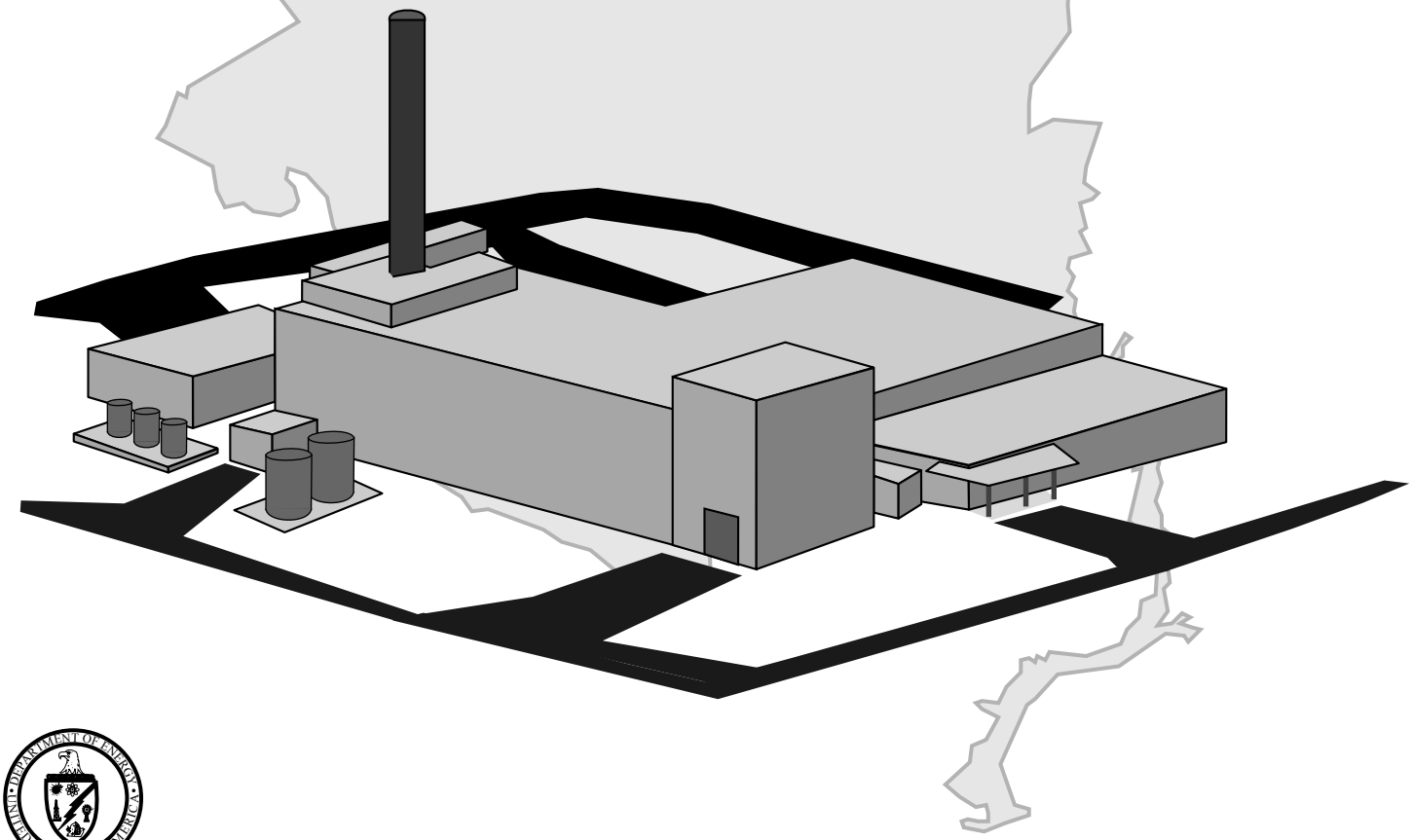
DOE/EIS-0271

Final Environmental Impact Statement

Construction & Operation of a Tritium Extraction Facility at the Savannah River Site



Department of Energy
Savannah River Operations Office
Aiken, South Carolina

March 1999

COVER SHEET

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

TITLE: Final Environmental Impact Statement: Construction and Operation of a Tritium Extraction Facility at the Savannah River Site (DOE/EIS-0271)

LOCATION: Aiken and Barnwell Counties, South Carolina

CONTACT: For additional information on this environmental impact statement (EIS), write or call:

Andrew R. Grainger, NEPA Compliance Officer
U.S. Department of Energy
Savannah River Operations Office
Building 742A, Room 183
Aiken, South Carolina 29802
Attention: Tritium Extraction Facility EIS
Local and Nationwide Telephone: (800) 881-7292.
E-mail: nepa@SRS.gov

For a complete package, the Draft TEF EIS is needed alongside the Final TEF EIS and these may be obtained by contacting Andrew R. Grainger at the address above.

For general information on the DOE National Environmental Policy Act (NEPA) process, write or call:

Carol M. Borgstrom, Director
Office of NEPA Policy and Assistance, EH-42
U.S. Department of Energy
1000 Independence Avenue, S.W.
Washington, D.C. 20585
Telephone: (202) 586-4600, or leave a message at (800) 472-2756.

ABSTRACT: DOE proposes to construct and operate a Tritium Extraction Facility (TEF) at H Area on the Savannah River Site (SRS) to provide the capability to extract tritium from commercial light water reactor (CLWR) targets and from targets of similar design. The proposed action is also DOE's preferred alternative. An action alternative is to construct and operate TEF at the Allied General Nuclear Services facility, which is adjacent to the eastern side of the SRS. Under the no-action alternative DOE could incorporate tritium extraction capabilities in the accelerator for production of tritium. This EIS is linked to the *Final Programmatic Environmental Impact Statement for Tritium Supply and Recycling* (DOE/EIS-0161), from which DOE determined that it would produce tritium either in an accelerator or in a commercial light water reactor. The purpose of the proposed action and alternatives evaluated in this EIS is to provide tritium extraction capability to support either tritium production technology. The EIS assesses the environmental impacts from the proposed action and the alternatives, including the no action alternative.

PUBLIC COMMENTS: In preparing the Draft EIS, DOE considered comments received by letter and voice mail, and comments given at public meetings in Savannah, Georgia, and Aiken, South Carolina, on December 3 and 5, 1996, respectively. A summary of public comments was made available on April 28, 1997, and may be obtained by contacting Andrew R. Grainger at the address above.

A 45-day comment period on the Draft TEF EIS began with publication of a Notice of Availability in the *Federal Register* on May 8, 1998. A public meeting to discuss and receive comments on the Draft EIS was held on June 9, 1998, at the North Augusta Community Center, 101 Brookside Drive, North Augusta, South Carolina. The Draft EIS public comment period ended June 22, 1998. Comments were

submitted at the public meeting and by voicemail, e-mail, or regular mail at the address provided above. The comments received were considered in the preparation of this Final EIS.

PREFACE

The Tritium Supply and Recycling Final Programmatic Environmental Impact Statement (PEIS) (DOE/EIS-0161), which was completed in October 1995, assessed the potential environmental impacts of technology and siting alternatives for the production of tritium for national security purposes. On December 5, 1995, DOE issued a Record of Decision (ROD) for the Tritium Supply and Recycling PEIS that selected the two most promising alternative technologies for tritium production and established a dual-track strategy that would, within 3 years, select one of those technologies to become the primary tritium supply technology. The other technology, if feasible, would be developed as a backup tritium source. Under the dual-track strategy, DOE would: (1) initiate the purchase of an existing commercial reactor (operating or partially complete) or irradiation services with an option to purchase the reactor for conversion to a defense facility; and (2) design, build, and test critical components of an accelerator system for tritium production. Under the PEIS ROD, any new facilities that might be required, i.e., an accelerator and/or a Tritium Extraction Facility to support the commercial reactor alternative, would be constructed at DOE's Savannah River Site (SRS) in South Carolina.

The PEIS described a two-phase strategy for compliance with the National Environmental Policy Act (NEPA). The first phase included completion of the PEIS and subsequent ROD. The second phase included the preparation of site-specific NEPA documents tiered from the PEIS. These EISs address the environmental impacts of specific project proposals. As a result of the PEIS and the ROD, DOE determined to prepare three site specific EISs: the Accelerator Production of Tritium at the Savannah River Site (APT) (DOE/EIS-0270), the Production of Tritium in a Commercial Light Water Reactor (CLWR) (DOE/EIS-0288), and the Tritium Extraction Facility at Savannah River Site (TEF) (DOE/EIS-0271). Each of these EISs presents an analysis of alternatives which do not effect the alternatives in the other EISs with one exception. This exception is one alternative in the TEF EIS which would require the use of space in the APT. For this alternative to be viable, the APT would have to be selected as the primary source of tritium.

On December 22, 1998, Secretary of Energy Bill Richardson announced that commercial light water reactors (CLWR) will be the primary tritium supply technology. The Secretary designated the Watts Bar Unit 1 reactor near Spring City, Tennessee, and Sequoyah Unit 1 and 2 reactors near Soddy-Daisy, Tennessee as the preferred commercial light water reactors for tritium production. These reactors are operated by the Tennessee Valley Authority (TVA), an independent government agency. The Secretary designated the APT as the "backup" technology for tritium supply. As a backup, DOE will continue with developmental activities and preliminary design, but will not construct the accelerator. Finally, selection of the CLWR reaffirmed the December 1995 Tritium Supply and Recycling PEIS ROD to construct and operate a new tritium extraction capability at the SRS.

DOE has completed the final EISs for the APT, CLWR, and TEF. No sooner than 30 days after publication in the Federal Register of the Environmental Protection Agency's Notice of Availability of the final EISs for CLWR, APT, and TEF, DOE intends to issue a consolidated Record of Decision to: (1) formalize the programmatic announcement made on December 22, 1998; and (2) announce project-specific decisions for the three EISs. These decisions will include, for the selected CLWR technology, the selection of specific CLWRs to be used for tritium supply, and the location of a new tritium extraction capability at the SRS. For the backup APT technology, technical and siting decisions consistent with its backup role will be made.

FOREWORD

Introduction

This *Final Environmental Impact Statement for Construction and Operation of a Tritium Extraction Facility at the Savannah River Site* (TEF EIS) has been prepared in a manner consistent with the President's Council on Environmental Quality regulations (40 CFR Part 1500-**1508**) and Department of Energy Procedures (10 CFR Part 1021). Because DOE received few comments on the Draft EIS (DOE/EIS-0271D), it is not preparing a modified draft as the Final EIS, as is typically done. Rather, DOE is finalizing the TEF EIS by reference to the Draft EIS and is issuing this Final EIS as a record of changes made according to a process described in 40 CFR Part 1503.4 and to the recommendation in 40 CFR Part 1500.4(m), which encourages agencies to publish only the changes to the draft when changes are minor. This document focuses on changes that are of importance to the decision maker and the public. Specifically, modifications to finalize the TEF EIS were made for the following reasons:

- To incorporate responses to comments received during the public comment period
- To correct or clarify factual information presented in the Draft EIS
- To reflect TEF, commercial light water reactor, and accelerator production of tritium design concepts developed since the Draft EIS was issued

Document Modification

Modifications to the Draft EIS are presented as follows. Text or elements of tables in the Draft EIS have been modified and shown as **bolded text**. The change is preceded by a text box that explains the change, states why the change was made, and references the pertinent section of the Draft EIS. The text box is followed by the applicable modification. As mentioned, changes to text and table information are **bolded** and reproduced with an adequate amount of the applicable material in the Draft EIS to place the change in context. As a result, the reader needn't refer to the Draft EIS to understand the change.

Comment Identification

Comments received by DOE on the Draft EIS, both verbal and written, appear in Section 1 of this document. If a comment prompted a modification to the EIS, DOE has noted the change and directs the reader to that change.

Comments are noted by one of the following letter codes:

- M1 – M2 (comments submitted in either session 1 or 2 of the public meeting)
- L1 – L4 (comments received by letter or email)
- V1 – V2 (comments submitted by telephone to DOE's message line)

DOE numbered the specific comments in each letter or verbal presentation sequentially (e.g., V1-01, V1-02, etc.) to provide unique identifiers. The meeting comments are organized in categories, which are discussed below. Appendix C contains transcripts of sessions 1 and 2 of the public meeting held on June 9, copies of written comments submitted at the public meeting, copies of the letters acknowledged receipt of the Draft EIS but did not require comment responses for DOE, and a copy of a letter and enclosed forms from the South Carolina Office of State Budget.

DOE extends its gratitude to all the individuals and agencies who showed an interest and took the time to provide comments.

Public Meetings

The public meetings consisted primarily of informal discussions and questions and answers related to the TEF. As can be seen from the transcripts prepared by a court reporter (repro-

duced with comments marked and numbered as Appendix C of this document), a number of public comments and concerns were raised and discussed with DOE officials during the meetings. The responses in this document focus on those comments or questions which were not answered during the meeting, or need elaboration or clarification.

Comment Categories

Most of the comments and issues discussed in the meetings fall into the following broad categories:

- Presentation of costs in an EIS
- Comparison of differences between alternatives
- U.S. nuclear nonproliferation policy
- Worker health and safety, and emergency preparedness
- Contaminant releases and relative severity of impacts of a combination facility
- Effect of this facility on the ongoing cleanup of SRS waste sites
- Legality of TEF as a DOE defense nuclear facility and the implications thereof

Organization of the Final EIS

The Final EIS is composed of this Foreword, the Summary, two sections, one appendix, and relevant front and back material. DOE has provided the Summary in its entirety with modifications identified by bold text and the rationale for modifying the EIS explained in a text box. Section 1 provides public comments and DOE responses. Section 2 presents modifications to the Draft EIS, incorporates responses, clarifies factual information, and reflects design concepts developed for the tritium supply program. This document also includes the List of Preparers; Organizational Conflict of Interest Representation Statement; Glossary; Distribution List; and Appendix C, Transcripts, Letters, and Forms. Letters included in Section 1 are letters that offered comments for DOE to address. Letters included in Appendix C are letters that had no comments for DOE to address.

Interested persons may obtain a copy of this document or the Draft EIS by calling 1-800-881-7292, or writing to: Andrew R. Grainger, U.S. Department of Energy, Savannah River Operations Office, Building 742A, Room 183, Aiken, South Carolina 29802.

TABLE OF CONTENTS

Section		Page
Cover Sheet		iii
Preface		**v**
Foreword		vi
Acronyms and Abbreviations		x
Metric Conversion Chart		xiv
Summary		S-1
1	Public Comments and DOE Responses	1-1
2	Modifications to the Draft TEF EIS	2-1
List of Preparers		LP-1
OCI Statement		
Glossary		GL-1
Distribution List		DL-1
Index		IN-1
Appendix C – Transcripts, Letters, and Forms		C-1

List of Tables

Table		Page
S-1	Comparison of the alternatives for construction and operation of TEF	S-8
S-2	Comparison of operation of APT with and without extraction capability	S-15
1-1	Public comments on the Draft TEF EIS	1-1
2-2	Comparison of the alternatives for construction and operation of TEF	2-3
2-3	Comparison of operation of APT with and without extraction capability	2-11
4-5	Annual radionuclide emissions (curies) from normal processing of CLWR targets or targets of similar design at TEF in H Area	2-13
4-6	Annual doses from normal radiological air emissions from H Area TEF	2-15
4-7	Impacts on SRS treatment, storage, and disposal facilities from operation of proposed action for CLWR targets or targets of similar design	2-16
4-8	Construction waste generated from the proposed action for CLWR targets and targets of similar design	2-17
4-9	TEF operational waste types, generating activities, and examples	2-18

TABLE OF CONTENTS (continued)

List of Tables (continued)

Table		Page
5-1	Estimated maximum cumulative ground-level concentrations of nonradiological pollutants (micrograms per cubic meter) at SRS boundary	2-22
5-2	Estimated average annual cumulative radiological doses and resulting health effects to offsite population in the 50-mile radius from airborne releases	2-23
5-3	Estimated average annual cumulative radiological doses and resulting health effects to offsite population from aqueous releases	2-24
5-4	Estimated average annual cumulative radiological doses and resulting health effects to offsite population and facility workers	2-25
5-5	Estimated life-of-project waste disposal volumes from SRS projected activities	2-27
5-6	Estimated average annual cumulative electrical consumption	2-27

List of Figures

Figure		Page
S-1	Tritium decay over time	S-1
1-3	NEPA documentation for related DOE actions	2-1

ACRONYMS AND ABBREVIATIONS

AAQS	Ambient Air Quality Standard
AGNS	Allied General Nuclear Services
ALARA	As low as reasonably achievable
APSF	Actinide Packaging and Storage Facility
APT	Accelerator Production of Tritium
AQCR	Air Quality Control Region
ARF	Airborne release fraction
AWQC	Ambient water quality criteria
BA	Biological Assessment
BLS	Bureau of Labor Statistics
CCDF	Complementary Cumulative Distribution Function
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CIF	Consolidated Incineration Facility
CLWR	Commercial light water reactor
CO	Carbon monoxide
CPA	Cask Processing Area
CSRA	Central Savannah River Area
CSWTF	Central Sanitary Wastewater Treatment Facility
D&D	Decontamination and decommissioning
dB	Decibel
dBA	A-weighted decibel
DOE	U.S. Department of Energy
DOI	U.S. Department of Interior
DOT	U.S. Department of Transportation
DR	Damage ratio
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
EPD	Environmental Protection Department
ETF	Effluent Treatment Facility
FFCA	Federal Facilities Compliance Act
FG-Evac	Flush-gas evacuation

FR	Federal Register
gpd	Gallons per day
gpm	Gallons per minute
gpy	Gallons per year
GRP	Gross Regional Product
HEPA	High efficiency particulate air
HSV	Hydride storage vessel
HVAC	Heating, ventilation, and air conditioning
HWR	Heavy water reactor
IBA	In-bed accountability
ICRP	International Commission on Radiological Protection
JCW	Job control waste
kW	Kilowatt
LCF	Latent cancer fatality
LHS	Latin Hypercube Sampling
LLRW	Low-level radioactive waste
LPF	Leak path factor
LTR	Lower Three Runs
MACCS	MELCOR Accident Consequence Code System
MAR	Material at risk
MEI	Maximally exposed individual
msl	Mean sea level
MW	Megawatt
NAAQS	National Ambient Air Quality Standard
NCRP	National Council on Radiation Protection and Measurements
NEPA	National Environmental Policy Act
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NFPA	National Fire Protection Association
NOI	Notice of Intent
NO_X	Oxides of nitrogen
NPDES	National Pollutant Discharge Elimination System
NPH	Natural phenomena hazard
NWI	National Wetlands Inventory
NWSM	Nuclear Weapons Stockpile Memorandum

O_3	Ozone
OSHA	Occupational Safety and Health Administration
P-Evac	Product evacuation system
PEIS	Programmatic Environmental Impact Statement
PEL	Permissible Exposure Limit
PIDAS	Perimeter Intrusion Detection Assessment System
PM_{10}	Particulate matter **less than or equal to** 10 microns
$PM_{2.5}$	Particulate matter **less than or equal to** 2.5 microns
PRA	Probabilistic Risk Assessment
PSD	Prevention of Significant Deterioration
RCRA	Resource Conservation and Recovery Act
rem	Roentgen equivalent man
RF	Respirable fraction
RHA	Remote Handling Area
RHSS	Receiving, Handling, and Storage System
ROD	Record of Decision
SCDHEC	South Carolina Department of Health and Environmental Control
SCE&G	South Carolina Electric and Gas Company
SHPO	State Historic Preservation Officer
SNL	Sandia National Laboratories
SO_2	Sulfur dioxide
SO_x	Sulfur oxides
SRS	Savannah River Site
START	Strategic Arms Reduction Treaty
SWMD	Solid Waste Management Department
SWMS	Solid Waste Management System
SWPPP	Stormwater Pollution Prevention Plan
TDS	Total dissolved solids
TEF	Tritium Extraction Facility
TFM&C	Tritium Facilities Modernization and Consolidation Project
TPBAR	Tritium-producing burnable absorber rod
TRP	Target rod preparation
TSP	Total suspended particulates
TWA	Time-weighted average

USC	United States Code
USGS	U.S. Geological Survey
UTR	Upper Three Runs
VOC	Volatile organic compound
WSRC	Westinghouse Savannah River Company
Z-bed	Zeolite bed

Metric Conversion Chart

To convert into metric			To convert out of metric		
If you know	**Multiply by**	**To get**	**If you know**	**Multiply by**	**To get**
Length					
inches	2.54	centimeters	Centimeters	0.3937	inches
feet	30.48	centimeters	Centimeters	0.0328	feet
feet	0.3048	meters	Meters	3.281	feet
yards	0.9144	meters	Meters	1.0936	yards
miles	1.60934	kilometers	Kilometers	0.6214	miles
Area					
sq. inches	6.4516	sq. centimeters	sq. centimeters	0.155	sq. inches
sq. feet	0.092903	sq. meters	sq. meters	10.7639	sq. feet
sq. yards	0.8361	sq. meters	sq. meters	1.196	sq. yards
acres	0.0040469	sq. kilometers	sq. kilometers	247.1	acres
sq. miles	2.58999	sq. kilometers	sq. kilometers	0.3861	sq. miles
Volume					
fluid ounces	29.574	milliliters	Milliliters	0.0338	fluid ounces
gallons	3.7854	liters	Liters	0.26417	gallons
cubic feet	0.028317	cubic meters	cubic meters	35.315	cubic feet
cubic yards	0.76455	cubic meters	cubic meters	1.308	cubic yards
Weight					
ounces	28.3495	grams	Grams	0.03527	ounces
pounds	0.4536	kilograms	Kilograms	2.2046	pounds
short tons	0.90718	metric tons	metric tons	1.1023	short tons
Temperature					
Fahrenheit	Subtract 32 then multiply by 5/9ths	Celsius	Celsius	Multiply by 9/5ths, then add 32	Fahrenheit

Metric Prefixes

Prefix	Symbol	Multiplication Factor
Exa-	E	1 000 000 000 000 000 000 = 10^{18}
Peta-	P	1 000 000 000 000 000 = 10^{15}
Tera-	T	1 000 000 000 000 = 10^{12}
Giga-	G	1 000 000 000 = 10^{9}
Mega-	M	1 000 000 = 10^{6}
Kilo-	k	1 000 = 10^{3}
Centi-	c	0.01 = 10^{-2}
Milli	m	0.001 = 10^{-3}
Micro-	µ	0.000 001 = 10^{-6}
Nano-	n	0.000 000 001 = 10^{-9}
Pico-	p	0.000 000 000 001 = 10^{-12}
Femto-	f	0.000 000 000 000 001 = 10^{-15}
Atto-	a	0.000 000 000 000 000 001 = 10^{-18}