A Roadmap for Biological and Environmental Research: Objectives and Performance Targets

	2006	2008	2010	2012	2014	2016

Life Sciences

- Artificial chromosome **(2006)**
- Mathematical model for microbial community that detoxifies uranium **(2007)**
- Photosynthetic microbe for continuous hydrogen production **(2008)**
- New capabilities for using microbial communities to solve complex energy challenges **(2010)**
- New strategies for CO2 capture **(2012) AG**
- Enhanced biobased sources of fuel and electricity **(2012) AG**
- New knowledge base for cost-effective cleanup **(2012) EM**
- ○ Characterize the multi protein complexes (or the lack thereof) involving a scientifically significant fraction of a microbe's proteins. Develop computational models to direct the use and design of microbial communities to clean up waste, sequester carbon, or produce hydrogen. **(2015)**

Climate Change Research

- Deliver new measurements of clouds especially in regions where observations have been missing **(2006)**
- Include improved cloud simulations in a climate model **(2007)**
- Measure critical ecosystem responses to climate change for high priority ecosystems **(2008) CCSP**
- Develop/validate improved models predicting the effect of aerosols on climate forcing **(2010)**
- Develop a climate model that links the Earth climate system with earth's biological systems **(2010) CCSP**
- ○ Develop improved climate data and models for policy makers to determine safe levels of greenhouse gases by 2015. Reduce differences between observed temperature and model simulations at subcontinental scales using all available, validated data **(2013) CCSP** *NOTE: new goal wording - OMB review pending*

Environmental Remediation

- Alternative cesium separations process for High Level Waste **(2006) EM**
- Technical basis for leaving in place radionuclides beneath tank farm at the Hanford Site **(2007) EM**
- New technologies for in situ characterization **(2008) EM**
- Bioremediation of metals and rads validated in the field **(2008) EM**
- Validate new long-term monitoring tools at multiple field sites that are inexpensive and fast **(2010)**
- Suite of field characterization techniques for long-term monitoring of closed sites **(2012) EM**
- ○ Provide sufficient scientific understanding to allow a significant fraction of DOE sites to incorporate coupled biological, chemical and physical processes into decision making for environmental remediation. **(2015) EM** *NOTE: new goal wording - OMB review pending*

Medical Sciences

- Microfabrication of 1000-electrode prototype artificial retina **(2006) NIH**
- Develop and test multi-dimensional imaging strategies to probe mechanisms underlying gene-disease/behavior relationships **(2006)**
- Develop mechanisms to support multi-disciplinary training centers in the imaging sciences through training grants and interagency agreements **(2006)**
- Preclinical tests of radiolabeled probes for imaging defective genes and aberrant gene products **(2006)**
- Advance rate of development & translation of highly specific radiotracers & radiotherapeutic agents for applications in neuropsychiatric illness & cancer **(2006-2010)**
- In vitro testing of 1000-electrode artificial retina devices in dogs **(2007) NIH**
- Develop next generation detectors, electronics and reconstruction algorithms to advance PET, SPECT & multi-modality imaging **(2008)**
- Application of microengineering and remote technology to advance radiotracer chemistry with short lived isotopes **(2008)**
- Nuclear medicine centers "graduate" first class of new radio tracer chemists **(2008)**
- Develop advanced imaging hardware and software for imaging a moving subject to advance the study of child development **(2010)**
- ● Department-sponsored research into viewing the makeup of genes in living cells, tissues, and organisms is used by clinicians as a new, sensitive tool for diagnosing disease and for monitoring the efficacy of disease therapies that target the products of specific genes. **(2013)**

Future Facilities *(Cross cut and support multiple objectives and targets):*

- **Protein Production and Tags Facility:** construction begins **(2006)**
- **Analysis and Modeling of Cellular Systems Facility:** construction begins **(2006)**
- **Whole Proteome Analysis Facility:** construction begins **(2006)**
- **Characterization and Imaging of Molecular Machines Facility:** construction begins **(2006)**
- **Protein Facility:** operation begins **(2011)**
- **Cellular Systems Facility:** operation begins **(2010)**
- **Proteome Facility:** operation begins **(2010)**
- **Characterization and Imaging Facility:** operation begins **(2010)**

Interdependencies: *(Descriptions)*

*Broadly with **ASCR** on computational developments, both hardware and software, affecting all facets of basic research and advanced instrumentation.*

Future facilities directly support performance targets in the life sciences, and through this, subsequent targets in climate change and environmental remediation.

EM =with EM and between two cleanup timeline elements, as noted.

NIH =with National Institutes of Health

AG =with Agriculture and EPA.

CCSP = Climate Change Science Program (Interagency)

● =Key Intermediate Objective from DOE Strategic Plan

○ =Long Term Success Measure from PART

This timeline is for planning purposes only and does not constitute financial or contractual commitments by the Federal Government.