

# Appendix A

## Federal Research, Development, Demonstration, and Deployment Investment Portfolio for Fiscal Years 2005 and 2006, with Budget Request Information for Fiscal Year 2007, U.S. Climate Change Technology Program

In order for the U.S. Climate Change Technology Program (CCTP) to carry out its mission, it is necessary to assess on a periodic and continuing basis the adequacy of Federal investments in the CCTP-relevant research portfolio and make recommendations. A first step in this regard is to establish and maintain a current inventory, or baseline, of all the Federal research, development, demonstration and deployment (R&D) activities among the participating agencies relevant to the vision, mission, and goals of the CCTP. This baseline, and subsequent years of data, can be used to identify and track trends and other changes in the portfolio. It also serves as an index or guide to relevant Federal R&D investments and programs.

In 2003, the CCTP, Office of Management and Budget (OMB) and other agencies agreed on a set of classification criteria to identify R&D activities that would be included as part of the CCTP. These criteria are provided on page A-2.

The baseline information for the Federal R&D budget shown in this Appendix are for Budget Authority as Enacted for Fiscal Years 2005 and 2006, and for the Administration's Budget Request for Fiscal Year 2007. For each year, respectively, the participating Federal agencies submitted budget data for R&D activities that meet the CCTP/OMB criteria. Table A-1 is a summary table for all participating agencies. This process is updated annually. Current versions of Table A-1 may be found at the CCTP Web site.<sup>1</sup>

This baseline activity and resulting portfolio contribute to and are consistent with the Congressional requirement that the President report annually on Federal climate change expenditures. The multi-agency R&D baseline for CCTP constitutes the technology component of OMB's Federal Climate Change Expenditures Report to Congress.<sup>2</sup>

### A.1

## Climate Change Technology Program Classification Criteria

Research, development, and deployment activities<sup>3</sup> classified as part of the Climate Change Technology Program (CCTP) must be activities funded via discretionary accounts that are relevant to providing opportunities for:

- ◆ Current and future reductions in or avoidances of emissions of greenhouse gases (GHGs),<sup>4</sup>
- ◆ Greenhouse gas capture and/or long-term storage, including biological uptake and storage;
- ◆ Conversion of GHGs to beneficial use in ways that avoid emissions to the atmosphere;
- ◆ Monitoring and/or measurement of GHG emissions, inventories and fluxes in a variety of settings;
- ◆ Technologies that improve or displace other GHG emitting technologies, such that the result would be reduced GHG emissions compared to technologies they displace;
- ◆ Technologies that could enable or facilitate the development, deployment and use of other GHG-emissions reduction technologies;
- ◆ Technologies that alter, substitute for, or otherwise replace processes, materials, and/or feedstocks, resulting in lower net emission of GHGs;
- ◆ Technologies that mitigate the effects of climate change, enhance adaptation or resilience to climate change impacts, or potentially counterbalance the likelihood of human-induced climate change;

<sup>1</sup> See <http://www.climatechange.gov>.

<sup>2</sup> Fiscal Year 2007 "Federal Climate Change Expenditures Report to Congress," April 2006. This report is an account of Federal spending for climate change programs and activities, both domestic and international. The report is provided annually to Congress.

<sup>3</sup> In this context, "research, development, demonstration, and deployment activities" is defined as: applied research; technology development and demonstration, including prototypes, scale-ups, and full-scale plants; technical activities in support of research objectives, including instrumentation, observation and monitoring equipment and systems; research and other activities undertaken in support of technology deployment, including research on codes and standards, safety, regulation, and on understanding factors affecting commercialization and deployment; supporting basic research addressing technical barriers to progress; activities associated with program direction; and related activities such as voluntary partnerships, technical assistance/capacity building, and technology demonstration programs that directly reduce greenhouse gas emissions in the near- and long-term.

<sup>4</sup> GHGs are gases in the Earth's atmosphere that vary in concentration and may contribute to long-term climate change. The most important GHG that arises from human activities is carbon dioxide (CO<sub>2</sub>), resulting mainly from the oxidation of carbon-containing fuels, materials or feedstocks; cement manufacture; or other chemical or industrial processes. Other GHGs include methane from landfills, mining, agricultural production, and natural gas systems; nitrous oxide (N<sub>2</sub>O) from industrial and agricultural activities; fluorine-containing halogenated substances (e.g., HFCs, PFCs); sulfur hexafluoride (SF<sub>6</sub>); and other GHGs from industrial sources. Gases falling under the purview of the Montreal Protocol are excluded from this definition of GHGs.

- ◆ Basic research activities undertaken explicitly to address a technical barrier to progress of one of the above climate change technologies; and
- ◆ GHG emission reductions resulting from clear improvements in management practices or purchasing decisions.

## A.2

### Climate Change Technology Program Classification Example Activities

Specific examples of climate change technology activities include, but are not limited to:

- ◆ Electricity production technologies and associated fuel cycles with significantly reduced, little, or no net GHG emissions;
- ◆ High-quality fuels or other high-energy density and transportable carriers of energy with significantly reduced, little, or no net GHG emissions;
- ◆ Feedstocks, resources or material inputs to economic activities, which may be produced through processes or complete resource cycles with significantly reduced, little or no net GHG emissions;
- ◆ Improved processes and infrastructure for using GHG-free fuels, power, materials, and feedstocks;
- ◆ CO<sub>2</sub> capture, permanent storage (sometimes referred to as sequestration), and biological uptake;

- ◆ Technologies that reduce, control or eliminate emissions of non-CO<sub>2</sub> GHGs;
- ◆ Advances in sciences of remote sensing and other monitoring, measurement and verification technologies, including data systems and inference methods;
- ◆ Technologies that substantially reduce GHG-intensity, and therefore limit GHG emissions;
- ◆ Voluntary government/industry programs designed to directly reduce GHG emissions; and
- ◆ Programs that result in energy efficiency improvements through grants or direct technical assistance.

*Note: Programs and activities presented for consideration can include Congressionally mandated "earmarks," but earmarked activities must be relevant to one or more of the CCTP criteria, and descriptions and funding levels must be clearly called out as such in the information provided. Programs and activities funded by mandatory authorizations should not be included.*

## A.3

### CCTP Participating Agencies, Budgets and Requests

In the following budget table, data are provided on CCTP-related activities, per the criteria above, for Fiscal Years 2005 and 2006, and for the President's Budget Request for Fiscal Year 2007, across all CCTP participating agencies. In each FY, budget data includes activities for CCTP-related research, development and demonstration (R&D).

**Table A-1 CCTP Participating Agency – FY 2005 to FY 2007 Budgets and Requests**  
**Categorization of RDD&D Funding To Climate Change Technology**  
**(Funding, \$ Millions) <sup>5,6</sup>**

DEPARTMENT AND ACCOUNT(S)	FY 2005 ENACTED	FY 2006 ENACTED	FY 2007 REQUEST
<b>Department of Agriculture</b>			
Natural Resources Conservation Service (NRCS) – Biomass R&D (Section 9008 Farm Bill)	13.0	12.0	12.0
– NRCS Carbon Cycle	0.5	0.5	0.5
Forest Service R&D – inventories of carbon biomass	0.0	0.5	0.5
Agricultural Research Service – Bioenergy Research	2.4	2.4	2.4
Cooperative State Research, Education and Extension Service (CRSEES) – Biofuels/Biomass Research; formula funds, National Research Initiative	4.7	4.7	3.4
Forest Service – Biofuels/Biomass, Forest and Rangeland Research	2.4	2.4	2.8
Rural Business Service – Renewable Energy Program and Value Added Producer Grants	24.8	25.3	12.7
<b>Subtotal – USDA</b>	<b>48.2</b>	<b>47.8</b>	<b>34.2</b>
<b>Department of Commerce - ITA</b>			
International Trade Administration (ITA) - Asia Pacific Partnership	0.0	0.0	2.0
<b>Subtotal – DOC/ITA</b>	<b>0.0</b>	<b>0.0</b>	<b>2.0</b>
<b>Department of Commerce - NIST</b>			
National Institute of Standards and Technology (NIST) Scientific and Technological Research and Services	7.7	7.2	7.2
Industrial Technical Services – Advanced Technology Program	18.1	10.3	0.0
<b>Subtotal – DOC/NIST</b>	<b>25.8</b>	<b>17.4</b>	<b>7.2</b>
<b>Department of Defense</b>			
Army	27.0	36.5	5.5
Navy	18.1	23.4	6.9
Air Force	1.0	0.0	0.0
Defense Advanced Research Projects Agency (DARPA)	11.0	7.1	3.0
R&D, Office of Secretary of Defense	2.0	3.6	0.0
<b>Subtotal – DOD</b>	<b>59.1</b>	<b>70.6</b>	<b>15.4</b>
<b>Department of Energy</b>			
Energy Efficiency and Renewable Energy (EERE)	1,234.3	1,174.0	1,176.3
Fossil Energy	373.8	404.5	419.1
Nuclear Energy	291.4	332.5	463.3
Science	385.5	422.6	551.4
Electricity Delivery and Energy Reliability	57.4	73.0	100.3
Climate Change Technology Program <sup>7</sup>	0.0	0.0	1.0
<b>Subtotal – DOE</b>	<b>2,342.4</b>	<b>2,406.5</b>	<b>2,711.4</b>

<sup>5</sup> This table is consistent with the Fiscal Year 2007 “Federal Climate Change Expenditures Report to Congress” prepared by the Office of Management and Budget (OMB), <http://www.whitehouse.gov/omb/>, and published in April 2006. Minor differences, if any, are due to arithmetic corrections after the OMB report was finalized and due to differences in rounding.

<sup>6</sup> All agency data are current, as of April 2006. Totals may not add due to rounding.

<sup>7</sup> In Fiscal Year 2005, \$1.5M was enacted for CCTP Program Direction within DOE’s EERE Program Direction account.

DEPARTMENT AND ACCOUNT(S)	FY 2005 ENACTED	FY 2006 ENACTED	FY 2007 REQUEST
<b>Department of Interior</b>			
US Geological Survey – Surveys, Investigations and Research - Geology Discipline, Energy Program	2.4	0.0	0.0
<b>Subtotal – DOI</b>	<b>2.4</b>	<b>0.0</b>	<b>0.0</b>
<b>Department of Transportation</b>			
Office of the Secretary for Technology – Transportation, Policy, R&D	0.8	0.0	0.0
National Highway Traffic Safety Admin	0.0	0.9	0.9
Research and Innovative Technology Admin	0.5	0.5	0.5
<b>Subtotal – DOT</b>	<b>1.3</b>	<b>1.4</b>	<b>1.4</b>
<b>Environmental Protection Agency</b>			
Environmental Programs and Management	90.5	90.0	91.9
Science and Technology	19.0	18.6	12.5
<b>Subtotal – EPA</b>	<b>109.5</b>	<b>108.6</b>	<b>104.4</b>
<b>National Aeronautics and Space Administration<sup>8</sup></b>			
Exploration, Science & Aeronautics	207.8	104.4	85.8
<b>Subtotal – NASA</b>	<b>207.8</b>	<b>104.4</b>	<b>85.8</b>
<b>National Science Foundation</b>			
Research and Related Activities	10.6	17.7	18.6
<b>Subtotal – NSF</b>	<b>10.6</b>	<b>17.7</b>	<b>18.6</b>
<b>Total for CCTP</b>	<b>2,807.1</b>	<b>2,774.4</b>	<b>2,980.4</b>

**ACTIVITIES ASSOCIATED WITH CCTP<sup>9</sup>****USAID Activities Associated with CCTP**

Energy Technology Development	80.1	92.0	57.3
Carbon Capture and Sequestration Measures	87.3	80.3	71.7
<b>Subtotal – USAID</b>	<b>167.5</b>	<b>172.2</b>	<b>129.0</b>

**Department of State Activities Associated with CCTP**

Asia Pacific Partnership	0.0	0.0	30.0
Methane to Markets	0.8	6.0	6.0
<b>Subtotal - STATE</b>	<b>0.8</b>	<b>6.0</b>	<b>36.0</b>

<b>Total CCTP and Associated Activities</b>	<b>2,975.3</b>	<b>2,952.6</b>	<b>3,145.4</b>
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<sup>8</sup> For Fiscal Year 2006 and Fiscal Year 2007, NASA is realigning its Aeronautics Research and is no longer pursuing previously reported activities in certain vehicle systems areas.

<sup>9</sup> STATE and USAID activities are not included in the totals for CCTP, as they are associated expenditures promoting deployment and adoption of climate change technologies abroad. They are shown here for completeness to the extent that such activities are consistent with the criteria for inclusion in CCTP.