

| Comment number | Comments | Responses |
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| | C. DOE's Efforts to Mask L-Reactor Non-Compliance With 10 CFR Part 100 | |
| BL-4 | In response to extensive public criticism questioning the L-reactor's safety and its lack of a containment building, DOE has developed the following argument to deflect attention from the L-reactor's failure to meet 10 CFR Part 100 requirements. DOE now claims that there are no credible L-reactor accidents that could result in fuel melting of more than 3% of the reactor core and, consequently, that one should assume a design basis accident[6] and a source term which are 30 times smaller than DOE and NRC previously assumed. Based on these assumptions, DOE argues, the offsite doses associated with all credible L-reactor accidents are well within 10 CFR Part 100 guideline values. This argument simply cannot withstand scrutiny. | See the response to comment BL-2.<br><br>The 3-percent core-melt accident was selected for comparison to 10 CFR 100 dose criteria because it is a major accident, postulated from the consideration of possible accident events, that would result in potential hazards not exceeded by those from any accident considered credible. Clearly, the 1-percent design limit for the Emergency Cooling System (ECS) could not be considered limiting for site evaluation because it is not the maximum credible accident.<br><br>It is incorrectly inferred here and throughout this statement that the ECS is designed to limit core damage to 1 percent in the event of the maximum credible LOCA. For all credible LOCAs, no fuel melting is anticipated (see SAR, page 15-44). The 1-percent design basis referred to is, in fact, a limit applied to the reactor power level to limit core damage to 1 percent in the event of a hypothetical maximum-rate leak (an accident that is not considered credible, as discussed below) accompanied by two other circumstances that render two of the three emergency coolant injection systems ineffective.<br><br>The hypothetical maximum rate leak is assumed to result from an abrupt, double-ended break of a large pipe. Such a break is not considered credible because stainless-steel pipe in the low-temperature, low-pressure, low-corrosion conditions of SRP reactors would not undergo abrupt catastrophic failure. The two conditions assumed to render two-thirds of the emergency coolant injection system ineffective contend that the break occurs in one of the injection lines and that some unspecified failure of an active component disables one of the two remaining injection lines. |

[6]The term "design basis" is used in the context of nuclear licensing to denote the range of postulated accidents for which it is required to provide protection in the form of engineered safety features systems. For purposes of 10 CFR Part 100, the NRC equates "design basis accidents" with "credible accidents." The 10 CFR Part 100 source term must be greater than that resulting from any "credible" or "design basis" accident.

Table M-2. DOE responses to comments on Draft EIS (continued)

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| | DOE apparently bases this argument on the fact that the SRP emergency core cooling systems (ECCS) are currently designed to limit core melting to no greater than 1% of the fuel.[7] DOE also points to its estimates that a fuel reloading accident at SRP would result in no greater than 3% core melting (1983 SAR, p. 15-69). DOE's claims that this 1-3% fuel melting figure should be plugged into the 10 CFR Part 100 source term analysis flies in the face of both DOE's own analysis of existing SRP reactors and NRC's treatment of licensed commercial reactors. | |
| BL-5 | To begin with, neither DOE nor NRC has ever used ECCS design criteria as a basis for judging the adequacy of the confinement system under 10 CFR Part 100. For light water power reactors, *and historically for the DOE production reactors, NRC and DOE* have assumed a full-core meltdown and the traditional 10 CFR Part 100 source term as the design basis accident for the confinement system. The 10 CFR Part 100 requirements were intended to provide a substantial additional layer of conservatism above and beyond that provided by emergency core cooling and other safety features designed to mitigate against design basis accidents. In other words, when 10 CFR Part 100 was developed, the AEC decided that, even if the plant were designed to prevent and mitigate against all credible accidents, the possibility for a much more serious, though highly | The ECS performance has no direct bearing on the "adequacy of the confinement system" as evaluated, because the accident causing the greatest core damage is not a loss-of-coolant accident (LOCA); *it is, rather, a fuel melt resulting from a* reloading criticality accident that is not mitigated in any way by ECS performance. The fact that the most severe credible accident at the L-Reactor is a criticality accident (rather than a LOCA for a power reactor) reemphasizes the need to consider "the characteristics of a particular reactor" (10 CFR 100, note) in arriving at appropriate source terms. |

[7] DOE has postulated two classes of DBAs for which the SRP ECCS should be capable of providing protection: loss-of-coolant and loss-of-circulation (J. W. Joseph, Jr., and R. C. Thornberry, "Analysis of the Savannah River Reactor Emergency Core Cooling System," SRL, DPST-70-463, Oct. 1970, p. 13). In 1970, DuPont estimated that the maximum amount of core melting for which the ECCS could be maintained was 10%. Id. at p. 17. Today, SRP establishes operating power limits designed to limit core damage from loss-of-coolant and loss-of-circulation accidents to less than 1%. 1983 SAR, pp. 15-51, 15-54.

Table M-2. DOE responses to comments on Draft EIS (continued)

| Comment number | Comments | Responses |
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| | improbable, accident could never be completely discounted, and therefore its consequences must be considered when siting the plant and designing the containment system.[8] As implemented, the 10 CFR Part 100 regulations state that the major accident from which the source term should be calculated has "generally been assumed to result in substantial meltdown of the core with subsequent release of appreciable quantities of fission products." [10 CFR §100.11(a), n. 1.][9] Thus, the history of 10 CFR part 100 convincingly demonstrates that the regulation should not be based on ECCS design criteria. | |
| BL-6 | Secondly, DOE's argument, if carried to its logical conclusion and applied to NRC-licensed reactors, would result in a complete anomaly. DOE claims that, since SRP reactor ECCSs are designed to limit fuel melting to 1%, the 10 CFR Part 100 doses should be calculated, and the adequacy of the containment tested, based on the 1% figure. Yet, reactor ECCSs licensed by the NRC are designed to permit no fuel melting whatsoever.[10] According to DOE's logic, NRC-licensed reactors would not even need containment buildings, since there would be no 10 CFR Part 100 offsite doses at all based on the ECCS no-fuel-melting criteria. This absurd result underscores the weakness of DOE's argument and demonstrates the need to assure sufficient conservation by basing 10 CFR Part 100 upon a substantial meltdown accident, rather than on ECCS design criteria. | As indicated in Table 4-22 of the Draft EIS, the limiting accident is derived from a reloading criticality, not a LOCA; therefore, it is unaffected by ECS performance. Section 4.2.1.5 and Table 4-24 of the draft EIS further assess the effectiveness of the confinement system for a postulated 10-percent core melt based on the NRC CRAC2 methodology.<br><br>Also see the response to comment BL-4 concerning the design of the SRP ECS. |
| | [8]Atomic Energy Commission Reactor Site Criteria, Report to the Director of Regulation by the Director, Licensing and Regulation, AEC-R 2/39, Appendix D at p. 9. | |
| BL-7 | [9]As noted previously, the precedent with regard to both commercial power reactors and production reactors has been to interpret "substantial meltdown with subsequent release of appreciable quantities of fission products" to mean full core meltdown with the instantaneous release to the containment or confinement system of 100% of the noble gases, 50% of the iodine, and 1% of the remaining fission products. | See the responses to comments BL-1 and BL-2. |
| BL-8 | [10]The NRC assumes as a design basis accident a loss-of-coolant accident caused by a double-ended pipe break. Reactors must be designed to permit no fuel melting from this accident, even assuming the single failure criterion. | See the response to comment BL-4. |

Table M-2. DOE responses to comments on Draft EIS (continued)

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| BL-9 | Furthermore, even if DOE were somehow correct in basing the 10 CFR Part 100 analysis upon the ECCS design criterion, the 1-3% fuel melt figure is still far too low to be considered the maximum credible accident. The ECCS design criterion of not more than 1% fuel melting is based on the single failure criterion, which assumes that an accident--e.g., a pipe break--is accompanied by the most detrimental failure of a single active component of the system. Common cause failures, which could cause simultaneous failure of two or more active components, could cause fuel melting beyond that established as the ECCS DBA. For example, the accident at Three Mile Island Unit 2 was "beyond the design basis of the ECCS" in that there were multiple failures of active components, resulting in cladding, and possible fuel melting well beyond the ECCS design limits. | See the response to comment BL-4 concerning definition of ECS design criterion.<br><br>Since the startup of SRP reactors, a continuing effort has been devoted to review of the effectiveness of the reactor safety systems and the upgrading of the systems. These reviews have included analysis of what has come to be known as "common cause" failure modes. Where credible failure modes of this nature have been identified and considered to be of importance, design or operational changes have been implemented to cope with the failure modes. Several examples of the design changes implemented to cope with common cause failures of the ECS are described in Appendix J of the EIS (see the discussion of submersible addition valves, page J-9, isolation valves, page J-11, new sump pumps, page J-11, 36-inch-high dams, page J-12, and automatic incident action sensors, page J-12). The ECS header represented a unique failure point in that a massive leak from the header could flood the reactor basement, possibly causing a "loss of pumping" accident while at the same time possibly rendering the ECS incapable of coping with the accident. To overcome this deficiency, a series of isolation valves were installed in the mid-1970s.<br><br>The risk analyses discussed in the EIS and 1983 SAR include estimates of recognized credible common cause failures, but do not make an arbitrary allowance for nonspecific common cause failures. |
| BL-10 | The Three Mile Island accident points up another flaw in the DOE analysis of "credible" accidents at SRP. DOE assumes that the percent release of noble gases is directly proportional to the percentage of fuel melted, e.g., 3% fuel melting results in the release of 3% of the noble gases. To the contrary, at TMI Unit 2, the percentage of the noble gas inventory released was several times the percentage of the core damaged. | The assertion that "at TMI Unit 2, the percentage of the noble gas inventory released was several times the percentage of the core damaged" is without foundation. Most recent estimates of TMI-2 core condition suggest that a very large portion is damaged. It is significant to note that despite the large core damage, quantities of radioiodine released from the coolant system were minute compared to the full-core-melt estimate. |

Table M-2. DOE responses to comments on Draft EIS (continued)

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| BL-11 | In any case, the question of whether fuel melting beyond 3% is "credible" or "incredible," from the standpoint of the ECCS criteria, is irrelevant from the standpoint of the confinement system design requirements. The confinement system must meet 10 CFR Part 100 requirements. It must maintain off-site doses below 10 CFR Part 100 guideline values, assuming the release of 100% of the noble gases, if it is to achieve its "defense-in-depth" objective of limiting the risk to the public if a more serious accident, not normally considered credible, should occur. As shown above, the L-reactor simply does not meet these requirements. | The confinement system for L-Reactor would meet the dose criteria of 10 CFR 100, were they to apply (see draft EIS Tables 4-22 and 4-24; also see the response to comment BL-1). |
| BL-12 | As a separate matter, DOE has attempted to use probabilistic risk analyses to bolster its argument that accidents resulting in more than 1-3% fuel melting are not "credible." In essence, DOE claims that more severe accidents are not credible since the probability of their occurrence is less than one in a million ($10^6$) per reactor year of operation. The calculations cited in the DEIS (Vol. 1, p. 4-54; Vol. II, pp. G-44 to G-48) refer to estimates made in a recent internal DuPont memorandum (J. P. Church to D. A. Ward, "Risk Estimates for SRP Production Reactor Operation," DPST-83-717, Aug. 26, 1983). This internal document, however, points out that the risk assessment will not be completed for about two years and that | Four accidents which bound the consequences of credible accidents are reviewed and discussed in the EIS and the 1983 SAR. The bounding accidents were selected by following the traditional approach to reactor safety analysis by analyzing the consequences of "worst case credible" and even some "noncredible" accidents based on the single failure criteria. Both mechanistic and probabilistic arguments were used to define the "worst case credible" accidents. Best estimates of the probability of occurrence of these accidents are presented in the EIS in order to define as accurately as possible not only the consequences of these accidents but also the associated risk (consequence multiplied by probability of occurrence) of these accidents. |

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| | The present study should be viewed as a preliminary estimate of risk. The study is not sufficient for use as a basis for making absolute decisions about improving reactor safety. It is intended as a guide to engineering judgement in establishing priorities for the use of resources in making further improvements in reactor safety, just as the previously estimated risks and probabilities have been used in the past. Even the complete PRA will have limitations and will be used in much the same way.<br><br>PRA results are inherently subject to uncertainty. In particular, PRA results cannot be expected to quantify risks from accidents or events which cannot or have not been postulated and quantified.<br><br>Id., pp. 2-3 (emphasis added).<br><br>In the DEIS, the DOE conveniently fails to mention this cautionary note,[11] and also fails to mention the caveats at the end of the DuPont document, including the following:<br><br>The estimates of probabilities used in this study for specific accident sequences and consequences should be considered with | As noted in the second quote, the probabilities are the best estimates that can be made at the present time with existing data and resources; and they are judged to be reasonable. The primary deficiency alluded to in the first quote is not with the probabilities but with the fact that some less probable accident scenarios are not yet included as noted in the remainder of the caveat, which was not quoted but is reproduced below:<br><br>"... They do not include the probability of initiating events which could result in common failures of several safety systems, and which can be postulated, but for which there is no experience based upon which to estimate probabilities. For example, a very large earthquake, well beyond the design basis earthquake for the reactor, might render inoperative several or all of the heat removal systems. *The frequency of occurrence* of such an earthquake is not known--it might truly be zero; it is certainly less than once in 10,000 years. However, when the results of probability calculations yield values as low as $10^{-7}$ (as in this study) per year, it is appropriate to recognize that there may very well be exceedingly rare events whose risk contributions have been quantified. The important conclusion is that an event so rare as to occur only once in $10^7$ years, as in cases discussed above, should be regarded as having, in effect, zero probability. There is no incentive to further reduce its probability or its consequence. An event having a probability of once in $10^4$ years might be considered as a significant contributor to risk if the consequence of the event is known or judged to be very large. Thus there is incentive to reduce its probability or consequence."<br><br>NRC's conclusion concerning risk analysis of sequences initiated by natural phenomena or deliberate acts of sabotage is pertinent and stated below:<br><br>"Sequences initiated by natural phenomena such as tornadoes or seismic events and those that could be initiated by deliberate acts of sabotage are in a |

[11] In the Appendix of the DEIS, DOE indicates that the analysis is "preliminary" (DEIS, Vol. II, p. G-48). In the main text (DEIS, Vol. I, pp. 4-54 to 4-55), the results are presented without caveats and are presented as "fact."

Table M-2. DOE responses to comments on Draft EIS (continued)

| Comment number | Comments | Responses |
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| | careful regard to the assumptions made. First, the estimates of component and system failure rates or failure probabilities used in this study were not obtained by a comprehensive analysis. They are the best estimates that can be made at the present time with existing data and resources. They are judged to be reasonable. Second, the estimated rates are based upon extrapolations of experience. They do not include the probability of initiating events which could result in common failures of several safety systems, and which can be postulated, but for which there is no experience base upon which to estimate probabilities. | large measure taken into account in the design bases and operation. The data base for assessing the probability of events more severe than the design bases for natural phenomena is extremely small. Therefore, accident sequences initiated by such events is considered beyond the state-of-the-art of probabilistic risk assessment." (Reference: Final Environmental Statement on the operation of Bryon Station, Units 1 and 2, NUREG-0848, U.S. Nuclear Regulatory Commission, April 1982.) |
| | Id., p. 16 (emphasis added). | Of all the types of accidents considered in the preliminary PRA, the LOCA accident and the associated response of the ECS are the most thoroughly studied. Rather comprehensive analysis including common cause failures has been applied to this accident as evidenced by the number of design changes implemented to address common cause failures (see the response to comment BL-9). |
| | Indeed, the failure to take into account common cause failures results in estimates of fuel melting that are likely to be several orders of magnitude too low. This renders the overall absolute probabilities meaningless for judging whether the probability of accidents resulting in more than 3% fuel melting is $10^{-6}$ per reactor year, as DOE would have us believe, or closer to $10^{-4}$ per year, or even higher. | |
| | DOE has used the same probability analysis as a partial basis for its contention that alternative containment/confinement options are not cost effective (DEIS, Vol. 1, Table 4-31, fn. d, p. 4-80). The absolute probabilities are similarly an insufficient basis for this contention. | |
| BL-13 | The DOE comparisons of the cost effectiveness of alternative containment/confinement options (DEIS, Vol. 1, Table 4-31) contain even more fundamental errors that render them useless. It is perhaps useful to mention several of these errors, although I do not intend to discuss them in detail in this statement. | With respect to the comments on the cost-effectiveness evaluation of alternative safety systems: |
| | (1) It is inappropriate to include a production loss of $150,000 per reactor-day without including offsetting operating costs that would not be incurred. | 1. The value of $150,000 takes into account reduced operating costs. |

Table M-2. DOE responses to comments on Draft EIS (continued)

| Comment number | Comments | Responses |
|---|---|---|
| | (2) The estimated man-rems averted do not include exposures:<br>(a) to persons exposed on site,<br>(b) to persons exposed at a distance greater than 80 km,<br>(c) to organs other than whole body, e.g., thyroid, and bone,<br>(d) associated with fuel-melting beyond 10% of the core.<br><br>Recognizing these inherent deficiencies, the NRC has decided that this cost-benefit approach should under no circumstances be used as a substitute for existing regulatory requirements. These requirements include ensuring compliance with 10 CFR Part 100, performing adequate site selection, and ensuring that the containment/confinement system is adequate for the protection of public health. | 2(a). The estimated person-rem do not consider onsite exposures with any alternative because there is no basis for assuming any difference in onsite exposures to plant workers subject to emergency procedures in the event of an accident.<br><br>2(b). As noted in Table 4-24 of the Draft EIS, person-rem exposures at distances as far as 800 kilometers are only about twice those out to 80 kilometers for each alternative and do not alter the cost benefit by more than a factor of two.<br><br>2(c). Table 4-24 of the Draft EIS also lists the population thyroid doses for both 80- and 800-kilometer radius zones. Inclusion of these doses would not significantly alter the cost-benefit values, particularly those based on the EPA value per health-effects averted, because thyroid damage is extremely unlikely.<br><br>2(d). Values for any desired core-melt hypothesis can be determined by inverse scaling of the cited cost-benefit values with the core-melt percentage. |
| BL-14 | In sum, the L-reactor, as presently designed, is simply unsafe. *It does not meet the minimum standards for design of a* containment/confinement system to protect the public health in the event of a severe accident. Following the recent controversy over the adequacy of the L-reactor confinement system, DOE has attempted to lower its safety requirements--reducing the requirements for confining noble gases by a factor of 30--rather than improve the confinement technology.<br><br>Simply stated, DOE believes its reactors should be held to the nuclear regulatory requirements of the Truman and Eisenhower administrations rather than today's standards. We disagree. | The L-Reactor is not unsafe and does meet the minimum standards *for design of a containment/confinement system* (see the response to comment BL-11). Rather than lower its safety requirements (see the response to comment BL-2), DOE has continued to upgrade reactor safety systems and explore new methods to further protect the public health and safety. |
| | II. The National Security Issue<br><br>I will now turn to the national security issue. Here, the central question is whether DOE can safely defer the restart of the L-Reactor in order to incorporate the technologies needed | |

Table M-2. DOE responses to comments on Draft EIS (continued)

| Comment number | Comments | Responses |
|---|---|---|
| | to meet today's minimal environmental and safety standards. Can we have both a safe and clean environment and adequate national security, or must the former be sacrificed for the latter, as DOE would have us believe? | |
| BL-15 | In the DEIS (Vol. I, Chapter 1), DOE's emphasis on the "need" issue has been in terms of whether the L-reactor should be restarted at all, rather than the less demanding question of whether restart of the L-reactor can be deferred. A 36-month delay in L-reactor operations is ample time to upgrade the environmental control and safety systems. This period would permit installation of four of the five confinement/containment alternatives (DEIS, Vol. 1, p. 4-80), and would also permit the installation of mechanical draft cooling towers (DEIS, Vol. 1, p. 4-95). The cost of a 36-month delay in terms of foregone plutonium production is approximately 1.5-1.75 MT of plutonium. Thus, the central question here is whether 1.5-1.75 MT of foregone plutonium production is a threat to national security, or, alternatively, whether this amount (or some fraction thereof) can be supplied by other production initiatives without incurring a shortage of plutonium "needed" for nuclear weapons production. | The effects on meeting established needs for defense nuclear materials with a delay of the L-Reactor restart is analyzed in Appendix A (classified). Implementation of the potential combination of partial-production options providing the greatest material production (the accelerated useof the Mark-15 lattice at SRP reactors and the production of less than 6 percent plutonium at the N-Reactor) to compensate for production losses commensurate with these delays in the L-Reactor restart provide only a small fraction of needed defense materials that could be produced by L-Reactor. This is summarized in Section 2.1.3 in the EIS. |
| BL-16 | To place this issue in perspective, it should be noted that the U.S. nuclear weapons stockpile currently contains some 80 to 90 metric tons of plutonium and 600 to 700 metric tons of highly enriched uranium. It is incredible to think that a 2 percent change in the plutonium inventory would be detrimental to national security. Certainly, we cannot estimate the number of Soviet warheads or weapons material production to that level of accuracy.<br><br>Setting this argument aside, there is strong evidence that restart of the L-reactor can be delayed for at least 36 months without incurring a shortage in plutonium to meet DOE projected weapon requirements. | The national policy on nuclear weapons, their deployment, and the need for increased weapons is beyond the scope of this EIS. |

Table M-2. DOE responses to comments on Draft EIS (continued)

| Comment number | Comments | Responses |
|---|---|---|
| | A. Would a Near-Term Shortage of Plutonium Be Incurred By a Delay In Start-up of the L-reactor? | |
| BL-17 | First, the DEIS fails significantly to give special consideration to a short-term delay in L-reactor operation and the shortages of materials, if any, that this delay would incur, even without alternative production options. The relevant questions that must be asked are: Would a near-term shortage occur, and, if so, could the alternative production options eliminate it? | See the response to comment BL-15. |
| BL-18 | When the 1981-83 Nuclear Weapons Stockpile Memorandum (NWSM) was signed by President Carter in October 1980, DOE projected that, unless the new production initiatives were implemented, there would be a shortage of plutonium in 1985 or shortly thereafter. With the implementation of several planned initiatives, including the restart of the L-reactor (DEIS, p. 1-3), a plutonium shortage was not projected to occur prior to the early 1990s. DOE indicates that "the increased defense nuclear material requirements . . . have been reaffirmed in subsequent Stockpile Memoranda" (DEIS, p. 1-2), but that "Congress has delayed or failed to fund certain nuclear weapons systems" (DEIS, p. 1-2). The effect has been to eliminate the shortage previously projected to occur in the early 1990s. In my view, foregoing plutonium production in the L-reactor for 36 months, even if none were made up through alternative near-term production initiatives, would not create near-term shortages. In the long term (after 1990), shortages that might otherwise appear can be made up by a variety of production initiatives, several of which are identified below.<br><br>DOE apparently does not dispute this view. Rather, DOE simply asserts that "none of the [alternative] production options, or combinations of options, would provide sufficient material in time to fully compensate for the delay or loss of L-Reactor production" (DEIS, p. 1-6). But this is not the relevant question. As stated above, the questions are: Would a near-term shortage occur, and, if so, could the alternative production options eliminate it? | The quantitative analysis of nuclear material requirements and supply provided in Appendix A (classified) demonstrates the need for the restart of L-Reactor as soon as practicable to meet the the requirements identified in the FY 1984-1989 Nuclear Weapons Stockpile Memorandum.<br><br>See also the response to comment BL-15. |

Table M-2. DOE responses to comments on Draft EIS (continued)

| Comment number | Comments | Responses |
|---|---|---|
| | B. The Recent Delays in Weapons Systems Have Significantly Reduced the Near-Term Requirements for Plutonium. | |
| BL-19 | This can be seen by comparing the weapons requirements set forth in the Carter FY 1981-83 NWSM against today's requirements.<br><br>The FY 1981-83 NWSM, signed in October 1980, included a significant increase in warhead production and was the impetus for materials production initiatives. Included in this NWSM were:<br><br>- the first firm requirements for 700 W84 and W85 warheads for Pershing II and Ground-Launched Cruise Missiles,<br><br>- some 2000 MX missiles warheads planned for a 200-missile force,<br><br>- sufficient W76 Trident I warheads (5,520) for backfit into 12 Poseidon submarines and 15 new Trident submarines,<br><br>- 1200 W-70-3 Lance and W79 8-inch nuclear artillery warheads built as fission warheads with the technical ability to be shifted to enhanced radiation yields,<br><br>- 460 W80-0 Sea-Launched Cruise Missile warheads,<br><br>- 3,394 W80-1 Air-Launched Cruise Missile warheads, and<br><br>- 1000 W-82 155-mm fission artillery warheads.<br><br>The FY 1983-88 NWSM signed by President Reagan in November 1982 made significant changes to its early assumptions, which were similar to the Carter Administration:[12] | See the response to comment BL-16. As indicated in Section 1.1.1 and Appendix A (classified), the defense nuclear material requirements of the FY 1984-1989 Nuclear Weapons Stockpile Memorandum support the need to restart L-Reactor as soon as practicable.<br><br>The availability of all recoverable material from retired weapons is included in the determination of material supply for new weapons in the NWSM. DOE utilizes this material in meeting new defense nuclear material requirements. Section 1.1 contains added information on this subject in this final EIS. |

[12]Nine warhead types continue in production during 1983:
- the B61-3/4 bomb,
- the W76 Trident I warhead,
- the W79 enhanced radiation artillery warhead,
- the W80-0-0 Sea-Launched Cruise Missile warhead,
- the W80-1 Air-Launched Cruise Missile warhead,
- the B83 Modern Strategic Bomb,
- the W84 Ground-Launched Cruise Missile warhead,
- the W85 Pershing II warhead, and
- the W87 MX warhead.

Table M-2. DOE responses to comments on Draft EIS (continued)

| Comment number | Comments | Responses |
|---|---|---|
| | - only 1000 MX warheads would be built for 100 MX missiles,<br><br>- W76 Trident I warhead production would be cut to 3840 in the short term, with a shift to Trident II production in time for fitting the ninth Trident submarine (1989),<br><br>- the W70-3 Lance and W79 8-inch nuclear artillery warheads would be built as enhanced radiation warheads,<br><br>- 758 rather than 460 W70-0 Sea-Launched Cruise Missile warheads,<br><br>- a significant reduction in near-term W80-1 ALCM production from 3,394 to 1,739 with shift to the Advanced Cruise Missile, and<br><br>- a shift from fission to enhanced radiation yield for 1000 W82 155-mm warheads.<br><br>Significant reductions in nuclear material requirements have resulted from Reagan's decision to shift the MX warhead from the W78 design to the W87. In addition, DOE has considerable flexibility in the rate of retirement of old warheads.[13] This is the primary source of material for new weapons production.<br><br>The 1983-88 NWSM also included a number of new retirement initiatives, including retirement of B-52Ds and accelerated retirement of B52Gs (with the reduction in bomb needs), retirement of the Titan II, and accelerated retirement of Polaris. The retirements traditionally account for a large proportion of nuclear materials for new warheads. By the end of the decade, some nine warhead types (W25, B28, W31 Nike Hercules, W33, V43, W50, B53, and W76) will be retired either in part or in full. | |

[13]Two significant restraints exist in retiring warheads when scheduled: warhead retirements contingent on replacements (particularly when lack of Congressional funding slows down replacements) and double sets of warheads necessary when enhanced radiation replacements for fission warheads (W70-3, W79, and W82) are kept in the U.S. and a full set of overseas deployed warheads are also kept.

Table M-2. DOE responses to comments on Draft EIS (continued)

| Comment number | Comments | Responses |
|---|---|---|
| | C. Alternative Plutonium Production Initiatives Are Available to Make Up for a Potential Loss of Some 1.5-1.75 MT of Plutonium Within the Three-Year Period the L-Reactor Is Deferred. | |
| BL-20 | Since 1981, DOE has exceeded its plutonium equivalent production goal. Consequently, part of the 1.5-1.75 MT Pu alternative production requirement has already been met. We estimate that DOE has surpassed its planned production goal at Savannah River by about 0.5 MT in FY 1982-83. At Hanford, the conversion of the N-reactor to the weapon-grade mode of operation was completed in FY 1982, approximately five months ahead of schedule, providing some 0.23 MT of additional plutonium. Thus, the makeup needed from alternative sources is only on the order of 0.8-1.0 MT. | The availability of nuclear material defined in the Nuclear Weapons Stockpile Memorandum includes actual material produced in DOE facilities rather than past production goals and schedules. |
| BL-21 | D. Other Alternatives to L-Reactor Operation<br><br>(1) Mark-15 Cores. The use of Mark-15 cores could boost plutonium production by at least 25% per reactor. If such cores are installed in two operating SRP reactors, weapon-grade plutonium production (with blending) could be increased by 0.375-0.475 MT per year. Plans exist to install Mark-15 cores in one reactor in late FY 1985 or as late as August 1986. Accelerating introduction of the Mark-15 cores by one year could provide approximately one-half of the plutonium makeup required.<br><br>(2) Production of 5% Pu-240 Plutonium at the N-reactor. The shift from 6% to 5% Pu-240 production would produce greater quantities of plutonium than a 10% increase in N-reactor power (DEIS, pp. 2-5, 6). Such a shift could therefore increase plutonium production through blending by about 90 kg/yr, or some 0.27 MT over the next three years.<br><br>(3) Restart of the Purex Reprocessing Plant at Hanford. DOE now plans to restart the Purex Reprocessing Plant at Hanford in April 1984 to process stored and new N-reactor spent fuel to recover both fuel-grade and weapon-grade plutonium. Restart of the Purex plant three months earlier would provide an additional 100 kg of plutonium per month, or 0.3 MT total. | The acceleration of Mark-15 lattice cores and production of 5-percent plutonium-240 at the N-Reactor were considered in the EIS (Sections 2.1.2.2, 2.1.2.3, 2.1.2.4, and 2.1.3). The additional plutonium that would be generated by these partial production options is small compared to the amount needed to offset a delay in L-Reactor restart. The early restart of the PUREX facility will have little effect on the supply of weapons-grade plutonium in the near term because sufficient supplies of fuel-grade plutonium are directly available for blending; the capacity of the facility is large in relation to the backlog of N-Reactor weapons-grade material available for processing. Furthermore, the early plant startup was factored into the material supply information in the FY 1984-1989 NWSM recently approved by President Reagan and used as a basis for the need for L-Reactor in this final EIS. Additional information on implemented initiatives and production options has been included in Sections 1.1 and 2.1 of this final EIS. |

Table M-2. DOE responses to comments on Draft EIS (continued)

| Comment number | Comments | Responses |
|---|---|---|
| | E. Summary: Production Options and Proposed Action | |
| BL-22 | We take issue with the DEIS claim that no combination of production options can fully compensate for the loss of material that would be produced by the L-reactor if restart is delayed (DEIS, p. 2-1).<br><br>As noted above, DOE has given short shrift to its discussion of the combination of production options by failing to examine quantitatively the effect of a 36-month restart delay. The combination of the following alternatives can make up the 1.5-1.75 MT Pu-equivalent loss prior to a shortage developing in the Pu stockpile:<br><br>(a) Excess Pu already obtained by exceeding previously planned production goals.<br><br>(b) Operating N-reactor to produce 5% Pu-240 product.<br><br>(c) Accelerating Purex by 3 months.<br><br>(d) Accelerating Mark-15 core by 1 year.<br><br>This combination of alternatives would permit much needed improvements in L-reactor environmental control technology while still meeting defense nuclear material needs.<br><br>This concludes my statement. NRDC will be submitting to DOE more extensive comments on the L-reactor DEIS prior to the close of the comment period in two weeks. Thank you. | See the responses to comments BL-15, and BL-19 through BL-21. |

| Comment number | Comments | Responses |
|---|---|---|

APPENDIX A

Requirements of 10 CFR §100.11

10 CFR §100.11 states, in relevant part:

(a) As an aid in evaluating a proposed site, an applicant should assume a fission product release[1] from the core, the expected demonstrable leak rate from the containment and the meteorological conditions pertinent to his site to derive an exclusion area, a low population zone and population center distance. For the purpose of this analysis, which shall set forth the basis for the numerical values used, the applicant should determine the following:

(1) An exclusion area of such size that an individual located at any point on its boundary for two hours immediately following onset of the postulated fission product release would not receive a total radiation dose to the whole body in excess of

[1]The fission product release assumed for these calculations should be based upon a major accident, hypothesized for purposes of site analysis or postulated from considerations of possible accidental events, that would result in potential hazards not exceeded by those from any accident considered credible. Such accidents have generally been assumed to result in substantial meltdown of the core with subsequent release of appreciable quantities of fission products.

Table M-2. DOE responses to comments on Draft EIS (continued)

| Comment number | Comments | Responses |
|---|---|---|
| | 25 rem[2] or a total radiation dose in excess of 300 rem[2] to the thyroid from iodine exposure.<br><br>(2) A low population zone of such size that an individual located at any point on its outer boundary who is exposed to the radioactive cloud resulting from the postulated fission product release (during the entire period of its passage) would not receive a total radiation dose to the whole body in excess of 25 rem or a total radiation dose in excess of 300 rem to the thyroid from iodine exposure. | |

[2]The whole body dose of 25 rem referred to above corresponds numerically to the once in a lifetime accidental or emergency dose for radiation workers which, according to NCRP recommendations may be disregarded in the determination of their radiation exposure status (see NBS Handbook 69 dated June 5, 1959). However, neither its use nor that of the 300 rem value for thyroid exposure as set forth in these site criteria guides are intended to imply that these numbers constitute acceptable limits for emergency doses to the public under accident conditions. Rather, this 25 rem whole body value and the 300 rem thyroid value have been set forth in these guides as reference values, which can be used in the evaluation of reactor sites with respect to potential reactor accidents of exceedingly low probability of occurrence, and low risk of public exposure to radiation.

| Comment number | Comments | Responses |
|---|---|---|

APPENDIX B

TABLE 15-4

Calculated Radiation Dose to a Person at the SRP Site Boundary Following Four Specific Accidents

| Accident | Operating and Meteorological Conditions* | Calculated Dose, rem Whole Body (2 hr) | Thyroid (2 hr) | Thyroid (120 hr) |
|---|---|---|---|---|
| Reference values for reactor siting in 10 CFR 100.[3] | | 25 | 300 | 300 |
| $D_2O$ Spill | Typical | 0.007 | | |
| | Very Unlikely | 0.14 | | |
| Discharge Mishap (one fuel assembly melts) | Typical | 0.0038 | 0.0078 | 0.018 |
| | Very Unlikely | 0.055 | 0.12 | 0.29 |
| Misloading Criticality (3% core damage) | Typical | 0.39 | 0.48 | 1.4 |
| | Very Unlikely | 6.6 | 11.1 | 31.5 |
| Hypothetical LOCA (1% core damage) | Typical | 0.13 | 0.16 | 0.46 |
| | Very Unlikely | 2.2 | 3.7 | 10.5 |

*Typical conditions are 2500 MW reactor power, average (50%) meteorology, and 19-month service age carbon filters (carbon filter age is discussed in Section 15.3.2.2). Very unlikely conditions are maximum anticipated reactor power of 3000 MW, very unfavorable meteorology as specified in NRC Regulatory Guide 1.145 (95% site, 99.5% worst sector), and 19-month aged carbon filters. Values shown are maximum for any of the P, L, K, and C Reactors. The core inventory of tritium is included in the whole body calculations.

Table M-2. DOE responses to comments on Draft EIS (continued)

| Comment number | Comments | Responses |
|---|---|---|

APPENDIX C

Evolution of the Confinement Technology at SRP Production Reactors

The production reactors at SRP were constructed in the early 1950s. The L-reactor, the third of five, began operating in July 1954. SRP originally controlled airborne radioactive releases by dispersion via tall stacks (DEIS, Vol. II, p. J-1). SRP also relied on the fact that the site extended over 300 square miles, thus permitting greater dispersion of radioactivity prior to reaching the site boundary. The L-reactor is some 9 km from the SRP site boundary (DEIS, p. 2-10). In 1958, the AEC's Advisory Committee on Reactor Safeguards (ACRS), after performing an extensive review of the SRP safety philosophy, concluded:

> The buildings in which the SR reactors are housed do not possess any significant containment features, such as those now being provided for power reactors located in more populated areas. In the event of a serious accident that would breach the reactor tank and shield, the building shell in itself could not be expected to provide a third line of defense of any consequence on restraining the volatile fission products.
>
> It was recommended that the Du Pont Company explore alternative paths toward obtaining a higher degree of confinement that is now in effect.

DEIS, Vol. II, p. J-7.

Also in 1958, the capacity of the SRP primary coolant pumps was approximately doubled (from 78,000 gpm to 150,000 gpm) which permitted a doubling of each reactor's power from about 1000 megawatts thermal (MWt) to approximately 2000 MWt (DEIS, Vol. II, pp. J-3 and J-6). Since the fission product inventory of noble gases and iodine is proportional to reactor power, this

Table M-2. DOE responses to comments on Draft EIS (continued)

| Comment number | Comments | Responses |
|---|---|---|
| | change effectively doubled the magnitude of the consequences of a serious fuel meltdown accident. Since 1958, the power level of the production reactors has been further increased, and the L-reactor is currently expected to operate at 2350 MWt* (DEIS, Vol. I, p. 2-14).<br><br>In 1960-61, in response to the ACRS criticism, SRP began a major confinement system improvement project. This system would remove airborne contamination, particularly iodine-131, through moisture separators, particulate filters, and halogen absorbers (carbon) in the process area ventilation exhaust stream (DEIS, Vol. II, p. J-7). This filtration system, while lowering the thyroid dose from halogen releases, was, however, incapable of removing noble gases, the primary contributors to the whole body dose.<br><br>In the 1950s, there were no criteria specifying the degree of site isolation or reactor containment considered desirable for mitigating the consequences of severe reactor accidents. In 1962, after extensive public comment, the AEC promulgated the 10 CFR Part 100 site suitability regulations for licensed power reactors. Throughout the remainder of the 1960s, DuPont and the AEC examined a number of alternative containment/confinement proposals. Although some of these proposals, if adopted, would bring the SRP production reactors into compliance with 10 CFR Part 100, they were rejected because of their expense.<br><br>Improvements were made in the confinement system in the 1970s, including the installation of a Confinement Heat Removal System to avoid overheating the filter system in the event of a full core meltdown. This system was needed because overheating the filters would reduce their retention capacity and cause desorption of the collected iodine (DEIS, Vol. II, p. J-13), thus defeating the purpose of the filters. This and other improvements, however, offered no reduction in the whole body dose due to accidental noble gas releases. | |

*The highest power level achieved at SRP was 2915 MWt.

Table M-2. DOE responses to comments on Draft EIS (continued)

| Comment number | Comments | Responses |
|---|---|---|
| | ADDITIONAL COMMENTS MADE AT PUBLIC HEARING ON NOVEMBER 3, 1983 | |
| BL-23 | Now, let me add one or two other things. I just came, day before yesterday, from a conference in Washington, D.C. on the global effects of nuclear war which was where some of the top scientists from this country and also from the Soviet Union met to release their findings, principally on the thermal effects following the nuclear exchange.<br><br>And they pointed out that the debris and soot that would be picked up by an exchange between the Soviet Union and the United States would lead to blockage of the sunlight for a month or more, several months before it cleared up, a year before it cleared up completely, and the temperature at the surface of the earth, average, over the Northern Hemisphere, would drop about 40 to 50 degrees Centigrade, and the loss of light would lead to the loss of photosynthesis.<br><br>And, in effect, beyond the billion or so people you killed outright in a nuclear exchange, it would be credible that an equal number or larger number of the remaining survivors could not survive the aftereffects.<br><br>Well, another thing they pointed out was that because the principal blockage of the sunlight comes from the soot that is produced by fires, that as little as 100 megaton exchange, say, from a thousand weapons of a tenth of a megaton each, would have similar effects. I mean, most of the effects could be produced by this small of an exchange.<br><br>I just did a back-of-the envelope calculation, weapons stockpiled has about, oh, in the neighborhood of 7,000 megatons in weapons, in itself.<br><br>This is in some twenty-six or so thousand weapons, and these are produced from about 80 to 90 tons of plutonium and six or seven hundred tons of highly enriched uranium.<br><br>The L-Reactor, over a ten-year period, would produce somewhere on the order of five tons, more or less. | These comments are outside the scope of the EIS. |

Table M-2. DOE responses to comments on Draft EIS (continued)

| Comment number | Comments | Responses |
|---|---|---|
| | Just scaling those numbers, you can argue that the L-Reactor would effectively produce over a ten-year period about 400 megatons, give or take a few hundred megatons of warhead yield, which is more than the minimum needed to essentially produce this newest catastrophe that has been identified.<br><br>I raised that because I think that DOE has an obligation to discuss all foreseeable facts in the Environmental Impact Statement, and the effects of misuse of these warheads or use of them eventually is certainly one foreseeable impact that they must discuss. | |

Table M-2. DOE responses to comments on Draft EIS (continued)

| Comment number | Comments | Responses |
|---|---|---|
| | STATEMENT OF FRANCES CLOSE HART<br><br>ENERGY RESEARCH FOUNDATION<br><br>I am Frances Hart and I represent the Energy Research Foundation. We have not yet had time to analyze the draft environmental impact statement as thoroughly as we intend, and will submit more extensive written comments before November 15th. I would just like to make some very general observations now.<br><br>The point of an EIS - as we're all aware by now - is to provide for an assessment of the environmental impacts of a particular project as part of the planning to avoid environmental damage where possible. | |
| BM-1 | Whether by design or mistake, DOE has given the impression that startup of L-Reactor will follow almost immediately upon completion of this EIS. That schedule would preclude implementation of any of the protective alternatives mentioned in the draft and by other sources. There are a number of technical experts analyzing the draft and possible environmental protection measures, and we expect DOE to seriously consider comments and suggestions for action. It is their legal obligation to do so and we consider it to be a substantive obligation to the states of South Carolina and Georgia as well. Those of us who have participated in this process find it disturbing that DOE seems not to be entertaining the possibility that plans could change in response to comments. Although renovation of the L-Reactor is completed, it is certainly not too late to make changes and reassess schedules, and we would remind DOE that it is incumbent upon them to consider the comments with an open mind.<br><br>The protective measures described in the draft are generally dismissed because it is claimed that their implementation before startup would not allow production schedules to be met. | The EIS does not "dismiss" production alternatives or potential mitigative measures. Information with respect to meeting established needs and the technical feasibility of implementing mitigative measures are factors along with environmental consequences that are essential to making a "reasoned" decision. In accordance with the Council on Environmental Quality's regulations implementing the procedural provisions of NEPA, the Department's preferred alternatives are identified in this final EIS.<br><br>The Department will base its Record of Decision on this final EIS, including the public comments. The Record of Decision will address alternatives considered in reaching the decision, the environmentally preferable alternatives, preferences for alternatives based on the technical, economic, and statutory missions of the agency, and whether all practicable means to avoid environmental effects from the selected alternative have been adopted. |

Table M-2. DOE responses to comments on Draft EIS (continued)

| Comment number | Comments | Responses |
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| BM-2 | But recent statements from Dr. George Rathjens of the Massachusetts Institute of Technology and Dr. Thomas B. Cochran of the Natural Resources Defense Council have cast doubt on this assumption. According to Dr. Cochran, delay in startup of the L-Reactor for 36 months to implement necessary environmental control and safety systems would have no effect on national security. Dr. Cochran's comments on the draft EIS provide a detailed justification of this claim. And Dr. Rathjens stated that the draft "is totally unconvincing in justifying the need for increased production," and that "there is not likely to be any need for reactivation of the L-Reactor in the near future, and possibly ever."<br><br>Given that the evidence to which we have access strongly suggests that delay of L-Reactor startup to allow implementation of protective alternatives would not have detrimental effects on national security, we would suggest that the following changes be made in DOE's plans for operation of that reactor. I repeat that we are not yet finished with our analysis of the draft EIS and that these recommendations are general ones which are by no means a comprehensive reflection of our concerns. However, we believe them to be sound and justifiable. | See the responses to comments AB-2 and AB-5 regarding information in the EIS on need and production alternatives, and the responses to comments AB-8, BL-15, BL-19, BL-20, and BL-21 regarding suggested production alternatives and need. |
| BM-3 | First, DOE should implement some kind of cooling water discharge alternative to the presently planned direct discharge into Steel Creek. Some of the alternatives described in the draft would cause as much damage as would direct discharge and we would oppose any plan which would in effect make Steel Creek into a thermal mitigation zone. We would also oppose any alternative which does not result in compliance with state NPDES regulations in Steel Creek. The benefits from implementation of such a protective measure before startup would include the avoidance of severe thermal damage and of cesium remobilization. | Section 4.4.2 of the EIS, which discusses cooling-water mitigation alternatives, has been revised based on public comments received on the draft EIS. Specifically, Section 4.4.2 has been revised to provide a detailed discussion of additional combinations of various cooling-water systems. In Section 4.4.2, each of the cooling-water mitigation systems is evaluated for attaining the thermal discharge limits of the State of South Carolina. Section 4.4.2 and a revised Appendix I, Floodplain/Wetland Assessment, discuss the wetland impacts of each of the systems considered.<br><br>The Department of Energy has been reviewing and evaluating alternative cooling-water systems for L-Reactor. Based on these reviews and evaluations, and consultations with |

Table M-2. DOE responses to comments on Draft EIS (continued)

| Comment number | Comments | Responses |
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| | | representatives of the State of South Carolina regarding a mutually agreed upon compliance approach, a preferred cooling-water mitigation alternative is identified in this EIS. This preferred cooling-water alternative is to construct a 1000-acre lake before L-Reactor resumes operation, to redesign the reactor outfall, and to operate L-Reactor in a way that assures a balanced biological community in the lake. The Record of Decision prepared by the Department on this EIS will state the cooling-water mitigation measures that will be taken which will allow L-Reactor operation to be in compliance with the conditions of an NPDES permit to be issued by the State of South Carolina. |
| BM-4 | Secondly, we believe that DOE should complete the phaseout of all seepage basins at SRP before startup of the L-Reactor. | See the responses to comments AJ-1 and BG-4 regarding seepage basins and ground-water contamination at SRP and DOE ground-water protection commitments. |
| BM-5 | According to the draft EIS, normal operations of L-Reactor will involve the routine discharge of liquids contaminated with radioactivity from the disassembly basin at the reactor to an on-site seepage basin. This basin is now empty but remains contaminated from releases made during previous operation of the L-Reactor. According to DOE, the routine discharges "will cause contamination of the uppermost layer of the water-table aquifer (Barnwell Formation)." (DEIS, 4-26) DOE is assuming that this contamination will move laterally into Steel Creek rather than vertically into the lower aquifers. But DOE projections about groundwater movement have proven to be inaccurate in the past, as was the case in the M-area where the Tuscaloosa aquifer was contaminated by solvents from seepage basins despite DOE's claims that the aquifer was protected.<br><br>Questions about increased groundwater use resulting from L-Reactor operations and the effect on head differentials under the L-Reactor (which I will discuss in more detail in a moment) make the reactivation of this presently dried-up and still irradiated seepage basin an option to be avoided. | Section 4.4.3 discusses alternatives to the use of the L-Area seepage basin that are under consideration. Studies of the hydrostratigraphic units show that conditions at L-Area are different from those at M-Area (Sections 3.4.2.1 and 5.1.1.4). If the L-Area seepage basin is used, the analyses indicate that the filtered deionized disassembly-basin wastewater will seep into the shallow ground water and flow laterally to seepline springs along Steel Creek.<br><br>The upward head differential between the Tuscaloosa and Congaree Formations at L-Area is presently about 3.7 meters. Projections indicate that this an upward head differential will continue to be present for 10 or more years after L-Reactor operation resumes; this includes the effects of increased pumping at SRP in support of L-Reactor. This head differential and the clay layers beneath L-Area tend to protect the Tuscaloosa Aquifer (see Section 4.1.2.2 of this final EIS).<br><br>The SRP has discharged contaminated wastewater to seepage basins in the central part of the plant site since the mid-1950s. To date, there has been no contamination of the Tuscaloosa Aquifer in this area. Also, see the response to comment AJ-1 regarding seepage basins and ground-water contamination at SRP. |

Table M-2. DOE responses to comments on Draft EIS (continued)

| Comment number | Comments | Responses |
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| BM-6 | There is known to be serious contamination of groundwater from seepage basins presently in use at a number of support facilities whose workload will increase with L-Reactor startup. The M-area I just mentioned and the chemical separations areas face a 33% increase in activity. It is presently planned to phase out use of seepage basins over a period of time, estimated in the case of the M-area basins to be by March 1985. To increase the load on these basins before protecting our groundwater from further contamination is unacceptable environmental practice - as is the use of seepage basins for waste disposal in general.<br><br>Increased use of groundwater following L-Reactor startup adds to our concern in that possible impacts on head differentials at various places under the Savannah River Plant raise questions about deeper aquifer contamination in the future. According to the draft EIS:<br><br>"Incremental ground-water pumping from the Tuscaloosa Formation, required to support the resumption of L-Reactor operation, will occur in five areas on SRP... The incremental withdrawal of water from the Tuscaloosa Formation at K-Area and the Central Shops will not affect the protection of the Ellenton and Tuscaloosa aquifers afforded by the upward head differential between the Tuscaloosa and Congaree Formations. In F- and H-Areas, this head differential no longer exists at the producing wells, and the downward head differential at these wells will be increased when the incremental pumping for L-Reactor starts. However, the hydrostratigraphic properties of the overlying wells will continue to offer protection to the Ellenton and Tuscaloosa aquifers at the pumping wells. At the seepage basins the head differential between the Tuscaloosa and Congaree Formations will be reduced by drawdown to about 3.6 meters in F-Area and to near zero in H-Area."<br><br>"This is not the case in M-Area where the hydrostratigraphic characteristics of the subsurface materials are different from those in F- and H-Areas. In addition, the downward head differential between | DOE is committed to perform mitigative actions at SRP to reduce pollutants released to the ground water and to establish with the State of South Carolina a mutually agreed-on compliance schedule. Studies are being conducted on the phaseout of seepage basins at SRP. Also, see the responses to comments AJ-1 and BG-4 regarding seepage basins and ground-water contamination at SRP and DOE ground-water protection commitments. Sections 5.1.1.2 and 5.1.1.4 have been expanded to include a more thorough discussion of incremental ground-water impacts and the protection of public health and safety. |

Table M-2. DOE responses to comments on Draft EIS (continued)

| Comment number | Comments | Responses |
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| | the Congaree and Tuscaloosa Formations will be increased by about 2.6 meters at the M-Area seepage basins as the result of increased pumping to support the L-Reactor." (DEIS, 5-9, 5-12) | |
| BM-7 | According to Dr. A. R. Jarrett of the Department of Agricultural Engineering at Pennsylvania State University:<br><br>"Page 3-25 and Appendix F [of the draft EIS] reveal an extensive review of the total heads existing at various locations within the SRP. These results are summarized several places, particularly Figures 3-8 and 3-9, which show most of the SRP to be in a zone of upward hydraulic gradient from the Tuscaloosa formation to the Congaree formation. The equal potential map, Figure 3-9, reveals the magnitude of these head differences ranging from an upward head difference of greater than 30 feet in the swamp region near the Savannah River where the Congaree is drawn down to support the flow in this river. As one moves northward, the upward differential decreases until it reaches an equal head condition near Par Pond and then a reversal implying that there is presently flow from the Congaree into the Tuscaloosa in the area of Par Pond. Figure 3-9 does not quantify the magnitude of this downward gradient but does suggest that Par Pond and the surrounding area is a recharge zone for the Tuscaloosa. This entire analysis is done using well data from the area, but nothing is said about the condition of pumping or the pumping history of wells used in the analysis when the head data were taken. *It must be assumed that these data are under* conditions of no withdrawal. The only pump drawdown data I could find in the report was on page 3-36 where drawdown values of 6 to 12 meters are suggested as typical for the existing withdrawal rates of the Tuscaloosa. If one superimposes these drawdowns to the stagnant well levels from the Tuscaloosa, the area of downward gradient enlarges as shown in | See the response to comment AW-1 which addresses Dr. Jarrett's remarks. |

Table M-2. DOE responses to comments on Draft EIS (continued)

| Comment number | Comments | Responses |
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| | Figures 1 and 2.... Even using the 6 meter data enlarges the recharge area to include the L-Reactor area and during discharges creating a 12 meter drawdown essentially the whole SRP becomes a recharge area."<br><br>I am not a hydrologist, but I do know that such considerations are vital to an understanding of groundwater flow and therefore possible aquifer contamination. It is obvious that questions about hydrology remain unanswered. | |
| BM-8 | In conclusion, the priority assumed in the following illustrative statement from the draft EIS is most disturbing: "If an engineering alternative cooling-water system is implemented after the restart of L-Reactor, successional recovery of the Steel Creek system would begin as soon as the alternative is implemented. Any alternative that postulates a delay of the restart necessarily results in a loss of production that cannot be recovered."<br><br>Let us make it clear that we South Carolinians consider the protection of our environment to be a vitally important priority; indeed, it is part of our national security. We are very aware that damage to the environment cannot be undone easily, frequently not at all.<br><br>We are being asked to accept the destruction of a large area of wetlands, the remobilization of curie amounts of cesium, further contamination of the groundwater and possibly of our sources of drinking water - all severe and essentially irreversible impacts. In expressing concern about the impacts we have frequently been told that the incremental dangers they represent are small and that we shouldn't worry. DOE also wants us to accept without question the assumption that a two percent increase in the plutonium inventory is worth the damages we must pay.<br><br>We submit that the burden of proof is theirs; that it is to DOE to prove their case much more convincingly than has been done so far. | In Section 4.4.2, the EIS compares the implementation of cooling-water alternatives before and after restart. This comparison encompasses a number of factors. A loss of production is a factor that will be considered in preparing the Record of Decision. The Record of Decision will state the decision and any mitigation measures DOE will undertake. Also see the responses to comments BM-1 and BM-3 regarding the Record of Decision on this EIS and cooling-water mitigation alternatives. |

Table M-2. DOE responses to comments on Draft EIS (continued)

| Comment number | Comments | Responses |
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| | NATIONAL AUDUBON SOCIETY<br>Southeast Regional Office<br>P.O. Box 1268, Charleston, S.C. 29402 (803) 723-6171<br><br>STATEMENT OF TERRENCE C. LARIMER<br>SOUTHEASTERN REGIONAL REPRESENTATIVE FOR THE<br>NATIONAL AUDUBON SOCIETY<br>ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT<br>FOR L-REACTOR, SAVANNAH RIVER PLANT<br>AIKEN, SOUTH CAROLINA<br>AT THE DEPARTMENT OF ENERGY PUBLIC HEARING<br>BEAUFORT, SOUTH CAROLINA<br><br>November 3, 1983<br><br>My name is Terrence Larimer. I am the southeastern regional representative for the National Audubon Society. Previous to my employment with Audubon I worked with the University of Georgia's School of Forest Resources, U.S. Forest Service and the U.S. Fish and Wildlife Service.<br><br>The National Audubon Society is a private, nonprofit membership organization. We are dedicated to the conservation of wildlife and other natural resources and for the sound protection of our natural environment. Audubon has roughly 500,000 members and nearly 500 local chapters. We operate 75 wildlife sanctuaries and we publish AUDUBON magazine and AMERICAN BIRDS. | |
| BN-1 | Our concern with the Draft Environmental Impact Statement (DEIS) on the Savannah River Plant L-Reactor centers primarily on its possible effects on wildlife habitat. Specifically, we are concerned with its effect on wood stork foraging habitat in Beaver Dam and Steel Creak Swamps. The DEIS acknowledges that *wetlands in the Savannah River Plant* (SRP) *are important foraging* sites for the nearby Birdsville Rookery of the endangered wood stork. However, the effect of the loss of these foraging areas, due to L-Reactor plant operation (high, hot, polluted water), on the colony is not discussed. We believe that these areas are critical to the continued success of the Birdsville Rookery and that this problem has not been adequately addressed. | See the response to comment AD-1 regarding the wood stork and foraging sites. |

Table M-2. DOE responses to comments on Draft EIS (continued)

| Comment number | Comments | Responses |
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| | It is a known fact that wood storks have high food requirements during the nesting season, 201 kilograms per nesting pair. It is also known that wood storks will abandon nests when food becomes a limiting factor. | |
| BN-2 | The DEIS acknowledged the swamps of Beaver Dam Creek and Steel Creek are important foraging areas for the wood stork. Is it not likely that elimination of these foraging areas will reduce the food resource to a point where colonies might be abandoned during what would have previously been only moderately adverse natural conditions? That is, will not the colony fail much more often during periods of moderate stress after the loss of an important feeding area than it would have before that loss? | See the response to comment AD-1 regarding incidences of foraging at SRP locations and inclusion of more detailed data in Appendix C, Section C.3.2 of this EIS, and the response to comment AD-2 regarding abandonment of colonies. |
| BN-3 | Along these same lines, not only are foraging areas along Beaver Dam and Steel Creek in jeopardy but current management practices on the SRP may be reducing other nearby foraging areas. Last year nearly 200 beavers were trapped in a three-month period on the SRP at a cost of $15,000. Essentially all beavers were killed on the area. No information on the number of beaver traps, the number of trap sites, or trap site relation to actual beaver damage to railroad bed or roadway beds is mentioned. | Due in part to a lack of natural predators, the beaver population on the SRP has increased markedly in recent years. Because beaver activity has had adverse impacts on (1) 750 acres of timber, (2) environmental monitoring of streams, and (3) damaged roads and railroads, consultations were held with the U.S. Fish and Wildlife Service and the South Carolina Wildlife and Marine Resources Department. An evaluation of several alternative actions recommended that a selective trapping program be implemented at 34 areas. During a 3-month period, 196 beaver were trapped and removed at a cost of $16,231.50. This management approach has not eliminated the entire beaver population on the SRP. |
| BN-4 | I raise these questions because of the concern over the relationship between beaver ponds and foraging areas for wood storks. It is a well known fact that beaver ponds provide valuable wildlife habitat for many species. It is likely that they provide excellent foraging habitat for wood storks. This is a question that has not been addressed and should be. | Wood storks from the Birdsville colony commonly used black gum (Nyssa sylvatica) and cypress swamps for foraging. Black gum swamps comprised 33 percent of the foraging sites. Beaver probably used many of these sites sometime in the past. The most productive stork foraging site in terms of fish resources (biomass per square meter) was a recent beaver-dammed black gum swamp. Wood storks probably benefit from foraging habitat created by beaver dam construction. |
| BN-5 | The question of mitigating loss of critical foraging areas is not adequately discussed in the DEIS. It should be. How will this habitat be replaced? | Mitigation of foraging areas in the Steel Creek swamp might be accomplished through the implementation of the alternative cooling systems discussed in Section 4.4.2. |

Table M-2. DOE responses to comments on Draft EIS (continued)

| Comment number | Comments | Responses |
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| BN-6 | Surrounding foraging areas are primarily on private lands which are under increasing pressure to drain and clear for agricultural use. Indeed, the annual flooding and concurrent resupply of forage fishes to the waters associated with the Savannah River Swamp System make the Beaver Dam Creek and Steel Creek areas especially valuable to foraging wood storks. More valuable than nearby wetland areas which are not annually flooded by the river.<br><br>The supposition that wood storks will simply move into "other" areas if Beaver Dam Creek and Steel Creek are lost to them is at best wishful thinking. Cumulative loss of wetlands to agricultural use and L-Reactor operation will likely prove fatal to this important segment of endangered species population. This question should be more carefully examined in the final Environmental Impact Statement. | See the response to comment AD-10 regarding habitats for the wood stork. |
| BN-7 | Indeed the entire question of the effect of L-Reactor start-up *of the Birdsville Rookery needs further examination. The* majority of the DEIS information on wood storks is based on data gathered during less than half of last year's breeding season. This is obviously not a large enough data base to form any sound conclusions. | See the response to comment AD-3 regarding inclusion of more *detailed data in Appendix C, Section C.3.2 of this EIS.* |
| BN-8 | In conclusion the DEIS for L-Reactor operation on the Savannah River Plant is woefully inadequate in its handling of possible impacts on the wood stork population of the Birdsville Rookery. The importance of foraging habitat in Beaver Dam Creek and Steel Creek and the effect of their loss on the rookery needs further examination. Possible mitigation schemes should be explored and enhancement of alternative feeding areas considered. | See the response to comment AD-2 regarding the use of foraging sites at SRP versus sites not located on the SRP. |

Table M-2. DOE responses to comments on Draft EIS (continued)

| Comment number | Comments | Responses |
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| | R. I. (BOB) NEWMAN<br>388 Wahoo Drive<br>Fripp Island, S.C. 29920<br><br>PREPARED STATEMENT<br>PUBLIC HEARING<br>DRAFT ENVIRONMENTAL STATEMENT, L-REACTOR OPERATION,<br>SAVANNAH RIVER PLANT<br><br>November 3, 1983 | |
| | I am Robert I. Newman, residing on Fripp Island, here in Beaufort County and a consumer of water from the Beaufort-Jasper water system. I am a Chemical Engineer, registered in South Carolina and New Jersey. I worked for Allied Chemical Corp. for 37 years--the last 15 in various nuclear-related projects (including 7 years with Allied-General Nuclear Services). I was elected a Fellow of the American Institute of Chemical Engineers and a Diplomate of the American Association of Environmental Engineers. I served one year on the Clemson University Board of Visitors. | Comments noted. |
| | Before endeavoring to counter some of the most often voiced objections to the restart of the L-Reactor, I would like to put forth several basic considerations. I, personally, feel these are factors which should be taken into account in the making of any decision affecting, among other things, our environment. I think they are important to the future of the nation. I hope they are considered important to the DOE in this matter. I wish they were in the reasoning process of those opposing the restart. | |
| | First, our resources of both money and people (both technically trained and leaders) have a finite limit. Any wastage of either must divert resources away from other, maybe more important, activities. We hear often that other countries are getting ahead of us in technology. We all know our government is running with enormous deficits. I think we would all like to see our people in Congress spend more time constructively acting to stop the arms race; but there are only 24 hours in a day | |

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and unnecessary time spent on one matter is time not available for other matters.

Second, we can never achieve the "best" solution to any problem. Regardless of what remedy is developed, some ambitious research person is going to come up with an idea that might be better. What we must strive for is solutions which are adequate to serve the necessary purpose--not the most elegant. Our decision process must consider the alternatives and their costs in dollars, time (which often equates to dollars) and other resources.

Third, try as we may, we can never achieve perfection or an activity in which there is no risk. Yet, we see time and time again the spending of enormous resources to avoid miniscule risks because of emotion or unfounded cries of concern.

Fourth and finally, one must compare one risk (both magnitude and likelihood) with others we may better understand and accept. I, personally, cannot accept the argument that nuclear risks are different because they are not our personal choice, while flying in an airplane (for instance) is an activity in which we do not participate unless we choose to do so. When I walk down the sidewalk, if a drunken driver swerves off the street and hits me, that is not by my choice, but I am sure statistics show more people have been killed by such an accident than by the handling or manufacture of nuclear materials.

Now I would like to comment on several of the objections to the restart of L-Reactor as voiced in the record I have seen. These are not necessarily in order of importance but rather in the order I noted them as I read the absurdly lengthy transcripts and letters on this matter.

LOSS OF WETLANDS HABITAT AND DANGER TO ENDANGERED SPECIES

This may be the most picayune objection raised against the restart. Of the SRP area, only some 12% of the wetlands will be affected. Looking at it another way, only some 2.5% of the site will be affected by the hot water from the operation of the L-Reactor. Maybe those objecting do not know that wildlife can walk or fly to unaffected areas. Maybe they do not want to realize that the SRP area is probably the finest

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wildlife refuge in South Carolina--keeping even the "econuts" from disturbing the wildlife. Do they know about the Savannah River Ecology Laboratory which is doing such a fantastic job because of the efforts funded by the DOE and the lack of people on the site? There is an artificial lake on the site--Par Pond. This lake receives hot water from reactor operations. When I lived in Barnwell, I heard many times of local fisherman sneaking into Par Pond (sometimes caught) to catch the large fish in the pond--thermal pollution? To carry out many additional studies, to build cooling towers to avert a non-problem is a lovely example of waste of resources.

IMMEDIATE OR CUMULATIVE RADIATION EFFECTS

I have no quarrel that an excess dose of radiation will harm me--or anyone. But I compare this with being hit with a wheeled vehicle. I'd be dead if it were a 10 ton truck going 50 miles an hour. I would not be hurt so much if it were a tricycle ridden by a four-year-old. Similarly, a radiation dose of 500,000 millirem might kill me. One millirem won't! I touched above on comparisons. Let's look at some here. The estimated impact on nearby residents from airborne releases will be less than 0.5 millirem per year. The dose to consumers of Beaufort-Jasper water might reach less than 0.05 millirem per year. These are above background radiation levels--the natural radiation we are all exposed to in this area. Now let's look at the comparisons. Should the Rocky Mountain area (like Denver) be posted "TO ENTER THIS AREA IS DANGEROUS TO YOUR HEALTH"? Its radiation level is 100 millirem higher than the good people of South Carolina will be exposed to because of L-Reactor restart--and Denver does not have a high cancer incidence. Our worthy Legislators spend a lot of time in the State House in Columbia. Columbia itself has a higher background radiation level than Barnwell or Beaufort because of higher altitude (cosmic radiation) and the composition of the ground (more radioactive). But also, a radiation survey of the State House has shown that, because of the radioactive granite used in its construction, radiation levels are quite high--as much as 500 millirem above background outside the Governor's Office. There are many areas of South Carolina where radiation levels are higher than those to which the good people of Beaufort might be exposed from the restart of L-Reactor because of altitude or rock (radioactive) outcropping. I cannot

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understand why some people of Beaufort will travel to Aiken or take so much other time to protest an activity which might subject them to an exposure to a carcinogen (radioactive material) at a level of, say, 1% of the federal limit when they are silent on the fact that their water company regularly delivers water to them with trihalomethane (another carcinogen) content exceeding the federal limits--over 100%! Such misdirected concern can only lead--or try to lead--to a real waste of resources if this miniscule exposure is required to be reduced.

CONSEQUENCE OF ACCIDENTS

One fundamental consideration in the assessment of the consequence of an accident in nuclear activities is the "stored energy" which can disburse radioactive material. Unlike a nuclear power plant, L-Reactor will operate at low pressures and temperatures. Accordingly, there is not the high temperature nor the high pressure potential to spread fission products into the environs as one might believe. However, there is a real consideration that most people like to overlook. There are natural processes, not a function of engineering or construction that cannot be ignored, though they have occurred repeatedly in nuclear mishaps. There have been reactor accidents in the U.S., in Canada, in England. In every case, the actual release was a factor of 1,000 to 100,000 times less than what had been predicted to result (using models similar to those on which the minimal releases from L-Reactor were calculated). This is really not surprising when one appreciates the natural phenomena such as agglomeration, condensation, impingement, etc. which take place regardless of design. Another factor which comes into play--and certainly did at TMI--is that two of the radionuclides of most concern, cesium and iodine, are both volatile. However, they also have a great affinity for each other and promptly combine chemically to form cesium iodide, which is not volatile and settles out on surfaces or is caught in the filter system.

CONTAMINATION OF THE TUSCALOOSA AQUIFER

I was responsible for the hydrology studies for the Barnwell nuclear plant, downstream from the SRP above the Tuscaloosa. Our studies clearly showed that the Tuscaloosa was under a

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hydraulic head higher than the overlying aquifers, so that any flow between them would be from the Tuscaloosa up, not from the upper aquifers down into the Tuscaloosa. The L-Reactor Environmental Assessment supports this on page 3-16. Granted there are holes in the aquiclude above the Tuscaloosa, but that aquifer is so immense that any loss of its water through these holes, or abandoned wells, is insignificant.

NEED FOR PUBLIC PARTICIPATION

When NEPA was enacted over a decade ago, I cheered it because I perceived that it would require that decision makers would have to take into consideration some of the basics I earlier listed like weighing of alternatives and conservation of resources in a realistic manner. My current perception is that NEPA has been prostituted and is being used by those opposing any action they do not favor to delay and delay the action--in many cases killing it just by the passage of time, not for any real, proven or demonstrated reason. Here, with L-Reactor restart at stake, the public record of operations at the Savannah River Plant--especially the reactors--clearly refutes the cries of opposition. Publishing of the Environmental Assessment gave further support. Yet poorly founded objections have resulted in the expenditure of large sums of money (some of it supplied by me in taxes), the waste of many hours of time of highly qualified people who could have been working productively, and the diversion of the efforts of Members of Congress, State leaders and federal and state regulatory agency people. I can see no evidence that any objector has shown and proved there will be any significant impact from the operation of L-Reactor when judged against rational criteria. In this regard, it is notable that, with no exception I have found, the people of nearby communities give full support to the restart-opposition coming from those with less familiarity with SRP operation. Nearby residents work at the SRP, have relatives or friends working there or have retired, in good health, from working there. If any objector wishes to counter this by saying they are doing this, knowing there is danger, let them say so, face to face, to these people, telling them they are deliberately jeopardizing the future of their friends or their children. Many of the Health Physics professionals working at the plant are parents, they know the effects of radiation. Does anyone

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really think they are disregarding the future of their own children?

CONCLUSION

This has not, obviously, been a technical presentation. The record is replete with technical facts. But many people either do not understand or they prefer to ignore facts in preference to emotion.

Let me close by mentioning an article I wrote which was published last December in THE STATE and in THE BEAUFORT GAZETTE. It compared many of the objectors to nuclear activities to Chicken Little--the misguided creature which, after being hit on the head, went around saying, "The sky is falling." While unfounded, its cries alarmed many others. The article led off, "Why can't South Carolina get away from the 'Chicken Little Syndrome' (the sky is falling)? Many reporters and editorial writers grossly distort the picture of nuclear activities from the factual situation. The same goes for a number of our leading politicians."

Thank you for letting me participate in this waste of time.

R. I. Newman, P.E.

Table M-2. DOE responses to comments on Draft EIS (continued)

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| | STATEMENT OF REPRESENTATIVE HARRIET KEYSERLING BEFORE THE DEPARTMENT OF ENERGY HEARING NOVEMBER 3, 1983 | |
| | I appreciate the opportunity to appear before you today. I do not have a scientific background, so as I read the Draft Environmental Impact Statement, I was examining the process by which you will make your decisions more than the scientific data. I am glad that others here will speak with knowledge and authority on the technical and scientific aspects of the EIS. | |
| BP-1 | At your May 27, 1983 hearing, I stated that it was my opinion that nuclear hazards are nuclear hazards, whether they be related to commercial or defense facilities; and therefore, nuclear safety criteria and standards should be the same for all. For that reason I supported an EIS for the L-Reactor.<br><br>For the same reason I urge you again, as you listen to the responses and testimony submitted to you this week, to make decisions which will require of the L-Reactor the same standards for the protection of health and safety as are required of commercial facilities. | Chapter 7 of the EIS presents the Federal and state environmental protection regulations that are applicable to the restart of L-Reactor. The restart of L-Reactor will comply with all of these regulations. For example, the proposed restart of L-Reactor will be in compliance with an NPDES permit issued by the State of South Carolina, and the restart of L-Reactor will be in compliance with DOE radiation protection standards that are comparable to those of the Nuclear Regulatory Commission (10 CFR 20) for a production facility (i.e., 500 millirem to the whole body in any one calendar year).<br><br>With respect to engineered safety features such as a containment dome, the need for specific engineered safety features is based upon limiting potential radiological consequences. The potential radiological consequences are related to the design and operation of the specific type of reactor being considered; for example, the Fort St. Vrain reactor, which is a gas-cooled commercial reactor in Colorado, has no containment dome and was licensed for operation by the NRC. |
| BP-2 | As I read through the Draft EIS I had an uneasy feeling that, as alternatives were evaluated and weighed, the overriding considerations were time and expense, and that alternatives which could not meet the January 1, 1984 start-up were not seriously considered. I sincerely hope this is not so, for the health and safety of the people of South Carolina and Georgia, now and for future generations, must be considered equally. | The purpose of the EIS is to evaluate the environmental consequences of the proposed restart of L-Reactor. In accordance with the Council on Environmental Quality's regulations implementing the procedural provisions of NEPA, the Department's preferred alternative (including mitigation alternatives) are identified in this final EIS. |

Table M-2. DOE responses to comments on Draft EIS (continued)

| Comment number | Comments | Responses |
|---|---|---|
| | | The Record of Decision on this EIS will state the alternatives to be implemented. The Record of Decision will address the alternatives considered in reaching the decision, environmentally preferable alternatives, and preferences for alternatives based on technical, economic, and statutory missions of the agency, and whether all practicable means to avoid environmental effects from the selected alternative have been adopted. |
| | I would like to say, in closing, that I was pleased to read of the broadening of the health studies of cancer and infant death, a subject of great concern here. We will be waiting anxiously to learn the results. | |

| Comment number | Comments | Responses |
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STATEMENT OF THE LEAGUE OF WOMEN VOTERS OF NORTHERN BEAUFORT COUNTY AT A DOE HEARING ON THE DRAFT EIS OF THE L-REACTOR AT THE SRP
Nov. 3, 1983

I am Dr. Zoe Tsagos. I appear before you for the third time as the representative of the LWVNBC where I hold the Energy Chair.

Since today's meeting is about the Draft EIS on the restart of the L-Reactor at the SRP, we have decided that we would concentrate on the Draft EIS response to the five recommendations which we presented at the Scoping meeting in August. Having read all the presentations made by individuals and by organization representatives at the four scoping meetings as published by DOE, we feel sure that other aspects of the L-Reactor start-up will be covered, either here or at the other hearings.

At the scoping meeting our fourth recommendation concerned itself with safety planning and the steps to be taken during a serious accident at the SRP, onsite and offsite. We stressed the importance of letting people know how an emergency would be handled.

Both in the body of the EIS (4.2.1.3.) and in Appendix (H) a carefully delineated program of safety measures is presented. We quote from Appendix (H.2.1.) the following two statements: "The DOE-SR is developing a set of 11 Emergency Management Plans for managing emergencies on and off the SRP (DOE, 1983 a-k)" and "DOE-SR has recently entered into agreement with lead agencies of South Carolina (DOE, 1983m) and Georgia (DOE, 1983n) to prepare such plans."

The point we wish to stress here is that although in the thirty years of operation there was apparently some liaison with key persons in Georgia, South Carolina and the South Carolina counties within 80 kilometers of the SRP in case of an emergency, the concept of carefully developed step by step action apparently is a recent program from the dates cited above. We find this clear cut response encouraging. There was no indication of any of this in the EA.

Table M-2. DOE responses to comments on Draft EIS (continued)

| Comment number | Comments | Responses |
|---|---|---|
| BQ-1 | We are disappointed that nothing is planned before start-up about the problems of ground water usage and contamination. We had presented as our one recommendation that the seepage basins be replaced by other means of containment of radioactive and nonradioactive chemical wastes.<br><br>Instead, we have the following (Draft EIS 5.1.1.2.): "The chemical separations of product and waste from the irradiated L-Reactor fuel and target assemblies will result in additional effluent discharges to the seepage basins at the chemical separations areas. Based on past experience, about 1.5 kilograms per year of mercury ... and larger quantities of other chemicals ... are expected to be discharged to seepage basins in the F- and H-separations areas due to the operation of the L-Reactor ... In addition, approximately 7 kilograms per year of the chlorinated degreasing solvent (1,1,1 trichloroethane) and quantities of other chemicals ... will be discharged to the seepage basin in the fuel and target fabrication area ..."<br><br>In an interview on July 1, 1983 with Roger E. Davis, Assistant Deputy Commissioner of Environmental Quality Control at the South Carolina DHEC by a member of the staff (see Research Exchange published by Energy Research Foundation, July-August 1983, pp. 4, 5, 6, 12) Mr. Davis spoke of the Clean Water Act of 1977 and about the permitting system which passed into the jurisdiction of the states. Before April 1, 1983 the SRP permits had been issued by EPA. When SCDHEC was asked for permit renewal, it was found that SRP was in violation of water quality standards. Asked about his main concern, Mr. Davis named ground water contamination through seepage basins, lagoons, and other disposal sites. SRP is asking for a variance so that it can operate the L-Reactor while at the same time develop a study on alternative means for nuclear and non-nuclear waste storage. Until the study is completed, the ground water pollution will worsen. | See the response to comments AJ-1 and BG-4 regarding seepage basins and DOE's commitments for ground-water protection, and the response to comment BA-5 regarding disposal of high- and low-level radioactive waste. |

Table M-2. DOE responses to comments on Draft EIS (continued)

| Comment number | Comments | Responses |
|---|---|---|
| BQ-2 | We are also disappointed that no cognizance has been given to our third recommendation to the need for an outside, independent group to oversee SRP operations along with government agencies such as DHEC and others.<br><br>There are universities and colleges in both South Carolina and Georgia from where knowledgeable, good citizens can come to perform this public service. There are other citizens' groups which can be called upon. There is one other factor which must be taken in consideration--the lack of funds to do an effective job of monitoring such as installations at SRP.<br><br>In the aforementioned interview with the DHEC Deputy Commissioner, Mr. Davis responded to a question on funding the work of DHEC at the SRP by saying that it has been hampered by lack of funds because the South Carolina Legislature feels that part of the money should come from the federal government and added, "So far we have not received any indication that the federal government is going to provide these resources." (reference as above p. 12.)<br><br>A dedicated group with scientific know-how could be of assistance to augment the limited forces that DHEC now commands. | DOE-owned, contractor-operated facilities, such as the Savannah River Plant are excluded from NRC licensing requirements under Section 110(a) of the Atomic Energy Act as amended. DOE is therefore responsible for protecting the safety and health of the public and the environment from the effects of activities at DOE nuclear facilities. To assure the health and safety of the public and to protect the environment, DOE provides an effective, independent health and safety overview function through the Assistant Secretary for Policy, Safety and Environment, who has no program responsibilities with respect to the nuclear programs of DOE. The health, safety, and environmental protection requirements and programs of the Assistant Secretary are implemented through a series of Orders and regulations by DOE program personnel. The DOE program personnel are then responsible for assuring contractor compliance. Within DOE, the health, safety and environmental protection responsibilities are a line management responsibility assuring clear lines of authority in implementing requirements, and also assuring that health, safety and environmental protection is an integral part of each program maximizing the sensitivity of all program personnel to requirements.<br><br>In addition to the health, safety and environmental protection programs of DOE, oversight is also provided through the monitoring of SRP activities and joint participation in studies by several state and Federal agencies as discussed in Chapter 6 of this EIS. These programs and studies include the Georgia Department of Natural Resources (radioanalysis of fish near SRP and crabs and oysters near the seacoast and monthly analysis of 13 water-quality parameters), South Carolina and Georgia (air-monitoring network, including eight sampling stations near SRP), U.S. Geological Survey (continuous monitoring of river flow and temperature above and below the SRP), National Centers for Disease Control (epidemiological studies), and the Academy of Natural Sciences of Philadelphia (long-term aquatic and water-quality studies in the Savannah River near SRP). The current reports documenting the radiation monitoring programs of the states are Environmental Radiation Surveillance Report, Summer 1980-Summer 1982, Georgia Department of Natural Resources, and Nuclear Facility Monitoring, South Carolina Department of Health and Environmental Control. |

Table M-2. DOE responses to comments on Draft EIS (continued)

| Comment number | Comments | Responses |
|---|---|---|
| | | Other independent oversight activities initiated by DOE include long-term aquatic and water-quality studies in the Savannah River near SRP by the Academy of Natural Sciences of Philadelphia, epidemiological studies by the Los Alamos National Laboratory and by the Oak Ridge Associated Universities, independent environmental studies of the SRP site by the University of Georgia's Savannah River Ecology Laboratory, and the conduct of consultations with the U.S. Fish and Wildlife Service and National Marine Fisheries Service on endangered species.<br><br>DOE has also initiated a 2-year program to determine the environmental effects of cooling-water intake and discharge of the SRP production reactors. The States of South Carolina and Georgia, the U.S. Environmental Protection Agency, the U.S. Fish and Wildlife Service, and the U.S. Army Corps of Engineers are participating in this program.<br><br>See also the response to comment CX-3 regarding DOE's response to the GAO report entitled "Better Oversight Needed for Safety and Health Activities at DOE's Nuclear Facilities." |
| BQ-3 | We still would like to see the L-Reactor on a stand-by basis, as we indicated in our fifth recommendation, until the vitrification of high level radioactive waste be made possible. It is a pity that the building of the Defense Waste Processing Facility had not been started earlier to perform this very needed operation. The Draft EIS states that it will be put on stream in 1989. (Draft EIS 5.1.2.8.) | As stated in Section 5.1.2.8, the volume of high-level radioactive waste to be generated by chemical processing of L-Reactor material was considered in the EIS for the Defense Waste Processing Facility (DWPF); this facility is presently under construction at SRP. This waste will be stored temporarily in Type-III double-walled tanks, which have experienced no leakage, until the DWPF begins to immobilize SRP high-level waste.<br><br>Also see the response to comment BA-5 regarding high-level waste disposal. |
| BQ-4 | Finally, we come to our first recommendation made at the Scoping Hearing; a recommendation of particular importance to us who drink the Savannah River water. This has to do with thermal effluent which will further degrade the Savannah River as soon as the L-Reactor goes in production. | See the response to comment AA-1 regarding cooling-water mitigation alternatives and issuance of an NPDES permit for L-Reactor. |

Table M-2. DOE responses to comments on Draft EIS (continued)

| Comment number | Comments | Responses |
|---|---|---|
| | We here quote our recommendation, in part, as we presented it in August. "... we strongly recommend that a method of cooling the reactor effluent be introduced either by recycling, by cooling pools or by any other acceptable method which will cool the emissions to the standard of 90°F acceptable to South Carolina DHEC."<br><br>Since 1977 with the passage of the Clean Water Act there has been further enabling legislation. One of these laws is connected with permit issuance to companies that are not polluting and qualify under the Clean Water Act. This is the National Pollutant Discharge Elimination System (NPDES). Since SRP does not qualify under NPDES, it has asked DHEC to allow the L-Reactor start-up and to run for five years during which time an alternative method of cooling the effluent would be worked out. It is our understanding that DHEC with some modifications will grant the permit, or at least that was Mr. Davis' position in July before the issuance of the Draft EIS. | |
| BQ-5 | We wish to end this presentation with a quotation from a draft position paper which was prepared by the staff of the Natural Resources Defense Council and was to be sent to DOE in its final form in July. On page 5 under "Production Alternatives" occurs the following statement:<br><br>> The Draft EIS should consider as a reasonable alternative a delay in the operation of the L-Reactor for an extended period to allow the implementation of "mitigative alternatives" combined with, if necessary, the alternatives of (1) boosting throughput at the SRP reactors and the N-Reactor and (2) Accelerating the recovery of nuclear materials from the retirement of obsolete warheads. In regard to the first, DOE now plans to install the Mark 15 core in one of the SRP reactors, which will increase its plutonium production by approximately 25%. The Draft EIS should address the possibility of the use of such cores in one or more additional reactors.<br><br>Although the Draft EIS shows no inclination on the part of DOE to delay in starting the L-Reactor, perhaps a reconsideration may be possible at what is proposed above. | See the responses to comments BL-15, BL-19, and BL-21 regarding production alternatives. |

Table M-2. DOE responses to comments on Draft EIS (continued)

| Comment number | Comments | Responses |
|---|---|---|
| BQ-6 | We do not find what we have learned from the Draft EIS reassuring. We are aware that with the start-up of the L-Reactor there will be four polluting sources in the SRP rather than three and they will be under less rigid control than say the commercial Georgia Power Vogtle plant nearby.<br><br>Thank you, Mr. Chairman. | See the response to comments AA-1 and AA-3 regarding issuance of an NPDES permit and DOE's commitment to comply with all applicable Federal and state environmental protection requirements, and the response to comment BQ-2 regarding independent monitoring and studies. |