Strategic Laboratory Missions Plan

July 1996
Volume II
Mission Activity Profiles

Laboratory Operations Board
U.S. Department of Energy
1000 Independence Ave., SW
Washington, DC 20585

CONTENTS

Acronyms ix

Preface xi

National Security Profiles

Stockpile Stewardship

Stockpile Readiness NS–1
Enduring Stockpile NS–2
Future Stockpile NS–3
Stockpile Reduction NS–4
Experimental Activities NS–5
Weapons Transportation Safeguards NS–6
Joint DOD/DOE Munitions Technology Development NS–7
Accelerated Strategic Computing Initiative NS–8
Threat Assessment and Treaty Implementation NS–9
Conceptual Design and Assessment NS–10
Physics NS–11
Computation and Modeling NS–12
Systems Engineering NS–13
Electronics, Photonics, Sensors, and Mechanical Components NS–14
Advanced Manufacturing Technology Development NS–15
Chemistry and Materials NS–16
High Explosives NS–17
Special Nuclear Materials NS–18
Tritium NS–19
Los Alamos Neutron Science Center NS–20

Inertial Confinement Fusion

Indirect Drive With Glass Laser Driver NS–21
Direct Drive With Glass Laser Driver NS–22
Krypton Fluoride Laser NS–23
Light Ion Beams NS–24
Capsule Fabrication and Development NS–25
National Ignition Facility NS–26

Technology Transfer

Technology Transfer NS–27

Stockpile Management

War Reserve New Production NS–28
Weapons Program NS–29
Materials Recycle and Recovery NS–30

Production Capability Assurance NS–31
Nuclear Emergency Search Team NS–32
Accident Response Group NS–33
Atmospheric Release Advisory Capability NS–34
Nuclear Weapons Complex Reconfiguration NS–35
Accelerator Production of Tritium NS–36
Alternative Tritium Production Technologies NS–37
Nuclear Materials Surveillance NS–38
Verification and Control Technology
Onsite Systems NS–39
Regional Monitoring Systems NS–40
Remote Sensing Systems NS–41
Advanced Systems NS–42
Intelligence
Arms Control and Nonproliferation NS–43
Analytical Support NS–44
Threat Assessment NS–45
Counter Intelligence NS–46
Technical Support NS–47
Nuclear Safeguards and Security
Technology Development NS–48
Fissile Materials Storage and Disposition
Storage Options NS–49
Disposition Options NS–50
Technical Integration NS–51
Naval Nuclear Reactors
Naval Reactor Development NS–52

Energy Resources Profiles
Fossil Energy
Advanced Clean Fuels ES–1
Advanced Clean/Efficient Power Systems ES–2
Advanced Research and Technology Development ES–3
Clean Coal Technology ES–4
Natural Gas Research ES–5
Fuel Cells ES–6
Oil Technology ES–7
Strategic Petroleum Reserve ES–8
Nuclear Energy
Light-Water Reactors ES–9
Advanced Radioisotope Power Systems ES–10
Nuclear Technology Research and Development ES–11

University Nuclear Science and Reactor Support ES–12
Soviet-Designed Reactor Safety ES–13
Facilities and Termination Costs ES–14
Nuclear Isotope Support ES–15
Nuclear Energy Uranium Enrichment Technology Partnerships ES–16
Highly Enriched Uranium (HEU) Transparency Measures ES–17
Renewable Energy
Solar Building Technologies ES–18
Photovoltaic Energy Systems ES–19
Solar Thermal Energy Systems ES–20
Biofuels Energy Systems ES–21
Wind Energy Systems ES–22
Solar International ES–23
Solar Technology Transfer ES–24
Resource Assessment ES–25
Technical and Financial Assistance ES–26
Geothermal Energy Systems ES–27
Hydropower ES–28
Energy Management
Electric and Magnetic Field Effects Research ES–29
Electricity Transmission and Distribution Reliability ES–30
Energy Storage Systems ES–31
High-Temperature Superconductivity ES–32
Hydrogen Research and Development ES–33
Building Technologies
Building Systems ES–34
Building Envelopes ES–35
Building Equipment ES–36
Codes and Standards ES–37
Federal Energy Management Program ES–38
Building Technologies Implementation and Deployment ES–39
Industrial Technologies
Cogeneration ES–40
Process Heating and Cooling ES–41
Materials and Metals Processing ES–42
Process Efficiency ES–43
Industrial Waste ES–44
Municipal Solid Waste ES–45
Electric Motor Systems ES–46
Industrial Technologies Implementation and Deployment ES–47

Transportation Technologies
Alternative Fuels Utilization ES–48
Materials Technology ES–49
Heat Engine Development ES–50
Electric and Hybrid Propulsion Development ES–51
Transportation Technologies Implementation and Deployment ES–52
Energy Policy
Policy Planning and Analysis and Country Analyses ES–53

Environmental Quality Profiles
Civilian Radioactive Waste Management
Yucca Mountain Site Characterization EQ–1
Waste Acceptance, Storage, and Transportation EQ–2
Radioactive Waste Technical Program Support EQ–3
Spent Fuel Research and Development EQ–4
Environmental Management
Environmental Science and Technology Development EQ–5
Waste Management Technology Development EQ–6
Field Site Technical Support EQ–7

Science and Technology Profiles
Basic Energy Sciences
Metallurgy and Ceramics SC–1
Solid-State Physics SC–2
Materials Chemistry SC–3
Materials Sciences Facilities Operations SC–4
Photochemical and Radiation Sciences SC–5
Chemical Physics SC–6
Atomic Physics SC–7
Chemical Sciences Facilities Operations SC–8
Chemical Energy SC–9
Chemical Separations and Analysis SC–10
Heavy-Element Chemistry SC–11
Chemical Engineering Sciences SC–12
Engineering Research SC–13
Geosciences SC–14
Exploratory Energy Concepts SC–15
Energy Biosciences SC–16
Applied Mathematical Sciences SC–17
Health and Environmental Research
Dosimetry Research SC–18
Measurement Science SC–19
Atmospheric Science SC–20

Marine Transport SC–21
Terrestrial Transport SC–22
Ecosystem Functioning and Response SC–23
Biological Research SC–24
Radiological and Chemical Physics SC–25
Structural Biology SC–26
Molecular and Cellular Biology SC–27
Genome Research SC–28
Global Change Research SC–29
Carbon Dioxide Information Analysis SC–30
Advanced Mathematics and Model Physics SC–31
Atmospheric Radiation Measurement SC–32
Oceans Research SC–33
Radioisotope Development SC–34
Radiopharmaceuticals SC–35
Medical Imaging Technology SC–36
Clinical Feasibility SC–37
Boron Neutron Capture Therapy SC–38
Molecular Nuclear Medicine SC–39
Advanced Biomedical Science and Technology SC–40

High-Energy Physics

High-Energy Physics SC–41
High-Energy Physics Facilities Operations SC–42
High-Energy Technology SC–43

Nuclear Physics

Medium-Energy Nuclear Physics SC–44
Heavy-Ion Nuclear Physics SC–45
Nuclear Theory SC–46
Low-Energy Nuclear Physics SC–47

Technology Transfer

Energy Research Technology Transfer SC–48

Fusion

Applied Physics and Technology SC–49
Confinement Systems SC–50
ITER and Technology Development SC–51
Ion Driver Research SC–52
Chamber Propagation SC–53
Target Design SC–54

LIST OF ACRONYMS

ALWR	advanced light-water reactor
ANL	Argonne National Laboratory
BAPL	Bettis Atomic Power Laboratory
BNL	Brookhaven National Laboratory
DOD	Department of Defense
DOE	Department of Energy
EML	Environmental Measurements Laboratory
EPRI	Electric Power Research Institute
ETEC	Energy Technology Engineering Center
FNAL	Fermi National Accelerator Laboratory
FOAKE	first-of-a kind engineering
HEU	highly enriched uranium
INEL	Idaho National Engineering Laboratory
ITRI	Inhalation Toxicology Research Institute
KAPL	Knolls Atomic Power Laboratory
LANL	Los Alamos National Laboratory
LBNL	Ernest Orlando Lawrence Berkeley National Laboratory
LLNL	Lawrence Livermore National Laboratory
LREH	Laboratory of Radiobiology and Environmental Health
METC	Morgantown Energy Technology Center
NAS	National Academy of Sciences

NBL	New Brunswick Laboratory
NIPER	National Institute for Petroleum and Energy Research
NREL	National Renewable Energy Laboratory
NRL	Naval Research Laboratory
NSF	National Science Foundation
ORISE	Oak Ridge Institute for Science and Education
ORNL	Oak Ridge National Laboratory
PEIS	programmatic environmental impact statement
PETC	Pittsburgh Energy Technology Center
PNNL	Pacific Northwest National Laboratory
PPPL	Princeton Plasma Physics Laboratory
SLAC	Stanford Linear Accelerator Center
SNL	Sandia National Laboratories
SREL	Savannah River Ecology Laboratory
SRTC	Savannah River Technology Center
TJNAF	Thomas Jefferson National Accelerator Facility
UR/LLE	University of Rochester Laboratory for Laser Energetics

Strategic Laboratory Mission Plan Mission Activity Profiles

Preface

This volume describes in detail the Department's research and technology development activities and their funding at the Department's laboratories. It includes 166 Mission Activity Profiles, organized by major mission area, with each representing a discrete budget function called a Budget and Reporting (B&R) Code. The activities profiled here encompass the total research and technology development funding of the laboratories from the Department. Each profile includes a description of the activity and shows how the funding for that activity is distributed among the DOE laboratories as well as universities and industry. The profiles also indicate the principal laboratories for each activity, as well as which other laboratories are involved.

The information in this volume is at the core of the Strategic Laboratory Mission Plan. It enables a reader to follow funds from the Department's appropriation to a specific activity description and to specific R&D performing institutions. This information will enable the Department, along with the Laboratory Operations Board and Congress, to review the distribution of R&D performers chosen to execute the Department's missions.

We expect this process to result in a clearer understanding both of how the Department manages its research and technology development programs and the rationale for this management. We also expect that these reviews will result in management improvements, such as:

- Management of the laboratories more as a system, primarily by establishing the laboratories that serve as the principal institutions in each area.
- More productive and streamlined management of R&D programs by DOE headquarters and the laboratories.

The information will also help the Department and Congress work together to address the complex issue of eliminating redundancies within the National Laboratory system without the jeopardizing the complementary skills and diversity of approaches needed to accomplish the Department's missions.

We caution against using this as a tool for micromanagement of the laboratories. If the detailed information in this plan fuels prescriptive, narrowly focussed policy or management actions that subvert the process of ensuring that R&D is performed in the most cost-effective way possible in pursuit of national needs, then it will have been misused.

Technical Notes on the Mission Activity Profiles

Activities Included

The budget codes profiled here include all of the research and technology development activities of the laboratories that are funded by the Department. They includes some technical activities performed by the laboratories that are not classified as R&D according the Office of Management and Budget definitions. An example of this kind of activity is the engineering support work for the Waste Isolation Pilot Plant and the Yucca Mountain Site Characterization Project.

The profiles include only those activities funded and directed by the Department of Energy. It does not include work funded by other agencies or private organizations at the laboratories. For some laboratories, this constitutes 20 percent of the laboratories' activities. In addition, the profiles do not include descriptions of work that is funded out of the laboratory overhead. This includes laboratory-directed research and development, which is typically 1 to 6 percent of each laboratory's budget and is allowed by statute to be directed by the laboratory. It also does not include support activities at the laboratories, such as security, environment, safety and health management, or site cleanup.

Designation of Principal, Contributing, and Participating Laboratories

The Laboratory Complex box identifies which laboratories are the principal, contributing, and participating laboratories for each mission activities. In most cases, these have been designated according to the percentage of the mission activity's funding. Principal laboratories are defined as those receiving more than 20 percent of the activity's funding to the laboratory complex. Contributing laboratories are those that receive between 10 and 20 percent of the funding. Participating laboratories receive between 0 and 10 percent of the funding. In some cases, as noted, these designations have been made by the funding program offices to reflect their view of the laboratories' role.

Funding History

FY 94 and FY 1995 are actual budget levels. The FY 1996 level is the appropriated level where available. For the parts of the Department without a final FY 1996 appropriation (for example, those parts funded by the Interior Appropriations bill), the FY 1996 budget request is used.

Laboratory-Academia-Industry Participation

The distribution of funds between laboratories, academia, and industry is as provide by each program, generally based on operating funds.

Fiscal Year 1995 Funding Profile

These are based on operating funds to the 22 laboratories covered in Section VIII of Volume 1.