

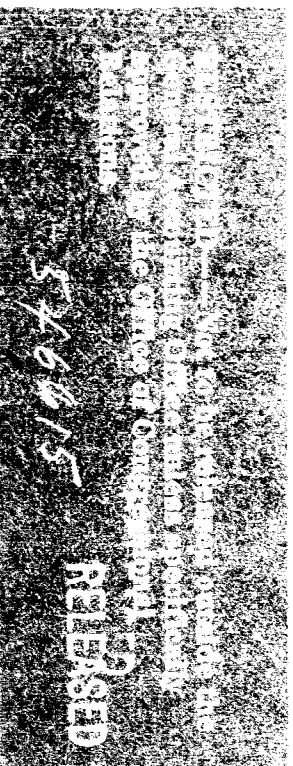
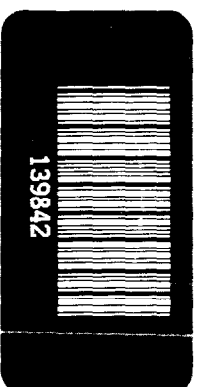
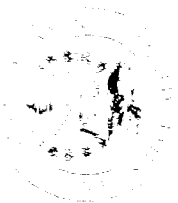
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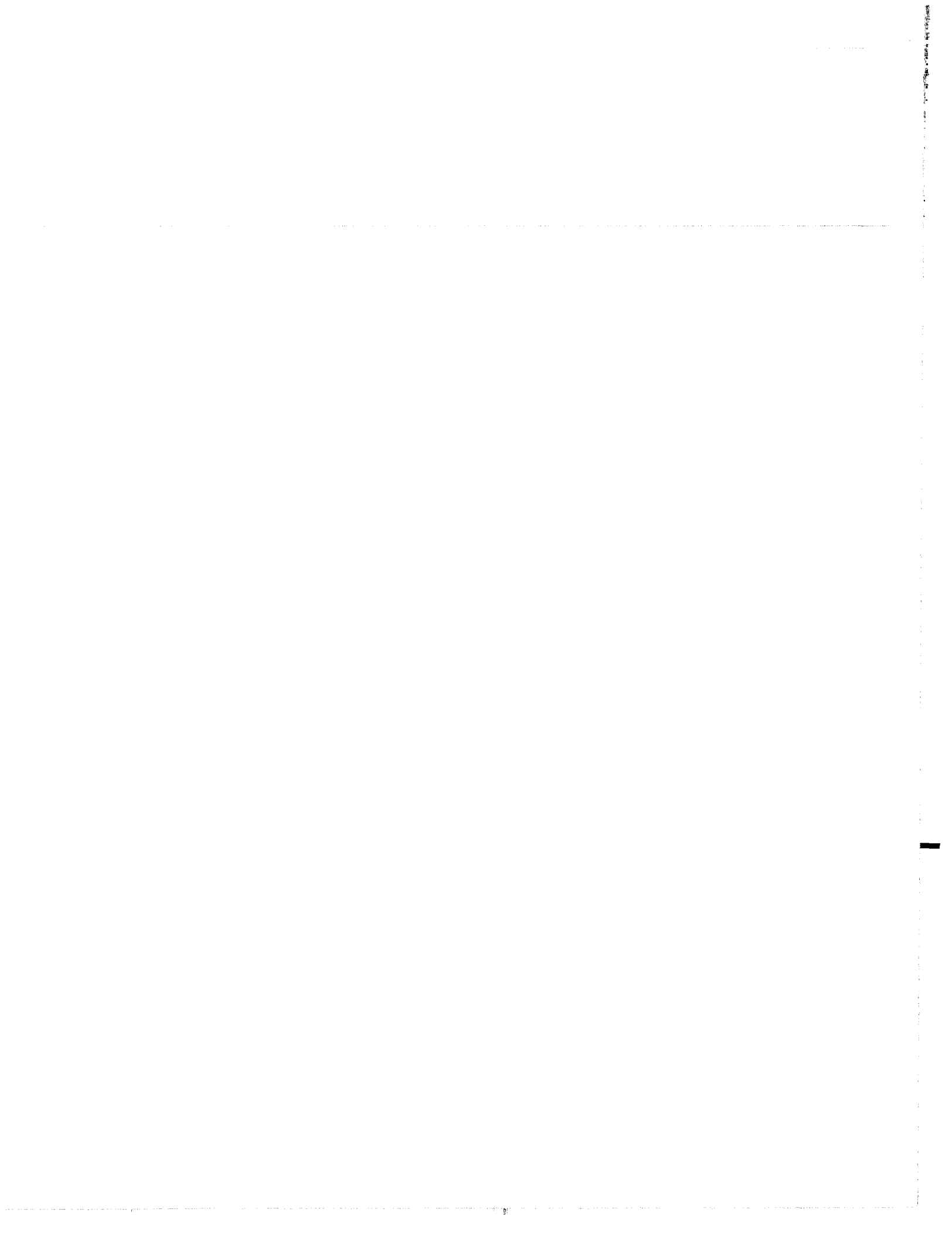
United States General Accounting Office
Report to Congressional Requesters

September 1989

NUCLEAR HEALTH AND SAFETY

Policy Implications of Funding DOE's K Reactor Cooling Tower Project





**Resources, Community, and
Economic Development Division**

B-236604

September 27, 1989

The Honorable J. James Exon
Chairman, Subcommittee
on Strategic Forces and
Nuclear Deterrence
Committee on Armed Services
United States Senate

The Honorable John M. Spratt, Jr.
Chairman, Department
of Energy Defense Nuclear
Facilities Panel
Committee on Armed Services
House of Representatives

As agreed with your offices, we reviewed the issues surrounding a congressional decision regarding funding construction of a cooling tower for the K reactor at the Department of Energy (DOE) Savannah River Site (SRS) in Aiken, South Carolina. The tower is required by an agreement between the state of South Carolina and DOE to bring the reactor into compliance with water quality standards set by the Federal Water Pollution Control Act (Pub. L. No. 92-500)—commonly called the Clean Water Act. The Congress has deferred decisions on funding the project in the past because public benefits of the cooling tower—preventing environmental damage to 10 to 12 acres of restricted land each year the reactor operates—do not seem to balance with the costs involved—estimated to be \$127 million for construction and \$1.2 million per year for operating costs. The Clean Water Act makes no provision for such cost benefit tradeoffs.

The Congress could decide, however, to exempt the K reactor from water quality standards set by the Clean Water Act. As a part of this exemption, the Congress could also decide to compensate public environmental interests by funding a project outside SRS. You asked us to determine what the costs and benefits of such a compensating project might be. This report presents information on the costs and benefits of the cooling tower compared to an example of a project that is accessible to the public and for which the environmental gains might be larger. It also contains our observations on the policy implications of funding decisions for the cooling tower project.

Results in Brief

We found that the cooling tower would prevent further destruction of cypress and tupelo trees, maintain a more consistent flow from SRS streams into the Savannah River, and allow earlier recovery of stream corridors inside a portion of the Savannah River Site, a 192,000 acre national security facility with controlled access. The cooling tower will cost an estimated \$127 million for construction and \$1.2 million per year for operation. Hot water resulting from cooling the reactor when it operates drains into an area of about 1,000 acres of wetlands--stream corridors and swamp land. Most of these wetlands (630 acres) have already been impacted by the hot water discharged during the 35 years the K reactor has been in operation. Approximately 10 to 12 acres of additional damage would be prevented by the tower for every year the reactor is operated, and if current plans for re-start and retirement of the reactor are followed, a total of less than 100 acres would be preserved.

As requested, we identified—in discussions with South Carolina environmental and wildlife officials—an example of a project that could be funded as compensation to the public for the damage the K reactor would do if the Congress exempted it from the Clean Water Act and allowed it to continue to operate without a cooling tower. The project involves preservation of the Ashepoo, Combahee, and Edisto River Basin in coastal South Carolina and would protect approximately 90,000 acres of publicly accessible wetlands for between \$40 million and \$65 million. The project is in a developmental stage and is a priority item on the North American Waterfowl Management Plan and a candidate site for a National Wildlife Refuge.

Background

The three nuclear materials production reactors that DOE operates at the Savannah River Site—P, K, and L—are the only U.S. source of tritium, a radioactive gas that must be periodically replenished in nuclear weapons. DOE plans to operate these reactors to maintain the existing nuclear weapons stockpile and to meet planned weapon modernization schedules. None of these reactors has been in operation since mid-1988, however, because of safety and procedural concerns, and the existing supply of tritium is gradually diminishing as it decays.

Re-start and continued operation of each reactor depends on resolution of numerous technical and operational problems. Among these problems is compliance with the Clean Water Act. In order to meet water quality standards set by the act, the K reactor requires a cooling tower to lower the temperature of water it discharges into streams at SRS. The P and L

reactors also have problems controlling the temperature of water discharges, but do not now require cooling towers. Start-up of both of these reactors results in fish kills, that are prohibited by South Carolina regulations implementing the act. South Carolina's Department of Health and Environmental Control (SCDHEC) has informed DOE that fish kills in past operations may be cited as violations of the regulations. This report deals primarily with DOE's admitted violation for the K reactor and the resulting project to construct a cooling tower.

When operating, the K reactor discharges hot water into two small on-site, state-regulated streams. As designed, the reactor does not meet the thermal requirements of a National Pollutant Discharge Elimination System (NPDES) permit for maintaining a balanced biological community and ambient temperature of the streams. Therefore, in January 1984, DOE entered into a consent order (amended in 1985 and 1987) with the South Carolina Department of Health and Environmental Control to allow DOE to operate the K reactor pending completion of a means to control the reactor's discharges—the cooling tower.

Compliance with this order requires DOE to initiate construction of a recirculating cooling tower system for the K reactor by February 1990 and to complete construction by December 1992. The state has accepted work already underway as meeting the February 1990 deadline. DOE originally asked for, but was denied, authorization to build a cooling tower in fiscal year 1987. The 1987 House Armed Services Committee report on authorizations for DOE stated that cooling tower construction funds were not authorized because the Committee was "not convinced that the proposed \$100,000,000 cooling tower will provide any thermal protection off the Savannah River site."

DOE again requested funding authorization for the tower in fiscal year 1988, but the request was deleted from the President's budget by the Office of Management and Budget (OMB). The project was funded for \$1 million in fiscal year 1989, and DOE notified the appropriate congressional committees that it planned to reprogram an additional \$14 million for the project in 1989. As directed in the fiscal year 1989 authorization, DOE and state officials discussed substituting higher priority projects for the cooling tower, using a list DOE prepared of alternative environmental projects already planned that could be accelerated. The South Carolina Department of Health and Environmental Control responded that, without specific legislative relief, the state had no alternative but to require completion of the cooling tower project as agreed regardless of alternatives suggested by DOE.

Cost Estimates for the Cooling Tower Project

DOE plans to contract for design and construction of a cooling tower to bring K reactor water discharges into compliance with the Clean Water Act. The tower is estimated to cost \$127 million to construct and \$1.2 million per year to operate. It will be designed to recirculate water that is hotter (up to 180 degrees Fahrenheit for the K reactor) than normally found in standard, commercial practice (up to 130 degrees for commercial reactors). The cooling tower is scheduled for completion in December 1992 and will be useful for the remaining operating life of the K reactor only; it will have no alternative uses after the reactor is closed. According to the SRS Long Range Operations Plan, DOE plans to discontinue K reactor operations in the year 2000, but the reactor could be needed longer if completion of a proposed new production reactor is delayed.

Limited Public Benefits From Proposed Cooling Tower Project

Except for protecting foraging areas for the wood stork, an endangered species, reducing damage to fish caught in pumps used to withdraw water from the Savannah River, and reducing fluctuation in SRS streams that flow into the river, the cooling tower project would provide benefits only within the boundaries of the Savannah River Site.¹ At a cost of approximately \$127 million for construction and \$1.2 million per year for operation, the tower would prevent damage to about 10 to 12 acres each year the reactor is operated. This estimate is based on studies of the environmental damage from the K reactor in 1985, when the reactor was operating at 100 percent power. The area affected, if the reactor is operated at lower power levels as tentatively planned, will probably be smaller, according to an official of the Savannah River Laboratory, but no studies have been done of effects at these lower power levels.

If the K reactor is re-started in 1990 and closed in 2000 as currently planned, and if the cooling tower is completed by December 1992, the tower would be used for 8 years to prevent damage to less than 100 acres. In addition, another 630 acres of damaged streams and wetlands could begin natural recovery from the effects of reactor operations approximately 8 years sooner than would otherwise occur without the cooling tower. Most of the area already damaged by K reactor operations is currently recovering—vegetation and wildlife communities are returning to the area—while the reactor is not operating. Re-start of the

¹The SRS is providing alternative wood stork foraging habitat at Kathwood Lake, near SRS. This alternative habitat was provided to compensate for the habitat lost because of the discharge from the L reactor.

reactor will again degrade this recovered area. A description of K reactor impacts on wetlands and the cooling tower project is in appendix I.

Public Benefits From an Alternative Project

We were requested to identify any environmental protection projects that might provide some form of compensation to the public outside the Savannah River Site if the K reactor were allowed to continue operating without the cooling tower. Although we could not determine all possible alternatives, we identified an example of that type of project in discussions with South Carolina officials—preservation of about 90,000 acres of the drainage basin of the Ashepoo, Combahee, and Edisto Rivers (ACE) in coastal South Carolina. This is a priority project of the North American Waterfowl Management Plan and a candidate site for a National Wildlife Refuge. Preliminary cost estimates for acquiring land and easements range from \$40 million to \$65 million, to be requested from multiple sources, including state, federal, and private organizations. A description of the project is in appendix II. Table 1 provides a detailed comparison of the costs and benefits of this project versus the cooling tower.

Table 1: Comparison of Project Costs and Benefits

| | K reactor cooling tower | ACE basin project |
|---|--------------------------------|----------------------------|
| Cost | | |
| Acquisition | \$127.0 million | \$40 million –\$65 million |
| Annual operating | \$1.2 million | Not available |
| Benefits | | |
| Total area protected includes: | 1,014 acres | 90,000 acres |
| Available wood stork feeding grounds | 1,014 acres | 24,000 acres |
| Accelerated recovery of damaged areas | 630 acres | Not applicable |
| Prevention of wetland forest losses | 12 acres per year of operation | 20,000 acres |
| Public access | No | Yes |
| Habitats for rare or endangered species | 2 species | 6 species |
| Rivers protected | 0 rivers | 3 rivers |
| Commercial fishing value | none ^a | \$2.73 million |

^aAccording to an official of the Environmental Protection Agency's Region IV, reduced withdrawals of water from the Savannah River and less fluctuation in SRS streams that flow into the river could provide a slight benefit for commercial fishing down-river from SRS.

Congressional Options for Balancing Competing National Interests

In the past, the Congress has deferred funding decisions for the K reactor cooling tower because of doubts about the limited environmental benefits to be gained from such a large expenditure of federal funds. DOE's reprogramming is the initial step in funding construction of the cooling tower, and this action may move DOE a step closer to being able to assure production of tritium in the future. Unfortunately, the difficulties DOE faces in operating all three SRS reactors without violating the Clean Water Act contributes to uncertainties about the department's ability to provide an assured supply of tritium. The Clean Water Act poses potential compliance problems that can prevent or delay operation of all three reactors at SRS. Without assured operation of the reactors, uncertainties about future supplies of tritium—and maintenance of the existing nuclear weapons stockpile—will continue until a new production reactor is in operation.

Re-start of the K reactor, currently being discussed for 1990, may be precluded by the fact that environmental conditions have changed since the date of the consent order previously discussed. When the consent order was written, in 1984, the reactor was operating at full power with short interruptions for maintenance. In 1986, however, power levels were reduced by half, and the reactor has not been operating at all since April 1988. This lengthy interruption of operations has allowed the affected wetlands to revegetate and to be repopulated with aquatic animals, and the recovery will continue progressing until the reactor is in operation again. Thus, the impact of reactor re-start on the environment will be more severe than it would have been without the long interruption of operations. SRS managers recognize that DOE may face legal challenges from the state and from public interest groups that would postpone re-start until the cooling tower is actually completed. A chronology of this issue is in appendix III.

Furthermore, compliance with Clean Water Act restrictions against damage to indigenous aquatic species may block operation of the P and L reactors. South Carolina's state regulations define these restrictions against destruction of indigenous aquatic life to include prohibitions for fish kills. In November 1988, the state issued a notice to show cause why DOE should not be found in violation for fish kills that occurred in past operation of the P and L reactors. DOE told us that fish kills are unavoidable when the P and L reactors re-start at the beginning of each production cycle, and DOE's position is that so long as a balanced biological community is maintained, thermal fish kills *per se* are not prohibited by the Clean Water Act, but the question has not been finally resolved and could affect future operations.

The Congress will, therefore, continue to face decisions about the SRS reactors that must balance conflicting policy objectives—protecting the nation's wetlands, maintaining national security, and reducing the federal budget. Following is a brief discussion of some of the options that may be considered:

- Continue funding construction of the K reactor cooling tower, recognizing that reactor re-start could be prevented anyway but reducing doubts that future operations could be interrupted. This option supports environmental objectives, leaves national security concerns in doubt, and achieves no budgetary reductions.
- Exempt the K reactor from the Clean Water Act to assure future supplies of tritium. This supports national security and achieves budget reductions but does not support environmental objectives.
- Exempt the K reactor from the Clean Water Act and earmark funds for a compensating project to satisfy public environmental interests. This achieves national security objectives, supports environmental objectives, and could support budgetary reductions.
- Deny future funding for the K reactor cooling tower, recognizing that both re-start and continued operation of the reactor will be very uncertain and, since future operation of the P and L reactors are also not assured, future supplies of tritium will remain unassured. This option could support environmental objectives if the K reactor cannot be operated, and it supports budgetary reductions, but it does not support national security objectives.

Observations

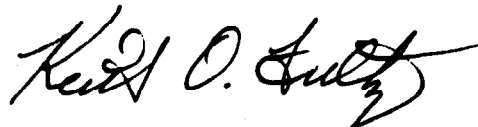
Given that the K reactor is 35 years old, has an unknown remaining useful life, and is damaging wetlands inside a national security site at a relatively slow rate, decisions about investing large sums to bring it into compliance with the Clean Water Act are complicated. Is it wise to invest millions of dollars to add a new component to an old facility with a very uncertain future? Is such an investment worthwhile to prevent increases to damage in wetlands to which the public will not have access in the foreseeable future? On the other hand, is it prudent to exempt the reactor from compliance with an environmental law, regardless of the costs and benefits? Would such an exemption serve as a precedent to the private sector to request similar exemptions? Finally, do military requirements for assured supply of tritium require such an exemption to meet national security needs? These are policy questions with profound implications for the Congress to address. The information provided in this report should provide a basis for congressional deliberations on these issues.

The objective of this report is to present information requested and to discuss the policy implications of decisions about funding construction of a cooling tower for the K reactor at DOE's Savannah River Site. It also provides information on a potential compensating project that protects wetlands that are open to public access. To respond to your requests, we analyzed existing studies and correspondence for the K reactor and interviewed responsible officials at DOE's Savannah River Site and South Carolina Department of Health and Environmental Control. We also obtained information about the alternative wetlands preservation project from representatives of the South Carolina government.

We requested cognizant officials of DOE, South Carolina Department of Health and Environmental Control and Department of Natural Resources and Wildlife, and Environmental Protection Agency's Region IV to provide us with informal comments on this report, and we made appropriate changes accordingly.

Unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days from the date of this letter. At that time, we will send copies to appropriate congressional committees, the Secretary of Energy, and the Director of the Office of Management and Budget. We will also make copies available to others upon request.

A description of our scope and methodology is provided in appendix IV, and appendix V lists major contributors to this report. Should you require any additional information on the report, please call me at (202) 275-1441.



Keith O. Fultz
Director, Energy Issues

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Abbreviations

| | |
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| ACE | Ashepoo, Combahee, and Edisto River Basin |
| DOE | Department of Energy |
| EIS | environmental impact statement |
| EPA | Environmental Protection Agency |
| FWS | Fish and Wildlife Service |
| NPDES | National Pollutant Discharge Elimination System |
| OMB | Office of Management and Budget |
| SCDHEC | South Carolina Department of Health and Environmental Control |
| SRS | Savannah River Site |

Clean Water Act Problems for the K Reactor

To operate the nuclear material production reactors at the Savannah River Site (SRS), the Department of Energy (DOE) must have a National Pollutant Discharge Elimination System (NPDES) permit pursuant to the Clean Water Act, issued by South Carolina under authority delegated by the Environmental Protection Agency (EPA) in 1980. In November 1982, the South Carolina Department of Health and Environmental Control (SCDHEC) changed the thermal (water temperature) compliance point from the site boundary where water enters the Savannah River to the point the reactor cooling water enters on-site streams. DOE subsequently requested the state to reclassify these streams to allow continued reactor operation as in the past. South Carolina denied the request because the Clean Water Act precluded a release that would not protect "indigenous aquatic populations" from hot water discharges.

The Savannah River Site could not meet the cooling water discharge temperature limitations for K reactor established in a NPDES permit from the state in December 1983. Therefore, DOE and the state entered into a consent order in January 1984 (amended in 1985 and 1987) that superseded the NPDES permit until DOE identified actions to be taken by specified dates to attain compliance. Eventually, in February 1988, DOE and the state agreed that construction of a recirculating cooling tower would provide the best means to achieve compliance. The amended consent order established a February 1990 deadline for beginning and a December 1992 deadline for finishing construction of the tower.

K Reactor Environmental Impacts

An environmental study published in 1987 at SRS showed that the environmental impacts of the hot water discharged from the K reactor were primarily limited to within the Savannah River Site. One exception occurs when the Savannah River floods, causing K reactor discharges to flow across Steel Creek into an off-site swamp. These discharges damage vegetation and aquatic communities, including foraging areas for the wood stork, an endangered species. This study also found that the incremental increase in damage over that which had already occurred in the 35 years of operation since the K reactor was constructed would expand at the rate of 10 or 12 acres per year when the reactor operated at full power.

The area affected by cooling water effluent from K reactor operations extends from the reactor through on-site streams and an on-site swamp, all of which are inside a controlled access area. Hot water (up to 180 degrees Fahrenheit at full power) is discharged from the reactor into an 80-foot-wide canal and flows through it for about 2,200 feet. The water

then enters Indian Grave Branch and flows for about 2 miles to join Pen Branch. From Pen Branch the water flows into the on-site swamp—about 3 miles from the Savannah River, the Site boundary. In the swamp, the water flows about 1.5 miles toward the river and then along an embankment, running parallel to the river for about 5 or 6 miles. Finally, the water discharges into Steel Creek then the Savannah River at near ambient temperature, having been cooled in the swamp. Figure I is a map of this area.

K reactor cooling water discharged into this area increases stream and swamp flows and temperatures. These changes result in such impacts as erosion, vegetation and aquatic community loss, and sediment deposition, forming a delta in the swamp. Damage to the stream corridors stabilized in the 1960s, but the delta continues to expand when the reactor is operating. The damage causes both short-term and long-term impacts.

Environmental studies at SRS show that damage to vegetation, except for wetland forest, is short term, and vegetation in the streams and swamp return naturally when the reactor is not in operation. The principal long-term impact is destruction of cypress and tupelo forest—about 630 acres of trees have already been destroyed or damaged during the 35 years the reactor has been operating. DOE studies of the area estimate that additional damage to this wetland forest could occur at a rate of about 10 to 12 acres annually when the reactor is operated. Savannah River Site's long-range operation plan calls for operation of the K reactor until the year 2000—when a new production reactor is planned for completion. This new reactor may not be available as planned, but if this plan is successfully implemented, and the reactor is re-started in 1990, the estimated additional wetland forest damage would be about 120 acres without operation of a cooling tower.

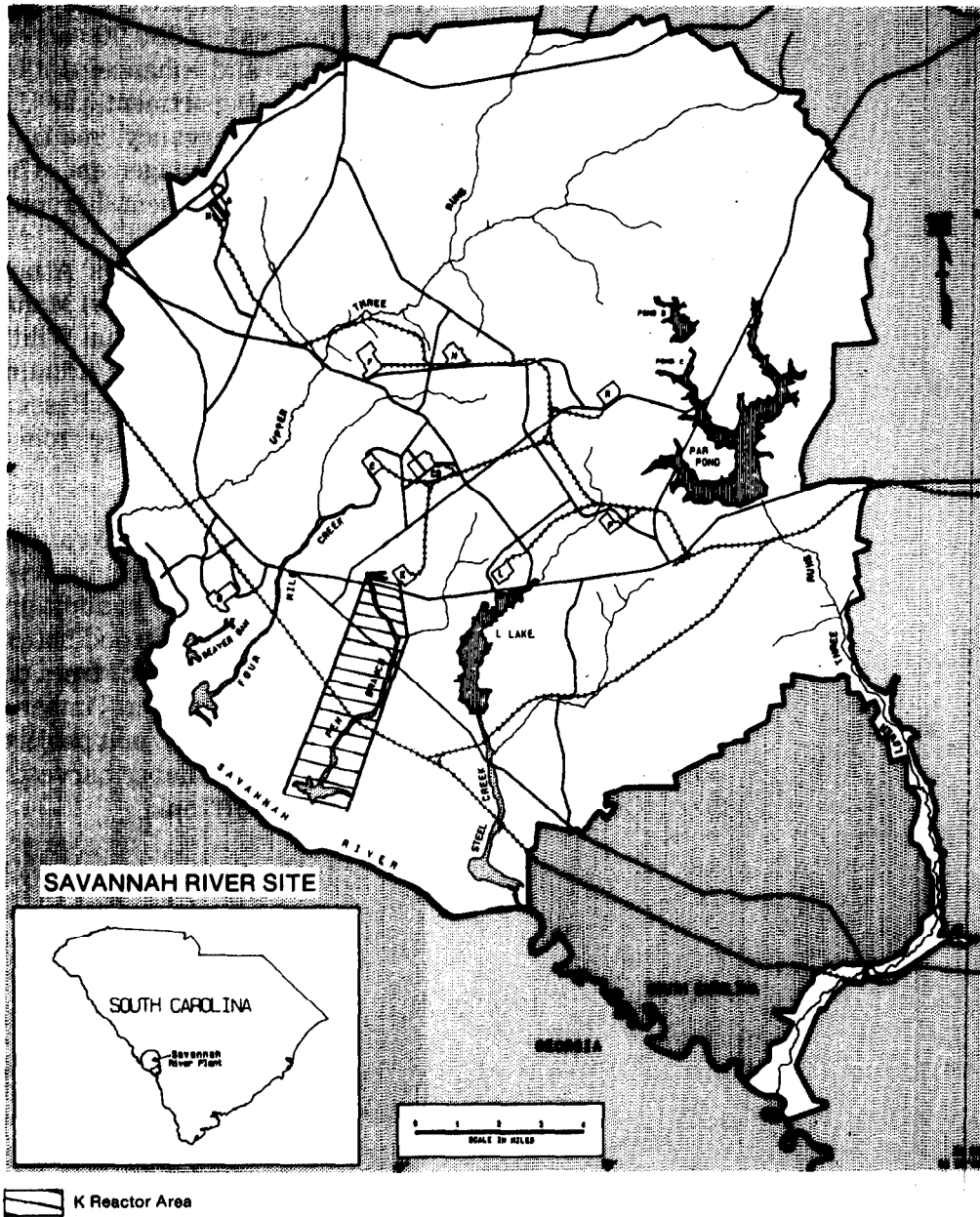
Potential Environmental Benefits From K- Reactor Cooling Tower

According to DOE's environmental studies, the total area affected by hot water from the K reactor is about 230 acres of stream corridors and about 784 acres of swamp. Since the shutdown of the K reactor in the spring of 1988, there has been rapid revegetation of the stream corridors and swamp, and aquatic communities, including fish, have repopulated the streams. The vegetation is different from that originally destroyed by reactor discharges, but it is representative of the type of recovery that will occur after the reactor is retired from operation or after the proposed cooling tower is in operation. In addition to the earlier recovery of these affected areas, the cooling tower would protect foraging areas for the wood stork, an endangered species; improve the

water flow in the affected streams; and reduce withdrawals of water from the Savannah River and resulting damage to fish caught in pumps.

Appendix I
Clean Water Act Problems for the K Reactor

Figure I.1: Map of Savannah River Site With the Area Affected by Water Discharges From the K Reactor Highlighted



Source: DOE.

Project Description for Preservation of the Ashepoo, Combahee, and Edisto River Basin

A multiagency project to preserve wetlands in coastal South Carolina includes areas with characteristics similar to the area affected by K reactor cooling water. The Ashepoo, Combahee, and Edisto River (ACE) Basin Project encompasses approximately 350,000 acres and includes 90,000 acres targeted for protection and enhancement by the South Carolina Wildlife and Marine Resources Department, the U.S. Fish and Wildlife Service (FWS), the Nature Conservancy, and Ducks Unlimited. According to a South Carolina wildlife management official, the project has been endorsed by 50 different environmental groups.

Protection of the area is a priority item in the FWS' Atlantic Coast Joint Venture portion of the North American Waterfowl Management Plan. The FWS is also considering establishing a National Wildlife Refuge in the area, and the National Oceanic and Atmospheric Administration is considering part of the area for a National Estuarine Research Reserve. Preliminary estimates of funding requirements range from about \$40 million to \$65 million.

The Basin project area is the habitat known for 6 rare or endangered species, including the wood stork. The area includes wetlands similar to the area affected by K reactor cooling water. In addition, the Basin project area includes about 20,000 acres of hardwood bottomlands containing cypress and tupelo trees—the same kinds of trees destroyed by K reactor cooling water stress and sedimentation. Timber companies own about 90,000 acres in the Basin project area, and project proponents hope to acquire this acreage to preclude timber harvests, according to a South Carolina wildlife management official.

Chronology of K Reactor Thermal Mitigation Problems

| | |
|-------------------|--|
| 1976 | EPA issued a National Pollutant Discharge Elimination System (NPDES) permit to the Savannah River Site establishing the point of thermal compliance at the Savannah River (site boundary). |
| September 1980 | EPA delegated authority to issue the NPDES permit for SRS (Savannah River Site—formerly plant) to South Carolina Department of Health and Environmental Control (SCDHEC). |
| October 19, 1982 | The state of South Carolina's Office of the Attorney General ruled that all waters on the SRS were state waters subject to regulation by SCDHEC unless exempted by the President as provided in the Clean Water Act. |
| November 16, 1982 | SCDHEC notified DOE that it had changed the thermal compliance point for SRS' NPDES permit from the Savannah River to the receiving streams at or near the reactor outfalls. |
| June 13, 1983 | SRS requested reclassification of streams affected by SRS reactors cooling water to avoid the need for thermal mitigation. |
| August 12, 1983 | SCDHEC denied SRS' reclassification request because Section 316 of the Clean Water Act precludes a classification which does not protect indigenous aquatic populations from thermal discharges. |
| December 15, 1983 | SCDHEC issued an NPDES permit that would become effective January 1, 1984, and expire December 31, 1988, regulating discharges to the Savannah River and SRS on-site streams. The NPDES permit specified cooling water discharge temperature limitations as well as temperature limitations in on-site streams. |
| January 3, 1984 | DOE and SCDHEC entered into Consent Order (84-4-W) to achieve permit temperature requirements because SRS could not meet the NPDES permit requirements. The consent order temporarily superseded the NPDES permit requirements allowing the SRS reactors (including K reactor) to operate temporarily out of compliance and identified actions required to bring them into compliance. |
| July 22, 1985 | DOE published in the Federal Register a Notice of Intent to prepare a thermal mitigation environmental impact statement (EIS) for K and C reactors. |
| August 27, 1985 | Amendment 1 to the consent order established the compliance schedule for C and K reactors by requiring the construction of a cooling tower for the C reactor by March 31, 1989, and by July 31, 1989, for the K reactor. |
| July 1986 | The Congress disapproved a fiscal year 1987 thermal mitigation project line item and directed DOE to complete the National Environmental Policy Act process, including an EIS. |
| September 1986 | DOE headquarters submitted a thermal mitigation project line item in its fiscal year 1988 budget, but the Office of Management and Budget (OMB) deleted the project line item. |
| August 31, 1987 | Amendment 2 to the consent order postponed the K reactor cooling tower construction completion date from July 31, 1989, to December 31, 1992, to give DOE additional time to respond to significant comments on the draft EIS. The thermal mitigation project for C reactor was dropped as the reactor was placed in cold-standby condition. |

(continued)

**Appendix III
Chronology of K Reactor Thermal
Mitigation Problems**

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| October 27, 1987 | To comply with the consent order, DOE issued the final EIS and specified a once-through cooling tower as the preferred alternative for mitigating K reactor thermal discharges. |
| December 1987 | SCDHEC and EPA informed DOE that a once-through cooling system was inadequate to ensure protection of in-stream biological communities. |
| February 12, 1988 | The DOE Record of Decision stated the approved alternative was a recirculating cooling tower instead of the once-through cooling tower specified in the October 27, 1988, EIS. |
| April 10, 1988 | The K reactor was shut down for maintenance. |
| May 31, 1988 | SRS requested that SCDHEC amend the consent order by delaying the construction completion date for the cooling tower from December 31, 1992, to February 28, 1995, because of the change from a once-through to a recirculating cooling tower. |
| July 7, 1988 | With respect to DOE's decision to reprogram fiscal year 1989 funds for the K reactor cooling tower, the Armed Service Committees requested DOE to determine if SCDHEC would agree to funding a higher priority item instead of the cooling tower. The Committees also requested DOE to study the feasibility of constructing a cooling tower that would support both the K reactor and the new production reactor. |
| July 22, 1988 | The SRS contractor completed the requested study and concluded that a cooling tower common to both K reactor and the new production reactor would not be cost-effective. |
| November 3, 1988 | SCDHEC rejected DOE's request to amend the cooling tower construction completion date (Dec. 31, 1992) in the consent order because SRS could meet the required construction completion date. |
| November 8, 1988 | SRS submitted a fiscal year 1989 request to DOE headquarters to reprogram \$14 million for the K reactor cooling tower. The \$14 million was needed to fund the contract for design and construction of the tower, site preparation, and advanced procurement actions. |
| December 13, 1988 | The Natural Resources Defense Council, Inc., and others filed suit in the United States District Court to require DOE to complete an EIS and to comply with the National Environmental Policy Act requirements before re-starting the K, L, and P reactors. |
| December 1988 | SRS' completed a draft long-range plan calling for the shutdown of the K reactor in the year 2000. |
| December 31, 1988 | The NPDES permit for SRS expired. Operation under the old permit and consent order is to continue until a new NPDES permit is approved. |
| March 3, 1989 | SRS briefed DOE officials on the schedule for re-starting K reactor in December 1989. Potential problems cited included legal challenges to re-start without completing an EIS. |
| March 29, 1989 | DOE published in the Federal Register a Notice of Intent to prepare an EIS on the continuing operation of K, L, and P reactors and stated that completion of the EIS is not a pre-condition to operation in the near future. Scheduled date for completing the EIS is October 1990. |
| April 27, 1989 | DOE and SCDHEC discussed alternatives to the cooling tower, but SCDHEC could not legally agree to any alternative. |

(continued)

**Appendix III
Chronology of K Reactor Thermal
Mitigation Problems**

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| June 26, 1989 | The SRS contractor submitted a preliminary plan showing a September 1990 re-start date for the K reactor; DOE is now reviewing the re-start plan. |
| July 21, 1989 | SRS's Office of the Chief Counsel briefed SRS management to inform them that due to the recovery of SRS wetlands since the shutdown of K reactor in April 1988, SCDHEC and EPA anti-degradation polices could be imposed to prevent re-start of the K reactor before completion of the cooling tower to avoid degradation of the recovered wetlands and aquatic communities. |
| August 22, 1989 | DOE reprogrammed \$14 million for the K reactor cooling tower in fiscal year 1989. |

Scope and Methodology

To provide information on the issues affecting a congressional decision on whether or not to fund construction of a cooling tower for the K reactor at DOE's Savannah River Site, we analyzed DOE's environmental assessment reports, decision documents for constructing a cooling tower, project justifications and related fund requests, and correspondence between DOE, the Congress, and South Carolina on the subject. We also identified an example of a potential alternative project that would protect similar wetlands that are open to public access. We discussed the issues with representatives of the Savannah River Site Operations Office and the South Carolina Department of Health and Environmental Control. We compared data from these sources with data in project descriptions and environmental analyses prepared by South Carolina environmental and wildlife conservation organizations. In addition, we reviewed lists of alternative projects for the Savannah River Site, prepared by DOE for discussions with state officials.

This work was performed between June and August 1989 and was done in accordance with generally accepted government auditing standards.

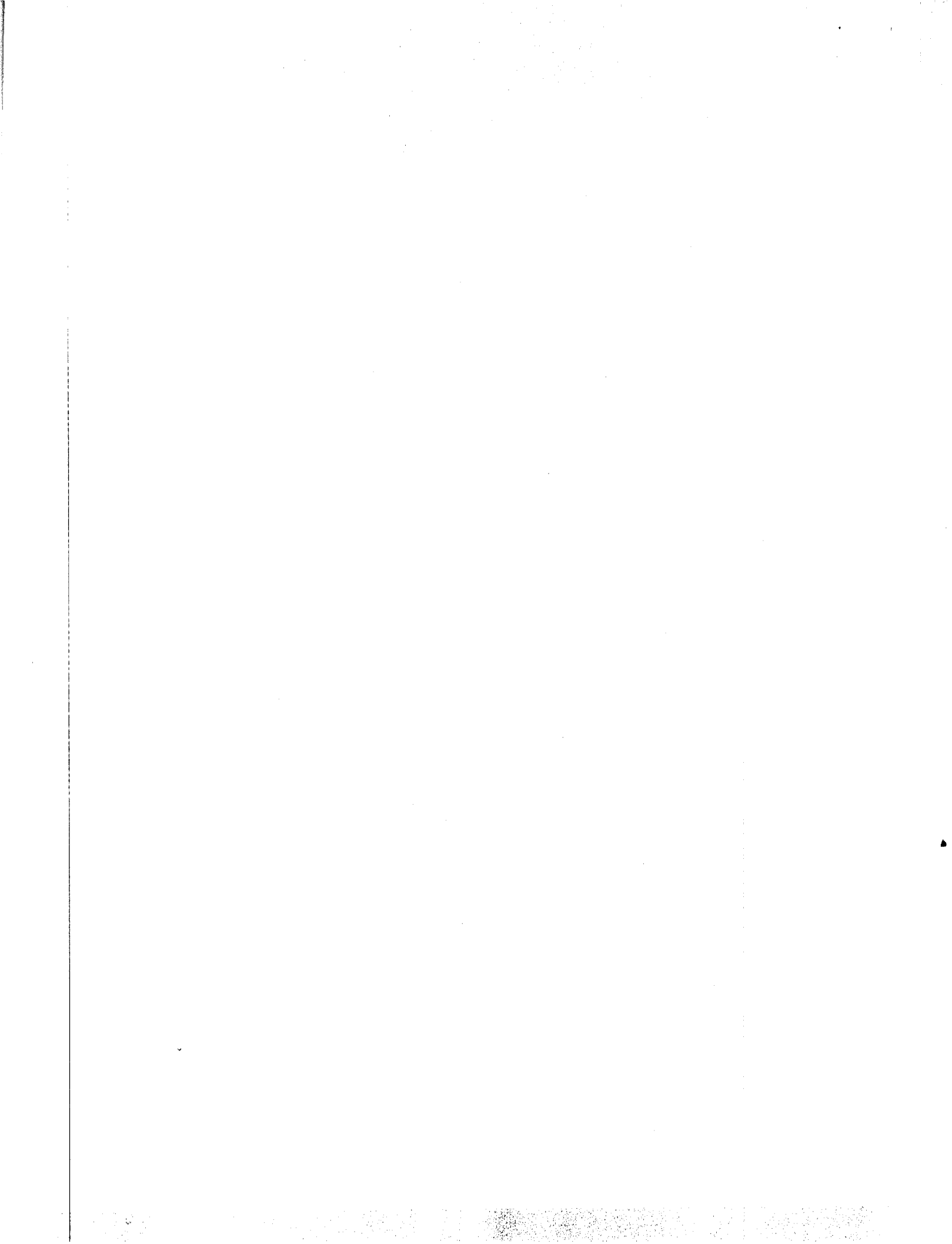
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