DEPARTMENT OF ENERGY
FY 1994 CONGRESSIONAL BUDGET REQUEST
ENERGY SUPPLY, RESEARCH AND DEVELOPMENT

OVERVIEW

ADVANCED NEUTRON SOURCE (ANS)

Neutrons are extremely useful to study the structure and dynamics of materials, to produce certain isotopes, to understand radiation effects, and for other research. Because they are uncharged, neutrons can penetrate deeply into materials, and interact with the nuclei of atoms; thus, they afford a unique capability to study materials. From neutron scattering experiments, it is possible to obtain detailed information on a microscopic scale of the position of atoms in a material, and the manner in which these atoms move as the result of thermal excitations. Because the neutron possesses a magnetic moment, the location of atomic-scale magnetic moments can be obtained. The structural and magnetic information thus obtained by neutron experiments is essential to the understanding of materials and has been instrumental in the creation of new materials. Of particular importance is the impact made by neutron research on polymers and biological materials. The use of neutron scattering to investigate the microscopic characteristics and structures of polymers has increased exponentially in the past decade, and this trend continues at the present time. Neutrons, by virtue of their capability to determine accurately the position of hydrogen in macromolecular structures, provide unique methods to study the structure and function of, for example, receptor molecules in biological systems. These latter studies are, in turn, vital to the understanding of disease and human genetics. Neutrons are also needed to make transuranic and other isotopes which find important uses in such diverse areas as medical applications, aircraft radiography, residual stress analysis, the study of impurities and dopants in semiconductors, and the inspection of a variety of components of industrial equipment. Neutrons are also used for irradiation studies of materials for fusion and fission reactors, materials analysis, and nondestructive evaluation of materials.

Over the past two decades, a considerable erosion in the strength of the U.S. neutron capability has occurred relative to other industrialized countries. The two major U.S. high-flux reactors, the High Flux Beam Reactor at Brookhaven National Laboratory and the High Flux Isotope Reactor at Oak Ridge National Laboratory, were both constructed in the 1960's. The High Flux Beam Reactor was optimized for neutron scattering. The High Flux Isotope Reactor was optimized for isotope production; however, it also provides several scattering beam lines and facilities for materials irradiation. Since the 1960's, no new high-flux beam research reactor has been constructed in the U.S. In Europe, the situation is different. Major reactor facilities were constructed in 1971 and 1980 in France, and in 1982 and 1991 in Germany.

The strategy for the development of new, advanced research reactor facilities which serve a broad scientific community in the investigation of the structure of matter resulted from an evaluation by the National Research Council's Major Materials Facilities Committee. In 1984, this Committee recommended an advanced steady-state neutron facility. This recommendation was reaffirmed in 1985 by the Energy Research Advisory Board; in 1987 by the National Research Council's Physics Review Panel, the Energy Research Advisory Board's Physics Review Panel, and the Basic Energy Sciences Advisory Committee; in 1989 by the National Research Council's Materials Science and Engineering Committee; and in 1990 again by the Basic Energy Sciences Advisory Committee. More recently in 1993, the Basic Energy Sciences Advisory Committee's Panel on Neutron Sources provided the following recommendation:

"Recommendation 1: Complete the design and construction of the Advanced Neutron Source according to the schedule proposed by the project."

The Office of Energy Research currently supports a number of major user facilities, including the High Flux Isotope Reactor and the High Flux Beam Reactor, which provide neutrons for research. Both of these reactors were built in the 1960's and will approach the end of their useful lifetimes probably in the next decade. The Advanced Neutron Source would replace both reactors, provide increased research capability, and provide increased assurance of worker and public safety. The Advanced Neutron Source is an experimental facility designed to meet the Nation's need for an intense steady-state source of neutrons, as described above. The facility will be based on a new research reactor that will have the

most intense neutron beams in the world, exceeding its closest competitor by a factor of 5 to 10. The Advanced Neutron Source will be designed to meet the programmatic needs of the Department of Energy in condensed matter physics, chemistry, the biological sciences, materials science, polymer science, isotope production, and materials irradiation. In addition, it will function as a national facility open to researchers from universities, national laboratories, and industry. Based on the experience in Europe, it is anticipated that the Advanced Neutron Source will serve over 1,000 researchers per year.

The requested construction funds for ANS, $26,000,000 in FY 1994 and $1,242,865 over the next 5 years, are part of the President's Investment proposal.

DEPARTMENT OF ENERGY
FY 1994 CONGRESSIONAL BUDGET REQUEST
ENERGY SUPPLY RESEARCH AND DEVELOPMENT
(Tabular dollars in thousands. Narrative in whole dollars).

LEAD TABLE

Advanced Neutron Source

Activity	FY 1992 Adjusted a/	FY 1993 Appropriation a/	FY 1993 Adjustment	FY 1994 Request
Operating Expenses	$0	$0	$0	$12,000
Capital Equipment	0	0	0	1000
Construction	0	0	0	26,000
Total	$0	$0	$0	$39,000
Summary				
Operating Expenses	0	0	0	12,000
Capital Equipment	0	0	0	1,000
Construction	0	0	0	26,000
Total Program	$0	$0	$0	$39,000
Staffing (FTE's)	(Included in Basic Energy Sciences Program Direction)			

Authorization: Section 209, P.L. 95–91

a/ ANS is budgeted as part of the Basic Energy Sciences program in FY 1992 and FY 1993 ($24,095,000 in FY 1992 and $21,419,000 in FY 1993).

DEPARTMENT OF ENERGY
FY 1994 CONGRESSIONAL BUDGET REQUEST
ENERGY SUPPLY RESEARCH AND DEVELOPMENT
(dollars in thousands)

SUMMARY OF CHANGES

Advanced Neutron Source

FY 1993 Appropriation	$ 0
- Adjustments	0
FY 1993 Adjusted	0
Operating Expenses	+ 12,000

Provides research and development to further develop the design and provide the technical foundation for the Advanced Neutron Source.

Capital Equipment	+ 1,000

Provides funds for equipment associated with the Reactor Component Test Facility and the Safety Test Facility.

Construction	+ 26,000

Provides funds to begin Title I design of the Advanced Neutron Source.

FY 1994 Congressional Budget Request	$ 39,000

DEPARTMENT OF ENERGY
FY 1994 CONGRESSIONAL BUDGET REQUEST
ENERGY SUPPLY, RESEARCH AND DEVELOPMENT
(dollars in thousands)

KEY ACTIVITY SUMMARY

ADVANCED NEUTRON SOURCE (ANS)

I. Preface: Advanced Neutron Source, Research, Development and Operations

The Advanced Neutron Source Research and Development (R&D) Program provides support for research and development to further the design and provide the technical foundation for the ANS and its technical systems. The program currently has a strong focus on the design, fabrication, and testing of the fuel elements for the reactor. Also included are corrosion testing and analyses of potential fuel elements, the neutronic and thermal hydraulic design of the reactor core, and reactor kinetics studies. Specific experiments will be carried out such as the irradiation of aluminum in the High Flux Isotope Reactor and the development of a materials data base for reactor system components. Continued modelling and testing of components and concepts for sources of cold (long wavelength) neutron beams will be undertaken. Efforts to refine designs and concepts for scientific instruments and beam guides will be continued. Shielding calculations, design of reactor protection systems and sensor development will be carried out. Various activities such as thermal hydraulics testing, material certification, and flow blockage to support the safety analysis will be carried out.

This budget includes $12,000,000 in FY 1994 in support of Advanced Materials and Processing FCCSET activities.

II. A. Summary Table: Advanced Neutron Source, Research, Development and Operations

Program Activity	FY 1992 Enacted	FY 1993 Enacted	FY 1994 Request	% Change
Advanced Neutron Source, Research, Development and Operations	$ 0	$ 0	$ 12,000	>999
Total, Advanced Neutron Source, Research, Development and Operations	$ 0	$ 0	$ 12,000	>999

II. B. Major Laboratory and Facility Funding

OAK RIDGE NATIONAL LABORATORY	$ 0	$ 0	$ 12,000	>999

III. Activity Descriptions: (Budget Obligations in thousands of dollars)

Program Activity	FY 1992	FY 1993	FY 1994
Advanced Neutron Source, Research, Development and Operations	This activity was funded in the Basic Energy Sciences program.	This activity is funded in the Basic Energy Sciences program.	The FY 1994 Research and Development (R&D) Program will be a continuation of designs, tests and modelling of ANS components in order to provide further results before the ANS goes into physical construction. Activities in FY 1994 will include fuel element R&D such as the irradiation of the second miniplate in the reflector region of the High Flux Isotope Reactor facility. Upper and lower fuel elements without uranium in fuel plates will be fabricated for use in core flow tests. The fabrication of fuel elements for use in ANS critical experiments will begin. Cold source tests will be performed. Dynamic tests of some reactor core elements, the control rods, and the reflector shutdown rods will be carried out. A study will be undertaken to examine the impact on the ANS performance goals if low or medium-enriched fuel is used rather than the highly enriched fuel used for the design. The study will build on existing information using currently developed fuels and focus on low (20%) and medium (35%) enriched fuel. Continue work on Environmental Impact Statement.
	$ 0	$ 0	$ 12,000
Advanced Neutron Source, Research, Development and Operations	$ 0	$ 0	$ 12,000

DEPARTMENT OF ENERGY
FY 1994 CONGRESSIONAL BUDGET REQUEST
ENERGY SUPPLY, RESEARCH AND DEVELOPMENT
(dollars in thousands)

KEY ACTIVITY SUMMARY

ADVANCED NEUTRON SOURCE (ANS)

I. Preface: Capital Equipment

The ANS has specific capital equipment requirements in support of the research and development efforts on the many technical system components and for the engineering design of scientific instruments and systems which will exploit these neutron beams. Included are equipment to support control rod element testing and evaluation, the design and cold source component and loop tests, natural circulation test, transient low flow testing, and reactor component tests.

II. A. Summary Table: Capital Equipment

Program Activity	FY 1992 Enacted	FY 1993 Enacted	FY 1994 Request	% Change
Capital Equipment	$ 0	$ 0	$ 1,000	>999
Total, Capital Equipment	$ 0	$ 0	$ 1,000	>999

II. B. Major Laboratory and Facility Funding

OAK RIDGE NATIONAL LABORATORY	$ 0	$ 0	$ 1,000	>999

III. Activity Descriptions: (Budget Obligations in thousands of dollars)

Program Activity	FY 1992	FY 1993	FY 1994
Capital Equipment	This activity was funded in the Basic Energy Sciences program.	This activity is funded in the Basic Energy Sciences program.	Funds are being provided for equipment associated with the Reactor Component Test Facility and the Safety Test Facility.
	$ 0	$ 0	$ 1,000
Capital Equipment	$ 0	$ 0	$ 1,000

DEPARTMENT OF ENERGY
FY 1994 CONGRESSIONAL BUDGET REQUEST
ENERGY SUPPLY, RESEARCH AND DEVELOPMENT
(dollars in thousands)

KEY ACTIVITY SUMMARY

ADVANCED NEUTRON SOURCE (ANS)

I. Preface: Construction

The Advanced Neutron Source will be a new reactor facility planned to meet national experimental needs for an intense, steady-state source of neutrons. It will be open for use by scientists from universities, industry, and other Federal laboratories. The Advanced Neutron Source research complex will be built around a new reactor with a fission power of approximately 330 megawatt.

A heavy-water cooled and moderated system using highly enriched uranium fuel is required to maximize performance. Alternative cores with enrichment levels of 20% and 35% will be examined for their impact on performance levels. The core is comprised of two right circular cylindrical elements which are coaxially aligned, separated on the vertical axis, and offset in radius such that unheated coolant enters each element. The core volume is approximately 67 liters. The core is positioned in a replaceable core pressure boundary tube which constitutes a section of the primary coolant loop piping. Surrounding the core pressure boundary tube is a reflector tank of heavy water, approximately 3 meters in diameter, which serves as a neutron reflector and moderator for the reactor and experimental systems. Materials irradiation and transuranic production targets are located inside the core pressure boundary tube near the core while beam tubes and other irradiation facilities are located in the reflector tank. For further moderation of neutrons to very low energies, the reflector tank will also contain two "cold sources." Each cold source is a helium-cooled cryostat containing a liquid deuterium moderator and serves as a source of cold neutrons.

There are four major buildings planned for the Advanced Neutron Source complex. The central structure is an approximately 60-meter-diameter cylindrical, domed reactor containment building. This building houses the reactor itself, with the first floor dedicated to beam and irradiation experiments, the second floor divided between experimental facilities and reactor operations, and a high bay floor dedicated to reactor operations. Adjacent to the reactor building is a reactor support building. This structure houses other large reactor equipment and the general support equipment which need not be located in the reactor building. Also connected to the reactor building is the guide hall. This structure, outside of reactor containment, is dedicated to beam experiments and will be equipped with an initial complement of advanced instruments for neutron scattering. The fourth building in the complex is an office building, serving both the extensive user community and the reactor operations staff. A number of state-of-the-art experimental systems will be provided to make use of the intense neutron beams from the Advanced Neutron Source. These would include beam transport systems, monochrometers, sample chambers, detectors, and the necessary electronics.

This budget includes $26,000,000 in FY 1994 in support of Advanced Materials and Processing FCCSET activities.

II. A. Summary Table: Construction

Program Activity	FY 1992 Enacted	FY 1993 Enacted	FY 1994 Request	% Change
Construction	$ 0	$ 0	$ 26,000	>999
Total, Construction	$ 0	$ 0	$ 26,000	>999

II. B. Major Laboratory and Facility Funding

	FY 1992 Enacted	FY 1993 Enacted	FY 1994 Request	% Change
OAK RIDGE NATIONAL LABORATORY	$ 0	$ 0	$ 26,000	>999

III. Activity Descriptions: (Budget Obligations in thousands of dollars)

Program Activity	FY 1992	FY 1993	FY 1994
Construction	No activity.	No activity.	Provides necessary funds to begin Title I design of the Advanced Neutron Source (ANS). Funding for this project is part of the President's Investment proposal.
	$ 0	$ 0	$ 26,000
Construction	$ 0	$ 0	$ 26,000

IV. A. Construction Project Summary

Project No.	Project Title	Previous Obligations	FY 1993 Appropriated	FY 1994 Request	Unappropriated Balance	TEC
94-E-308	Advanced Neutron Source	$ 0	$ 0	$ 26,000	$ 2,113,329	$ 2,139,329
	Total, Advanced Neutron Source	$ 0	$ 0	$ 26,000	$ 2,113,329	XXX

IV. B. Construction Funded Project Descriptive Summary

1. Project Title and Location: Project 94-E-308 Advanced Neutron Source
Oak Ridge National Laboratory
Oak Ridge, Tennessee

TEC: $2,139,329
TPC: $2,748,900

Start Date: 1st Qtr. FY 1996 Completion Date: 4th Qtr. FY 2002

2. Financial Schedule (Federal Funds):

Fiscal Year	Appropriated	Obligations	Costs
1994	$ 26,000	$ 26,000	$ 26,000
1995	88,616	88,616	67,415
1996	168,532	168,532	124,829
1997	359,473	359,473	249,945
1998	600,244	600,244	507,683
1999	472,757	472,757	555,762
2000	257,174	257,174	387,407
2001	146,130	146,130	189,087
2002	20,403	20,403	31,201

3. Narrative: The Advanced Neutron Source will be a new reactor facility planned to meet national experimental needs for an intense, steady-state source of neutrons. It will be open for use by scientists from universities, industry, and other Federal laboratories. The Advanced Neutron Source research complex will be built around a new reactor with a fission power of approximately 330 megawatt.

There are four major buildings for the Advanced Neutron Source complex. The central structure is an approximately 60-meter-diameter cylindrical, domed reactor containment building. This building houses the reactor itself, with the first floor dedicated to beam and irradiation experiments, the second floor divided between experimental facilities and reactor operations, and a high bay floor dedicated to reactor operations. Adjacent to the reactor building is a reactor support building. This structure houses other large reactor equipment and the general support equipment which need not be located in the reactor building. Also connected to the reactor building is the guide hall. This structure, outside of reactor containment, is dedicated to beam experiments and will be equipped with an initial complement of advanced instruments for neutron scattering. The fourth building in the complex is an office building, serving both the extensive user community and the reactor operations staff. A number of state-of-the-art experimental systems will be provided to make use of the intense neutron beams from the Advanced Neutron Source. These would include beam transport systems, monochrometers, sample chambers, detectors, and the necessary electronics.

4. Total Project Funding (BA):

	Prior Years	FY 1992	FY 1993	FY 1994 Request	To Complete
Construction	$ 0	$ 0	$ 0	$ 26,000	$ 2,113,329
Capital Equipment	3,500	1,000	860	1,000	22,589
Operating Expenses	37,281	23,095	20,559	12,000	487,687

DEPARTMENT OF ENERGY
FY 1994 CONGRESSIONAL BUDGET REQUEST

ENERGY SUPPLY RESEARCH AND DEVELOPMENT
(Tabular dollars in thousands. Narrative material in whole dollars.)

Basic Energy Sciences 1/

1. Title and Location of Project: Advanced Neutron Source (ANS)
Oak Ridge National Laboratory (ORNL)
Oak Ridge, Tennessee

2a. Project No. 94-E-308
2b. Construction Funded

3a. Date A-E Work Initiated, (Title I Design Start Scheduled): 1st Qtr. FY 1994

3b. A-E Work (Title I, II, III) Duration: 108 months

5. Previous Cost Estimate: None

4a. Date Physical Construction Starts: 1st Qtr. FY 1996

4b. Date Construction Ends. 4th Qtr. FY 2002

6. Current Cost Estimates:
TEC: $2,139,329
TPC: $2,748,900

7. Financial Schedule (Federal Funds):

Fiscal Year	Appropriations	Obligations	Costs
1994	26,000	26,000	26,000
1995	88,616	88,616	67,415
1996	168,532	168,532	124,829
1997	359,473	359,473	249,945
1998	600,244	600,244	507,683
1999	472,757	472,757	555,762
2000	257,174	257,174	387,407
2001	146,130	146,130	189,087
2002	20,403	20,403	31,201

1/ The Office of Energy Research is the sponsoring (funding) office while the Assistant Secretary for Nuclear Energy will be responsible for project management and execution.

1. Title and Location of Project:	Advanced Neutron Source (ANS) Oak Ridge National Laboratory (ORNL) Oak Ridge, Tennessee	2a. Project No. 94-E-308 2b. Construction Funded

8. Brief Physical Description of Project

The Advanced Neutron Source (ANS) is a new experimental facility planned to meet the national need for an intense, steady-state source of neutrons. It will be open to use by scientists from universities, from industry, and from other federal laboratories. The ANS will be equipped with an initial complement of instruments for neutron scattering and nuclear physics research, isotope production, and materials irradiation.

The facility will be built around a new research reactor of unprecedented flux that will have the most intense beams of steady-state neutrons in the world--a minimum of five to ten times higher than the current world leader at the Institute Laue-Langevin (ILL) in Grenoble, France. The higher source flux and improved instruments and detectors will create a useful neutron flux that is at least ten times and, for certain experiments, more than one hundred times, higher than is now available in the United States. When fully instrumented, there will be three times as many scattering instruments as there are at either of the present high-flux reactors so that the scientific output can be much more than 10 times greater than that at the High Flux Isotope Reactor (HFIR) at Oak Ridge and the High Flux Beam Reactor (HFBR) at Brookhaven together. The potential also exists for the development of entirely new lines of scientific research based on the advanced capabilities that will be available in the ANS.

In addition to meeting the DOE programmatic needs, this will be a national facility with an open user policy attractive to scientists from universities, other national laboratories, and industry. It is anticipated that the ANS would be used by approximately 1000 different individuals each year for neutron scattering experiments in solid state physics, chemistry, metallurgy, ceramics, polymers, colloids, biology, and nuclear physics. In addition, a wide community of isotope and materials irradiation users will also be supported both on-site and throughout the world.

The primary objectives in the design of the site and buildings for the ANS are to provide a protective containment structure for the reactor, to provide the optimal instruments for utilization of neutron beams and irradiation studies, and to address the mix of needs associated with the user community, the operations staff, security, contamination control, noise, etc.

1. Title and Location of Project:	Advanced Neutron Source (ANS) Oak Ridge National Laboratory (ORNL) Oak Ridge, Tennessee	2a. Project No. 94-E-308 2b. Construction Funded

8. Brief Physical Description of Project (Continued)

The objectives stated above are being met with a four major building concept. The central structure is an approximately 60 m (200 ft.) diameter cylindrical, domed, reactor containment building. This building houses the reactor itself, with lower floors dedicated to beam and irradiation experiments, and a high bay floor dedicated to reactor operations. The entire primary cooling circuits are located in cell banks in reactor containment. Adjacent to the containment building is a reactor support building. This structure houses other large reactor and general support equipment which need not be located in containment.

Also connected to the reactor dome is the guide hall. This structure, outside of reactor containment, is dedicated to cold neutron beam experiment use. The fourth building in this complex is an office building, serving both the extensive user community and the permanent staff. Other ancillary structures associated with facility operations will be located in proximity to the basic four building complex.

9. Purpose, Justification of Need for, and Scope of Project

All studies of U. S. facilities used for conducting research in neutron scattering and other fields of materials science have shown the facilities do not have state-of-the-art capabilities. The most significant studies supporting this finding were the Seitz/Eastman committee of the National Academy on Major Materials Facilities (1984) and the DOE Energy Research Advisory Board (1985). Both recommended an immediate start on development and design work for a new advanced steady state neutron source. More recently the Basic Energy Sciences Advisory Commission (BESAC) Panel on Neutron Sources concluded the ANS was the Panel's highest priority for rapid construction.

The purpose of the ANS project is to provide a research reactor with unsurpassed capability for scientific experiments. The ANS will provide for very greatly enhanced neutron scattering research in condensed matter physics, chemistry, biology, materials science, and polymer science. It will also replace and enhance the High Flux Isotope Reactor's capabilities for production of transuranium elements, for irradiation test facilities and abundant fast neutrons required for fusion reactor materials research and development.

If the ANS is not supported, the United States will not be capable of performing state-of-the-art research and will fall further behind the Europeans, whose existing reactors are superior to those in the U.S. Further, existing major U.S. reactors (HFIR, HBFR) are expected to be retired in the next decade. The specific impact for

1. Title and Location of Project:	Advanced Neutron Source (ANS) Oak Ridge National Laboratory (ORNL) Oak Ridge, Tennessee	2a. Project No. 94-E-308 2b. Construction Funded

9. Purpose, Justification of Need for, and Scope of Project (Continued)

not supporting this request is an increase in the likelihood that the U.S. will be without any of these research capabilities and will not be able to preserve a minimum level of U.S. competitiveness in the areas based on this important area of research.

The scope of this project is defined by the requirements for neutron flux and materials irradiation consistent with the recommendations contained in the studies mentioned earlier. This requires the design and construction of a new research reactor to meet the defined national need for an intense, steady-state source of neutrons.

10. Details of Cost Estimate

			Total Cost
a.	1. Engineering, design, and inspection at approx. 16.8% of construction costs, Item b.....		$223,578
	2. Construction management costs.....		205,676
b.	Construction costs:.....		1,327,670
	1. Land improvements.....	45,568	
	2. Building costs.....	43,739	
	3. Other structures.....	18,745	
	4. Special facilities.....	1,195,035	
	5. Outside utilities.....	24,583	
c.	Standard equipment.....		15,844
	Subtotal.....		1,772,768
d.	Contingency at approximately 20.7% of above costs.....		366,561
	Total line item cost.....		$2,139,329

1. Title and Location of Project:	Advanced Neutron Source (ANS) Oak Ridge National Laboratory (ORNL) Oak Ridge, Tennessee	2a. Project No. 94-E-308 2b. Construction Funded

11. Method of Performance

The ORNL Management and Operating Contractor will subcontract for the services of a Prime Contractor, teamed with an Architect-Engineer for the balance-of-plant, a Reactor Manufacturer for reactor systems, and a Construction Manager. To the extent feasible, construction and procurement will be accomplished by fixed-priced subcontracts awarded on the basis of competitive bidding.

12. Funding Schedule of Project Funding and Other Related Funding Requirements

	Prior Years	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	TOTAL
a. Total project funding											
1. Total facility costs											
(a) Line item (Sec. 10).	0	26,000	67,415	124,829	249,945	507,683	555,762	387,407	189,087	31,201	2,139,329
(b) Expense funded equipment											
(c) Inventories.....								a/			
Total direct cost...	0	26,000	67,415	124,829	249,945	507,683	555,762	387,407	189,087	31,201	2,139,329
2. Other project costs											
(a) R&D necessary to complete construction.....	36,200	12,000	26,056	27,725	27,402	16,825	8,766	5,511	2,040	200	162,725
(b) Conceptual design costs.....	44,673										44,673
(c) Other project related costs.....				3,613	12,327	21,381	29,563	58,845	100,651	146,782	373,162
(d) DOE site office support subcontracts.....	62										62
(e) Capital equipment not related to construction	5,360	1,000	5,572	4,016	3,849	3,397	2,734	1,971	426	624	28,949
Total other project Costs.....	$86,295	13,000	31,628	35,354	43,578	41,603	41,063	66,327	103,117	147,606	609,571
Total project cost (TPC)...	$86,295	39,000	99,043	160,183	293,523	549,286	596,825	453,734	292,204	178,807	2,748,900

a/ Value of Heavy Water (D_2O) (assumed to be supplied in this year from existing government stocks) not included.

1. Title and Location of Project:	Advanced Neutron Source (ANS) Oak Ridge National Laboratory (ORNL) Oak Ridge, Tennessee	2a. Project No. 94-E-308 2b. Construction Funded

12. Funding Schedule of Project Funding and Other Related Funding Requirements (Continued)

	TOTAL
b. Related annual funding (Estimated Life: 40 Years) a/	
1. Facility operating costs	$119,687
2. Programmatic operating expenses directly related to the facility	57,937
3. Capital equipment not related to construction but related to the programmatic effort in the facility	848
4. GPP or other construction related to the programmatic effort in the facility	0
5. Accelerator reactor improvement modifications (ARIM)	2,448
6. Other costs	0
Total related annual funding	$180,920 b/

a/ Estimated costs in thousands escalated to 2003-year dollars.

13. Narrative Explanation of Total Project Funding and Other Related Funding Requirements

a. Total project funding

1. Total facility costs

(a) Line item

The estimated costs for this data sheet are for providing Title I and II design, inspection and construction of the ANS facility.

(b) Expense funded equipment

No narrative required

b/ These costs will be offset by savings from closing down HFIR and HFBR. The annual operating costs of these facilities escalated to 2003 dollars is $72,500,000.

1. Title and Location of Project:	Advanced Neutron Source (ANS) Oak Ridge National Laboratory (ORNL) Oak Ridge, Tennessee	2a. Project No. 94-E-308 2b. Construction Funded

13. Narrative Explanation of Total Project Funding and Other Related Funding Requirements (Continued)

(c) Inventories

No narrative required

2. Other Project Costs

(a) R&D necessary to complete construction

A research and development program is needed to confirm several design bases related primarily to the reactor core performance, system control concepts, cold source designs, and neutron guides, beam tubes, and instruments. Several of these development tasks require long time durations to resolve detailed life cycle characteristics and the timely coupling of development results into the design is a major factor in detailed task planning. A detailed R&D plan has been prepared which defines each specific task and the interface requirements and timing relationships to the ANS project.

(b) Conceptual design costs

Costs are included for preparation of the conceptual design documentation and for one year of advanced conceptual design prior to the start of Title I design in FY 1994.

(c) Other project related costs

Costs in this category include one-third of the full complement of instruments which were not included in the line item and for buildup of the operations staff participation in the design, construction, and test and checkout phases of the project.

(d) DOE site office support

Subcontractor support costs for the DOE-OR project office are included in this item.

1. Title and Location of Project:	Advanced Neutron Source (ANS) Oak Ridge National Laboratory (ORNL) Oak Ridge, Tennessee	2a. Project No. 94-E-308 2b. Construction Funded

13. Narrative Explanation of Total Project Funding and Other Related Funding Requirements (Continued)

(e) Capital equipment not related to construction but related to the programmatic effort in the facility. Estimated costs are to provide test facilities for use in development of cold sources, evaluation of core flow blockage, natural convection cooling and flow induced vibration of components. In addition, equipment and facilities supporting structural testing of the fuel elements as well as reactor control components evaluation and major equipment items evaluation is required.

b. Related annual funding:

1. Facility operating costs

The annual facility operating costs expressed in FY 2003 dollars include all operations, Quality Assurance and support staff and the annual utility costs.

2. Programmatic operating expenses directly related to the facility

The costs included in this category are those related to support for the users of the ANS facility.

3. Capital equipment not related to construction but related to the programmatic effort in the facility. Costs included are intended to reflect probable replacement parts for capital equipment with moving parts.

4. GPP or other construction related to the programmatic effort in the facility

No narrative required

5. Other costs

No narrative required