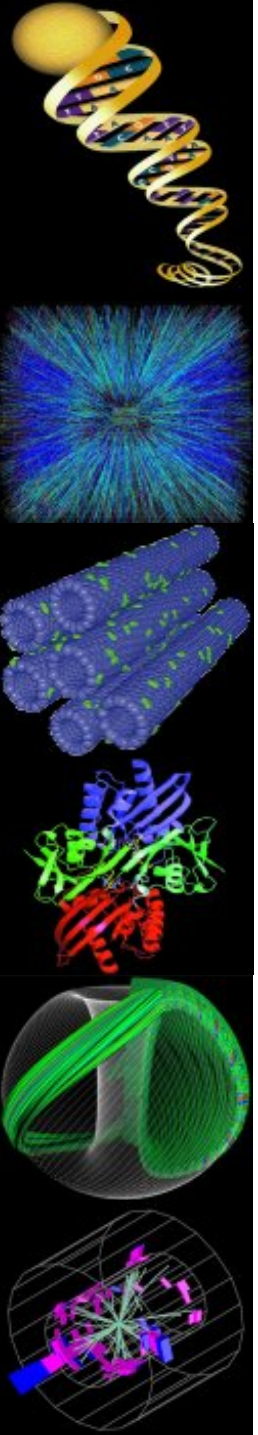


U.S. Department of Energy

Office of Science

Facilities for the Future of Science

A Twenty-Year Outlook

Dr. Raymond L. Orbach

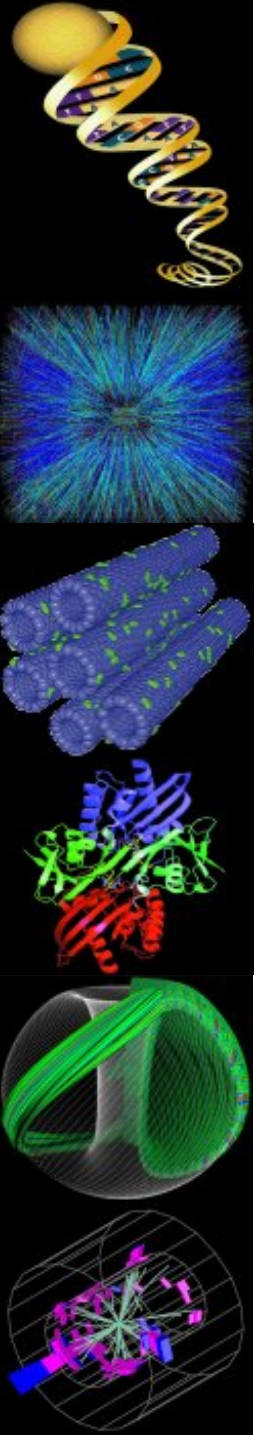
Director

DOE Office of Science Announces 20-Year Facilities Outlook

Throughout its history, the DOE's Office of Science has designed, constructed, and operated many of the Nation's most advanced, large-scale R&D user facilities.

-- Spencer Abraham, Secretary of Energy

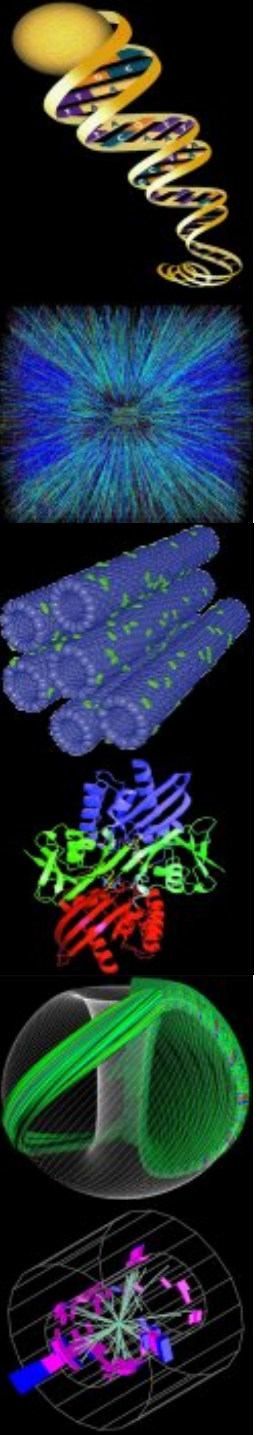
- SC facilities used by more than 18,000 users world-wide.
- A list of 28 world-class facilities and upgrades that will ensure U.S. scientific pre-eminence for the next two decades.
- Sets priorities across disciplines and fields of research.
- Complements interests of other U.S. science agencies (e.g., NASA, NSF, NIH.)



Ongoing Construction Projects

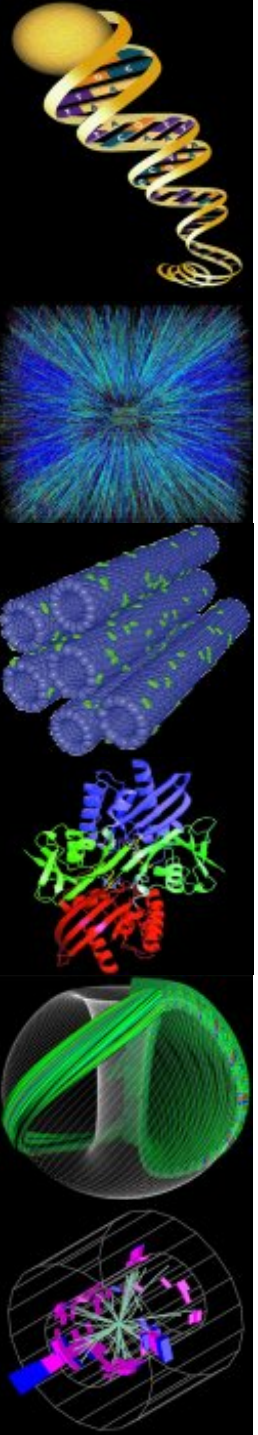
Project	Completion Date	TPC ($ in M)
Spallation Neutron Source*	6/06	1,411.7
Neutrinos at the Main Injector*	9/05	171.4
U.S. LHC - CMS Detector* - ATLAS Detector* - Accelerator*	9/08 9/08 9/08	167.3 163.8 110.0
Large Area Telescope*	3/06	121.0
Center for Nanophase Material Sciences*	9/06	65.0
SPEAR 3*	2/04	58.0
The Molecular Foundry**	12/06	85.0
Center for Integrated Nanotechnologies**	1/07	75.8
National Compact Stellerator Experiment**	6/07	73.5

*Past CD-2, Approve Performance Baseline
**Past CD-1, Approve Preliminary Baseline Range (project not baselined/preliminary date/TPC)



The Prioritization Process

- Asked Associate Directors to develop initial lists – resulted in 46 facilities
- Asked Advisory Committees to add/subtract (list grew to 53) and assess all according to two criteria:
  - Importance of the science
  - Readiness for construction
- Used “Biggert” authorization as optimistic, arbitrary funding envelope
- R. Orbach prioritized according to importance of science and relevance to DOE mission, based on Advisory Committee assessments and consultation with Associate Directors, and fit facilities under envelope
- Twenty-eight of fifty-three facilities made the cut

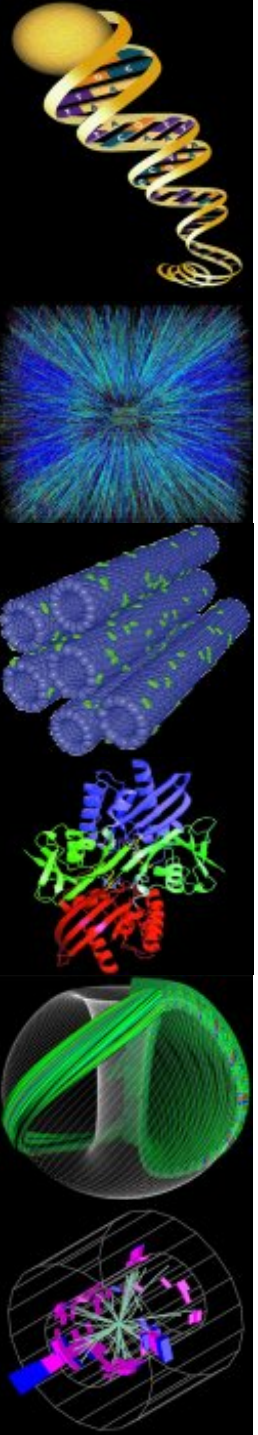


Five Categories of SC Facilities

Category A Highest Scientific Importance, Soonest Ready for Construction	Category B Highest Scientific Importance, Mid-term Readiness for Construction	Category C Highest Scientific Importance, Farthest-term Readiness for Construction
	Category D Secondary Scientific Importance, Varying Readiness for Construction	
	Category E Hard to Assess Scientific Importance, Varying Readiness for Construction	

Importance of Science →

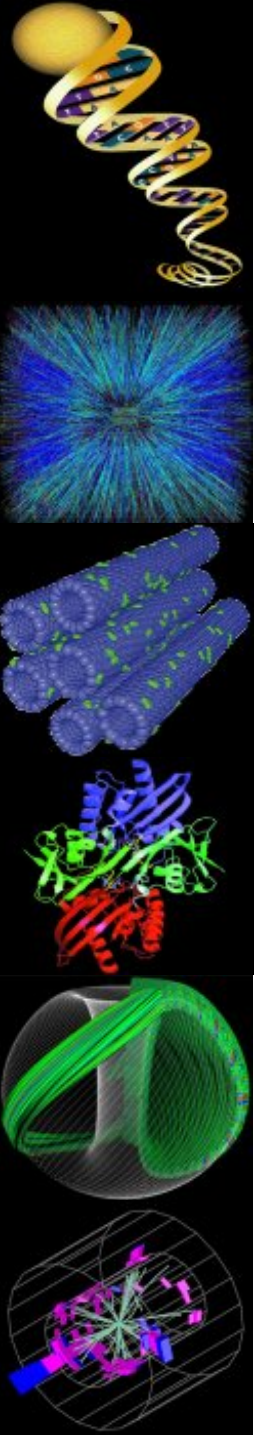
Time to Construction →



28 of 53 Facilities Made the List

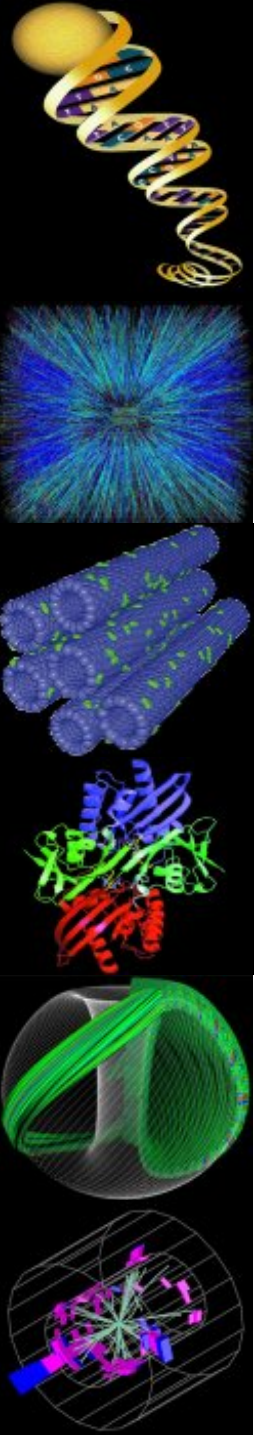
1 Angstrom Free Electron Laser Major User Facility
Accelerator-based Continuous Neutron Source
Advanced Light Source Upgrade
Advanced Photon Source Upgrade
BES Instrumentation Initiative
BTeV
Center for Computational Sciences Upgrade
Charged Kaons at the Main Injector
Complex Interfacial Catalysis Facility
Component Test Facility (CTF)
Continuous Electron Beam Accelerator Facility 12 GeV Upgrade
Continuous Electron Beam Accelerator Facility II Upgrade
Double-Beta Detector (Liquid Xenon)
Energy Recovery Linac
Energy Sciences Network (ESnet)
eRHIC
Facility for Analysis and Modeling of Cellular Systems
Facility for the Production and Characterization of Proteins
Facility for the Production, Characterization, and Imaging of Exceptional Proteins and Molecular Machines
Facility for Whole Proteome Analysis
Femtosecond X-ray Source
Gamma Ray Energy Tracking Array
Green-field X-ray FEL
High-Flux Isotope Reactor Second Cold Source and Guide Hall
Inertial Engineering Test Facility (IETF)
Integrated Beam Experiment (IBX)
Integrated Research Experiment (IRE)
International Fusion Materials Irradiation Facility (IFMIF)
ITER
Joint Dark Energy Mission (JDEM)
LCLS Phase II Upgrade
LHC Accelerator Upgrade I
LHC Accelerator Upgrade II
LHC Detector Upgrade
Linac Coherent Light Source
Linear Collider
Muon Storage Ring/Neutrino Factory
National Compact Stellarator Experiment (NCSX)
National Energy Research Scientific Computing Center Upgrade
National Synchrotron Light Source Upgrade
Double-Beta Decay Underground Detector
Next-Step Spherical Torus Experiment (NSST)
Off-Axis Neutrino Detector
Plant Metabolomics Facility
Proton Decay Detector
Rare Isotope Accelerator
RHIC II
Spallation Neutron Source 2-4MW Upgrade
Spallation Neutron Source Second Target Station
Super B-Factory
Super Neutrino Beam
Transmission Electron Achromatic Microscope
UltraScale Scientific Computing Capability (USSCC)

*Facilities listed in **bold** made the cut for the Office of Science Twenty-year Facilities Outlook*
A **Fusion Energy Contingency** was added subsequently, and rounds out the list of 28 facilities in the *Outlook*



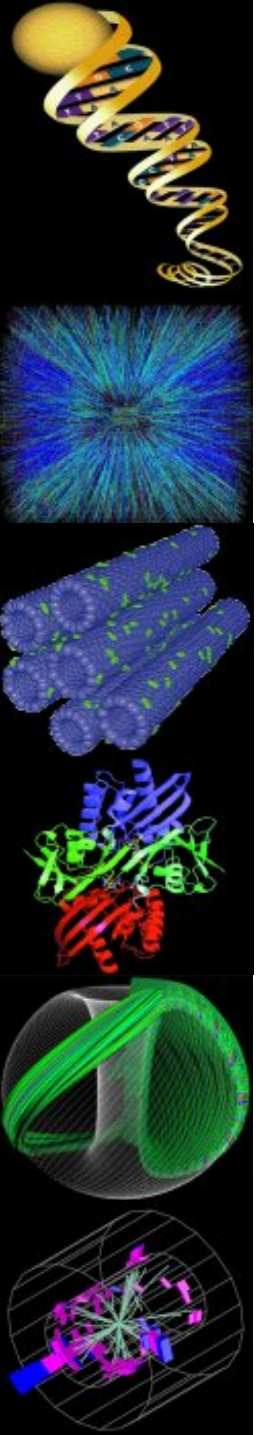
The Prioritized List

Priority			
Near-Term			
1		FES	International Thermonuclear Experimental Reactor
2		ASCR	UltraScale Scientific Computing Capability
Tie for 3		HEP	Joint Dark Energy Mission
		BES	Linac Coherent Light Source
		BER	Protein Production and Tags
		NP	Rare Isotope Accelerator
Tie for 7		BER	Characterization & Imaging
		NP	Continuous Electron Beam Accelerator Facility 12GeV Upgrade
		ASCR	Esnet Upgrade
		ASCR	NERSC Upgrade
		BES	Transmission Electron Achromatic Microscope
12		HEP	BTeV
Mid-Term			
13		HEP	Linear Collider
Tie for 14		BER	Cellular Systems Analysis & Modeling
		BES	SNS 2-4 MW Upgrade
		BES	SNS Target Station II
		BER	Whole Proteome Analysis
Tie for 18		NP	Double Beta Decay Underground Detector
		FES	Next Step Spherical Tokamak
		NP	RHIC II
Far-Term			
Tie for 21		BES	National Synchrotron Light Source Upgrade
		HEP	Super Neutrino Beam
Tie for 23		BES	Advanced Light Source Upgrade
		BES	Advanced Photon Source Upgrade
		NP	eRHIC
		FES	Fusion Energy Contingency
		BES	High Flux Isotope Reactor Guide Hall II
		FES	Integrated Beam Experiment



The Near-term Facilities

- ITER is an international collaboration to build the first fusion science experiment capable of producing a self-sustaining fusion reaction, called a “burning plasma.” It is the next essential and critical step that will demonstrate the scientific and technological feasibility of fusion energy.
- The UltraScale Scientific Computing Capability, located at multiple sites, will increase by a factor of 100 the computing capability available to support open (as opposed to classified) scientific research—reducing the time required to simulate complex systems, such as the earth’s climate or the chemistry of a combustion engine, from years to days and providing much finer resolution.
- Joint Dark Energy Mission is a space-based probe, developed in partnership with NASA, designed to help understand the recently discovered mysterious “dark energy” which makes up more than 70% of the universe, and is believed to be responsible for its accelerating expansion.
- The Linac Coherent Light Source will provide laser-like radiation 10 billion times greater in power and brightness than any existing x-ray light source, enabling the study of matter and chemical reactions at speeds and levels of detail well beyond what is currently possible.
- The Protein Production and Tags facility will use highly automated processes to mass-produce and characterize tens of thousands of proteins per year, create “tags” to identify these proteins, and make these products available to researchers nation-wide.
- The Rare Isotope Accelerator will be the world’s most powerful research facility dedicated to producing and exploring new rare isotopes that are not found naturally on earth.



The Near-term Facilities (cont.)

- Characterization and Imaging of Molecular Machines facility will build on capabilities provided by the Protein Production and Tags facility to provide researchers with the ability to isolate, characterize, and create images of the thousands of molecular machines that perform essential functions inside a cell.
- The upgrade to the Continuous Electron Beam Accelerator Facility (CEBAF) at Thomas Jefferson Laboratory is a cost-effective way to double the power of the existing beam, providing the capability to study the structure of protons and neutrons in the atom with much greater precision than is currently possible.
- The ESnet upgrade will enhance the network services available to support SC researchers and laboratories, maintaining their access to all major DOE research facilities and computing resources, as well as fast interconnections to more than 100 other networks.
- This upgrade will ensure that NERSC, DOE's premier scientific computing facility for unclassified research, continues to provide high-performance computing resources to support the requirements for scientific discovery.
- The Transmission Electron Achromatic Microscope will be the first of a new generation of electron microscopes that, by correcting for distortions in focus inherent to all electron microscopes built to-date, will give much clearer images and allow the use of much larger experimental chambers.
- BTeV ("B physics at the TeVatron") is an experiment designed to use the Tevatron proton-antiproton collider at the Fermi National Accelerator Laboratory (currently the world's most powerful accelerator) to make very precise measurements of several aspects of fundamental particle behavior that may help explain why so little antimatter exists in the universe.