

## DEPARTMENT OF ENERGY

**Record of Decision; Continued Operation of K, L, and P Reactors,  
Savannah River Site, Aiken, South Carolina**

**AGENCY:** U.S. Department of Energy (DOE).

**ACTION:** Record of Decision, Continued Operation of K, L, and P Reactors at the Savannah River Site (SRS), Aiken, South Carolina.

**SUMMARY:** DOE has considered the environmental impacts, benefits and costs, and institutional and programmatic needs associated with continued operation of the SRS reactors, and has decided that it will continue to operate K and L Reactors at SRS, and will terminate operation of P Reactor in the immediate future and maintain it in cold standby. For P Reactor, this will involve the reactor's defueling; storage of its heavy water moderator in tanks in the reactor building; shutdown of reactor equipment and systems in a protected condition to prevent deterioration; and maintenance of the reactor in a defueled, protected status by a skeleton staff, which would permit any future decision to refuel and restart. Currently committed and planned upgrade activities will be discontinued for P Reactor.

DOE will proceed with the safety upgrades and management system improvements currently scheduled for K Reactor in its program to satisfy the criteria of the Safety Evaluation Report (SER), and will conduct an Operational Readiness Review (ORR). The satisfaction of the SER criteria and completion of the ORR will demonstrate that the safety and health criteria for the resumption of production have been met. Reactor restart is expected to be in the third quarter of 1991 for K Reactor.

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Similar processes for L Reactor will be pursued, with that reactor expected to be ready to resume production early in 1992. Only when the Secretary of Energy is personally assured that safety and health requirements have been met for a reactor, will he consider authorizing its restart.

DOE will continue to base its production and outage schedules for K and L Reactors on the need for nuclear materials as established in the most recent Nuclear Weapons Stockpile Memorandum (NWSM). DOE will continue its interactions with regulatory agencies to ensure that actions implemented in accordance with this Record of Decision and the ensuing Mitigation Action Plan comply with applicable regulatory requirements.

**FOR FURTHER INFORMATION CONTACT:**

For further information on the K, L, and P Reactors contact:

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**Background**

DOE prepared this Record of Decision pursuant to Regulations of the Council on Environmental Quality for Implementing the Procedural Provisions of the NEPA (40 CFR Part 1505) and DOE's Guidelines for

Compliance with NEPA (52 FR 47662, December 15, 1987). This Record of Decision is based on DOE's Final Environmental Impact Statement (EIS) for Continued Operation of K, L, and P Reactors, SRS, Aiken, South Carolina [DOE/EIS-0147].

The SRS is located in southwestern South Carolina near the Savannah River, which borders Georgia. It encompasses approximately 198,737 acres within the Atlantic Coastal Plain. Since 1951, the SRS has been a defense facility for the DOE and its predecessor agencies. The K, L, and P Reactors are located in the south-central portion of the SRS.

On March 21, 1989, DOE published in the Federal Register a Notice of Intent to prepare an EIS for the continued operation of the three SRS reactors. Public scoping meetings were held in Savannah, Georgia; Columbia, South Carolina; and Aiken, South Carolina, on April 17, 20, and 28, 1989, respectively. On May 11, 1990, the Environmental Protection Agency (EPA) published in the Federal Register a Notice of Availability of DOE's Draft EIS, indicating that a public comment period would continue through June 25, 1990, with three public hearings on May 31, June 5, and June 8, 1990, again in Savannah, Columbia, and Aiken, respectively.

The Final EIS considered public and agency comments, written and oral, received on the Draft EIS. On November 29, 1990, the Secretary of Energy approved the Final EIS and the EPA published its Notice of Availability of the document on December 21, 1990, following the distribution of approximately 1,600 copies to Congress, state and Federal agencies, and concerned groups and individuals.

In the preparation of this Record of Decision (ROD), DOE also considered two comment letters on the Final EIS. The concerns expressed in these letters are addressed in the Final EIS Comments section of this ROD.

Pursuant to the Atomic Energy Act of 1954, as amended, DOE is responsible for developing and maintaining the capability to produce nuclear materials required for the defense of the United States, as defined in the annually updated NWSM. The primary use of such nuclear materials is in building and maintaining the nation's stockpile of nuclear weapons. DOE also is authorized to provide nuclear materials for other applications as needed.

Two materials required for the production of nuclear weapons, tritium and weapons-grade plutonium, are produced through the irradiation of target material in nuclear reactors. Because tritium decays at a rate of 5.5 percent per year, it must be replenished periodically in nuclear weapons to maintain the stockpile.

Based on the 1990 NWSM, approved on July 12, 1990, by President Bush, DOE has identified the need to continue to produce tritium, but not weapons-grade plutonium. Another form of plutonium (isotope Pu-238) may need to be produced for non-weapons program applications, particularly as an energy source for deep space missions and other purposes.

The Final EIS analyzes the impacts of continued operation of the K, L, and P Reactors to produce nuclear materials, as required for the weapons program and other applications.

Alternatives Considered: Four alternatives were considered:

1. Continue to operate K, L, and P Reactors at SRS.

This was the proposed action in the Final EIS. This alternative also was the No Action Alternative because it represented no change from the DOE course of action at the time the Final EIS was prepared.

Under this alternative, DOE would continue to operate K, L, and P Reactors at SRS as necessary to meet nuclear material production requirements (based primarily on the annual NWSM). DOE would schedule production runs and outages for these reactors to meet the needs based on the then-current NWSM, and other requirements for nuclear materials, while accommodating continued implementation of safety and environmental enhancements. Under this alternative, DOE would continue to operate all three reactors over a wide range of production capacity to meet nuclear materials production needs, at least until new production capability is established.

This range of production capacity extends from the operation of K, L, and P Reactors at full authorized power to yield the maximum production possible, to one or more reactors operating at less than full authorized power to yield intermediate production rates, to maintaining one or more reactors in cold shutdown to meet nominal production rates or ensuring the availability of increased production capability. This alternative also includes placing one or more reactors in cold standby, as described in Alternative 2, after completion of ongoing upgrades and tests if requirements can be met with fewer than three reactors operating. In any event, DOE would consider placing these reactors in cold standby after new production capability is demonstrated.

2. Terminate operation of one or two reactors at SRS in the immediate future and maintain in cold standby.

Under this alternative, the non-terminated reactor(s) will continue to operate, as described in Alternative 1. Current upgrade and modification activities at the terminated reactor(s) would be discontinued in the immediate future and the reactor(s) would be defueled and placed in cold standby. Cold standby involves: the defueling of the reactor(s); storage of the moderator in tanks in the reactor building(s); lay up (i.e., shutdown arrangement in a protected condition) of reactor equipment and systems to prevent deterioration; and maintenance in a protected status by a skeleton staff, which would permit the reactors' future refueling and restart.

3. Terminate operation of K, L, and P Reactors in the immediate future and maintain in cold standby.

Under this alternative, as in Alternative 2, the reactors would be defueled and equipment and systems maintained to permit future refueling and restart.

4. Other production options to K, L, and P Reactors operation.

Other options to the operation of K, L, and P Reactors include: new production reactors; nonfission reactor production technologies; acquisition of nuclear materials by such means as production in commercial nuclear reactors and procurement from foreign sources; the operation by DOE of its N Reactor at the Hanford Reservation, Richland, Washington; its Fast Flux Test Facility/Fuel Materials Examination Facility at Hanford; and renovation of its C Reactor at SRS.

The analyses in the Final EIS showed that none of these options was reasonable: the new production reactors would not be available for near-term materials production because of the long lead time required for their design and construction; nonfission production technologies are costly and not proven, and would not be available in the short-term; acquisition from commercial reactors or abroad would be contrary to national policies on separation of commercial and weapon technologies and on reliance on foreign governments for these materials; and use of the DOE reactors would entail significant technical risk, would be costly, and would not be available in the near-term.

Environmentally Preferable Alternative. DOE considers Alternative 3 to be the environmentally preferable alternative. Termination of reactor operation and maintenance in cold standby would result in a reduction or cessation of the environmental effects of continued reactor operation. DOE did not select the environmentally preferable alternative because it does not allow DOE to fulfill its mission to produce new nuclear materials as required.

#### **Decision**

Under Alternative 2, DOE has decided to continue to operate K and L Reactors at its Savannah River Site near Aiken, South Carolina, to ensure the capability to meet nuclear material production requirements for the Nation's defense programs and to provide certain nuclear materials, including Pu-238 for power generators used in space missions and in terrestrial applications. The operation of K and L Reactors at SRS would serve this purpose at least until replacement production

capacity is demonstrated. P Reactor will be terminated and placed in cold standby.

Three combinations of two-reactor operations were considered. Of these, the environmentally preferable combination would be the operation of L and P Reactors. However, based on the analysis of the classified appendix to the Final EIS, DOE has determined that tritium production should be resumed as soon as possible. The combination of K and L Reactors is the most immediately available. Accordingly, it was decided to continue operation of K and L Reactors and terminate P Reactor. Further, K and L Reactors are the most similar in plant layout and operation, and the onsite control room simulator is modeled after them. These similarities offer the most consistent operator training, and allow more interchangeability of reactor operations crews.

Upgrade and modification activities at P Reactor will begin to be phased out immediately. Work will begin to place the reactor in cold standby: the reactor will be defueled, the heavy water moderator stored, and equipment and systems protected to prevent deterioration. When these actions are complete, a skeleton staff would be organized to maintain protection of the reactor, and to begin reactivation if the reactor were subsequently required for producing nuclear materials. Any such activation would probably take several years to complete.

K and L Reactors presently use once-through secondary cooling water systems. The secondary coolant is pumped from the Savannah River into the reactor area basins, where it is supplied to the reactor building at a constant flow rate to provide heat removal from the closed loop primary coolant. In K Reactor, the secondary coolant flows into



Indian Grave Branch, a tributary of Pen Branch. The secondary coolant from L Reactor flows into L Lake, which discharges into Steel Creek. Both Pen Branch and Steel Creek return their flow to the Savannah River.

These discharges have caused adverse impacts in Pen Branch and the delta area that it feeds. DOE addressed questions on the thermal effects resulting from continued operation of K Reactor using once-through cooling in an earlier EIS (DOE-EIS/0121). In the ROD for that EIS, DOE committed to the construction and operation of a recirculating cooling tower for K-Reactor (53 FR 4203, February 12, 1988). Consent Order 84-4-W between the South Carolina Department of Health and Environmental Control (SCDHEC) and DOE allows the continued discharge of thermal effluents from K Reactor pending operation of the cooling tower, but no later than December 31, 1992. DOE will continue with the construction of this cooling tower, with its completion expected in mid-1992.

Under the current schedule, K Reactor is likely to be authorized for restart before the recirculating cooling tower becomes operational. If the then-current NWSM indicates that there is a need to produce tritium, and the reactor is otherwise ready in the opinion of the Secretary of Energy, K Reactor will be restarted even though it would be environmentally preferable to begin operation of K Reactor after the cooling tower is completed. In that case, the present indications are that K Reactor would be ready to resume tritium production approximately 1 year prior to the completion of the recirculating cooling tower.

The temperature of the L Reactor secondary cooling water, and therefore the reactor's power level, must be reduced in the summer to

meet the temperature criteria of the National Pollutant Discharge Elimination System permit for L Lake. The Final EIS discusses other requirements of the permit. DOE will continue to operate L Reactor within the limits of its permit and plans no change in its present secondary cooling system.

Continued operation of K and L Reactors includes a range of power operations (including startup, power ascension, partial-power operation, and full-power operation) and cold shutdown conditions (including fueling, maintenance, and upgrading). In addition, continued operation includes the placement of one or both reactors in cold standby if the requirements for nuclear materials can otherwise be met.

Safety and Health Considerations. On May 1, 1990, the Secretary of Energy stated, "Prior to any decision to restart the three reactors, I will consider the environmental factors assessed in the Final Environmental Impact Statement. Until I am assured that the environment, safety and health considerations have been satisfactorily addressed, I will not approve restart of the reactors at Savannah River." The Final EIS adequately addresses the environmental impacts of the selected alternative. The safety and health aspects of the operation of the reactors are being addressed in the SER and the forthcoming ORR.

The SER documents the results of DOE reviews and evaluations of topics that must be addressed satisfactorily and resolved before the DOE can conclude it is safe to restart K Reactor. Topics include DOE and operating contractor management, safety culture, compliance with DOE orders, quality assurance, radiation protection, seismic issues,

electrical issues, safe shutdown, fire protection, testing, maintenance, emergency preparedness, and conduct of operations. Separate SERs will be developed for K and L Reactors.

The ORR will be led by a senior DOE manager, and will be staffed by senior safety experts and technical experts. The senior safety experts will assist in defining the issues to be addressed by the technical experts. The senior safety experts will also oversee and review the findings of the technical experts. Among the areas to be assessed by the ORR will be operating procedures; operator proficiency, training and qualification; technical specification surveillance procedures; records of tests of safety systems and calibration of related instruments; modifications of safety-related equipment and systems; the Safety Analysis Report to ensure it reflects the current plant configuration; and DOE technical vigilance programs. Separate ORRs covering specific safety objectives will be conducted for K and L Reactors.

The reactors will be ready to be restarted when the requirements of the SER have been met by the operating contractor and after the completion of a successful ORR, including correction of deficiencies. When these criteria are met to the satisfaction of the Assistant Secretary for Defense Programs, the authorization for reactor restart will be requested from the Secretary of Energy.

In terms of readiness to resume production, K Reactor is several months ahead of L Reactor. The evaluations are being completed and the K Reactor SER is now being finalized, with publication scheduled for April 1991. Any open items remaining at that time will be closed prior

to restart. The K Reactor ORR will consist of three phases, with the final recommendations and associated corrective actions being completed prior to restart.

Major Environmental Impacts and Mitigation Measures. The major impacts analyzed in the Final EIS and DOE's proposed mitigation measures are summarized below.

The Final EIS shows that the resumption of production at K Reactor, before the projected completion of the cooling tower in mid-1992, could produce a loss of previously affected wetlands forest in the Pen Branch and adjacent banks within the influence of the flow from the reactor. These wetlands currently are in the process of revegetating. This loss would be 670 acres plus 10-12 acres for each year K Reactor operates without the cooling tower. Such wetlands impact would be unavoidable.

DOE policy is to preserve and protect wetlands resources at SRS in accordance with the national goal of no net loss of wetlands. Consistent with that policy, DOE is planning to mitigate wetlands impacts from operation of K Reactor. Mitigation involving enhancements to riverine wetlands, streams, or areas other than Pen Branch will begin as soon as possible. Mitigation involving Pen Branch will begin after the cooling tower becomes operational. DOE would restore approximately 500 acres of the Pen Branch delta after the cooling tower becomes operational. DOE would also provide enhancements at wetlands sites other than Pen Branch, both on and off the SRS for the 170 acres that would continue to be impacted.

DOE will also implement a program for the monitoring of impacts to determine the precise nature and magnitude of wetlands alterations from resumption of K Reactor production before, as well as after, cooling tower completion.

Full flow tests of the secondary cooling system of K Reactor will be started as soon as possible following this ROD. These tests are a normal and required part of routine testing before restarting the reactor. They result in the full flow discharge of cooling water at ambient temperature. This will have both physical and biological effects in the Indian Grave/Pen Branch flow system from K Reactor. These flows will produce upstream scouring and displacement or loss of insects and other biota. The increased flows will drive fish downstream and could strand some in higher areas when the full flow recedes. Full flow testing would also be conducted at L Reactor, with minimal resulting impacts.

The startup of K Reactor can result in fish kills in the outflow streams due to the initial shock of the heated water. It is expected that the recirculating cooling tower at K Reactor will mitigate the impacts of thermal discharges on fish.

Similarly, the startup of L Reactor can result in fish kills in upper L Lake. Heated water from the once through cooling system of the reactor is discharged to L Lake. During periods of outage, such as the present, the lake is populated with several species of fish. Some of these fish, particularly the younger ones, are killed when the cooling water first enters the lake. On July 5, 1990, DOE submitted a Remedial Action Plan to SCDHEC describing options for mitigating fish kills in

Upper L Lake. The L Lake plan included eight options, in addition to monitoring, consisting of mechanical, structural, or operational modifications. With the concurrence of SCDHEC, DOE has selected the following three options: reducing the rate of temperature increases during reactor startups; constructing a weir in the mouth of the discharge canal; and limited recontouring of the shoreline near the discharge points in L Lake. After approval by SCDHEC, DOE would implement the three options as scheduled, and would continue to monitor L Lake for impacts on fish.

K and L Reactors discharge radioactive liquid effluents to the environment. In addition to discharges from minor leaks into the secondary cooling water to heat exchangers, to sumps, and finally to permitted and monitored outfalls, periodic (usually twice a year) discharges occur from the disassembly basins to the reactor seepage basins. DOE has decided to actively pursue environmentally acceptable alternatives to the use of the seepage basins. The alternatives evaluated will include detritiation and source reduction, and will include a thorough multi-media risk assessment. DOE will provide EPA and SCDHEC with quarterly status reports of the alternatives evaluation.

It is expected that the termination of P reactor will result in the loss of approximately 2,200 jobs at that plant. Every effort will be made to retrain, relocate, or otherwise reduce the impact on individual workers.

#### **Mitigation Action Plan**

Under the direction of the Secretary of Energy Notice issued on February 5, 1990 (SEN-15-90), following completion of an EIS, "the

responsible Secretarial Officer will prepare an action plan [Mitigation Action Plan (MAP)] for implementation of any commitments made in the Final EIS or Record of Decision for mitigation of any environmental impacts associated with the project."

The MAP resulting from this decision will explain how measures designed to mitigate adverse environmental impacts associated with the proposed action will be planned and implemented. It will be prepared before resumption of production.

#### **Final EIS Comments**

DOE received two letters commenting on the Final EIS. The first letter, from the EPA, Region IV, addressed four concerns: Groundwater Impacts, K Reactor Cooling Water Discharge, Waste Management Capacity, and Compliance with the National Emissions Standards for Hazardous Air Pollutants. The second letter, from the Charleston, South Carolina, Office of the Fish and Wildlife Service, U.S. Department of Interior (FWS), also addressed K Reactor Cooling Water Discharge. The concerns and responses to these letters are summarized below.

EPA was concerned about the groundwater contamination associated with the continued use of the reactor disassembly purge water seepage basins because the Final EIS did not commit to a specific course of action. DOE, as indicated above, agrees that the purge water seepage basins must be eliminated, and is developing a strategy, in conjunction with EPA and SCDHEC, to implement that decision.

The operation of K Reactor prior to the completion of the cooling tower also concerned EPA because of further impacting the streams and wetlands of the area. EPA urged DOE not only to assess the

environmental costs of such an action against realistic future tritium needs, but also to coordinate closely with EPA to implement an acceptable MAP. As indicated above, DOE will not operate K Reactor unless the NWSM indicates there is the need to produce tritium. DOE will commit to working closely with EPA in developing and carrying out its MAP.

EPA was also concerned about the waste management capacity at SRS. The Final EIS for the reactors addressed the issue of waste management capacity. However, since the support facilities of the site actually generate the majority of the waste, all waste operations at SRS, including those at the reactors, will be addressed in the Support Facilities EIS, now in its early stages of planning, as recommended by EPA.

The final concern of EPA was DOE's compliance with the National Emissions Standards for Hazardous Air Pollutants regulation (NESHAPS), required to be demonstrated by June 30, 1991. Prior to April 1, 1991, DOE will present to EPA an Alternative Methods Information Package that will demonstrate the current status of existing monitoring methods and systems at SRS. This package, if approved by EPA, would establish SRS compliance with NESHAPS. At the same time, DOE is working with EPA on a Federal Facilities Compliance Agreement which, if executed prior to June 30, 1991, would also establish compliance with NESHAPS.

The FWS comments were based on an internal memorandum, which was sent to the Office of the Governor of South Carolina, which transmitted the memorandum to DOE via facsimile. The FWS memorandum expressed concern with the environmental impacts, particularly on fish, of



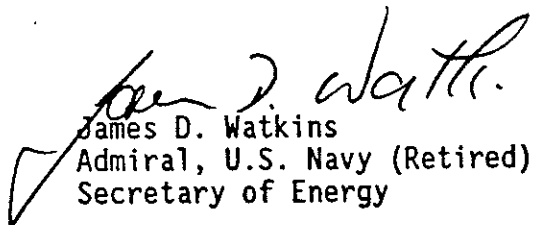
additional analysis of delaying K Reactor restart until the cooling tower is in operation. As stated above, DOE will operate K Reactor prior to completion of the cooling tower only if the requirements of the NWSM cannot be satisfied by other means.

#### Conclusion

Continued operation of K and L Reactors provides DOE with the capability to meet nuclear production requirements. The continued operation of these two reactors will provide sufficient assurance that future production needs can be met in the near-term.

Although the alternative selected is not the environmentally preferable alternative, it includes an ongoing program of environmental enhancements that will mitigate the impact of the continued operation of K and L Reactors.

Issued at Washington, D.C. this 4th day of February 1991.

  
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Secretary of Energy