

# **U.S. Science and Technology Policy Transformed: Emerging Trends in the Obama Administration**

A Report to NEDO

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## **Abstract**

Barack Obama's election to the presidency of the United States in November 2008 promised to usher in a new era of public policy making. The election of additional Democratic senators and representatives reinforced this expectation. And in fact President Obama and the new Congress have brought major changes to American policy, including policy for science and technology (S&T). However, the economic crisis and political deadlock from the end of the Bush Administration have made 2009 an unusual year in American politics and policy-making, causing both delays and new opportunities.

This report addresses the beginnings of a transformation in American science and technology policy under President Obama. It describes how he brings a new philosophical orientation to the role of scientific knowledge in public affairs, how he has appointed highly qualified people to senior positions in government, and how he has already made his imprint on key areas of public policy involving science and technology. It also discusses the unusual and convoluted budget process used this year. Political deadlock from the last year of the Bush Administration led to major delays in final appropriations for the current US fiscal year, FY 2009. And the financial crisis and associated recession and unemployment have forced the new President to focus on economic matters. But that economic crisis also led to a huge economic stimulus law, which gave the new Administration and Congress the opportunity to give additional funding to S&T programs, energy programs, and other priorities. In the longer term, though, continued economic problems may cause uncertainty for Federal S&T programs.

Much has been accomplished during the first four months of the Obama presidency; much remains to be done.

**Table of Contents**

Abstract	i
Preface	iii
About the Authors	iv
1. INTRODUCTION	1
2. CHANGES IN PHILOSOPHICAL ORIENTATION	
2.1 The Traditional Orientation of U.S. Science and Technology Policy	
2.2 Bush Administration Science and Technology Policies: Departure from Tradition	
2.3 President Obama’s Philosophical Positions on Science and Technology	
2.4 A Modified Science and Technology Policy Lexicon	
3. PRESIDENT OBAMA’S NOMINATIONS AND APPOINTMENTS	9
3.1 Overview	
3.2 Some Background	
3.3 The New President’s Philosophy and His Process Regarding Nominations and Appointments	
3.4 President Obama’s S&T Policy Officials	
3.5 One Example: the Impact of New People at the Department of Energy	
3.6 Chapter Conclusion	
4. OBAMA ADMINISTRATION ACTIONS RELATED TO SCIENCE AND TECHNOLOGY	23
4.1 Overview	
4.2 Energy and Environmental Actions	
4.3 Science and Technology in Governmental Decision Making	
4.4 Position on Stem Cell Research	
4.5 Conclusion	
5. PRESIDENT OBAMA’S BUDGETS FOR R&D	29
5.1 Extraordinary Budgeting for Extraordinary Times	
5.2 How Research and Development Fared in Recent Federal Budget Actions	
5.3 Further Observations on R&D Funding Under President Obama	
6. CONCLUSION	46

## **Preface**

The Washington, D.C., office of Japan's New Energy and Industrial Technology Development Organization (NEDO) commissioned the study underlying this report. The study examines the influence of the new Obama Administration on Science and Technology Policy in the United States. The authors have undertaken this study as independent consultants working together as the firm of Technology Policy International. The report and its findings are based on the authors' experience in government, the private sector, and academia. The opinions expressed in this report do not necessarily reflect the views of NEDO or the institutions with which the authors are affiliated.

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## 1. INTRODUCTION

Even before the Obama Administration took office in January of 2009, anticipation was widespread that its approach to science and technology (S&T) policy would transform the policies that existed during the Bush Presidency. Candidate Obama had consistently made this a theme of his campaign; some five months later, President Obama appears to be moving in the promised direction.

Presidential leadership, however, is only one element of the complex context that defines science and technology policies in the U.S. Certainly the national and global economic dislocation of the last year has exerted a profound influence on the shape of policy. In the domestic context, the politics and personnel of the Congress have changed significantly, as has the role of government in economic life. Among the general public, evaluations of the past policies and attitudes toward the future appear to have undergone a significant shift. For example, during this recession the public wants more assistance from government, but people are also worried about the long-term costs of current initiatives. All of these trends are affecting the development of S&T policy in the Obama Administration.

In the fall of 2008, the Washington, D.C. office of NEDO (Japan's New Energy and Industrial Development Organization) commissioned TPI (Technology Policy International) to undertake an analysis of current issues in the emerging U.S. technology policy. Its purpose was to examine the major science and technology policy actions unfolding during the early months of the Obama Administration and to assess their importance in the larger context of political, economic, societal and historical change. This report is the result of that effort. Its title reflects the judgment of the authors that a transformational change is indeed underway in the prominence and uses of science and technology in U.S. policy. Having asserted this, we are still mindful of the impermanence of

appearances. Indeed, what now appears to be transformational may, over the longer term, represent more of a return to traditional policy patterns than a new one; and bold initiatives often suffer from retrenchment as they proceed.

The report divides this discussion into four main parts. It begins with an examination, in Chapter 2, of the changes in philosophy and orientation that are implicit in the Obama Administration initiatives. Chapter 3 assesses the personnel nominations and appointments made by the Administration thus far. Chapter 4 looks in more depth at specific changes in policy priorities and law, and Chapter 5 analyzes funding changes to date as well as the current budgetary context. In Chapter 6, we conclude by considering issues and actions that are likely to emerge, or be postponed, in the near future.

## 2. CHANGES IN PHILOSOPHICAL ORIENTATION

### 2.1 The Traditional Orientation of U.S. Science and Technology Policy

The guiding principles of modern science and technology policy in the U.S. trace their origin to the seminal 1945 report to President Truman, *Science – The Endless Frontier*.<sup>1</sup> Known as the “Bush Report,” after its major author, Vannevar Bush,<sup>2</sup> its policy orientation – always influential though much modified – can be seen as the “traditional” paradigm” in U.S. science and technology policy. This paradigm emphasizes the following five major principles:

- The value of scientific inquiry, both inherently and as the underpinning for U.S. economic well-being
- The government’s vital and unique role in funding science and its use of universities and companies to perform much of this publicly-funded research
- Public funding for science in general rather than for particular societal objectives (with the exception of well-defined “missions”)
- Peer review and competition as the basis for project funding
- Minimal public role in commercial technology

Going beyond principles and funds, the traditional policy orientation in the U.S. has also rested on a deep respect for science and technology. Presidential science advisors have generally been eminent leaders from academia, the national laboratories, and the defense and aerospace industries, who both represented the scientific community and offered policy advice, based on the best available knowledge. Science thus occupied a place of privilege, both in terms of the funding it received and the influence it could bring to bear. This influence was probably felt most keenly in the Executive Branch, where tradition

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<sup>1</sup> In fact, it was President Roosevelt who requested the report and put forth as its principle question the design of U.S. science policy in civilian life.

<sup>2</sup> It should be noted that Vannevar Bush was no relation to the Bush presidential family.



argued for appointments based on technical merit irrespective of ideology, and the use of “independent science advice” in advisory bodies was an accepted norm.

## 2.2 Bush Administration Science and Technology Policies: Departure from Tradition

The eight years of President George W. Bush’s Administration saw science and technology policies in the U.S. depart from their traditional pattern in a number of respects. President Bush had never been closely associated with the scientific community, and therefore tended not to draw on its most prominent members for his science and technology policy apparatus.<sup>3</sup> But what became most controversial during this period was the “politicization” of the science policy process – a claim made by those who believed that science advice to the President and the agencies was being given by individuals more committed to ideology or loyalty to the President than to science.<sup>4</sup>

President Bush also seemed more willing than his predecessors to bring religious principles into the science and technology policy realm. The clearest example of this was in the area of stem cell research, where President Bush, in his first use of the veto power, directed it against legislation that would have provided additional Federal funds for stem cell research. In the prior five years,

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<sup>3</sup> This criticism was made of Science Advisor Marburger and the members of PCAST (Presidential Council of Advisors on Science and Technology), who tended to draw heavily on business interests during Bush’s term. But it should also be recognized that the scientific community is heavily Democratic (although the engineering and technical communities are much less so).

<sup>4</sup> For a critique of the Bush Administration in this regard, see “Scientific Integrity in Policymaking: An Investigation into the Bush Administration's Misuse of Science,” Union of Concerned Scientists, 2004.

Bush had never confronted Congress in this manner, and he justified the ban on Federal stem cell funding as necessary to preserve a “moral” society.<sup>5</sup>

The environmental area is one where science, particularly atmospheric science, became highly controversial during the Bush Administration. The claim that the Administration was willfully ignoring scientific reality came most dramatically to the fore in the lawsuit brought against EPA by 12 states, urging action under the Clean Air Act to combat carbon dioxide emissions that contribute to climate change. In its decision on this matter in 2008, the U.S. Supreme Court took the highly unusual position of recognizing a scientific reality that the government had not, and decided for the states against the Bush Administration. EPA was thus ordered by the Court to begin addressing the problem of climate change.<sup>6</sup>

These various philosophical postures, as well as the science funding priorities of the Bush Administration, had the effect of setting many in the scientific community firmly against the Administration and Republican candidates during the 2008 campaign. Thus, one of the main themes of all the Democratic candidates during the 2008 Presidential campaign was to reverse the “politicization” of science.<sup>7</sup> In this sense at least, all of them were advocating a return to the traditional principles of U.S. science and technology policy.

### 2.3 President Obama’s Philosophical Positions on Science and Technology

As a candidate, President Obama put forward a philosophical orientation toward science and technology that he has continued to emphasize in the White

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<sup>5</sup><http://www.washingtonpost.com/wpdyn/content/article/2006/07/19/AR2006071900524.html>.

<sup>6</sup> *Massachusetts, et al v. Environmental Protection Agency*, 549 U.S. 497 (2007).

<sup>7</sup> See the analysis of the 2008 campaign in “New Pathways in Innovation Policy.”

House, both in rhetoric and action. Broadly speaking, the Obama “philosophy” on science and technology seems to consist of the following:

- The “Yes We Can,” campaign slogan, which bespoke a belief in cooperation and progress, based on rational, scientific approaches.
- The frequent promise to “restore science to its rightful place” as a tool for the design of policy and as a national value.<sup>8</sup>
- The vow to “de-politicize” scientific advice and appoint respected scientists to positions of influence.<sup>9</sup>
- The recognition of science, technology, and research as a “vital national infrastructure” that underlies economic growth.<sup>10</sup>

The extent to which the actions, spending, and personnel appointments of the Obama Administration reflect the above principles will be discussed in subsequent chapters. What is worth emphasizing here is President Obama’s most recent speech on the subject of science and technology, which he delivered at the National Academy of Sciences on April 27, 2009.<sup>11</sup> The choice of the NAS as a venue for such a speech was in itself significant, underscoring, as few Presidents have, the rooting of national policy determinations in scientific information.<sup>12</sup> The theme of science as the underpinning both for economic

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<sup>8</sup> The most recent reiteration of this phrase was in the Presidential Order to NIH to begin reversing the ban on Federal stem cell research, March 7, 2009.

<sup>9</sup> This issue is discussed in full in the chapter below on appointments

<sup>10</sup> This connection of science and technology to infrastructure came to the fore during the debates on the Economic Stimulus Package (The American Recovery and Reinvestment Act of 2009).

<sup>11</sup> See “A Historic Commitment to Research and Education,” [http://www.whitehouse.gov/the\\_press\\_office/Fact-Sheet-A-Historic-Commitment-to-Research-and-Education](http://www.whitehouse.gov/the_press_office/Fact-Sheet-A-Historic-Commitment-to-Research-and-Education), 4/28/09. The full text can be accessed at <http://dotearth.blogs.nytimes.com/2009/04/27>.

<sup>12</sup> President Obama took pains to make the connection of the NAS to its founding by President Lincoln during the Civil War, and its relevance for current policy.

prosperity and the quality of life stood out.<sup>13</sup> The vow to “restore science to its rightful place” was again made, supplemented by the claim that “free and open inquiry” was not only the essence of science but also of democracy.<sup>14</sup> In terms of policy specifics, the President set the goal of devoting “more than 3 percent of GDP” to R&D – a dramatic increase. While this level of spending, if achieved, would likely benefit all areas of R&D, the President’s most enthusiastic endorsement was for research leading to clean energy, a campaign that, he said, would “capture the imagination” of young people.

#### 2.4 A Modified Science and Technology Policy Lexicon

To an important extent, the philosophical orientation of science and technology policy can be read in the words and terms that are chosen to describe it. Looking in this direction, one can see that over the last year or so, a new lexicon of policy descriptors has modified the terms that were once dominant.

Parsing the language of President Obama’s speeches, one sees that the linkage between “science and technology” is made less frequently and the unique emphasis on “science” is made more frequently than has been the case in the past. Combining this linguistic style with the pattern of eminent scientific appointments and proposals for science funding, it seems that the Obama orientation leans more toward science and less toward technology, particularly industrial technology, in its policy priorities.

Within the sphere of “technology policy,” the term “technology” seems to have taken on a new cast. Whereas in the past, “technology” would have been

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<sup>13</sup> Prosperity, security, health, the environment and quality of life were all mentioned as dependent on science.

<sup>14</sup> “To undermine scientific integrity is to undermine our democracy.” See dotearth, above, p. 5.

thought to apply broadly across sectors, it now routinely seems to imply “information technology.” Thus, term “technology policy” implies a policy rooted in the use of information, computers, databases, and such rather than one pertaining to general industrial technology. The term now most frequently used to indicate policies applicable to the more general range of industrial and consumer technologies is “innovation policy.”

These modifications of the science and technology lexicon may or may not turn out to have lasting importance. To some people in the science and technology policy community they indicate a turning away from the areas of manufacturing and industrial technology that were high concerns a decade or so ago, as well as the dominance of information technology concerns and people associated with IT in policy circles.

### 3. PRESIDENT OBAMA'S NOMINATIONS AND APPOINTMENTS

#### 3.1 Overview

This chapter discusses President Obama's choices for important science and technology policy positions in his Administration and also his process for selecting and managing those senior officials.

The chapter makes three main points.

First, the President is selecting first-class people to fill the senior S&T policy positions in his administration. He is particularly drawing on experts from top universities and from the high-technology community, although less from manufacturing and other sectors that are not part of high tech. Second, the President has created a particular management style – a particular way of running his administration and making decisions. That process simultaneously gives a significant coordinating role to senior White House officials – especially policy “czars” – but also allows more participation and open debate by S&T officials, Congress, and interest groups than was typical of the Bush years. In short, it is both “top-down” and “bottom-up.” Third, while the U.S. process for selecting top officials for a new administration is always slow, the selection process this year is particularly slow.

This chapter discusses these three points. It also provides a list of some of the key nominations and appointments so far. And, finally, it provides one example of how these new people and the policy-making process the President has created is affecting U.S. Government policy; that example is energy technology.

### 3.2 Some Background

America's process for selecting top government officials is unique among the world's industrial democracies. While other countries select a limited number of ministers and sometimes vice ministers or deputy ministers from the majority political party, a new U.S. president must select a much larger number of people for his or her new administration.

The total number of positions a U.S. president can fill is currently 7,996.<sup>15</sup> Of these, 1,141 require confirmation (approval) by the United States Senate.

(However, only about 487 of these are actually major officials; the others generally sit on various part-time boards and commissions.) The confirmation process is part of the U.S. Constitution's "checks and balances" – the provisions that require political power in the Federal government to be shared among the Executive, the Legislature, and the Judiciary. These Senate-confirmed positions include the heads and other senior officials of all Executive Branch departments and agencies, such as the Secretary of Energy, the Administrator of the National Aeronautics and Space Administration, their key deputies, and so forth.

Individuals named by a president for these positions are called "nominees," since a president is nominating them and the Senate then decides whether or not to confirm. In addition to these nominees, the remaining 6,855 positions go to "appointees" – people a president can appoint without Senate confirmation being required. The most important of these are 314 senior appointees, which include the senior White House staff.<sup>16</sup>

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<sup>15</sup> It should be noted that these are so-called "political" positions and are separate from the career civil servant corps, which numbers over one million.

<sup>16</sup> Committee on Homeland Security and Governmental Affairs, *United States Government Policy and Supporting Positions*, Washington, DC: United States Senate,

Filling these nearly eight thousand positions is difficult for any president. First, finding good people takes time. Next, the process for Senate-confirmed nominees is particularly long. A president must first make his or her choices, then the Federal Bureau of Investigation (FBI) makes background checks, the nominees must provide information to the Senate, Senate committees must consider the nominations, and finally the full Senate may be slow to vote on particular nominees. However, in addition to these usual slow procedures, additional delays have appeared during the Obama presidency, a point discussed in detail later in this chapter.

### 3.3 The New President's Philosophy and His Process Regarding Nominations and Appointments

Even with all of these slow procedures, selecting people for top government jobs gives a new president an extraordinary opportunity. These people will help the new president carry out his or her agenda, and good people will be both loyal and competent.

#### 3.3.1 President Obama Is Selecting First-Class People

The most important feature of Mr. Obama's approach to personnel is the high quality of the people he is selecting. In S&T policy, as in other policy areas, he is picking first-rate people.

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110<sup>th</sup> Congress, 2<sup>nd</sup> Session, Committee Print 110-36, November 12, 2008, <http://www.gpoaccess.gov/plumbok/2008/index.html>. This document is informally known as the "Plum Book," because the color of its cover is the color of plums. The one number in this paragraph that comes from another source is the figure of 487; that comes from *The Washington Post*, <http://projects.washingtonpost.com/2009/federal-appointments/>.



George W. Bush's administration had some outstanding individuals, but overall the Bush Administration had the reputation of selecting people based on loyalty to the President and the Republican Party more than on competence, experience, or expertise. In part, this reflected the conservative nature of the Bush Presidency: outside of foreign policy, there were few new things the President wanted to accomplish. Loyalty and an ability to follow White House instructions were the priorities. In addition, the Bush Administration seemed to lack confidence in the unique value of scientific expertise, and it censored government officials who wanted to present scientific evidence on topics such as climate change.<sup>17</sup>

President Obama's philosophy appears to be quite different. He respects both science and scientists, and he has begun to appoint world-class experts to key positions in his administration. Examples include John Holdren, an energy expert from Harvard who now holds both the non-confirmed position of Assistant to the President for Science and Technology and the Senate-confirmed role as Director of the Office of Science and Technology Policy (OSTP);<sup>18</sup> Steve Chu, the Nobel Prize-winning physicist who previously served as the Director of the Lawrence Berkeley National Laboratory and who is now Secretary of Energy; and Jane Lubchenco, a highly respected ocean scientist who now serves as Under Secretary of Commerce for Oceans and Atmosphere and, concurrently, Administrator of the National Oceanic and Atmospheric Administration (NOAA).

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<sup>17</sup> See, for example, Chris Mooney, *The Republican War on Science*, New York: Basic Books, 2005.

<sup>18</sup> Since the 1970s, presidential science advisors traditionally have held both of these jobs. However, in one sign of the low regard that George W. Bush held science, his OSTP director did not also hold the senior White House position of assistant to the president. Mr. Obama has returned to the traditional situation.

President Obama appears comfortable with elite scientists from top research universities and laboratories. He has selected this kind of person not only for administration jobs but also for his new senior advisory committee, the President's Council of Advisors on Science and Technology (PCAST).<sup>19</sup>

Another interesting point is that the President is also recruiting people from America's high-technology community and environmental community. For example, Google chief executive officer Eric Schmidt sits on PCAST, and several high-tech veterans have moved into important jobs in places such as the Energy Department, the National Telecommunications and Information Administration (NTIA), and the Federal Communications Commission (FCC). Many environmentalists and individuals in the high-tech community provided strong political support to Mr. Obama during his presidential campaign, so it is not surprising that they are participating in his administration. But the presence of high-tech people from Silicon Valley and elsewhere has an important implication for policy: these people are both pro-business *and* pro-environment. Like the president they serve, they want to promote "clean technologies" and adopt policies that will create new industries and jobs as well as reduce pollution. This is a big shift from the views of the Bush Administration.

There is another aspect of this situation, however. While the President is recruiting people from elite universities, high-tech companies, and the environmental community, so far he has not chosen many people from other parts of American life, such as general manufacturing. During the 2008 presidential campaign, he spoke about the importance of manufacturing and research and development for manufacturing. But Silicon Valley and

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<sup>19</sup> For a list of PCAST members, see [www.ostp.gov/cs/pcast](http://www.ostp.gov/cs/pcast).

environmental groups are more important constituencies for him, and the people he is selecting for senior government jobs reflect this point.

In addition, the people President Obama has chosen for PCAST heavily represent basic researchers and some information technology people. There is only one economist, no one who is an expert on the innovation process, and no one who currently works in a manufacturing company. This situation suggests that the President has generally accepted the philosophies – and the people – associated with the 2005 *Gathering Storm* report (which says that funding more basic research at universities and government laboratories will lead to more American jobs).<sup>20</sup>

### 3.3.2 The Obama Management Style Is Both Centralized *and* Open

Policy-making during the Bush years was generally quite centralized. Mr. Bush valued loyalty very highly, and he expected his officials to carry out the instructions provided by the White House. It was a “top-down” administration.

Mr. Obama is still developing his management style. So far, however, it has been an interesting mix of “top-down” coordination by the White House combined with a “bottom-up” openness that allows ideas and debate to flow from agency officials, Democratic Members of Congress, and interest groups. No one doubts that the President will make the final decisions about his administration’s policies, and he certainly wants an orderly decision-making process. But he appears comfortable with a wide range of opinions and spirited

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<sup>20</sup> For a review and analysis of these views, see our: “Innovation Policy Today in the United States: The Mainstream Consensus and Other Views,” report to NEDO, George R. Heaton, Jr., Christopher T. Hill, Patrick Windham and David W. Cheney, May 2007.

debates and is quite open to consultation. This management style has several important consequences.

First, it appears that officials in the departments and agencies will have many opportunities to present ideas and evidence to the White House. This White House is not censoring agency reports. For example, while the President has been a big supporter of corn-based ethanol, the Environmental Protection Agency recently published a study that concludes that corn-based ethanol poses serious environmental problems.

Second, this President is conducting broad consultations, both to get information and in the hope of gaining allies. One notable example, in a policy area outside of S&T, is his broad conversation on health care reform. Unlike the Clinton and Bush Administrations in their health care work, President Obama is openly and explicitly talking with a wide range of interest groups, including those who are skeptical of his health proposals. This does not mean that he will automatically accept everything they say, but he is listening and he is looking for possible agreements. Also, this President is listening closely to Democratic members of Congress and not simply expecting Democrats to carry out his wishes. For example, in several cases he has worked out a general agreement with senior Congressional Democrats and then let them decide many of the details. This happened with the economic stimulus package, and appears to be the approach now being used for both health care reform and cap-and-trade legislation.

Third, though, President Obama also clearly wants an orderly process within his administration and one that reflects his core priorities. To provide high-level coordination and to implement his decisions once he makes them, he not only

relies on the White House budget process (a process many presidents have used) but also an expanded set of White House policy "czars." A notable example is the creation of a new senior White House position, the Assistant to the President for Energy and Climate Change and the appointment of a veteran government official to this job, former EPA Administrator Carol Browner.

In summary, this President will consult widely, both within and outside his administration. This will give his officials a significant opportunity to contribute policy ideas. But then he wants these multiple views processed into orderly, coordinated policy positions.

### 3.3.3 The Obama Nomination Process Is Slow

As mentioned earlier, the American process of nominating senior government officials and then requiring them to go through the Senate confirmation process is inherently slow. But the Obama process has become particularly slow, mainly because some early embarrassments have led the Administration to move very carefully.

In particular, tax problems arose early with several individuals. Former Senator Tom Daschle, a close friend of the President's, ultimately withdrew as the nominee for Secretary of Health and Human Services (and as White House health policy "czar") because he had not paid approximately \$100,000 in back taxes. Even Treasury Secretary Timothy Geithner, who ultimately did receive Senate confirmation, had some tax problems. The White House is now very thorough about investigating anything about a person's history that might embarrass that person or the President.

As of May 25, 2009, only 146 individuals had been confirmed out of the most important 487 Senate-approved positions Mr. Obama needs to fill. This is 30 percent of the total. He has formally nominated an additional 68 (14 percent).<sup>21</sup>

### 3.4 President Obama's S&T Policy Officials

All of these points discussed above are reflected in the actual choices the President has made for key S&T policy jobs. The people selected so far are of high quality, although many key positions are still vacant.

Table 1 provides a summary of some key positions that have been filled and not filled. Filling such positions continues, so any such list is quickly out of date. This list was compiled in late May of 2009.

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<sup>21</sup> "Head Count: Tracking Obama's Appointments," *Washington Post*, <http://projects.washingtonpost.com/2009/federal-appointments/>. Retrieved May 8, 2009.

**Table 1. Selected Science and Technology Positions in the Obama Administration (as of May 25, 2009) (table footnotes at end of table)**

POSITION	PERSON (PREVIOUS EMPLOYER)	N or A? *	C? **
<b>White House</b>			
Assistant to President for Energy/Climate	Carol Browner (former EPA)	Appointed	
Assistant to the President for S&T	John Holdren (Harvard)	Appointed	
Director, OSTP	John Holdren (Harvard)	Nominated	Yes
Deputy Director for Policy, OSTP	Tom Kalil (UC Berkeley)	Appointed	
Associate Director, Environment, OSTP	Shere Abbott (Univ of Texas)	Nominated	Yes
Associate Director, Science, OSTP	Vacant	Nominated	
Associate Director, Technology, OSTP	Aneesh Chopra (Virginia State Govt)	Nominated	
Chief Technology Officer	Aneesh Chopra (Virginia State Govt)	Appointed	
Assistant Director, Federal R&D	Kei Koizumi (AAAS)	Appointed	
<b>Department of Energy</b>			
Secretary of Energy	Steven Chu (Berkeley Lab)	Nominated	Yes
Deputy Secretary	Daniel Poneman (Scowcroft Group)	Nominated	Yes
Under Secretary	Kristina Johnson (Johns Hopkins)	Nominated	Yes
Under Secretary, Science	Steven Koonin (BP & Caltech)	Nominated	Yes
Director, Office of Science	William Brinkman (Princeton Univ)	Nominated	No
Assistant Secretary, Energy Efficiency	Catherine Zoi (environmentalist)	Nominated	No
Assistant Secretary, Fossil Energy	Vacant	Nominated	
Assistant Secretary, Nuclear Energy	Vacant	Nominated	
<b>Department of Defense</b>			
Under Secretary, Acquisition, Technology, and Logistics	Ashton Carter (Harvard)	Nominated	Yes
Deputy Under Secretary, Acquisition/Tech	Vacant	Nominated	
Director, Defense Research & Engineering	Zachary Lemnios (Lincoln Lab, MIT)	Nominated	No
Director, DARPA	Vacant	Appointed	
<b>Department of Health &amp; Human Services</b>			
Assistant Secretary, Health	Howard Koh (Harvard)	Nominated	No

Director, National Institutes of Health	Vacant	Nominated	
Commissioner of Food and Drugs (FDA)	Margaret Hamburg (New York City)	Nominated	No
Surgeon General	Vacant	Nominated	
Director, Centers for Disease Control	Thomas Frieden (New York City)	Appointed	
<b>Department of Homeland Security</b>			
Under Secretary, Science & Technology	Tara O'Toole (Univ of Pittsburgh)	Nominated	No
<b>Department of Agriculture</b>			
Under Secretary, Research, Education, and Economics	Rajiv Shah (Gates Foundation)	Nominated	Yes
<b>Department of Commerce</b>			
Administrator, NOAA	Jane Lubchenco (Oregon State Univ)	Nominated	Yes
Chief Scientist, NOAA	Vacant	Nominated	
Director, NIST	Vacant	Nominated	
Under Secretary, Intellectual Property	Vacant	Nominated	
Under Secretary, Industry & Security	Vacant	Nominated	
Assistant Secretary, Communications and Information	Lawrence Strickling (Broadwing Communications)	Nominated	No
<b>National Science Foundation</b>			
Director	Arden Bement***	Nominated	Yes
<b>NASA</b>			
Administrator	Charles Bolden (JackandPanther)	Nominated	No
Deputy Administrator	Lori Garver (consultant, NASA)	Nominated	No



<b>Environmental Protection Agency</b>			
Administrator	Lisa Jackson (State of New Jersey)	N	Yes
Assistant Administrator, R&D	Paul Anastas (Yale, OSTP)	N	No

\* "N or A?" – Does this position require a nomination (in which the President submits a nomination to the Senate) or is it an appointment that does not require Senate confirmation?

\*\* "C?" – If this is a nominated position, has the Senate confirmed that nomination (as of May 25, 2009)?

\*\*\* Dr. Bement became the Director of NSF during the Bush Administration. The NSF Director is appointed for a six year term. However, by tradition, a new president either keeps the previous NSF director or asks that he or she resign so that he may nominate someone new. President Obama has not asked for Dr. Bement’s resignation.

### 3.5 One Example: the Impact of New People at the Department of Energy

Are these Obama officials in fact significantly different from their Bush predecessors? If so, in what ways are they different, and what implications do these differences have for U.S. Government policy?

A brief look at the U.S. Department of Energy illustrates what has and has not changed since the new president and his people took control. Three points are particularly interesting.

First, at first glance some of the differences are not very large. For example, some of Mr. Bush’s top officials at the Energy Department had eminent qualifications. While Mr. Bush’s first Secretary of Energy, Spencer Abraham, was a former U.S. senator with little interest in science, the next Secretary, Samuel Bodman, had a Ph.D. in chemical engineering from MIT and had served as the chief executive officer of a major financial company. Previous to becoming Secretary at DOE, he also served as Deputy Secretary of the Treasury and Deputy

Secretary of Commerce. Mr. Bush's Under Secretary for Science, Ray Orbach, also had a Ph.D. and served previously as the Chancellor of the University of California, Riverside. Both men strongly supported increased funding for scientific research.

The difference between Dr. Bodman and Dr. Steven Chu, the current Secretary, is therefore not one of training or support for science. The difference is more one of experience and attitude. When Dr. Chu became Director of Lawrence Berkeley National Laboratory, his job just before becoming Secretary, he and his staff engaged in an intense examination of what future energy sources might best meet the world's needs while still reducing greenhouse gas emissions. He has thought very deeply about these issues, and he comes to the Energy Department with that deep knowledge and commitment. Unlike Dr. Bodman, Dr. Chu has long-standing passion for developing new energy technologies. One major policy consequence is that the Obama Administration has now secured \$400 million to start DOE's new Advanced Research Projects Agency—Energy (ARPA-E), an agency President Bush and Dr. Bodman never sought funding for.

Second, however, the differences between the two administrations are even more pronounced in some other major DOE positions. For example, the Under Secretary of Energy (a position separate from Under Secretary for Science) oversees the Department's energy and environmental programs. The last person to hold this position in the Bush Administration was C.H. "Bud" Albright, Jr., a lawyer who previously was Republican Staff Director for the U.S. House of Representatives' Committee on Energy and Commerce and a lobbyist for an energy company. His Obama Administration replacement is Dr. Kristina Johnson, a Ph.D. electrical engineer who previously served as Dean of

Engineering at Duke University and then Provost at Johns Hopkins University. She holds 129 U.S. and foreign patents and is co-founder of several start-up companies. She is a very knowledgeable and respected engineer.

Below the level of Senate-confirmed positions, the Obama Energy Department has a number of young people not only from environmental groups but also from Silicon Valley. These people are convinced that new renewable energy technologies not only can reduce greenhouse gas emissions but also help create new industries and jobs. And they are active not only in discussions about energy R&D but also about tax incentives and other government policies that help create a demand for innovative energy technologies. That is, they are looking at “demand-pull” technology policies as well as traditional “technology-push” policies.

Third, and related, the decision to fund ARPA-E is potentially very significant. If the President and Secretary Chu choose a dynamic and competent director for this new agency, then DOE could begin to nurture new breakthrough energy technologies – a major change from DOE’s traditional policy of funding primarily just basic research, on the one hand, and, on the other, incremental improvements in existing energy technologies such as coal and nuclear.

### 3.6 Chapter Conclusion

President Obama has received praise for appointing truly competent people to important jobs in his administration, including S&T jobs. As of May 2009, many jobs remain unfilled, and once they are filled some analysts wonder how well all of these people with deep expertise and strong opinions will work

together. But there is no doubt that after the controversies over people and policies during the Bush Administration, the science and technology policy community welcomes Mr. Obama's emphasis on high-quality people.

## 4. OBAMA ADMINISTRATION ACTIONS RELATED TO SCIENCE AND TECHNOLOGY

### 4.1 Overview

This chapter discusses some actions on science and technology matters that the Obama Administration has taken early in the new President's term. The focus in this chapter is on actions other than appointments and budgets, which are discussed in other chapters. Most of these actions take the form of "Executive Orders" and "Memoranda for Heads of Departments and Executive Agencies." Such documents provide direction to executive branch agencies, generally within the authority of laws passed by the Congress.<sup>22</sup> These early actions both reflect the priorities of the Obama administration and reveal something of his approach to issues. These actions have pertained to energy and the environment, the role of science and technology in governmental decision-making, and stem cell research.

### 4.2 Energy and Environmental Actions

On the morning of January 26<sup>th</sup>, just six days after taking office, President Obama signed two Presidential Memoranda focused on energy efficiency and greenhouse gas emissions. In the first memorandum, he directed the Department of Transportation (DOT) to establish higher fuel efficiency standards for carmakers' 2011 model year. His authority to do so comes from a law allowing

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<sup>22</sup> Whether executive orders are consistent with prior acts of Congress is sometimes disputed. Occasionally, executive orders are overturned by the courts or by subsequent acts of Congress.

the government to set fuel efficiency standards, known as Corporate Average Fuel Economy (CAFE) standards. Congress first passed this law in 1975, in the wake of the Arab Oil Embargo. For most of the Bush years, President Bush had little interest in strengthening these standards, although in 2007 Congress passed amendments that would increase the standards to at least 35 miles per gallon by 2020. Using authority under those amendments, President Obama set stricter 2011 standards than those set by the Bush Administration.

The second presidential memorandum pertains to the regulation of automobile air emissions by the individual states. The State of California has historically set automobile emission standards that are stricter than the national standards. In 2008, however, the Bush Administration's Environmental Protection Agency (EPA) denied requests by California and other states to use stricter fuel efficiency standards as a way to reduce CO<sub>2</sub> emissions. President Obama directed the EPA to review the denial of the California waiver request immediately and determine the best way forward.<sup>23</sup>

A third and related decision came later, on May 19, 2009, when the White House announced tighter fuel efficiency standards for all new cars and trucks sold in the United States during model years 2012-2016. This new policy, in effect, approved California's request and applies California's strict fuel efficiency standards to the entire nation, in an attempt not only to save oil but also to reduce greenhouse gas emissions.<sup>24</sup>

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<sup>23</sup> White House Briefing Room Blog, January 26, 2009.

[http://www.whitehouse.gov/blog\\_post/Fromperiltoprogress/](http://www.whitehouse.gov/blog_post/Fromperiltoprogress/).

<sup>24</sup> Office of the Press Secretary, The White House, "President Obama Announces National Fuel Efficiency Policy," May 19, 2009.

In a fourth major environmental action, President Obama issued an executive order to increase substantially the Federal role in the cleanup of the Chesapeake Bay.<sup>25</sup> The Chesapeake Bay is the largest estuary in the United States, bordered by the states of Maryland and Virginia. It has been severely polluted for decades, and the states that are in the Bay's watershed (Delaware, Maryland, New York, Pennsylvania, Virginia and West Virginia, and the District of Columbia) have been working together to clean it up. These efforts have repeatedly fallen short of their goals, and President Obama's executive order directs a far greater Federal role in the bay cleanup. The order directs the EPA to coordinate the efforts of several Federal departments and to work with state governments to reduce pollutants flowing into the bay. It gives the agency enforcement authority if states miss established goals.

These early actions related to energy and the environment show that President Obama is committed to following up on the energy and environmental positions he supported in his campaign. The actions have generally received wide praise by the environmental community. The automobile decisions have not received wide criticism, perhaps largely because the automobile industry is now dependent on Federal support and is not in a strong position to attack the administration and also because the industry prefers one national set of fuel efficiency standards rather than a two-part one in which California and a few other states are allowed to have stricter regulations than the rest of the country.

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[http://www.whitehouse.gov/the\\_press\\_office/President-Obama-Announces-National-Fuel-Efficiency-Policy/](http://www.whitehouse.gov/the_press_office/President-Obama-Announces-National-Fuel-Efficiency-Policy/).

<sup>25</sup> Obama, Barak. May 12, 2009. "Chesapeake Bay Protection and Restoration." Executive Order. May 12, 2009.

### 4.3 Science and Technology in Governmental Decision Making

On January 21<sup>st</sup>, the day after he took office, President Obama announced changes with respect to transparency and openness in government, giving the new Chief Technology Officer a central role in this process.<sup>26</sup> He announced his intent to have his administration disclose information rapidly in forms that the public can readily find and use. He stated that departments and agencies should harness new technologies to put information about their operations and decisions online, and should solicit public feedback to identify information of greatest use to the public. They also should offer Americans increased opportunities to participate in policymaking and to provide their Government with the benefits of their collective expertise and information. He asked Executive departments and agencies to use innovative tools, methods, and systems to cooperate among themselves, with state and local governments, and with nonprofit organizations, businesses, and individuals in the private sector. He directed the Chief Technology Officer, in coordination with the Director of the Office of Management and Budget (OMB) and the Administrator of General Services (GSA), to coordinate the development of recommendations for an Open Government Directive, to implement these principles.

In another one of his early actions, President Obama issued a memorandum for the heads of Executive departments and agencies on scientific integrity.<sup>27</sup> In it, he assigned the Director of the Office of Science and Technology Policy the

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<sup>26</sup> Obama, Barack. "Memorandum for the Heads of Executive Departments and Agencies. Subject: Transparency and Open Government. January 21, 2009.

[http://www.whitehouse.gov/the\\_press\\_office/TransparencyandOpenGovernment/](http://www.whitehouse.gov/the_press_office/TransparencyandOpenGovernment/).

<sup>27</sup> Obama, Barack. "Memorandum for the Heads of Executive Departments and Agencies. Subject: Scientific Integrity". March 9, 2009.

[http://www.whitehouse.gov/the\\_press\\_office/Memorandum-for-the-Heads-of-Executive-Departments-and-Agencies-3-9-09/](http://www.whitehouse.gov/the_press_office/Memorandum-for-the-Heads-of-Executive-Departments-and-Agencies-3-9-09/).



responsibility for ensuring the highest level of integrity in all aspects of the executive branch's involvement with scientific and technological processes, and established a set of principles to be followed. These principles covered a wide range of areas, including the criteria for selecting people for scientific positions, the use of peer-reviewed science in decision-making, and protection of whistleblowers. This memorandum was directly in response to widespread concerns that the Bush Administration had politicized scientific decisions,<sup>28</sup> and followed up on candidate Obama's promise to restore the integrity of scientific decision-making.

#### 4.4 Position on Stem Cell Research

On March 9, 2009, simultaneous with the statement on scientific integrity, President Obama issued an executive order to reverse limitations on the Federal funding of research involving human embryonic stem cells that had been imposed by the Bush Administration.<sup>29</sup> The executive order also called for the Secretary of the Department of Health and Human Services (HHS), working through the Director of the National Institutes of Health (NIH), to review and issue new guidance on such research that is consistent with this order. President Bush had restricted Federal funding for embryonic stem cell research in a way that effectively limited investigations to fewer than two dozen pre-existing stem cell lines. The executive order will allow Federally funded research on hundreds

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<sup>28</sup> See Technology Policy International. "Integrity and Independence of Science Advice." September 20, 2004. <http://www.technopoli.net/Issue3.pdf>

<sup>29</sup> Obama, Barack, "Removing Barriers to Responsible Scientific Research Involving Human Stem Cells." Executive Order. March 9, 2009. [http://www.whitehouse.gov/the\\_press\\_office/Removing-Barriers-to-Responsible-Scientific-Research-Involving-Human-Stem-Cells/](http://www.whitehouse.gov/the_press_office/Removing-Barriers-to-Responsible-Scientific-Research-Involving-Human-Stem-Cells/)

of stem cell lines already in existence, as well as ones yet to be created, typically from embryos left over from fertility treatments that would otherwise be discarded.

Both the statement on scientific integrity and the decision on stem cell research brought immediate praise from the scientific community. The American Association for the Advancement of Science, for example, wrote a letter to the President thanking him for his action.

#### 4.5 Chapter Conclusion

Although we do not yet have a large base of actions upon which to judge the impact of Obama administration on science and technology, the actions to date seem to be consistent with his campaign promises and priorities. He has clearly taken initial actions with respect to energy and the environment that are consistent with his campaign priorities, and taken initial actions to use technology to improve public access to government. The scientific community is happy with his steps to give science a higher priority and to give scientific views more weight in decision-making. While the actions do not have innovation as their primary purpose, the energy and environmental actions have promoting innovation as one of their stated goals.

## 5. PRESIDENT OBAMA'S BUDGETS FOR R&D

### 5.1 Extraordinary Budgeting for Extraordinary Times

The world-wide financial crisis and recession—combined with the severe partisan gridlock that blocked action on much of President Bush's proposed budget for fiscal year 2009 at the end of the session of Congress that adjourned late in 2008—has created extraordinary demands on, as well as extraordinary opportunities for, the U.S. Federal budget.<sup>30</sup>

In more a more normal period of transition to a new president, Federal budgeting follows a relatively predictable pattern.<sup>31</sup> In early February of the final year of his term, the out-going president proposes a Federal budget for the next fiscal year, which begins on October 1, just four months before the presidential term ends on January 20. Throughout the spring and summer of his final year in office, Congress acts on elements of the president's budget, passing into law the twelve major annual appropriations acts that are required to make money available to operate the three branches of government. If actions are taken "normally," the appropriations acts for the fiscal year beginning October 1 of the outgoing president's final year in office will have all been passed, and, therefore, funding levels will have been established by October 1. The incoming president will be constrained to operate the Federal government for most of his first year in office along fiscal lines established by his predecessor and the previous Congress.

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<sup>30</sup> The U.S. Federal budget is developed for fiscal years that begin on October 1 of the calendar year whose number is one less than the fiscal year. So, for example, fiscal year 2010 (or, FY 2010) actually begins on October 1 of calendar year 2009.

<sup>31</sup> For more information on the regular Federal budget process, see: Office of Management and Budget, Executive Office of the President, "The Budget System and Concepts," President's Budget for Fiscal Year 2009, pp.389-410. On the web at: <http://www.whitehouse.gov/omb/budget/fy2009/pdf/concepts.pdf>.

Furthermore, in a normal transition year, the outgoing administration will have also completed the great majority of the planning for the presidential budget to be submitted early in February of the first year of the new president's term. Because there is a period of only two weeks between the inauguration of the new president on January 20 and the date on which he is required by law to submit a new budget for the following fiscal year, the new president usually has only very limited opportunity to re-shape that new budget to reflect his policy and spending priorities. The new president typically has to wait until his second annual budget proposal to offer sweeping changes in Federal spending.

By contrast, President Obama came into office under extraordinary circumstances that were anything but "typical." First, Congress was unable to pass several of the appropriations bills to fund the government for fiscal year 2009 before the end of the 2008 term.<sup>32</sup> To keep the government operating, they passed, and President Bush signed, a so-called "continuing resolution" to provide funds until several weeks after the beginning of President Obama's term. In practice, this meant that Congress would have to reconsider the funding

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<sup>32</sup> To oversimplify a very complicated political situation, Democrats in Congress, sensing that they might strengthen their control over both the House and Senate in the November 2008 elections, had an incentive to postpone final action on the FY 2009 appropriations in hopes of enjoying a larger majority as a result of the election that could force adoption of their priorities. At the same time, the House and Senate were at odds over spending priorities in a number of areas, and President Bush threatened to veto appropriations bills that were not to his liking. Neither Democrats nor Republicans in Congress wanted such a veto to occur just before the elections. Once the elections were over and the Democrats had won more seats in the House and in the Senate as well as the Presidency, they were in no mood to compromise on spending with the Republicans or President Bush in the post-election "lame duck" session held after the election results were known but with the outgoing members still in office. The only way to keep the government running was to adopt a continuing resolution and postpone action until March 2009. No one wanted to cause a government shutdown, as had occurred in early 1995 with disastrous results for a number of political careers.

levels for most agencies and programs for the remainder of fiscal year 2009 almost immediately after President Obama took office, which they did.

Second, the worsening economic situation throughout the year became a major focus of the 2008 presidential campaign. The Bush Administration's major response to the economic problems was to propose and then to implement a program of Federal assistance to financial institutions focused on restoring some degree of stability and liquidity in the private credit markets. Congress authorized the so-called Troubled Assets Relief Program, or TARP, in the fall. It made some \$700 billion available to the U.S. Treasury to purchase financial assets in the private market or to make loans to financial institutions to help strengthen their asset bases on which they could make new loans to consumers and companies. Meantime, candidate Obama, following Democratic party orthodoxy, proposed a so called "Stimulus Program" under which the Federal government would borrow, appropriate, and quickly spend a relative large amount of money in order to stimulate demand and spending by consumers, businesses and state and local governments. The Stimulus Program would be implemented through supplemental appropriations acts for fiscal year 2009 and would represent substantial expansions of spending above that under consideration for 2009 through the regular budget and appropriations channels.

Not surprisingly, the new Obama Administration – heavily focused on making TARP work, completing the regular FY 2009 appropriations, and proposing and defending the supplemental FY 2009 "Stimulus Plan" appropriations – was not able or willing to present its own fully developed FY 2010 budget proposal by the first week of February 2009. Nor were they willing simply to present the FY 2010 plan developed for them by the outgoing Bush

Administration.<sup>33</sup> Instead, the Obama Administration submitted an “outline” budget for FY 2010 to Congress during February 2009, and finally released all of the details of its proposed FY 2010 budget in May of 2009. As of this writing (late May 2009), Congress is actively considering the President’s FY 2010 budget plan.<sup>34</sup>

## 5.2 How Research and Development Fared in Recent Federal Budget Actions

### 5.2.1 Final FY 2009 Appropriations for Research and Development

As noted in Section 5.1, Congress did not complete action on President Bush’s original proposals for FY 2009 spending until well into calendar year 2009, when it completed action on appropriations bills to replace the temporary Continuing Resolution (“CR”) adopted in December 2008.

In light of all the financial pressures discussed in the previous section, newly-elected President Obama initially signaled his preference that the short-term funding levels adopted in the Continuing Resolution simply be adopted as the final appropriations levels for the balance of FY 2009. To a certain extent, this happened. However, certain key interest groups argued that their favorite programs needed more funds than the CR included. Among these groups were certain supporters of greater funding for science and technology. Ultimately,

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<sup>33</sup> The Obama Administration had to take on all of these tasks before having any of its top financial officials confirmed by Congress (Secretary of the Treasury and various deputies and assistants, Director of the Office of Management and Budget, etc.)

<sup>34</sup> Undoubtedly, the Federal departments and agencies, aided by various private contractors, are actively preparing their requests to OMB and the President for inclusion in the FY 2011 budget, which should be presented to Congress in early February 2010. In Washington, budget planning is a year-round activity.

some science and technology programs did receive additional funding above CR levels in the final FY 2009 appropriations.

To replace the CR, Congress passed an “omnibus” appropriations bill on March 10, and President Obama signed it into law on March 11, 2009.<sup>35</sup> According to figures compiled and analyzed by the American Association for the Advancement of Science (AAAS), when all the FY 2009 appropriations were complete total funding for research and development (R&D) had increased to \$151.1 billion, which is an increase of \$6.8 billion, or 4.7 percent, above the levels appropriated for FY 2008.<sup>36</sup>

For FY 2009, every major R&D agency received an increase in appropriations above the FY 2008 levels. By comparison, the outgoing Bush Administration had recommended a number of agencies for budget cuts in FY 2009. Those that were to be cut included NOAA, USGS, USDA, NIH, and EPA, as well as the “science and technology” program at DOD. (The latter supports basic and applied research related to DOD’s mission.) In the end, all received increases. This pattern of increases in all R&D programs reflects the determination of Congress to enhance R&D spending, the willingness of the new President to support such

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<sup>35</sup> An omnibus bill is one that combines a number of bills that might otherwise be considered separately by Congress. Such bills are typically considered when addressing an issue involves policies and programs that fall under the jurisdictions of multiple congressional committees. They are also used when time is running out and Congress wishes to present the President with a wide-ranging bill to sign into law that includes elements he would disapprove of if they were presented to him separately. Under the U.S. Constitution, the President must either approve or disapprove an entire bill presented to him; he may not pick and choose among its parts.

<sup>36</sup> American Association for the Advancement of Science, “Congress Finalizes Omnibus Budget for FY 2009 with Increases Across All Major R&D Agencies,” March 20, 2009. On line at [www.aaas.org/spp/rd/omnibus09.htm](http://www.aaas.org/spp/rd/omnibus09.htm).

increases, and, to some extent, the departure from office of a President who had sought cuts in certain R&D programs that he disfavored on policy grounds.

Within the overall 4.7 percent increase, there were numerous modest shifts in priorities and emphases from prior years. For example, Federal funding for basic and applied research (not including development) increased by 4.3 percent, the first “real” (inflation adjusted) increase in such funding for four years.<sup>37</sup> Non-defense R&D grew more on a percentage basis (6.0 percent) than did defense R&D (4.8 percent), reflecting a modest shift in priorities.<sup>38</sup> The agencies favored in the COMPETES Act of 2007 also experienced large increases, reflecting the bipartisan consensus in favor of that Act’s priorities.

Table 5.1 on the next page summarizes the final FY 2009 R&D appropriations.

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<sup>37</sup> Ibid.

<sup>38</sup> Ibid.



## AAAS R&amp;D Funding Update March 20, 2009

**Table 4. Total R&D by Agency**  
**Congressional Action on R&D in the FY 2009 Budget (including stimulus)**  
**(budget authority in millions of dollars)**

	FY 2008 Estimate	FY 2009 Request	FY 2009 Congress	House-Senate Conference		Chg. from FY 2008	
				Chg. from Request Amount	Percent	Amount	Percent
Defense (military) *	79,347	81,067	<b>82,678</b>	1,610	2.0%	3,330	4.2%
("S&T" 6.1, 6.2, 6.3 + Medical) *	13,456	11,669	<b>14,411</b>	2,742	23.5%	955	7.1%
(All Other DOD R&D) *	65,891	69,398	<b>68,266</b>	-1,132	-1.6%	2,375	3.6%
National Aeronautics & Space Admin.	12,251	12,780	<b>13,789</b>	1,009	7.9%	1,538	12.6%
Energy	9,724	10,519	<b>16,309</b>	5,791	55.1%	6,586	67.7%
(Office of Science)	3,637	4,314	<b>6,129</b>	1,815	42.1%	2,493	68.5%
(Energy R&D)	2,369	2,380	<b>6,378</b>	3,998	168.0%	4,009	169.2%
(Atomic Energy Defense R&D)	3,718	3,825	<b>3,803</b>	-22	-0.6%	85	2.3%
Health and Human Services	29,966	29,973	<b>41,877</b>	11,904	39.7%	11,911	39.7%
(National Institutes of Health)	28,826	28,666	<b>39,865</b>	11,199	39.1%	11,039	38.3%
(All Other HHS R&D)	1,140	1,307	<b>2,012</b>	705	54.0%	872	76.5%
National Science Foundation	4,501	5,175	<b>7,454</b>	2,279	44.0%	2,953	65.6%
Agriculture	2,359	1,955	<b>2,629</b>	674	34.5%	270	11.4%
Homeland Security	992	1,033	<b>1,085</b>	52	5.0%	93	9.4%
Interior	676	618	<b>707</b>	89	14.5%	31	4.6%
(U.S. Geological Survey)	586	546	<b>617</b>	71	13.1%	31	5.3%
Transportation	820	902	<b>922</b>	20	2.3%	102	12.4%
Environmental Protection Agency	548	541	<b>561</b>	20	3.7%	13	2.4%
Commerce	1,138	1,152	<b>1,789</b>	637	55.3%	650	57.1%
(NOAA)	581	576	<b>632</b>	56	9.7%	51	8.7%
(NIST)	521	546	<b>1,121</b>	575	105.3%	600	115.0%
Education	321	324	<b>336</b>	12	3.8%	15	4.7%
Agency for Int'l Development	223	223	<b>223</b>	0	0.0%	0	0.0%
Department of Veterans Affairs	891	884	<b>952</b>	68	7.7%	61	6.8%
Nuclear Regulatory Commission	71	77	<b>86</b>	9	11.7%	15	21.1%
Smithsonian	203	222	<b>222</b>	0	0.0%	19	9.4%
All Other	322	299	<b>339</b>	40	13.4%	17	5.3%
<b>TOTAL R&amp;D</b>	<b>144,354</b>	<b>147,743</b>	<b>171,958</b>	<b>24,214</b>	<b>16.4%</b>	<b>27,604</b>	<b>19.1%</b>
Defense R&D	83,065	84,892	<b>86,480</b>	1,588	1.9%	3,415	4.1%
Nondefense R&D	61,288	62,851	<b>85,477</b>	22,626	36.0%	24,189	39.5%
Basic Research	28,837	29,656	<b>38,920</b>	9,264	31.2%	10,083	35.0%
Applied Research	29,151	27,626	<b>36,395</b>	8,769	31.7%	7,244	24.8%
Total Research	57,988	57,282	<b>75,315</b>	18,034	31.5%	17,327	29.9%
Development	81,890	85,745	<b>88,202</b>	2,456	2.9%	6,312	7.7%
R&D Facilities and Capital Equipment	4,476	4,716	<b>8,440</b>	3,724	79.0%	3,965	88.6%

AAAS estimates of R&D in FY 2009 appropriations bills, including HR 1 (ARRA). Includes conduct of R&D and R&D facilities.

All figures are rounded to the nearest million. Changes calculated from unrounded figures.

FY 2008 figures have been adjusted to reflect supplementals enacted in Public Law 110-252 and contained in the FY 2009 CR.

These figures have been revised since the publication of AAAS Report XXXIII: R&D FY 2009.

Revised to reflect FY 2009 appropriations in the FY 2009 omnibus appropriations bill (HR 1105).

Table 5.1. Source: <http://www.aaas.org/spp/rd/FY2009update.pdf>

### 5.2.2 R&D Funding Under the “Stimulus Package”

Even before it completed action on the omnibus appropriations bill for FY 2009, Congress passed the American Recovery and Reinvestment Act (“ARRA” or the so-called “Stimulus Package,” Public Law 111-5) and President Obama signed it into law on February 17, 2009. This law was in essence a supplemental appropriations act that augments funding made available by the regular appropriations for FY 2009. It is based on a two-year expenditure of funds rather than the usual one-year plan that U.S. Federal budgets usually are based on.

As noted above, the purpose of ARRA is to get additional Federal funds into the hands of consumers, businesses and state and local governments quickly with the expectation that spending such funds will help revive both consumer spending and industrial production and investment, thus also helping reduce unemployment.<sup>39</sup> In economic terms, ARRA reflects a commitment to a massive round of Keynesian deficit spending in order to help raise the economy out of a demand trap.<sup>40</sup> It is a long and complex piece of legislation that runs to some 407 pages of text and includes a very long list of special provisions. It authorizes appropriations, entitlements and tax cuts of nearly \$800 billion, including \$311

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<sup>39</sup> The funds to be spent by government must be either borrowed from private sources and other countries or “created” by actions of the central bank, the Federal Reserve.

<sup>40</sup> It is beyond the scope of the present study to review the debates among economists as well as among policymakers about whether this kind and level of deficit spending will make a difference to the economic performance of the United States, or the rest of the world. ARRA as adopted incorporates some compromises with political interests that were opposed to greater Federal spending and that would have preferred greater cuts in Federal taxes instead of more spending. Likewise, ARRA disappointed some interests and observers who argue that not only is ARRA needed but that it is too modest—they suggest that ARRA is simply too small to make a large difference. Perhaps the passage of time will shed light on which side had the better argument.

billion in appropriations. By comparison, government-wide expenditures for FY 2008 totaled approximately \$3,000 billion.<sup>41</sup>

The requirement that ARRA funds be spent rapidly is important because it has tended to constrain the kinds of government expenditures for which ARRA funds could be used. To illustrate, some argued that using ARRA money to provide financial support to additional graduate students at universities would lead to rapid spending, on the theory that such students typically have very little money to spend, so any new money from ARRA would be used right away to pay rent, buy groceries, and make other immediate expenditures that would create jobs in the housing, food, and similar domestic industries. Other observers questioned whether ARRA money should be spent on R&D, arguing that R&D has impacts on the economy only after a number of years have passed.<sup>42</sup> Since much of the discretionary expenditures funded by the government go to investment programs of one kind or another, President Obama directed that ARRA funds be directed to projects that could be implemented within a few months, rather than to planning for new projects such as highway

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<sup>41</sup> A more technical comparison can be made by comparing the ARRA appropriations of about \$311 billion with the total government expenditures in the “discretionary” portion of the budget in an ordinary year; that is, that part of the budget which is subject to annual appropriations by Congress. (Non-discretionary expenditures consist largely of government entitlements such as retirement, health and welfare payments, and interest payments on the national debt.) In FY 2008, Congress appropriated approximately \$1,100 billion for discretionary programs. Therefore, one can see that the ARRA appropriations for discretionary programs for FY 2009 were roughly equivalent to one-third of the regular discretionary appropriations of the previous year. Thus, by any measure the ARRA spending is huge.

<sup>42</sup> On the other hand, other analysts countered that spending on R&D would go immediately into the hands of scientists, engineers, professors, and graduate students as well as to vendors of research equipment, and that all of these expenditures would tend to influence the economy immediately. The long-run positive effects of R&D on the economy could be seen, in this light, as a “bonus” associated with directing ARRA funds to supporting R&D as opposed to using them to pay for other public purposes.

construction that might take years to build and to spend money. He gave priority to projects that had already been planned and were simply waiting for funding. In the general media, projects that are ready to go became known as “shovel ready” projects (“shovel ready” because, once funds were released, workers could use shovels to start digging up dirt to build highways, high-speed rail, new buildings, and other physical infrastructures right away).

President Obama also insisted that expenditures of ARRA be conducted in a highly transparent and accountable manner. The basic idea has been that ordinary citizens and the media should be able to find out exactly what the ARRA funds were being used for and who received them. While potentially laudable as a goal, it has turned out more difficult than perhaps first imagined to create accounting systems and Web sites to gather and post such information. Furthermore, to the extent that fulfilling the transparency requirement has conflicted with getting the ARRA funds spent quickly, some have argued that transparency as a goal is in serious conflict with the greater goal of spending new money quickly to stimulate the economy.

The ARRA stimulus package included some \$21.5 billion for R&D, including \$18 billion for the conduct of R&D and \$3.5 billion for R&D plant and equipment.<sup>43</sup> Since this is all appropriated funds, a simple calculation shows that R&D will receive about seven percent of the total ARRA appropriations.

Nearly half of the ARRA funds for R&D will go to NIH—some \$10.4 billion. Another \$3 billion will go to NSF, more than \$4 billion to DOE, and the

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<sup>43</sup> American Association for the Advancement of Science, “Final Stimulus Bill Provides \$21.5 Billion for Federal R&D,” February 16, 2009. [www.aaas.org/spp/rd/stim09c.htm](http://www.aaas.org/spp/rd/stim09c.htm) All data on ARRA funding for R&D in this section is taken from this AAAS report unless otherwise noted.

remainder to other agencies.<sup>44</sup> In aggregate, the COMPETES Act agencies (NSF, DOE Office of Science, and NIST) will receive \$5.2 billion. For each of these agencies, these increases are large in percentage terms as compared with their regular appropriations for FY 2009. For NIH the increase is about 35 percent, for NSF about 50 percent, and for the DOE Office of Science about 37 percent.

Figure 5.1, from AAAS, summarizes these R&D increases.<sup>45</sup>

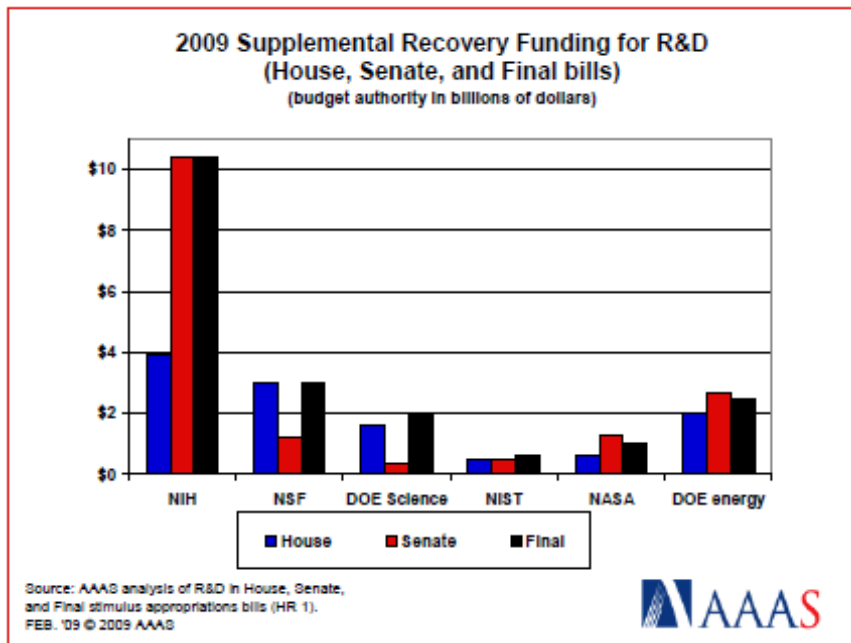


Figure 5.1. Source: AAAS

### 5.2.3 R&D Funding in President Obama's FY 2010 Budget

On May 7, President Obama released the full details of his FY 2010 Federal budget proposal. As noted above, this release was approximately three months

<sup>44</sup> It is widely reported that Senator Arlen Specter of Pennsylvania, who has long championed increased funding for health-related research, demanded the large injection of funding for NIH. It is said that the “price” of his voting for ARRA was the NIH increase. His vote was critical as he was one of only three Republicans to vote for ARRA, without which ARRA could not have passed in the Senate.

<sup>45</sup> Authors' calculations based on data in the AAAS reports cited above.

later than the statutory deadline for the president to submit his budget to Congress. The President was able to circumvent the law because (1) he did send to Congress a summary budget outline on February 26, 2009, and (2) Congress understood the extraordinary circumstances of this year's budget preparation and decision processes.

Ascertaining the specific levels of proposed spending for R&D in the annual budget proposal is not straightforward. Considerable effort and some informed judgment must be brought to bear to make credible estimates of exactly what the President has proposed. This happens because some key agencies incorporate R&D spending plans within larger aggregates of mission-oriented spending. Whereas it is relatively easy to extract R&D plans from the "R&D" agencies such as NSF and NIH, it is not so easy for DOE, NASA, DOD and the like.<sup>46</sup>

In addition, of course, the president's budget proposal is just that—a proposal. What will determine R&D funding in the final analysis is how the Congress modifies the President's proposal and how the various appropriations bills are shaped as they emerge from Congressional consideration and voting over the next several months.

In light of the above considerations, in this report we can only highlight some of the major implications of the FY 2010 proposal for R&D funding. All of the following observations are subject to modification as the Congressional process unfolds in detail. For the FY 2010 budget proposal, the Office of Science and

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<sup>46</sup> The challenge of extracting good R&D data from the president's budget is why the annual round of budget analyses performed by the AAAS and presented at the annual AAAS Science and Technology Policy Forum are so valuable. Unfortunately, the schedule of budget submission was so delayed this year that the AAAS and its partner organizations were not able to complete their analyses in time for the Forum, which took place on April 30 and May 1, a week before the budget details were released.

Technology Policy has issued a special summary statement regarding proposed funding for R&D, technology, and science, technology, engineering and mathematics (“STEM”) education.<sup>47</sup> We draw heavily on that statement.<sup>48</sup>

Figure 5.2 on the next page shows trends in Federal R&D funding (budget authority), taken from the OSTP report. The most striking feature of this chart is the sharp increase in R&D funding for FY 2009. This increase reflects, of course, the addition of the ARRA “Stimulus Plan” funding of \$18.3 billion to the regular FY 2009 appropriation of \$147.1 billion.<sup>49</sup> By contrast, the President’s budget proposes R&D funding of \$147.6 billion for FY 2010, or an increase over FY 2009, excluding ARRA, of only about one-half billion dollars, or 0.4 percent.

An increase of only 0.4 percent in total Federal R&D funding between the current fiscal year and the next one is somewhat surprising at first glance, given the considerable attention paid to “science” in the Obama Administration to date. In fact, taking inflation into account, this change can even be understood as a decrease in real terms. There are several possible explanations for this very limited increase.

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<sup>47</sup>Office of Science and Technology Policy, Executive Office of the President, “A Renewed Commitment to Science and Technology: Federal R&D, Technology, and STEM Education in the 2010 Budget,” May 7, 2009. On line at: <http://ostp.gov/galleries/budget/FY2010RD.pdf>.

<sup>48</sup>The statement is somewhat similar to statements issued by OSTP on Federal R&D funding in the past. That this is the case may not be surprising, since Kei Koizumi, formerly in charge of the R&D budget project at AAAS, is now Assistant Director of OSTP for Federal Research and Development.

<sup>49</sup>Op. cit., Table 1.

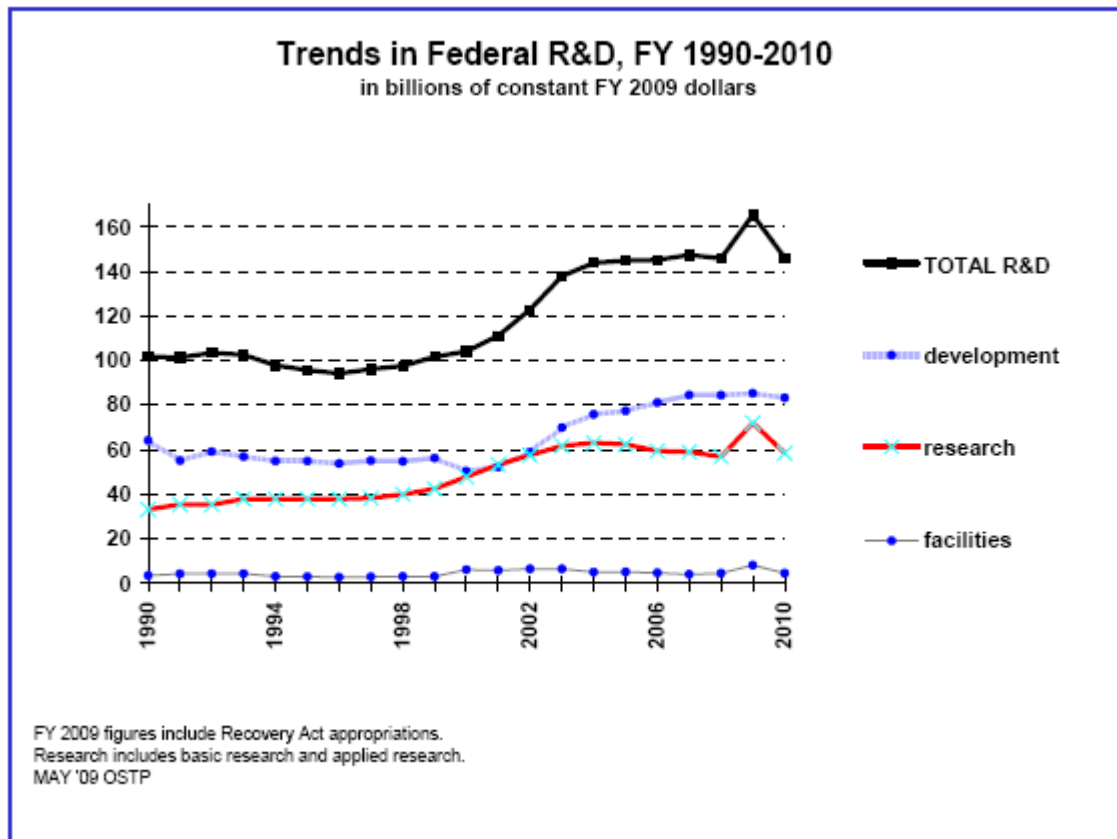


Figure 5.1. Source: OSTP

- Despite the outpouring of spending for the ARRA Stimulus, President Obama is, in fact, committed to reining in Federal spending, and this change is indicative of a general period of fiscal austerity to come once the financial crisis and recession have ended.
- The Administration is counting on the likelihood that the ARRA funding will get spent over two years to give the R&D agencies an effective boost in total R&D funds available for both FY 2009 and FY 2010. Of course, this means that the FY 2009 total funding will not be as large as it appears, while the FY 2010 total funding would be larger than the request.
- The Administration is playing the time-worn game of offering up lower budgets than it hopes to receive from Congress for programs and agencies that it knows Congress favors and will give increases to during budget consideration later in the year.



It may not be necessary to choose among these explanations. Each of them may have some validity in the current financial and budgetary situation. What we can say with some certainty is that the final appropriations are likely to differ from the President's request. There has some expression of dismay that the FY 2010 funding levels have not substantially increased, and one can expect various supporters of R&D inside Congress and out to press for increased spending above the levels in the budget proposal.

Within the constrained overall FY 2010 budget proposal, there are some notable changes.<sup>50</sup> Among these are:

- NASA +10%
- NIH +1.5%
- NIST +16%
- NSF +9.4%
- USDA -6.2%
- Defense R&D -2%
- Non-defense R&D +3.6%
- Basic research +3.4%
- COMPETES Act agencies +6.1%

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<sup>50</sup> Ibid.

These changes seem to reflect a more nuanced view of R&D priorities than was evident in the FY 2009 budget as enacted. They suggest a modest shift from defense toward non-defense R&D, continued support for the COMPETES Act agency programs, slowed growth in funding for NIH, and some cuts in mission agency programs.

### 5.3 Further Observations on R&D Funding Under President Obama

The worldwide financial crisis, the deepening US recession, and American political deadlock during the last year of the Bush Administration made early 2009 an extraordinary moment in U.S. budget history – a moment with extraordinary opportunities as well as extraordinary challenges. Instead of the normal budget process by which a President proposes a new budget in February and Congress enacts appropriations the following autumn, this year has seen the new Democratic President and Congress (1) enact final FY 2009 appropriations nearly five months late, (2) adopt a huge, special stimulus package in February to combat the recession, and (3) delay the FY 2010 budget process three months so that the Obama Administration could have time to produce a budget request that reflects his policy priorities, not those of the previous Bush Administration . This year, the U.S. Government is following a very unusual budget process.

However, while this year's budget process has been unusual, President Obama and the Democratic Congress have been remarkably consistent in their support for science and technology funding. The final FY 2009 appropriations contain increases for R&D programs, and the stimulus package contains large additional amounts of funding for general research and development, for energy

technology, and for expanding broadband Internet connections and the use of electronic medical records. And the President's FY 2010 budget proposes large increases in funding for some areas of R&D, funding that the Democratic Congress is likely to agree to.

## 6. CONCLUSION

This report argues that the new Obama Administration and its Democratic allies in Congress have indeed begun to transform U.S. science and technology policy. In particular:

- The new President has a philosophy of government that values science and expertise, and he has promised to restore the integrity of scientific advice and information within his administration. In many ways, his philosophy is a return to a traditional viewpoint that respects science and scientists.
- He is appointing first-rate people to key S&T policy positions, and while he has a strong White House staff he is also encouraging a wide range of viewpoints on major policy issues. Most of the senior people in general S&T policy positions come from elite universities, the high-tech community, and the environmental community, not from general manufacturing. The high-tech people and environmentalists are interesting in that they are both pro-business *and* pro-environment.
- President Obama has also begun to take a number of significant new policy actions that he promised during his campaign, including positions on climate change, stem cell research, and other areas that differ sharply from the views of the Bush Administration. Clean energy and stricter regulation of greenhouse gases are particular priorities for this President. But he also continues to support the bipartisan consensus in favor of basic research funding.
- The extraordinary economic crisis and political deadlock from the last year of the Bush Administration have led to significant delays in Federal budget decisions, including for R&D. At the same time, however, the recession created political pressure and support for a huge "Stimulus Package" that allowed President Obama and Congressional Democrats to give additional money to R&D, energy programs, and other activities far in excess of what would have been provided in more typical years.

These steps, therefore, are the main S&T policy developments of the first few months of the Obama Presidency.

The next question is: what is likely to happen in the future?

It is difficult to forecast at this early stage in the Obama Administration just where R&D funding and general S&T policy are likely to go. Many uncertainties will influence this process.

In terms of R&D, as the President chooses strong leaders for the various R&D agencies and as those leaders develop their own plans and proposals, the outcomes of the competition for funds within the Administration may include increases and decreases in R&D spending for particular agencies and programs. Furthermore, should additional financial stimulus be needed in the coming months, we can expect R&D to garner some of the new funds. At the same time, the President has set forth a call for his departments and agencies to look for ways to cut unnecessary spending in the years ahead, and some R&D projects that have outlasted their usefulness may be targets for major cuts. Pressures to cut at least some R&D programs may intensify if public and Congressional concerns over the rapidly expanding national debt grow.

Longer term, the new FY 2010 budget reflects relatively little concern for funding new programs to enhance the competitive performance of U.S. industries, other than those engaged in such favored sectors as clean energy, health information systems, and broadband expansion. Therefore, if and when the immediate financial crisis is resolved, we expect the re-emergence of concern for “competitiveness” investments that are not currently prominent. As we have argued elsewhere, the COMPETES Act programs should be seen, not as a solution to the nation’s competitiveness challenges, but only as a first step

toward a more far-reaching program.<sup>51</sup> The elimination of the Technology Administration in the Department of Commerce by the COMPETES Act, the apparent focus of the new Associate Director of OSTP for Technology on information technology to the exclusion of other areas of technology, and the lack of any initiatives so far in the competitiveness arena from the Obama Administration suggests that at some point in the future there will be a need to create a new agency or major program in an existing agency to address these challenges. In a report to NEDO last year, we outlined some of the directions that might be considered in the future.<sup>52</sup>

We also expect that debates over clean energy and greenhouse gas emissions will become more intense in the months ahead. Already, Energy Secretary Chu has become enmeshed in debates over “clean coal” programs, disagreements over America’s ethanol program are growing, and arguments continue over the Waxman-Markey cap-and-trade bill (H.R. 2454, the proposed American Clean Energy and Security Act). These debates are likely to continue.

However, despite whatever happens in the future President Obama has already changed the tone of S&T policy-making in Washington. As mentioned earlier, he respects science and scientists and has restored the traditional important role of science advice. Given the turmoil and occasional censorship of the Bush years, this is an important transformation in U.S. S&T policy.

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<sup>51</sup> “Innovation Policy Today in the United States: The Mainstream Consensus and Other Views,” report to NEDO, George R. Heaton, Jr., Christopher T. Hill, Patrick Windham and David W. Cheney, May 2007.

<sup>52</sup> “New Pathways in U.S. Innovation Policy,” report to NEDO, George R. Heaton, Jr., Christopher T. Hill, Patrick Windham and David W. Cheney, May 2008.