REPORT TO THE CONGRESS

BY THE COMPTROLLER GENERAL OF THE UNITED STATES

Evaluation Of The Status Of The Fast Flux Test Facility Program

Energy Research and Development Administration

Since congressional authorization of the Fast Flux Test Facility in July 1967, the construction completion date has been extended by more than 5 years to August 1978, and the construction project cost has increased from $87.5 million to $540 million. Support costs, which were not originally estimated, are now estimated at $613 million resulting in a total program estimate of $1.153 billion.

The Energy Research and Development Administration expects that the fuels and materials testing conducted in the facility, as well as the acquired experience in its design, development, and construction will assist the Administrator in making the 1986 decision on the acceptability of widespread commercial deployment of liquid metal fast breeder reactors.

Although agency officials are confident the facility will be completed by August 1978, the possibility of additional delays is evident. Severe construction delays, of a year or longer, and testing problems could result in postponing the 1986 decision.

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COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON, D.C. 20548

B-164105

To the President of the Senate and the
Speaker of the House of Representatives

This report presents the current status of and problems associated with the construction and testing capability of the Fast Flux Test Facility, an important test facility in the United States liquid metal fast breeder reactor research and development program.

We made our review pursuant to the Budget and Accounting Act, 1921 (31 U.S.C. 53), and the Accounting and Auditing Act of 1950 (31 U.S.C. 67).

We are sending copies of this report to the Director, Office of Management and Budget, and to the Administrator, Energy Research and Development Administration.

Elmer B. Staats

Comptroller General
of the United States

Contents

ABBREVIATIONS

AEC	Atomic Energy Commission
DHX	dump heat exchanger
ERDA	Energy Research and Development Administration
FFTF	Fast Flux Test Facility
FMEF	Fuels and Materials Examination Facility
GAO	General Accounting Office
HEDL	Hanford Engineering Development Laboratory
LMFBR	Liquid Metal Fast Breeder Reactor

COMPTROLLER GENERAL'S REPORT TO THE CONGRESS

EVALUATION OF THE STATUS OF THE FAST FLUX TEST FACILITY PROGRAM
Energy Research and Development Administration

D I G E S T

The Energy Research and Development Administration has projected that the Nation's electrical energy demand will increase more than 3-1/2 times by the year 2000. About 40 percent of that demand is expected to be met by nuclear power (fission reactors). Because of a potentially limited domestic supply of low-cost uranium ore for nuclear fuel, however, many people believe that the nuclear energy potential can only be fully realized by breeder reactors which are capable of producing more fuel (in the form of plutonium) than consumed. (See p. 1.)

Although research programs are underway to develop different breeder concepts, the liquid metal fast breeder reactor has been selected as the prime candidate for development. One of the major facilities to be used in developing breeder reactors is the Fast Flux Test Facility--which is intended to test breeder reactor fuels and materials and to acquire experience in the design, development, and construction of large liquid metal systems. (See pp. 1 and 2.)

The results of this Fast Flux Test Facility program are expected to assist the Administrator of the Energy Research and Development Administration in making a decision by 1986 about the acceptability of widespread commercial deployment of breeder reactors. (See p. 26.)

TESTING CAPABILITY

Since project authorization in 1967, an important objective of the facility has been the ability to conduct high-risk experiments, including testing breeder reactor fuel up to and beyond the point of failure. These tests are to be conducted in the facility's closed loop system.

At reactor startup, the facility will include two closed loops, each of which will be able to test up to 37 fuel pins of the size that will be used in the Clinch River Breeder Reactor. For tests involving projected larger fuel pins, the closed loops will be able to test only up to 19 pins.

GAO consultants believe that 37 pin tests will provide valid and useful data for establishing safe and economic design and operating limits of full-size assemblies. However, they said that 19 pin tests will provide less data and, therefore, will be statistically less valuable in establishing these conditions. The Energy Research and Development Administration believes the capability to test 37 or 19 pins in the closed loops will satisfy the facility's intended and needed function. (See pp. 4 to 6.)

PROGRAM COST AND SCHEDULE EXPERIENCE

Since congressional authorization in 1967, the estimated cost of the Fast Flux Test Facility program has increased considerably. The construction project then estimated to cost $87.5 million, is now estimated to cost $540 million. This estimate has remained constant since June 1975.

Supporting costs, for which complete estimates were not prepared at the time of original authorization, are now estimated to be an additional $613 million for a total facility program cost estimate of $1.153 billion. This is an increase of more than $200 million since GAO's last review of the program in 1974. (See p. 7.)

An underlying cause for the project's cost growth since authorization was that the original estimate was presented to the Congress, well in advance of the detailed (final) design effort needed to reasonably estimate the ultimate cost. (See p. 9.)

In addition to the already recognized cost growth, over $200 million in additional costs of three other breeder reactor program facilities should be recognized as Fast Flux Test Facility program costs. These facilities are essential for the efficient operation of the test facility. (See pp. 13 and 14.)

Since authorization, the project's construction completion date has been extended by more than 5 years to August 1978. (See p. 21.)

The project has recently been affected by two strikes. One of the strikes which began on June 1, 1976, was still underway as of mid-September 1976 and has a potential for a serious effect on both cost and schedule. (See p. 19.)

Construction delays, of a year or longer, and testing problems could result in postponing the Administrator's 1986 decision. (See p. 26.)

Technical problems with major components of the facility's heat transport systems remain. These components were committed to production before much of the development, test and evaluation, and redesign effort was completed. Problems encountered with these components must be resolved, or the project may not meet performance requirements or the currently projected completion date and cost estimate. (See pp. 27 to 34.)

RECOMMENDATIONS

GAO recommends that the Administrator of the Energy Research and Development Administration:

--Closely monitor all large construction projects to determine that sufficient design, development, and component testing has been completed before allowing construction to start. (See p. 13.)

--Provide the Congress with a current estimate and breakdown of all costs associated with the Fast Flux Test Facility, including the cost of facilities either built, being built, or planned that directly supported its test program. (See p. 18.)

AGENCY COMMENTS

The Energy Research and Development Administration provided comments on GAO's preliminary report. GAO considered these comments in finalizing the report and made appropriate changes. GAO believes there are no residual differences in fact.

However, the Energy Research and Development Administration disagreed with the GAO position that the cost of the three support facilities should be charged to the Fast Flux Test Facility program and recommended that GAO delete its recommendation on this matter.

The Energy Research and Development Administration believes the three facilities are essential parts of the overall breeder reactor development program and, as such, it is more appropriate to carry their cost under the total breeder reactor program.

GAO believes the cost of the three facilities should be accounted for and controlled as Fast Flux Test Facility program costs because these facilities will be used mostly in support of the facility. This should provide the Congress with greater visibility over planned costs in support of this program. (See pp. 17 and 18.)

CHAPTER 1

INTRODUCTION

The Energy Research and Development Administration (ERDA) 1/ projects that the Nation's electrical energy demand will increase more than 3-1/2 times 2/ by the year 2000. ERDA expects that nuclear power, which now accounts for only about 8 percent of our total installed electrical generating capacity, will increase to about 40 percent 2/ in the year 2000. Because of a potentially limited domestic supply of low-cost uranium ore for light water reactors, ERDA and others believe that the nuclear energy potential can be fully realized only by developing the fast breeder reactor which can produce more fuel (in the form of plutonium) than it uses and which can use 60 percent or more of the energy available in uranium.

Although ERDA is engaged in research programs to develop different breeder concepts, the Liquid Metal Fast Breeder Reactor (LMFBR) 3/ has been selected as its prime candidate. ERDA's stated objective for the LMFBR program is to develop and demonstrate the entire LMFBR energy system, both powerplant and fuel cycle technology, through extensive utility and industrial involvement in preparation for commercialization.

1/The Energy Reorganization Act of 1974 (Public Law 93-438) abolished the Atomic Energy Commission (AEC) and established the Energy Research and Development Administration and the Nuclear Regulatory Commission on January 19, 1975. In this report, all references to activities before this date are referred to as AEC activities and all activities after this date are referred to as ERDA activities.

2/Projections are based on the low case of the most current official ERDA estimates issued in February 1975. Projections equate to a constant compound yearly rate of increase of about 5.3 percent for electrical energy demand and about 11.7 percent for nuclear electrical-generating capacity. ERDA is currently revising its estimates. The revised estimates are expected to be lower.

3/Liquid metal refers to the liquid sodium used as the coolant to carry off the heat of the reactor fuel. A fast reactor is a reactor in which the chain reaction is sustained primarily by fast neutrons rather than by the slower speed neutrons found in present generation commercial nuclear power reactors.

One of the major facilities to be used in achieving this objective is the Fast Flux Test Facility (FFTF)--which is intended to test the kinds of nuclear fuels and materials most apt to work safely, effectively, and economically in future breeder reactors. According to ERDA, design and construction of FFTF will also contribute greatly to (1) advancing fast reactor safety and technology and (2) developing technological, design, and industrial capabilities required not only for the first LMFBR demonstration plant (the Clinch River Breeder Reactor) to be built near Oak Ridge, Tennessee, but also for full development of an LMFBR industry.

Since December 1974, we have issued several reports, staff studies, and issue papers concerning the LMFBR program. One of these documents 1/ was concerned with the cost, schedule, and performance aspects of FFTF from the time it was authorized by the Congress, July 1967, through June 1974--the cutoff date for that review. The present report essentially extends the coverage of that review through June 1976, with some information updated to mid-September 1976. The overall FFTF project was about 74 percent complete at the end of June 1976. Both conceptual and final design were 100 percent complete, compared with 100 percent for conceptual and 87 percent for final design in June 1974. The construction status of FFTF, which was 62 percent complete through June 1976, is shown in figure 1. This compares with 32 percent complete in June 1974.

1/This document is a staff study entitled "Fast Flux Test Facility Program," dated January 1975.

FIGURE 1 – JULY 1976 AERIAL VIEW OF THE FFTF

CHAPTER 2

FAST FLUX TEST FACILITY TESTING CAPABILITIES

The FFTF is a 400-megawatt thermal liquid sodium-cooled fast flux reactor designed specifically for irradiation testing of nuclear fuels and materials for LMFBRs. It is being built at the Hanford Engineering Development Laboratory (HEDL) in Richland, Washington. Although the FFTF is engineered for the temperatures and core fuel characteristics of fast breeder reactors, it is not designed to breed plutonium nor produce electricity as will commercial LMFBR powerplants. It is strictly a test reactor, and when completed, it will be the largest of its kind in the world.

The FFTF will provide controlled and instrumented fast flux conditions for testing fuel specimens, rods, subassemblies and cladding, as well as reactor structural materials. Eight instrumented test positions are being provided in the design of the initial FFTF core. As presently envisioned, two of these eight positions will be closed loops and six will be open loops. Installation of two additional closed loops is projected 2 to 4 years after startup. Capability exists to install up to six closed loops in the eight instrumented test positions.

The closed test loops are separate components that are inserted in the reactor core. They have sodium coolant, instrumentation and heat transfer completely separate from the main FFTF fuel core to permit testing of fuels and materials in a controlled coolant environment independent of the main reactor coolant system. The open loop test positions are integral components of the reactor core. They are cooled by the reactor primary coolant system and provide the capability for testing large quantities of candidate fuel specimens.

CLOSED LOOP TESTING CAPABILITY

Since project authorization, an important objective of FFTF has been its reliable closed loop testing capability. The closed loops are designed to accommodate high risk experiments, including testing fuel up to and beyond the point of failure. When failure testing is performed, it could produce a temporary loss of the closed loop, in which the test is conducted, for up to many months (if fuel meltdown occurs, which is not planned) due to fission product contamination, but would let the remainder of the facility continue its testing functions. Regarding the need for fuel failure testing, ERDA's most recent (fiscal year 1977) construction project data sheet stated that:

"The capability provided by the FFTF of testing fuel elements to failure to establish their ultimate capability and failure modes is essential to the complete evaluation of LMFBR core safety, reliability, performance, and life-times. FFTF provides for such failure tests under known conditions without compromising the reactor or facilities, since it has provisions for closed loops which contain the failed elements and any associated debris in complete safety." (Underscoring supplied.)

The data sheet further states that FFTF's closed loop capability is critically needed, since this capability is not available in the Nation's only other operating sodium-cooled test reactor--Experimental Breeder Reactor II.

At project authorization, AEC was considering installing in FFTF four or more closed loop test positions, each with a diameter "up to about 6 inches." Subsequent to project authorization, AEC decided that only two closed loops would be installed before reactor startup, each with a diameter of 4.7 inches. The maximum number of fuel pins that can be tested in this size loop is 37 pins of the size that will be used in the Clinch River Breeder Reactor. For tests involving projected larger-sized fuel pins for the Prototype Large Breeder Reactor, 1/ the closed loops can test up to 19 pins. In contrast, full-size fuel pins bundles, containing 217 Clinch River size pins, can be tested in the FFTF's open loop positions.

Because of the limited number of fuel pins that can be tested in the closed loops in comparison with the number that can be tested in the open loops, we asked several GAO consultants whether the data from fuel tests using 37 or 19 pins could be projected to full-size assembly operating conditions. They said that 37 pin tests will provide a test environment typical of full-size assemblies for about half the pins in the test and so will provide valid and useful data for establishing safe and economic design and operating limits of full-size assemblies. However, they said that 19-pin tests will provide less data and, therefore, will be statistically less valuable in establishing these conditions.

1/The next breeder reactor planned after the Clinch River Breeder Reactor. It is expected to be about 900 to 1,000 megawatt electric and to consist of commercial-size components.

ERDA believes that the 37- and 19-pin test capability of the present 4.7-inch-diameter closed loops is adequate for closed loop test purposes. It believes that the capability to test 37 pins or less under more controlled and severe conditions in the closed loops combined with the capability to test 217 pins in the instrumented open test conditions and other positions will satisfy FFTF's intended and needed function.

CHAPTER 3

PROGRAM COST EXPERIENCE

The estimated cost of FFTF has increased substantially since congressional authorization in July 1967. The construction project then estimated to cost $87.5 million, is now estimated to cost $540 million. This estimate has remained constant since June 1975. Supporting costs, for which complete estimates were not prepared at the time of original authorization, are now estimated to be an additional $613 million for a total FFTF program cost estimate of $1.153 billion. This is an increase of more than $200 million since our last review in 1974. In addition, it appears that over $200 million in additional costs for three other planned facilities should be recognized as FFTF program costs, as the facilities are essential to the efficient operation of FFTF.

A comparison of the current estimate with prior estimates is shown in the chart on the following page.

In terms of constant fiscal year 1975 dollars, 1/ the cost growth has been from $138.3 million to $560 million for the construction project estimate. The current program cost estimate in constant fiscal year 1975 dollars is $1.261 billion.

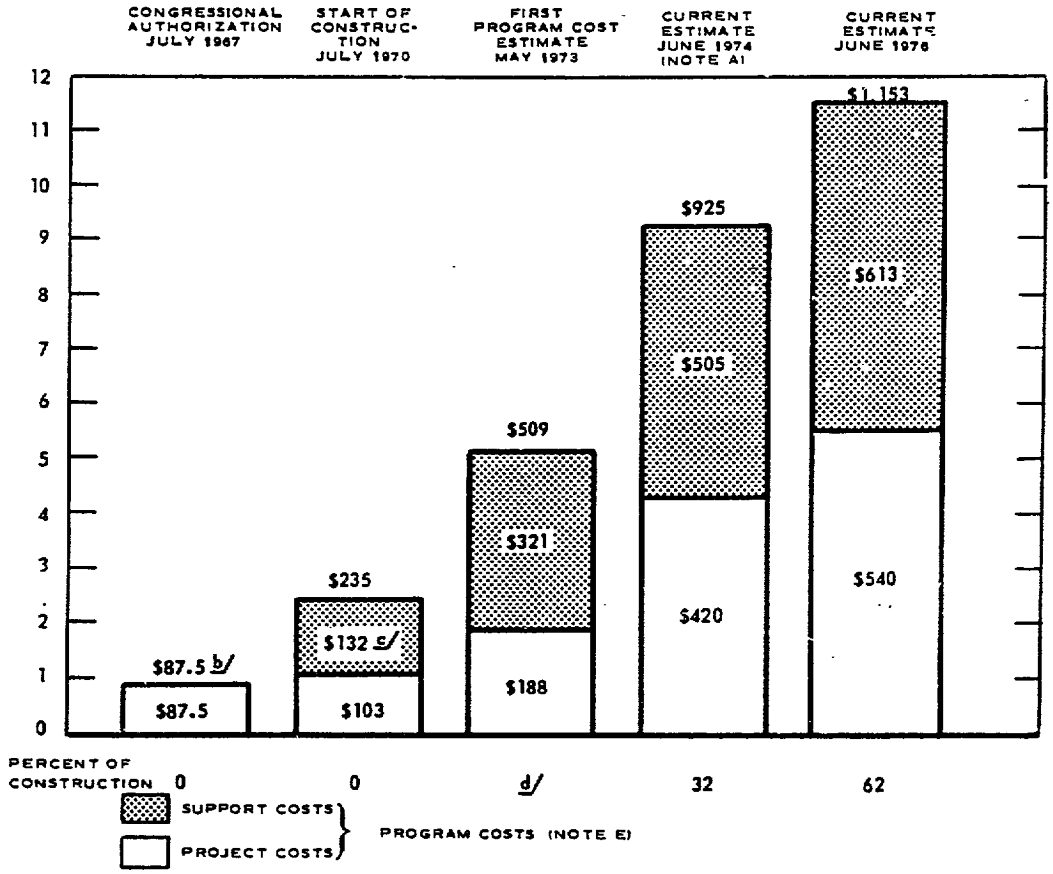
REASONS FOR COST GROWTH

The FFTF program cost growth is due to many factors, including inadequate scope definition, inaccurate estimates, changes in safety standards, design changes, schedule delays, and the unusually high rates of wage and price escalation which have occurred. The extent and nature of the cost growth, which occurred through June 1974, was discussed in our January 1975 staff study. Since then, an additional cost growth of $228 million has occurred in the FFTF program, of which $120 million is for the construction project and $108 million for supporting costs.

The ERDA estimate of $925 million in June 1974 was based on program costs through end of construction and start of sodium fill procedures, which were then scheduled for November 1977. This date has since slipped 9 months to August 1978.

1/Computation was based on an index provided by ERDA, which was not specifically developed for the unique labor and material escalation rates experienced by FFTF project.

FFTF COST GROWTH
(MILLIONS)



a/AEC advised the Joint Committee on Atomic Energy of this estimate by letter dated February 23, 1974.

b/Detailed cost estimates were not prepared for support costs, which are comprised of expense-funded equipment, capital equipment not related to construction, spare parts and equipment inventory, fuel inventory (four cores), FFTF operations (including operator training and fuel burning for 1 year), and research and development.

c/This amount is not a complete estimate of support costs. It does not include fuel, spare parts and equipment inventory costs. Estimates were not prepared for these program elements.

d/This figure was not readily ascertainable.

e/FFTF project costs and expense-funded equipment costs are usually added together to arrive at a total plant cost, which for the estimates in the charts are: 1970 – $144 million; 1973 – $270 million; 1974 – $530 million; and 1976 – $647 million.

The current estimate of $1.153 billion is based on program costs through criticality, which is scheduled to take place 1 year after start of sodium fill procedures. So an additional year's cost, amounting to about $54 million, that was not included in the previous estimate is included in the current estimate. The balance of the increase is attributable to considerable inflationary cost growth experienced for materials and labor ($68 million), design changes and design evolution ($17 million), low estimates and estimate omissions ($33 million) for the plant portion of the costs and to inflation and design changes ($56 million) for other supporting costs.

We concluded in the 1975 staff study that an underlying cause of the cost growth was that the original estimate was presented to the Congress well in advance of the detailed (final) design effort needed to reasonably estimate the ultimate cost. We further concluded that even at start of construction in mid-1970, a realistic cost estimate probably could not have been developed based on the limited detailed design effort and development of technology at that time.

In a February 1974 letter to the Joint Committee on Atomic Energy, the AEC General Manager also recognized that AEC had been highly optimistic in its early assessment of the stage of development of sodium-cooled plants. He stated that:

> "This optimism was based, in part, on the belief that experienced with previous sodium-cooled plants would provide a significant engineering and technological base for the design and construction of the FFTF. In fact, previously operated sodium-cooled plants were not designed and constructed with a view towards providing a base of well defined and characterized engineering technology, nor were operating conditions (temperature, flux, etc.) the same level as those considered necessary for FFTF and future commercial LMFBRs. <u>This lack of an adequate design base from which to develop FFTF systems and components had a particularly profound effect on initial cost and schedule estimates</u>." (Underscoring supplied.)

This matter is discussed further below.

Concurrency versus sequential design, development, and construction

Various authorities have addressed the subject of concurrency in design, development, and construction. For example, in December 1972 the Commission on Government Procurement concluded that concurrency was one of the reasons for avoidable cost increases in acquiring major systems. The Commission stated:

> "Committing to extensive production when much development, test and evaluation, and redesign still remain to be done usually leads to major retrofit and modification costs."

It is generally agreed within the utility industry that some concurrency in design and construction is necessary if a nuclear powerplant 1/ is to be built at the lowest possible cost, because this shortens the time required to get a plant on line. Industry officials disagree, however, on the extent that design and construction schedules should overlap. Some utility industry officials believe that design should be about 50 percent complete before starting construction.

Although the precise level of design and development needed to support a start-of-construction decision is subject to question, AEC recognized in February 1974 that FFTF construction was initiated long before this point was reached, and as a result the cost of the project escalated considerably. For example, AEC's General Manager stated, in February 1974, that:

> "In addition to the absence of a well-defined base of engineering technology from which to proceed with the design and construction of FFTF, original design concepts have been significantly modified in order to assure FFTF operability * * *. While it is difficult to quantify precisely the financial impact of the many complex development problems experienced to date, some indication of their scope and magnitude may be illustrated by the following cost growth history of two selective plant components.

1/Most nuclear reactors in use, being constructed, or planned are lightwater reactors--reactors that use either pressurized or boiling water as a coolant surrounding the nuclear fuel.

Component	April 1970 estimate	Dec. 1973 estimate
Dump heat exchangers	$3,125,000	$14,500,000
Production pumps (primary and secondary)	3,166,000	16,815,000

> It shou.d be noted that many factors have influenced the cost growth of these specific components and systems, including inadequate initial estimates. Nevertheless, there is little question that a substantial portion of the cost increases experienced to date result from uniquely complex design and development problems * * *. The problems experienced on these selective components and systems are * * * representative, in many ways, of the difficulties associated throughout many phases of FFTF component and system design and development." (Underscoring supplied.)

As of June 1976, the cost of the dump heat exchangers had increased to $17 million and the production pumps to $17.8 million. It is not possible to determine how much of the cost growth of these two components is attributable to inadequate initial estimates, concurrency of design, development, and production, or other reasons. It is evident, however, that concurrency of design, development, and production did contribute to a part of the cost increases. ERDA agrees that concurrency has added to the cost of these components but believes that the amount is minor and is probably less than escalation costs associated with a sequential approach.

The concurrency aspects of these two major FFTF components are discussed below.

Concurrency aspects of producing dump heat exchangers and pumps

The dump heat exchanger is an example of an FFTF component that was committed to production prior to completing test and evaluation. Of the 12 required exchangers, 11 have been installed in FFTF. However, because of heat transfer problems--heat discharge performance capability less than design requirements--disclosed during testing of the prototype unit, which is also to serve as the 12th plant unit, the exchangers may have to be modified (See pp. 32 to 34.)

The FFTF's heat transport sodium pumps--four primary pumps (including one prototype unit) and three secondary pumps--appear to be a prime example of a major component which was committed to production when much of the development, test and evaluation, and redesign effort still remained to be done.

These pumps--which are an extension of the state of the art--were manufactured concurrently, i.e., fabrication of the prototype unit had not yet been completed before production of the seventh (and final) unit was underway. Although three of the six plant units (two primary and one secondary) have been installed in FFTF, ERDA's pmpt test program disclosed certain problems which could adversely affect the operation of these pumps (see pp. 29 to 32). Corrective modifications have been made as a result of some of these problems and other problems are currently being investigated.

The prototype pump test program is still underway; it is scheduled for completion during the last quarter of calendar year 1976. To the extent that additional problems are detected that cannot be easily resolved, any required modifications could be costly since three plant units have already been installed.

Regarding this matter of concurrent versus sequential procurement of prototype and plant units, ERDA believes that necessary modifications to plant units would be held at a minimum if a prototype unit was totally developed and tested prior to initiation or plant unit procurement. However, it believes that the cost savings from this factor must be weighed against the potential cost penalties arising from elongating the procurement cycle in terms of escalating costs.

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The concurrency versus sequential construction approach was discussed during ERDA authorization hearings held before the Subcommittee on Legislation of the Joint Committee on Atomic Energy in March 1975. When a Subcommittee member questioned starting construction of the Clinch River Breeder Reactor before completing the FFTF, the Director of ERDA's Reactor Research and Development Division stated:

"* * * We wouldn't envision a major design change being required in Clinch River as a result of the operation of FFTF, but it is possible.

"We don't envision that. Our best judgment tells us at this time we have designed Clinch River in sufficient detail to be quite sure that we are going to be able to build it as we say we are going to be able to build it today. When we started FFTF, we were constructing and designing at the same time. We are not going to do that on Clinch River." (Underscoring supplied.)

Based on recent information supplied by ERDA officials working on the Clinch River project, it appears that a considerable amount of the final design effort will be completed by the time construction is expected to begin. As of June 1976, conceptual design has been 75 to 80 percent completed, preliminary design 30 to 35 percent completed, and final design 5 percent completed. By April 1978, when construction of the nuclear island concrete mat is expected to start, all conceptual and preliminary design and 70 percent of final design are scheduled to be completed. If these design schedules are met, the Clinch River project should be able to avoid many of the problems FFTF experienced.

RECOMMENDATION TO THE ADMINISTRATOR, ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION

There are a number of large facilities yet to be built for the LMFBR program. The ERDA Administrator should closely monitor these projects and any other large construction projects to determine that sufficient design, development, and component testing has been completed before allowing construction to start in order to obtain a proper balance between development risks and minimizing costs and schedule delays.

OTHER FFTF PROGRAM COSTS

Included in the LMFBR program are plans to build three major facilities, which are essential for the efficient operation of FFTF. These facilities, which are being reported by ERDA in budgetary information as separate and distinct facilities, have not yet been authorized but are currently planned for construction at the FFTF site. The three facilities are: the Maintenance and Storage Facility, the Fuels and Materials Examination Facility (FMEF), and the Fuel Storage Facility. Most of their utilization is estimated to be FFTF-related. Further, many features of the proposed maintenance and examination facilities were also features of the initially authorized FFTF project. As part of a cost-saving move, some of the maintenance and examination features were eliminated since they were not considered absolutely necessary to meet the project requirements even though they were necessary to obtain maximum efficiency. We believe that at least $229 million of the total estimated cost ($242 million) of the three facilities should be recognized and reported as additional FFTF program costs, making a total current estimated FFTF program cost of about $ .382 billion. The nature and purpose of each of these facilities follows.

Maintenance and Storage Facility

AEC's authorizing construction project data sheet included a requirement for a maintenance facility to enable work, removal, and replacement of majo FFTF components. A large maintenance and decontamination cell was to be provided for the decontamination and repair of FFTF's large components. In April 1970, however, the maintenance facility, as described in the project data sheet, was deleted from the project and replaced by a single-cell, combination examination/maintenance facility. In our January 1975 staff study, we questioned the capability of the replacement cell to meet FFTF maintenance needs and suggested there may be a need for an additional separate maintenance facility.

ERDA is now proposing the establishment of a separate Maintenance and Storage Facility, which was described as follows in a June 1976 draft construction project data sheet:

> "This project is for the construction of a new facility and modification to an existing Hanford facility to provide maintenance and operational support for the FFTF and LMFBR development facilities. * * *
>
> "As presently conceived, the new facility is an integrated complex with three major areas located in close proximity to the Fast Flux Test Facility and connected by a railroad spur. The three major areas are a maintenance support area, an equipment storage area and a process equipment area. * * *
>
> "These facilities are essential after components and systems become radioactive. The FFTF * * * will be the first LMFBR facility to utilize the maintenance and operational support of this multipurpose facility for radioactive components. Existing facilities can provide the needed support prior to FFTF criticality. Removal of several sodium wetted, radioactive and nonradioactive components can be expected during the first few years of FFTF operation. Provisions must be made for replacement of these components and for their repair, storage, or disposal.

"Repair facilities must be provided to permit reusing components which would otherwise be scrapped. Without these repair facilities, it will be necessary to scrap and replace entire components which need only minor repairs." (Underscoring supplied.)

It thus appears to us that such a facility will improve the efficiency of operation of FFTF. ERDA currently plans to begin construction of the Maintenance and Storage Facility at the FFTF site in early 1979 and complete construction in late 1980. The FFTF is currently scheduled to begin full power operations early in 1980. So, if construction of this facility is delayed, problems relating to the efficient repair, storage, or disposal of components may occur.

The current estimated cost of this facility is about $20.6 million, including escalation of funds to the year spent. According to the January 1976 FFTF Project Office Director's Plan (Draft), the facility will have an estimated FFTF-related use of 75 percent by 1984. It, therefore, appears at least 75 percent of the $20.6 million, or about $15.5 million, should be added to the recognized cost of FFTF program.

Fuels and Materials
Examination Facility

AEC's authorizing construction project data sheet also included a requirement of facilities for interim fuel examination. In addition, AEC testified before the Joint Committee in March 1967 that facilities at the FFTF structure would be required for both interim and detailed post-irradiation examinations of fuels. In April 1970, the examination facilities, as described in the project data sheet, were deleted from the project and replaced by the previously mentioned single-cell, combination examination/maintenance facility. When we questioned this substitution in 1974, AEC defended it by stating that:

"* * * the FFTF interim examination facility can perform all planned functions and tests, except neutron radiography which requires extensive and costly facilities that are usually separated from other examination cells. AEC believes it is more economical to move the fuel pins from FFTF for this operation to an existing facility with this capability at the Hanford site." (Underscoring supplied.)

Now, less than 2 years later, a separate examination facility is being proposed specifically for the FFTF project. The LMFBR program plan (ERDA-67), dated December 15, 1975, states:

> "Existing facilities are inadequate for handling the number and length of the fuel and materials assemblies and pins to be irradiation tested in FFTF. The FMEF will provide a high-throughput semi-automatic facility at HEDL to accomplish this work.
>
> "Less than 1 year after FFTF begins power operation, samples irradiated in that reactor in support of the Fuel program will require examination for determination of performance limits and effects of irradiation under varied test conditions. The FMEF will be capable of * * *. This is about a five-fold increase in capability over existing facilities." (Underscoring supplied.)

A June 1976 draft construction project data sheet prepared by ERDA also states that:

> "Failure to provide such a facility (FMEF) will result in the FFTF producing irradiated fuels and materials which will not be examined and tested in the required manner." (Underscoring supplied.)

So, in less than 2 years time, AEC/ERDA has moved from the position that an existing facility can be used to examine the fuel to a position that existing facilities are inadequate and that a new facility, with considerable increased capability, is needed. According to ERDA, this changed position is the result of added LMFBR program testing requirements and the development of new advances in examination techniques and analyses which makes the previous planning outmoded.

ERDA currently plans to begin construction of this facility in mid-to-late 1978 and complete construction in late 1981. ERDA's current estimated cost for this facility is $188.1 million, including escalation of funds to the year spent. Construction is estimated at $124.3 million and other supporting costs are estimated at $63.8 million. The January 1976 draft Director's plan states that the examination facility will have an estimated FFTF-related utilization of 100 percent by 1984. It therefore appears that all of the $188.1 million should be added to the currently recognized FFTF program cost.

Fuel Storage Facility

According to the LMFBR program plan, a separate fuel storage facility is necessary for the FFTF because the existing storage capacity is inadequate. According to ERDA, the initial FFTF design was based on the assumption that spent fuel would be shipped offsite to a reprocessing plant. Only interim storage was provided in the FFTF to allow for heat decay and for storage until the spent fuel could be shipped. Since reprocessing facilities are not available, long-term fuel storage at the FFTF site will be necessary. The facility description contained in the LMFBR program plan states:

> "The Fuel Storage Facility will provide capacity to store, in sodium, accumulated irradiated FFTF fuel together with experimental fuel sections and material associated with post-irradiation test programs. Although the FFTF has in-containment storage for spent fuel, the capacity is necessarily limited by building space and economic factors dictated by the plant design. As a result, the FFTF must, at some time, discharge spent fuel to an ex-reactor storage facility in order to continue operation. Detailed evaluation of the FFTF schedule of operation indicates that the ex-reactor storage of spent fuel will be required in early 1981 at the latest to ensure uninterrupted operation of the facility." (Underscoring supplied.)

ERDA currently plans to begin construction of this facility in late 1977 and complete construction in mid-1981. Recent ERDA estimates show that the fuel storage facility will cost about $33.6 million, including escalation of funds to the year spent. This includes $30 million for the construction project and about $3.6 million for other supporting costs. The previously mentioned draft Director's Plan estimates that the facility will have an FFTF-related utilization of 75 percent by 1984. It therefore appears that at least 75 percent of the $33.6 million, or about $25.2 million, should be recognized as part of the FFTF program costs because the facility is necessary for continued FFTF operation.

- - - -

ERDA agrees that the three facilities will enhance the conduct of the FFTF program and are necessary for efficient operation. They do not agree with our position that, because of this, their costs should be charged to the FFTF program.

ERDA believes that the three facilities, along with FFTF and other facilities now operating or planned, are essential parts of the LMFBR program and, as such, it is more appropriate to carry their cost under the total LMFBR program.

While we agree it is proper to separately identify these facilities in the budget, we believe that because they will be used mostly in support of FFTF, their costs should be accounted for and controlled as FFTF program costs. This should provide the Congress with greater visibility over planned costs in support of the FFTF program.

RECOMMENDATION TO THE ADMINISTRATOR, ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION

ERDA should provide the Congress with a current estimate and breakdown of all costs associated with FFTF, including the cost of facilities either built, being built, or planned that directly support FFTF test program, such as the planned Maintenance and Storage Facilith, Fuels and Materials Examination Facility, and Fuel Storage Facility.

POTENTIAL FOR ADDITIONAL COST GROWTH

The FFTF Project Office Director's Program Summary 1/ dated January 1976, listed the following areas of remaining uncertainty which could have an adverse effect on ERDA's current program cost estimate of $1.153 billion.

--The extent of design changes resulting from unresolved safety issues.

--The ability to achieve and sustain predicted materials and equipment installation rates.

--The extent of rework required because of testing and startup problems.

Also, continued slippages in ERDA-established project milestones (see pp. 22 to 25) and redesign and modification work made necessary by problems encountered with unproven equipment items, such as sodium pumps and dump heat exchangers, could result in further increases in the current program cost estimate.

1/This is a draft working document submitted to ERDA Headquarters for information.

In late March 1976, the FFTF Project Office Director told us he believed none of the above matters would result in a major cost increase. He said the primary reasons for his confidence were: (1) the FFTF detailed designs will be complete in April 1976 (they were completed on schedule), thus precluding the recurrence of large "surprise" cost increases disclosed by the completion of individual design segments, (2) the construction work is 55 percent complete (as of June, construction was 62 percent complete), with the majority of the needed equipment installed, and (3) the Project Office has implemented several management improvement practices to further assure that project cost estimates will not be exceeded. The two changes considered to be the most important are (1) a consolidated Change Control Board which gives the ERDA FFTF project director (located at the FFTF site) direct control over cost and schedule changes and (2) a Performance Measurement System which compares actual and planned status of the project.

In addition to the above, the FFTF project has been affected by two strikes in 1976, one of which was still underway as of mid-September. The first strike, by the Hanford Atomic Metal Trades Council which represents production and maintenance workers at the four principal contractors at HEDL, began April 30 and was ended some 3 months later on August 1. According to ERDA, the principal effect of this strike on the FFTF program was in the area of fuel pin fabrication because ERDA was not able to provide fuel material to the fuel pin fabricator. ERDA expects that this strike will have no effect on the project's schedule but may have a slight effect on cost.

The second strike, by a local of the plumbers and steamfitters union against the Mechanical Contractors Association which is the employers bargaining unit, has a potential for a more serious effect on both FFTF cost and schedule. Project construction, cost, and schedule are all areas of major concern due to the strike, which began June 1 and as of mid-September was still underway. Minimal work has been done on the project since early June as other craft laborers would not cross picket lines, which were established at that time. The picket lines were later removed late in July. In September the FFTF contractor began reducing the labor force because construction could not efficiently continue, except for some electrical work, without the pipefitters (essentially plumbers and welders). As of mid-September, ERDA did not know how long the strike would last or what effect the strike would have on cost and schedule. ERDA believes it can recover the lost schedule and complete the project within budget if the strike is settled soon and if large numbers of craft labor are available. ERDA does not expect to be able to make a firm estimate of the strike effect until sometime after the strike is settled.

CHAPTER 4

PROGRAM SCHEDULE EXPERIENCE

Timely design, construction, and operation of the FFTF is essential to the success of the Nation's LMFBR Program and to assist the ERDA Administrator in deciding whether widespread commercial deployment of LMFBRs is acceptable. Since congressional authorization, the FFTF schedule for construction completion has slipped 5 years to August 1978, including 9 months slippage since our last review. However, this date has remained constant since December 1974. But any further severe slippage, of a year or longer according to ERDA officials, could contribute to delaying the currently planned 1986 decision by the ERDA Administrator regarding the acceptability of LMFBR technology for widespread commercial deployment.

SCHEDULE SLIPPAGES

In its August 1968 LMFBR Program Plan, ERDA recognized that design, construction, and operation of FFTF required a systematic, disciplined, engineering approach and the highest degree of technical and managerial competence to achieve timely and successful introduction of LMFBRs. Although ERDA's objective was to proceed on the basis of stringent scheduling constraints, experience in the development of designs as well as actual FFTF construction demonstrated that the agency's schedule projections have been highly optimistic. The extent of resultant schedule slippages is shown below.

	Estimated schedule		
	Congressional authorization July 1967	Current as of June 1974	Current as of June 1976
Complete detailed design	(a)	Jan. 1975	Apr. 1976
Complete construction; start of sodium fill procedures	4th quarter fiscal year 1973	Nov. 1977	Aug. 1978
Criticality	(a)	Nov. 1978	Aug. 1979
Full power operation	Feb. 1974	May 1979	b/Feb. 1980

a/This date was not readily ascertainable.

b/This milestone date reflects ERDA's current best judgment.

Principal factors affecting these FFTF schedule projections prior to June 1974--the cut-off date used in our previous FFTF staff study--included:

--Difficulties in establishing the necessary disciplined engineering approach.

--Underestimation of technical complexity in certain areas of design.

--Difficulties in obtaining qualified personnel.

--Unexpected rework in design and fabrication.

Delays in the delivery of major equipment, increases in required quantities of piping and electrical wiring which need to be installed, and the occurrence of site labor disputes were the three reasons for the schedule slippages which occurred after June 1974. However, since December 1974, ERDA has remained within the August 1978 schedule for construction completion.

Because of changes in the method of calculating the percent of detailed design completion, FFTF's design progress reported to the Joint Committee on Atomic Energy, the House and Senate Appropriations Committees, and the Office of Management and Budget was overstated until June 1975, as shown in the following chart.

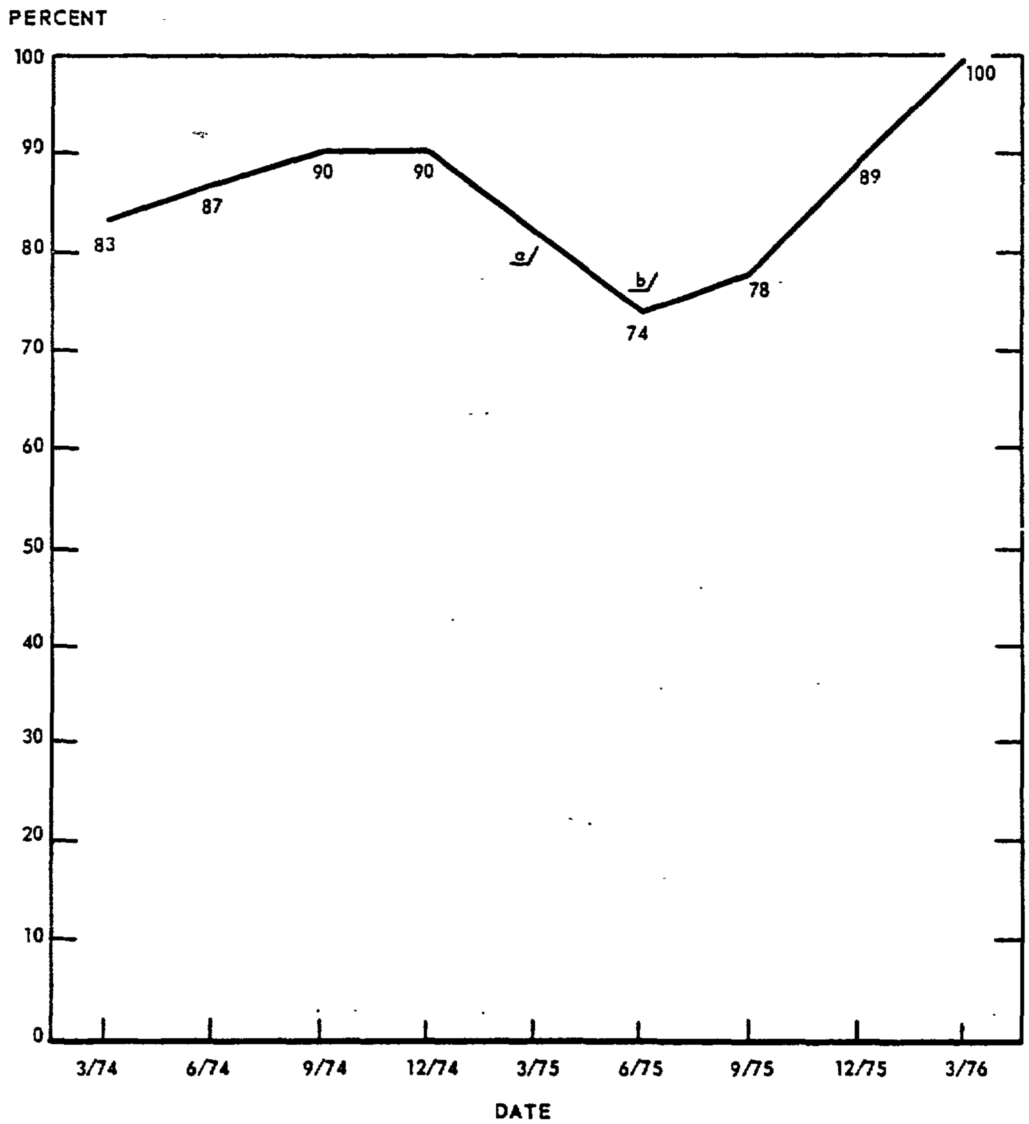
FACTORS WHICH COULD CAUSE FURTHER SLIPPAGE

ERDA milestones

To effectively manage the design and construction of FFTF, ERDA, early in 1975, established 41 milestone dates which culminate in an August 1978 construction completion date. The prime contractor's scheduling projections have been predicated upon achieving ERDA's milestones.

Although some of these milestone dates, such as the installation of small piping and processing of sodium piping and valves, have since been delayed, FFTF Project officials told us that, because of measures being taken to work around the delays, they do not believe these slippages will adversely affect the August 1978 construction completion date. This date, however, is not contractually required and has already slipped over 5 years since congressional authorization. As discussed below, inability to achieve scheduled milestones could delay completion of FFTF beyond August 1978.

STATUS OF DETAILED DESIGN COMPLETION



a/The method of calculating the percentage of detailed design completion was being evaluated during the quarter ending March 1975 and, therefore, no percentage of completion was reported for that quarter.

b/The 16-percent reduction between December 1974 and June 1975 reflects a revised method of calculating the completed detailed design effort. The new method compares the total number of FFTF detailed designs (about 21,000) to the number of detailed designs completed, rather than the previously used method of comparing actual staff-days of design effort used to the total estimated number of staff-days required.

Small piping

Based upon a May 1975 projection that about 30,400 linear feet of small pipe needed to be installed in the FFTF reactor containment vessel, ERDA established a small pipe in-containment installation target of 20-percent completion by January 1976. However, a need to install an additional 8,000 linear feet of small pipe in-containment was identified in late 1975. FFTF Project officials told us that the reason for the 8,000-linear-feet increase this late in the construction program is that the small pipe orders were initially based upon a preliminary design specification which had underestimated the in-containment requirements. According to Project officials, the 8,000-linear feet underestimate was not recognized until the small pipe detailed designs were completed.

Because of this large (26 percent) quantity increase, the target of 20-percent completion was rescheduled to April 1976. This milestone was surpassed with 27 percent of the installation completed in April. As of the end of June 1976, installation of this small piping was slightly behind schedule due to the strike (see pp. 19 and 20) with 27 percent of the installation completed versus 29.6 percent planned.

Sodium piping and valves

Initially, work in the Sodium Piping and Valve Cell (cell 576) had a projected completion date of December 1976. However, in February 1976, the FFTF contractor reported that cell 576 work was about 8 months behind schedule due to late deliveries of pipe, valves, pipe hangers, and late release and delivery of certain designs. The contractor further reported that this delay could slip FFTF construction completion 2 months and that significant improvements must be realized in deliveries of such materials as valves and hangers to prevent further schedule slippages.

FFTF project officials told us that the milestone for completing work in cell 576 has now been rescheduled 8 months later to August 1977. They further said they believe this revision, as in the case of the in-containment small pipe, will not delay FFTF completion.

Other FFTF uncertainties

In January 1976, ERDA officials identified several significant areas of remaining uncertainty in FFTF, which could delay its completion. These areas are centered around safety issues, construction, and acceptance testing and startup. In addition, the recent work stoppage could delay completion of FFTF.

Safety issues

The resolution of several unresolved safety questions--notably in the areas of emergency power, natural sodium circulation, and tornado hardening--could result in design changes that would extend FFTF construction schedule. FFTF Project officials believe that these safety questions can be resolved by March 1978 because the Final Safety Analysis Report was submitted to the Nuclear Regulatory Commission in March 1976, some 2-1/2 years prior to initial criticality thereby providing ample time to work out any residual safety questions. Nevertheless, if design changes are required, they could further delay scheduled completion.

Construction

As FFTF nears the point where construction space is limited, the extent that predicted installation rates can be achieved and sustained is unknown. As shown above, milestone dates for some installation rates have already been rescheduled. ERDA believes that the availability of trained craftsmen, such as welders, will also be a problem.

Acceptance testing and startup

The complex and developmental nature of FFTF will make testing and startup difficult and time consuming, and thus could delay project completion.

Strike by plumbers and steamfitters

As discussed on page 19, the FFTF project has recently been affected by two strikes, with the one by a local of the plumbers and steamfitters union still underway in mid-September 1976. This strike has a potential for a serious effect on both FFTF cost and schedule.

ADMINISTRATOR'S DEPLOYMENT DECISION

In a July 31, 1975, issue paper to the Congress entitled "The Liquid Metal Fast Breeder Reactor: Promises and Uncertainties," we suggested that ERDA make a firm decision within the next 7 to 10 years as to whether the Nation should commit itself to the LMFBR as a basic central energy source. In announcing his findings in December 1975, on the Final Environmental Statement on the LMFBR Program, the ERDA Administrator determined that a continued strong research effort in the LMFBR Program--including FFTF and supporting programs--would provide sufficient data by 1986 to enable him to determine the acceptability of widespread commercial deployment of LMFBRs. He further determined that, to be meaningful, this decision must be made before any commitment to widespread deployment becomes irreversible.

The Administrator emphasized the availability of the necessary decisional information by 1986 requires the successful and timely completion of interrelated and parallel efforts in such areas of uncertainty as plant operation, fuel cycle performance, reactor safety, safeguards, health effects, waste management, and uranium resource availability. The fuels and material testing conducted in FFTF, as well as the acquisition of experience in the design, development, and construction of this liquid metal reactor facility will assist the Administrator in making the 1986 decision.

Although project officials feel confident FFTF will be completed by August 1978, the possibility of additional delays is evident. Severe construction delays, of a year or longer according to ERDA officials, and testing problems could result in postponing the 1986 decision.

CHAPTER 5

STATUS OF PROBLEMS WITH

MAJOR HEAT TRANSPORT SYSTEM COMPONENTS

The FFTF Project has had a history of technical problems with major components of the heat transport system. At the time of our review, FFTF project and contractor officials were working on resolving certain problems which, if not resolved, could affect performance requirements or the August 1978 construction completion date.

The heat transport system is essential to the operation of FFTF because it removes heat from the reactor core during normal and emergency operating conditions. The system uses three independent, parallel cooling circuits, each of which is made up of (1) a radioactive primary sodium piping loop; (2) a nonradioactive secondary sodium piping loop, and (3) air-cooled dump heat exchangers. 1/

Each cooling circuit has the following major components:

1. A primary sodium pump.

2. An intermediate heat exchanger.

3. A secondary sodium pump.

4. Four dump heat exchangers (DHXs).

The flow process for one of the three identical heat transport system cooling circuits is illustrated in figure 2.

Problems to be resolved involve the primary and secondary pumps and the DHXs. FFTF project officials are confident that these problems have been resolved, but work is still being done to verify that planned fixes actually work. Until the verifications are completed, some uncertainty exists as to whether the problems have been completely resolved. The problems and proposed solutions are discussed below.

1/Components used to discharge the heat generated in the reactor to the atmosphere.

FFTF HEAT TRANSPORT SYSTEM
(ONE LOOP OF THREE)

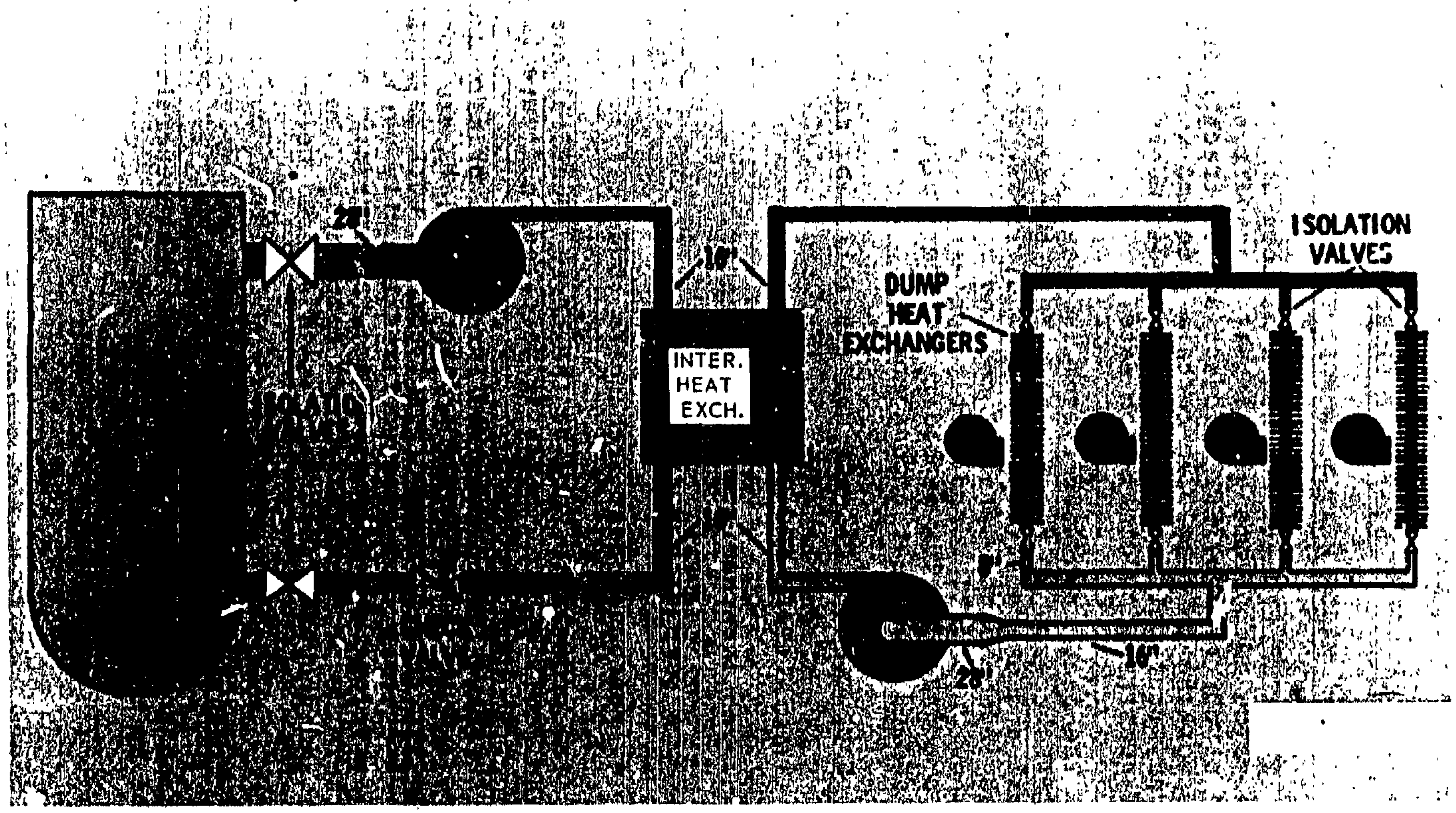


FIGURE 2

STATUS OF PROBLEMS
EXPERIENCED ON PUMPS

The FFTF primary and secondary pumps are an extension of the state of the art because they have to operate in a considerably hotter sodium environment than experienced by previous pumps. Also, the pumps are generally larger, their speeds higher, and their high temperature structural design requirements more rigorous than previous pumps.

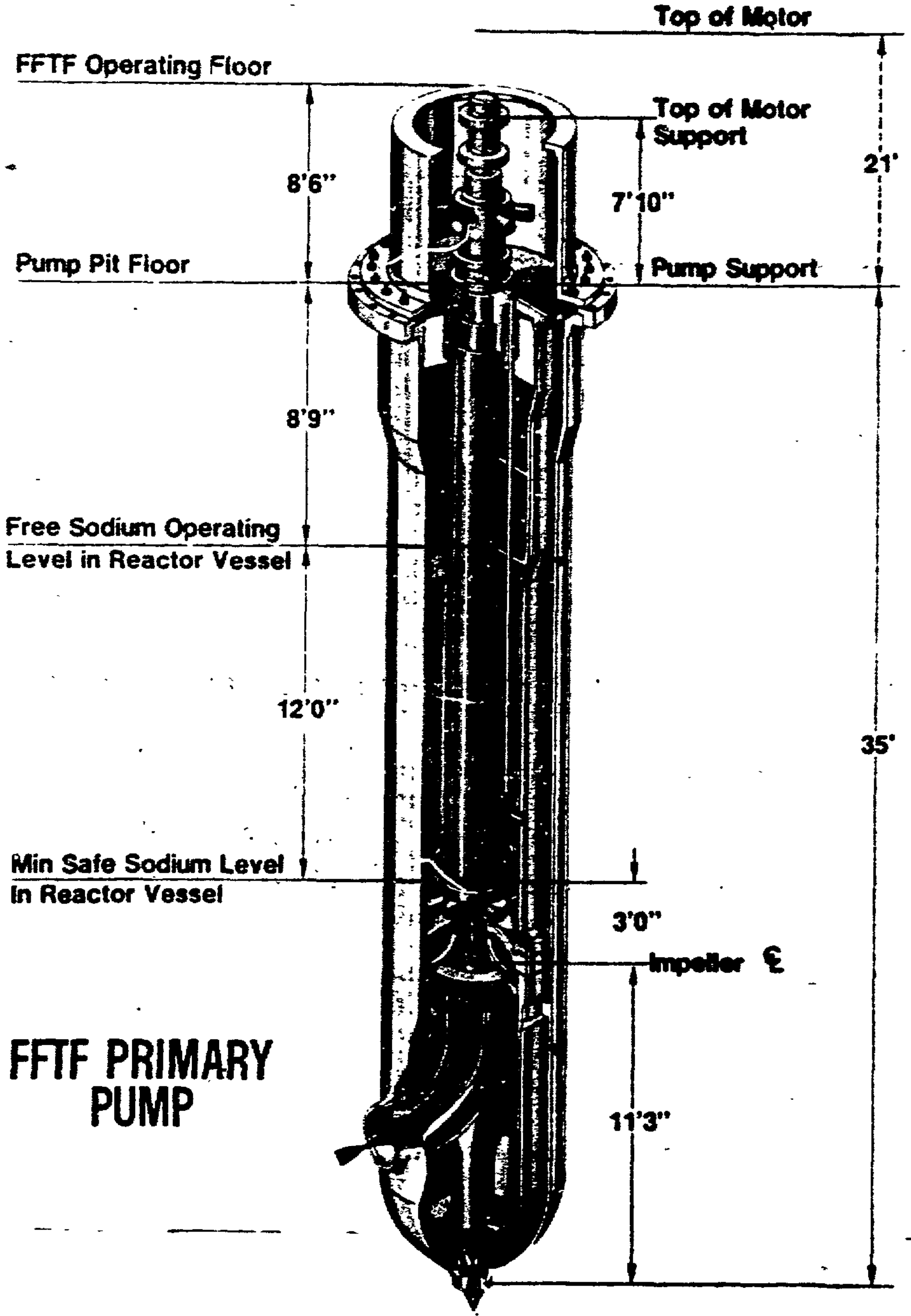
There are three primary and three secondary pumps, and a prototype primary pump which, after being tested in sodium, will serve as a spare. The primary pump (see fig. 3) is about 56 feet high (including the motor) and 7 feet in diameter. The secondary pump is shorter, about 42 feet high and 7 feet in diameter. Both types of pumps are designed to pump 14,500 gallons of sodium per minute. Figure 4 shows one of the primary pumps, less the motor, being installed in FFTF. Each pump has been tested in water and the prototype pump is also being tested in hot sodium, at ERDA's Liquid Metal Engineering Center in California, to assure that the pump designs are reliable for FFTF in-plant service.

When the prototype pump was operated in sodium at about 970 rpm, a whistling noise was detected which led to a diagnostic effort to determine its cause and effects. A similar noise was found during water testing of the number three secondary pump and diagnostic testing has also been done with that pump.

The cause--a vibration of a part of the pump's impeller initiated by sodium flow through a tight clearance between the impeller and the stationary part of the pump--and possible fixes of the whistling noises were identified in May 1976. Design changes on the number three secondary pump were made in June 1976. The unit was retested in water, which showed that the fix had eliminated the problem. The design changes are also being made on the prototype and other plant unit pumps.

The prototype pump had been operated for a considerable time in sodium and there was no indication of pump damage associated with the noise. The prototype pump has also been operated at the FFTF design temperature of 1,050° F in sodium with acceptable hydraulic and mechanical performance.

The three primary pumps have been water tested at the manufacturer's plant. The first two were considered to be acceptable for plant service and were shipped to the FFTF site, where they were assembled and installed. The third pump exhibited undesirable shaft displacements in the bearing,



Top of Motor
FFTF Operating Floor
Top of Motor Support
21'
8'6"
7'10"
Pump Pit Floor
Pump Support
8'9"
Free Sodium Operating Level in Reactor Vessel
12'0"
35'
Min Safe Sodium Level In Reactor Vessel
3'0"
Impeller ℄
FFTF PRIMARY PUMP
11'3"

FIGURE 3

FIGURE 4 – PRIMARY PUMP BEING INSTALLED IN FFTF

apparently caused by the pump shaft being slightly thicker on one side than the other. The shaft was rebalanced in June 1976 and the pump was retested in a water loop during July 1976. This water testing showed that the rebalancing solved the problem.

FFTF project and contractor officials decided to remove the number one pump from FFTF and have its shaft rebalanced. This was done in July 1976. The number two primary pump, the prototype pump, and the secondary pumps had no shaft imbalances.

In late July 1976 another problem occurred during testing of the primary prototype pump. The lower bearing of the pump failed during severe test conditions. The pump was disassembled and examined. As a result, changes to the pump were being considered and may be implemented prior to retest in mid-November. Whether these changes will be incorporated on the plant pumps is being evaluated. According to ERDA, it is not expected that resolution of this problem will have any significant effect on the cost or schedule of FFTF, although there is a potential for such.

FFTF project and contractor officials are confident that the various pump problems now identified will be resolved in time to meet the targeted FFTF construction completion date of August 1978. Testing of the prototype primary pump in sodium, however, will not be completed until about the end of 1976. To the extent that additional problems are disclosed that cannot be easily resolved, any required modifications could delay the construction completion date and increase the project's cost.

STATUS OF DUMP HEAT EXCHANGER PERFORMANCE PROBLEM

The FFTF dump heat exchanger is a sodium-to-air heat exchanger used to discharge reactor heat to the atmosphere. There are 12 DHX modules, each designed to discharge 33.8 megawatts of thermal energy at minimum design core inlet temperature conditions (600° F), with a maximum outside air temperature of 90° F. Of the 12 modules, 11 have been installed, and the 12th (the prototype unit) was scheduled for installation starting in June 1976. (See fig. 5 for a diagram of a DHX module.)

When the prototype DHX module was being tested at the Liquid Metal Engineering Center in June 1975, the heat discharge performance capability was found to be only 24.5 megawatts, or 27 percent less than design requirements. A

HTS DHX MODULE

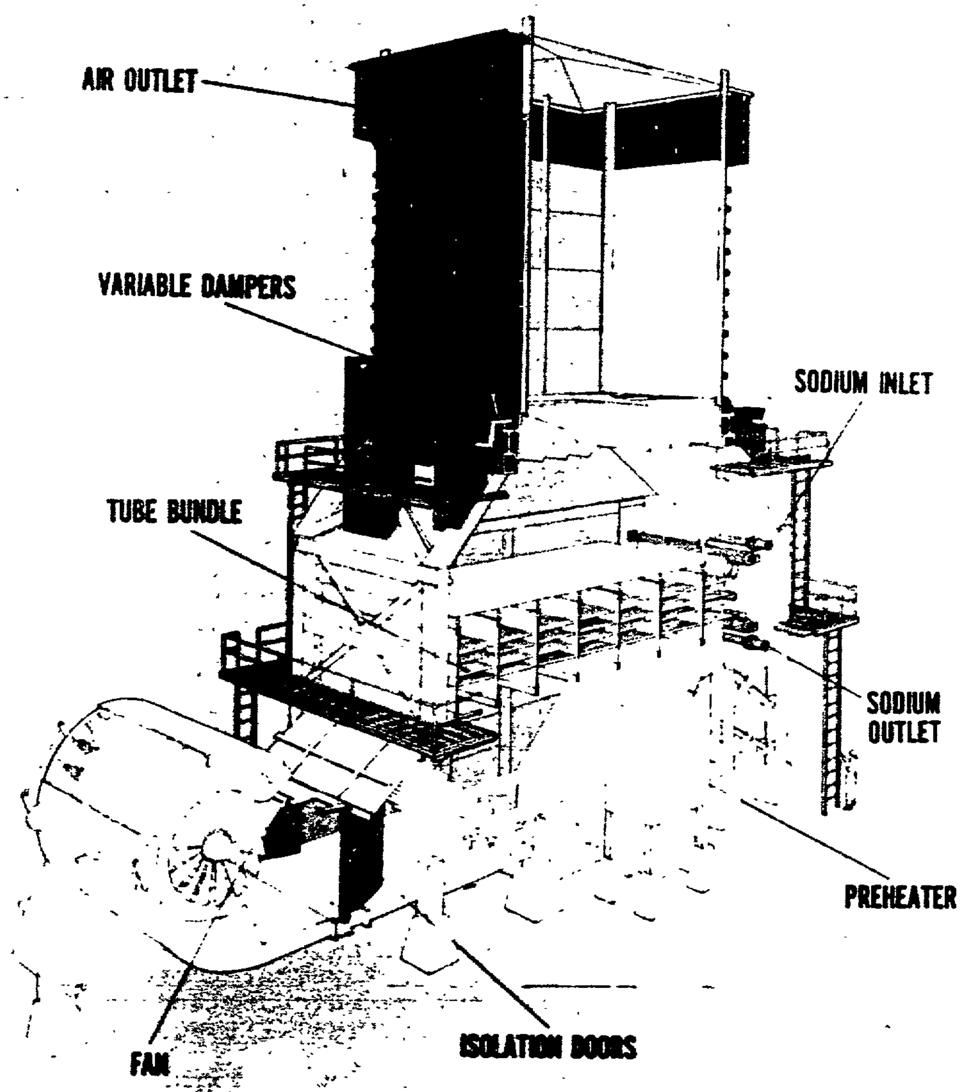


FIGURE 5

design and testing effort was initiated to study the DHX performance problem and to develop methods for improving the heat discharge capability.

Two potential solutions have been identified, which FFTF project and contractor officials feel confident will solve the performance degradation problem. These are: an extended fin concept and a combination of tapes, bypass baffles, and new fans and motors. The latter fix is not currently being pursued because of the high costs involved.

The extended fin concept would require replacing the bottom tube row of each DHX unit with tubes having enlarged, braized-on fins. (See fig. 6 for a picture of a DHX tube bundle.) This concept will be tested in a sodium loop to evaluate its performance. The calculated performance for the DHX with the replacement tube row is 34.9 megawatts at 600° F core inlet conditions. This is slightly above design requirements. This fix is estimated to cost about $3.2 million to develop and implement, which is within the $4 million being reserved from the contingency fund to complete the DHX modification program.

Along with the design and testing efforts to improve performance, studies are being conducted to define FFTF operating conditions which closely match those anticipated for such follow-on LMFBRs as the Clinch River Breeder Reactor and the Prototype Large Breeder Reactor. Contractor officials have recommended an FFTF operating condition with a core inlet temperature of 680° F. According to FFTF project officials, at a 680° F core inlet temperature, the DHX could meet the necessary heat discharge requirements with only bypass baffles installed and the fan operating at 115 percent of rated conditions. Thus the installation of redesigned lower tubes would be deferred until an assessment of the experimental need for FFTF to operate at the originally designed 600° F inlet condition is completed.

FFTF project and contractor officials are confident that the heat discharge performance problem on the DHX will be solved and that any modifications can be made prior to the currently estimated construction completion date. Until testing of the final design is completed, however, there is still a possibility that the fix will not be adequate and that a more costly and time consuming alternative will have to be found.

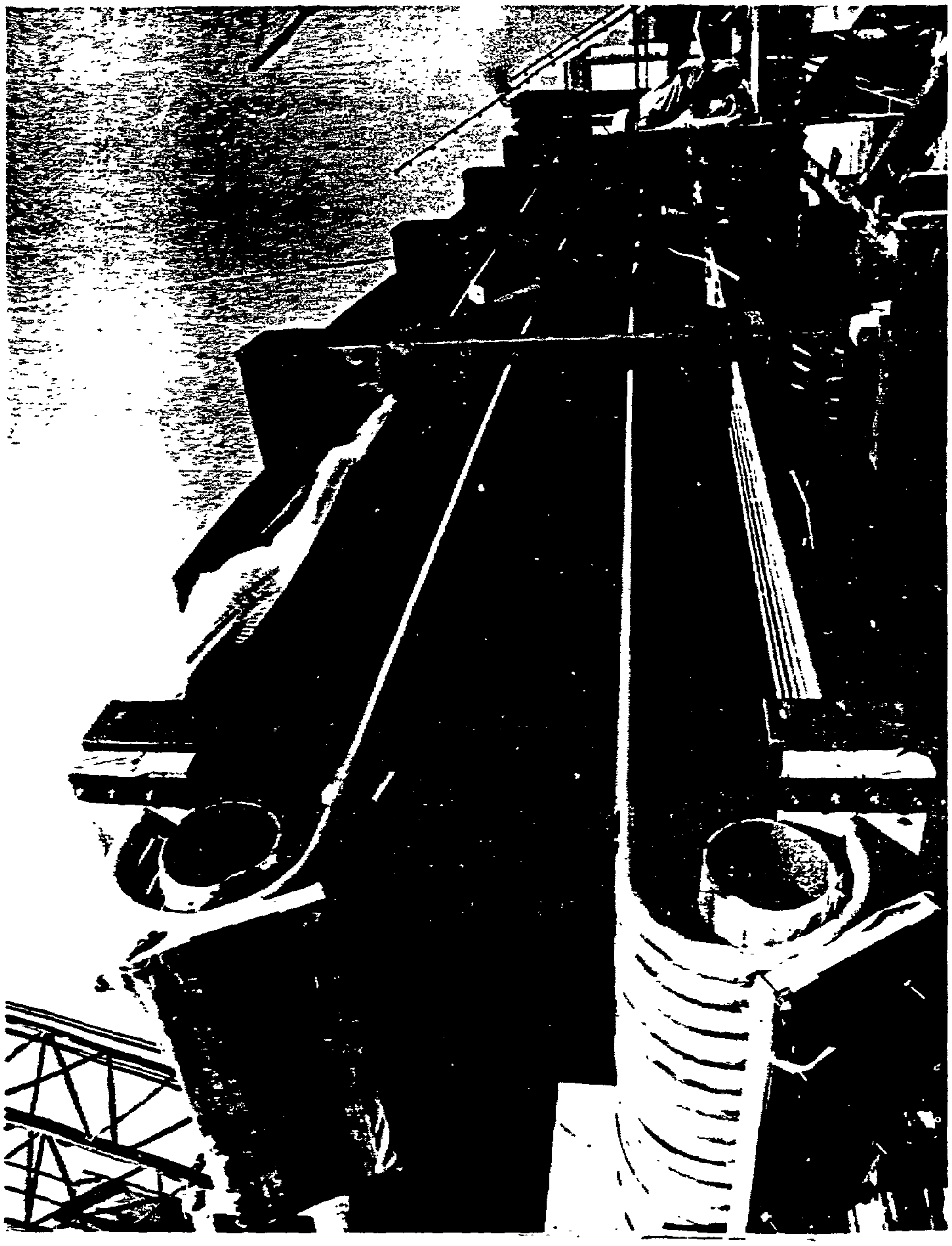


FIGURE 6 — DHX TEST BUNDLE

UNITED STATES
ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION
WASHINGTON, D.C. 20545

SEP 29 1976

Mr. Monte Canfield, Jr., Director
Energy and Minerals Division
U.S. General Accounting Office
Washington, DC 20548

Dear Mr. Canfield:

We appreciate the opportunity to review the GAO draft report entitled, "Evaluation of the Status of Fast Flux Test Facility Construction and Test Planning Efforts." We have reviewed the draft with members of your staff and we understand that a number of changes and clarifications which we suggested will be made. We are, however, very much concerned that we will not be given an opportunity to review the specific wording of these changes before the report is issued in final form. Under the circumstances, we find it difficult to provide you definitive all-inclusive comments. Nevertheless, there are several substantive matters which we would like to comment upon in the interest of making the report a more objective, meaningful document.

One major concern with the draft report is the Digest. In view of the statement on page 2 of the report that the present report extends the coverage of GAO's review from June 1974 (the cut-off date of a previous GAO report) through April 1976, one would expect the Digest to contain a summary of FFTF activities during those two years; yet, not a single reference is made to that period. Significant events highlighting this period included the setting of the reactor vessel head, the completing of the pressure test of the primary heat transport system loop and reactor vessel, the submittal of the Final Safety Analysis Report to Nuclear Regulatory Commission (NRC) and the completion of Title II Design (final detailed design). Instead, GAO has used the bulk of the report to review the findings of the previous report. Clarification of GAO's findings in that earlier report was covered in a November 18, 1974 letter from AEC to GAO and it should not be necessary to again discuss those findings. We strongly suggest that the Digest be rewritten to reflect the stated purpose and scope of this report, i.e., June 1974 through April 1976, and our comments on the report findings during that period.

In addition to the above concern, we feel that the following major issues in the report require a statement of the ERDA position so that

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Mr. Monte Canfield, Jr.

readers of the report can obtain a balanced understanding of the issues and draw their own conclusions:

1. the distinction between FFTF Project costs and FFTF Program costs;

2. technical understanding of the primary purpose of closed loop fuel testing:

3. objection to GAO's position regarding the inclusion of the cost of other facilities in FFTF program costs: and,

4. disagreement with the unsupported GAO conclusion that costs of a first-of-a-kind project would be lower if designed and built on a sequential basis.

Our comments on these issues are enclosed: they do not represent the total editorial change necessary to implement suggested changes throughout the report. It is requested that GAO reflect these comments in the revised report and, if at all possible, provide us with an advance copy of the revised report for our review.

Sincerely,

M. C. Greer
Controller

[See GAO note.]

GAO note: In finalizing this report, we considered ERDA's comments and made changes or included ERDA's views in the text of the report where we considered it appropriate.

PRINCIPAL OFFICIALS

RESPONSIBLE FOR ADMINISTERING ACTIVITIES

DISCUSSED IN THIS REPORT

	Tenure of office			
	From		To	
ATOMIC ENERGY COMMISSION				
CHAIRMAN:				
Dixy Lee Ray	Feb.	1973	Jan.	1975
James R. Schlesinger	Aug.	1971	Feb.	1973
Glenn T. Seaborg	Mar.	1961	Aug.	1971
GENERAL MANAGER:				
Robert D. Thorne (acting)	Jan.	1975	Jan.	1975
John A. Erlewine	Jan.	1974	Dec.	1974
Robert E. Hollingsworth	Aug.	1964	Jan.	1974
ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION				
ADMINISTRATOR:				
Robert C. Seamans, Jr.	Jan.	1975	Present	
ASSISTANT ADMINISTRATOR FOR NUCLEAR ENERGY:				
Richard W. Roberts	June	1975	Present	
Robert D. Thorne (acting deputy)	Jan.	1975	June	1975