The U.S. Government's Technology Strategy and the Process That Develops It

A Report to NEDO

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PREFACE

The study underlying this report was commissioned by the Washington, D.C., office of Japan's New Energy and Industrial Technology Development Organization (NEDO).

The report's authors, working together as the firm of Technology Policy International (TPI), have undertaken the study as independent consultants, although it should be noted that each has other professional affiliations and activities (see "About the Authors"). 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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Two Questions from NEDO

NEDO has asked TPI to answer two questions about U.S. technology strategy. First, does the United States Government have a single, unified technology strategy – that is, a single, unified set of technology goals and programs to try to reach those goals? And, second, how does the government create its technology strategy or strategies? That is, what is the policy-making process, and who are the main actors in that process?[1] This short paper discusses these questions.

Multiple Technology Strategies That Form an Overall Policy

The U.S. Government does *not* have a single, unified technology strategy. A combination of annual Presidential budget requests, Congressional spending laws, and other laws and government documents does set overall national priorities for science and technology (S&T). But the U.S. divides S&T policy and activities among many departments and agencies, each of which has its own particular strategies. As a result, overall U.S. S&T policy is a combination of

[1] This paper assumes that the terms "technology strategy" and "technology policy" mean the same thing: a set of goals regarding the development and deployment of new technologies and a set of programs that aim to achieve those goals. The paper will use the two terms interchangeably. Moreover, since the development of new technologies often involves new scientific research as well as engineering development, the paper will assume that a government agency's "technology policy" often includes some scientific research. Finally, the goals of an agency's technology strategy (technology policy) may be explicit and specific and agency programs specifically designed to reach those goals, or goals may be more general and programs may invest in a broad range of science and technology, in the hope that some of these investments will eventually lead to valuable new technologies.

agency strategies with some coordination by the White House and a great deal of modification by Congress – but not a single, unified technology strategy.

U.S. Government S&T policy and programs are decentralized (divided) in three important ways:

- Federal research and development (R&D) spending is divided among a large number of federal departments and agencies. Table 1 on the next page summarizes this R&D spending.[2] The column titled "FY 2015 budget" is President Obama's request for fiscal year 2015, which will begin on October 1, 2014. Congress and the President together will make the final decisions about FY 2015 funding levels.

- Related, U.S. leaders have long seen R&D as primarily a tool for helping to advance broad U.S. goals, such as defense, energy, space, health, energy, and agriculture. So the strategies for most R&D programs are determined by the specific needs and budgets of their departments and agencies. As a result, the U.S. has many technology strategies, not a single one. For example, the Defense Department's technology strategy will be different than the National Science Foundation's strategy, because they have different missions and different ways of using technology to help achieve those missions.

- In addition to R&D agencies, several non-R&D agencies of the government also influence the development and deployment of new technology. For example, these other agencies are responsible for intellectual property rules, taxation, antitrust, trade, and education. The policies of these non-R&D agencies are also part of overall U.S. policies regarding technology.

[2] The American Association for the Advancement of Science (AAAS) prepared this table, using U.S. Government data, http://www.aaas.org/sites/default/files/Total%20R%26D%2015p%202.jpg

Table I-1. R&D in the FY 2015 Budget by Agency
(budget authority in millions of dollars)

	FY 2013 Actual	FY 2014 Estimate	**FY 2015 Budget**	Change FY 14-15 Amount	Change FY 14-15 Percent
TOTAL R&D (Conduct of R&D and R&D Facilities)					
Defense (military)	65,540	66,086	**65,690**	-396	-0.6%
S&T (6.1-6.3 + medical)	*12,009*	*13,561*	***12,169***	-1,392	-10.3%
All Other DOD	*53,532*	*52,524*	***53,520***	996	1.9%
Health and Human Services	29,802	30,823	**31,053**	230	0.7%
National Institutes of Health	*28,341*	*29,252*	***29,524***	272	0.9%
All Other HHS	*1,461*	*1,571*	***1,529***	-42	-2.7%
Energy	10,705	11,389	**12,366**	977	8.6%
Atomic Energy Defense	*4,226*	*4,445*	***5,084***	639	14.4%
Office of Science	*4,291*	*4,655*	***4,714***	59	1.3%
Energy Programs	*2,187*	*2,289*	***2,568***	280	12.2%
NASA	10,999	11,491	**11,556**	66	0.6%
National Science Foundation	5,328	5,552	**5,566**	14	0.3%
Agriculture	2,116	2,418	**2,447**	29	1.2%
Commerce	1,297	1,636	**1,597**	-39	-2.4%
NOAA	*543*	*666*	***689***	23	3.4%
NIST	*596*	*666*	***690***	23	3.5%
Transportation	818	873	**897**	25	2.9%
Homeland Security	684	1,032	**876**	-156	-15.1%
Veterans Affairs	1,164	1,175	**1,178**	3	0.2%
Interior	785	839	**924**	85	10.1%
US Geological Survey	*636*	*650*	***686***	36	5.5%
Environ Protection Agency	530	538	**537**	-1	-0.1%
Education	319	323	**336**	13	4.0%
Smithsonian	238	232	**252**	20	8.6%
Intl Assistance Programs	273	203	**203**	0	0.0%
Patient-Centered Outcomes	488	464	**528**	64	13.8%
Justice	100	89	**89**	0	0.0%
Nuclear Reg Comm	87	90	**92**	2	2.2%
State	77	77	**77**	0	0.0%
Housing and Urban Dev	54	61	**85**	24	39.3%
Social Security	17	47	**88**	41	87.2%
Tennessee Valley Authority	15	17	**16**	-1	-5.9%
Postal Service	21	22	**23**	1	4.5%
Corps of Engineers	11	11	**11**	0	0.0%
Treasury	8	8	**8**	0	0.0%
Labor	4	4	**4**	0	0.0%
Cnsmer Prod Safety Comm	2	2	**2**	0	0.0%
Total R&D	131,482	135,501	**136,502**	1,001	0.7%
Defense R&D	69,766	70,531	**70,774**	243	0.3%
Nondefense R&D	61,716	64,970	**65,728**	757	1.2%

Source: OMB R&D data, agency budget justifications, and agency budget documents.
Does not include Opportunity, Growth, and Security Initiative funding (see Table II-20).
Note: The projected GDP inflation rate between FY 2014 and FY 2015 is 1.7 percent.
All figures are rounded to the nearest million. Changes calculated from unrounded figures.

U.S. Priorities and Programs

Even though U.S. technology policy is highly decentralized, the country's overall policy does have certain important features or characteristics. Four points are particularly important.

- ***R&D priorities***. Every country's R&D priorities reflect its national priorities. For the U.S., defense has been the highest priority since the Second World War. During that war, during the Cold War, and since September 11, 2001, the U.S. has invested heavily in R&D in order to maintain technological leadership in defense. Other priorities have changed over time, but U.S. priorities have included space, energy, health, and food and agriculture. Therefore, the U.S. Government spends large amounts of money to support R&D in these areas. The U.S. also invests heavily in basic research. For historical and political reasons, the U.S. Government invests only a small percentage of its R&D money to help general civilian industry improve its technologies. So, we can say that the U.S. Government's technology strategy focuses today primarily on developing technologies for defense, with additional funding for health, energy, space, and some other areas.

- ***R&D program priorities***. Because U.S. departments and agencies have different missions, their R&D programs have different types of priorities. For example, the Department of Defense (DOD) wants technologically advanced equipment, and therefore its R&D programs focus heavily on technology development and actual engineering. DOD supports some basic research, but for the purpose of improving technology. On the other hand, the National Science Foundation (NSF) and the Department of Energy's Office of Science focus more on basic scientific research and less on the development of new technologies. Recently, DOE's energy offices have placed more emphasis on programs that develop new technologies that either dramatically lower costs (such as the SunShot program) or develop radical new technology (as in ARPA-E).

- ***How the U.S. Government supports R&D***. In terms of how to get the best new technologies in high-priority areas, U.S. policy has certain common features. These include: funding world-class researchers in

universities and companies as well as in government laboratories; using competitive processes to select which researchers are funded; combining short-term R&D awards (often about three years) with long-term investments in promising technical areas; investing in "portfolios" of promising new scientific and technical areas; and appointing scientists and engineers to run R&D agencies and to make decisions about R&D grants and contracts.

- ***Other, non-R&D, parts of U.S. technology policy***. Historically, U.S. policies for intellectual property, taxation, and antitrust have focused on helping private companies to develop new technologies and products and to keep the private sector competitive.

U.S. Technology Strategy Documents

U.S. technology strategy documents are different from Japan's. The U.S. does not prepare national science and technology basic plans. Therefore, the U.S. Government does not have a single official document that states its overall science and technology policy and strategy.[3]

Instead, the U.S. has several documents that describe pieces of its technology strategy.

- ***The R&D section of the President's annual budget proposal***. One section of each annual Presidential budget request does provide a summary of overall research and development (R&D) spending and Presidential R&D priorities, but it is not a detailed document and usually does not discuss the S&T policies of non-R&D agencies –

[3] At one time, Congress asked the White House to prepare annual overall S&T plans. Section 102(b)(1) of the National Science and Technology Policy, Organization, and Priorities Act of 1976 (Public Law 94-282) said, "The Federal Government should maintain central policy planning elements in the executive branch…" and section 209 of the Act stated, "The President shall transmit annually to the Congress, a Science and Technology Report…." However, a Democratic President, Jimmy Carter, and his Science Advisor disliked this requirement for an annual report, and eventually the requirement was dropped. This type of central planning document is not popular in the United States.

agencies that set policy for patents, taxation of private R&D, antitrust, science and engineering education, and so forth.[4]

- ***OSTP summaries***. When a President submits an annual budget request to Congress, the White House Office of Science and Technology Policy (OSTP) usually distributes summaries of the R&D budget and sometimes specific "fact sheets" (summary documents) on Presidential R&D priorities.[5]

- ***Agency strategic plans.*** Some U.S. agencies prepare "strategic plans" that outline their missions, goals, and programs. These documents are important, but they are also often vague.[6]

Who Makes U.S. Technology Policy? The Formal Process

The U.S. has formal processes for making policy decisions, including decisions about R&D budgets. This section of the paper will summarize those processes. But later sections of the paper will also discuss the informal policy-making processes – the important ways in which people propose ideas, evaluate them, and decide what to do. In the United States, many government officials and citizens participate in this informal process.

The formal processes are those set forth in the U.S. Constitution, Congressional rules, Executive Branch procedures, and laws governing the

[4] This annual summary of R&D spending is the "Research and Development" section of a document called Analytical Perspectives. Analytical Perspectives is an official part of every President's annual budget request. The latest version of Analytical Perspectives is part of President Obama's budget for fiscal year 2015, and is available at: http://www.whitehouse.gov/sites/default/files/omb/budget/fy2015/assets/spec.pdf. The R&D section is pages 309-315.

[5] For example, see the documents listed on the OSTP page called "R&D Budgets," http://www.whitehouse.gov/administration/eop/ostp/rdbudgets.

[6] One example of this type of document is NSF's latest strategic plan, available at: http://www.nsf.gov/pubs/2014/nsf14043/nsf14043.pdf. In 2006, during President George W. Bush's administration, the Department of Energy prepared an overall strategic plan, and it included a discussion of how the Department's R&D programs support its overall mission. That plan is available at: http://energy.gov/sites/prod/files/edg/media/2006_DOE_Strategic_Plan.pdf. Multi-agency R&D programs also sometimes have strategic plans. For example, the most recent strategic plan for the National Nanotechnology Initiative is available at: http://www.nano.gov/sites/default/files/pub_resource/2014_nni_strategic_plan.pdf.

federal government's budget process. The processes give certain government officials important roles in developing federal technology strategies.

First, the U.S. Constitution divides power among Congress, Presidents, and the federal courts. Presidents can propose government policies, including budgets, but Congress writes the laws.

Second, Congress uses committees to oversee agencies and write law, and so we should look to see which committees have responsibility for particular agencies. For example, the House Science, Space, and Technology Committee and the Senate Commerce, Science, and Transportation committee write general laws (known as "authorization laws") for NASA, while the Commerce, Justice, and Science Subcommittees of the House and Senate Appropriations Committees decide NASA's actual budget levels. Other committees and their members have responsibility for defense, health, energy, agriculture, etc.

Third, the Executive Office of the President – the White House staff and affiliated organizations – has its own people who help set science and technology policy. The most important are the National Science and Technology Council (a committee of senior policy-makers, led by the President), the Office of Science and Technology (OSTP), and the very powerful budget office, the Office of Management and Budget (OMB). For each fiscal year, agencies submit formal budget requests to OMB, OMB decides what budgets to recommend to the President, and the President makes the final decisions before submitting his budget request to Congress.[7]

[7] This Executive Branch budget process is governed by the Budget and Accounting Act of 1921 (Public Law 67-13), as amended. Congressional procedures for setting overall annual budget levels are set in the Congressional Budget and Impoundment Control Act of 1974 (Public Law 93-344), as amended.

One important feature of the budget process is an annual memorandum that OMB and OSTP send to all agencies, listing the President's S&T priorities and asking agencies to submit proposed budgets that reflect these priorities.[8]

The Informal Policy Process for Existing R&D Programs

While the U.S. Government does not have a formal planning process similar to Japan's, U.S. R&D agencies do have their own thoughtful and successful processes for setting priorities, deciding on programs in priority areas, and revising those programs as circumstances change. Much of this work is "informal," in the sense that its procedures are not set by the U.S. Constitution or by official laws. But these informal processes have existed for many years.

In this part of the paper, we will discuss two examples of the informal policy processes used to set policy for existing federal R&D programs. These examples are nanotechnology programs and overall priorities at ARPA-E. Both examples illustrate how technically-trained agency officials consult widely with other experts, learn from those consultations, and then decide how they want to revise and improve R&D programs. They then ask the President and Congress to accept these changes in technology strategy. Similar procedures are used in other U.S. R&D programs.

Nanotechnology. Informal policy-making processes in U.S. agencies rely very much on consultations with the technical community in a particular field. Workshops, conversations with researchers, and advisory committees provide

[8] For example, see the most recent budget priorities memorandum, which lists President Obama's S&T priorities for the fiscal year 2016 budget. (Fiscal year 2016 will begin on October 1, 2015.) See: Brian C. Deese and John P. Holdren, "Memorandum for the Heads of Executive Departments and Agencies: Science and Technology Priorities for the FY 2016 Budget," July 18, 2014, http://www.whitehouse.gov/sites/default/files/microsites/ostp/m-14-11.pdf. These annual memoranda are not required by law, but both Republican and Democratic administrations have used them for many years to improve the coordination across agencies and to emphasize Presidential budget priorities.

insights and advice to agency officials, who then use that information to propose new research directions in existing programs.

In several areas of science and technology – including astronomy, physics, space, and nanotechnology – regular reviews of programs and research opportunities by the National Academies are particularly important.[9] In the case of nanotechnology, the National Academies provide reviews of the NNI every three years.[10] These reports are useful, but the informal, unwritten advice provided by the Academies' expert committees and the other experts who speak at them also is very helpful to agency officials.

ARPA-E. ARPA-E follows the process developed originally at the Defense Advanced Research Projects Agency (DARPA). Under that process, ARPA-E hires program directors who themselves are world-class technical experts, and those program directors then consult with their technical communities and use a set of questions – called "framing questions" – to develop proposed new research initiatives (called "focused programs"). And ARPA-E always concentrates on its main strategic goal: creating transformational technologies.

The following description of ARPA-E's process and the set of "framing questions" it uses come from the agency's "Strategic Vision" document:

> The concept for a new "focused" program is developed through engagement with diverse science and technology communities … and by examining lessons learned from current ARPA-E programs and projects….
>
> The ARPA-E program development cycle is primarily about identifying gaps where high-impact, high-potential investment by ARPA-

[9] The National Academies are official advisors to the U.S. Government. The Academies consist of the National Academy of Sciences, the National Academy of Engineering, the Institute of Medicine, and the National Research Council, which is the part of the Academies that organizes study committees and issues their reports. More information about the National Academies is available at: www.nas.edu.

[10] See, for example, Committee on Triennial Review of the National Nanotechnology Initiative, National Research Council, Triennial Review of the National Nanotechnology Initiative (Washington: National Academies Press, 2013), available at: http://www.nap.edu/catalog.php?record_id=18271.

E could lead to transformational technologies enabling entirely new ways to generate, store, and use energy. New programs are carefully constructed by program directors, working in an environment of constructive criticism where every aspect of a proposed program is intensely scrutinized for technical and economic viability, as well as impact on ARPA-E's mission….

[T]he agency is not bound by traditional technology development roadmaps. To the contrary, ARPA-E works "off roadmap" to quickly leverage new scientific breakthroughs and market developments…. ARPA-E uses a set of simply asked, but not always easily answered, questions to frame new programs….[11]

Box 1: ARPA-E Program Framing Questions (from "Strategic Vision 2013")

What is the problem to be solved? Is the problem stated clearly so it is easily understood?

If successful, how will the proposed program impact one or more of ARPA-E's mission areas: reducing imported energy, enhancing energy efficiency, and reducing energy-related emissions?

What are the program goals and how will progress towards those goals be measured?

What is the current state of research and development in this area and how is the proposed program a transformative and disruptive approach relative to the current state?

Why is now the right time to solve this problem?

What research communities need to be brought together to create project teams to address the program goals?

How does the program complement research and development efforts in other Department of Energy programs, other federal agencies, and the private sector?

What happens at the conclusion of the program? How will the program transition? Who will be the early adopters? What are the barriers to commercialization and how might these problems be overcome?

Adapted from the DARPA Heilmeier questions (questions posed by former DARPA director George Heilmeier)

[11] Advanced Research Projects Agency-Energy, "Strategic Vision 2013," pages 2-4, http://arpa-e.energy.gov/sites/default/files/ARPA-E_Strategic_Vision_Report_101713.pdf.

Every year ARPA-E also has an "open" competition, in which researchers may submit proposals on any technologies that they think are potential useful.

The Informal Policy Process to Develop New R&D Initiatives

One important feature of American politics is that Presidents and members of Congress often want to make new policy proposals and therefore welcome ideas from the policy community. They want to make new proposals because they want to help reach goals that they care about, or because they want to please voters and important constituencies, or both. Ronald Reagan is one example of a President who particularly liked to propose new science and technology projects; he suggested the Space Station, the Superconducting Super Collider (a large particle accelerator that the U.S. never built), and his Strategic Defense Initiative to shoot down enemy missiles. But other recent Presidents have also proposed large S&T initiatives that they hope will impress voters. President Kennedy's proposal to land men on the Moon is perhaps the most dramatic of all such initiatives. In addition, many members of Congress also like to propose new policy initiatives.

The situation creates a "demand" for new policy ideas, and people whom we call "policy entrepreneurs" are happy to provide a "supply" of new ideas. However, while many people in the science and technology policy community propose new R&D programs or make other proposals to create and deploy new technologies, the process of assembling strong political support for a new idea is difficult. One must persuade both the White House and majorities in the Senate and House Representatives to support the idea and provide funding.

Here we briefly describe the procedures that policy entrepreneurs used to create three new government technology programs. In the first and third cases,

policy entrepreneurs proposed new programs that changed the technology strategies of existing U.S. Government agencies. The second example – the creation of ARPA-E – shows how policy entrepreneurs persuaded officials to create an entirely new agency.

National Nanotechnology Initiative (NNI). Earlier in this paper we discussed the current operation of the NNI and the process used to revise its strategy and operations. Here we will briefly discuss its history.[12]

In January 2000, President Bill Clinton made a speech at the California Institute of Technology in which he proposed a new multi-agency R&D initiative in nanotechnology. While he was not popular with the Republican-controlled House of Representatives, the President succeeded in getting strong Congressional support for the initiative. Moreover, President George W. Bush supported the NNI while he was in office, and it still exists today under President Obama. Who was able to persuade President Clinton, Congress, and later Presidents to support this initiative, why did they succeed, and what does this story say about the process for creating politically successful new technology programs in the United States?

Three government officials (who became the "policy entrepreneurs") played a key role in the creation of the NNI. Nanotechnology became an intellectually exciting field in the late 1990s, and several meetings of researchers – some funded by NSF – identified promising research areas. The three government officials recognized this promise, saw that President Clinton might be interested, and then worked with the technical community, federal agencies,

[12] TPI provided a detailed history of the origins of the NNI in a 2001 report to JETRO. Here we summarize the main points made in that report. The report is: George R. Heaton, Jr, Christopher T. Hill, Patrick Windham, and David W. Cheney, with Tatsujiro Suzuki, *Public Policies and the Emergence of High-Technology Sectors*, Technology Policy International, January 2001.

OSTP, and OMB to develop a thoughtful, high-quality proposal. They then presented their proposal to President Clinton. President Clinton and Vice President Al Gore liked technology and always were looking for initiatives that U.S. voters might find exciting, and they approved the plan.

The three government staff people also handled the overall political situation very well. First, they included all major federal agencies in the initiative (ensuring that no agency would feel it was ignored); promised the agencies that the White House would try to get additional funding for this new research, so that existing programs would not be reduced; built a broad coalition of universities and companies that supported the initiative; focused on basic research and thus avoided applied R&D that might be controversial with Republican members of Congress; and found both Republican and Democratic supporters in Congress. And while President Clinton supported the initiative, the policy entrepreneurs presented the NNI as a non-partisan initiative from the U.S. research community.

This program design and political strategy worked very well, and, as mentioned earlier, the NNI continues to this day.

ARPA-E. How was ARPA-E created? A National Academies committee made the first highly visible proposal to create ARPA-E. In 2005, this committee issued an influential report called *Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future*.[13] Most of the report's recommendations were traditional and non-controversial: suggestions for more basic research, improvements in science education, and favorable patent and tax policies for industry. However, several members of the committee felt that new

[13] Committee on Science, Engineering, and Public Policy, *Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future,* the National Academies, 2005.

high-risk, high-payoff applied research was also important, particularly in the critical field of energy. Not all members of the committee liked the ARPA-E proposal, but the committee included it in the final report.

The two co-chairmen of this particular committee next did something unusual: they successfully asked both the Bush White House and members of Congress to carry out the report's recommendations. President Bush, possibly concerned about growing anxiety about U.S. economic performance in an increasingly global economy, agreed to support a bipartisan bill. His staff did not like the ARPA-E proposal but Democrats did, and the White House agreed to a provision that "authorized" ARPA-E (that is, allowed the agency to be created but did not give it money). The Bush White House never requested funding for the new organization.

In 2009, however, President Obama and the then-Democratic-controlled Congress included $400 million for the new agency in their large "economic stimulus law," the American Recovery and Reinvestment Act. President Obama was then and now a stronger supporter of research on new energy technologies. Since that first funding, the President has requested regular annual appropriations for the agency. The directors of the agency have not only created well-respected technology programs but also worked well with both Republican and Democratic members of Congress, and so far the agency has received annual funding. However, if a Republican Presidential candidate is elected in 2016, then the agency may run into political difficulties.

National Network of Manufacturing Innovation (NNMI). In his 2013 State of the Union Address (a major policy speech that Presidents give each January), President Obama proposed creating the NNMI – a set of regional institutes to

help U.S. manufacturers by accelerating the development and adoption of cutting-edge manufacturing technologies. Two such institutes already are operating, and in February 2014 the President announced the creation of two more.[14]

The NNMI is the product of a combination of factors: (1) President Obama's desire to help U.S. manufacturing companies, (2) information provided by experts in U.S. universities and Washington, DC, groups, and (3) work by OSTP to propose a program that could help those manufacturers, particularly small and medium-sized companies. So in this case the policy entrepreneurs were in OSTP, although drawing upon ideas presented by analysts and groups outside of the administration. It also appears that they looked at programs in other countries. For example, the proposal to create manufacturing institutes is somewhat similar to Germany's highly-regarded Fraunhofer institutes, which help German *Mittelstand* (medium-sized, family-owned) firms.

However, the NNMI proposal faces a problem: while many members of Congress want to help manufacturing, in today's bitter political environment Congress is unlikely to fund such a program. The President would like up to 25 institutes; so far, he has used some existing appropriations, mostly from the Defense Department, to fund four centers. In September 2014, the House of Representatives passed a bill to create a manufacturing centers program, but the bill provides no new funding for the program.[15]

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[14] "National Network for Manufacturing Innovation (NNMI)," http://manufacturing.gov/nnmi.html.

[15] On September 15, 2014, the House of Representatives passed H.R. 2996, the proposed Revitalize American Manufacturing and Innovation Act of 2014. If approved by the Senate and signed by the President, the bill would establish a Network for Manufacturing Innovation Program within the Commerce Department's National Institute of Standards and Technology (NIST). The centers that this program would create are similar to the President's manufacturing institutes. However, the bill denies new funds for this program. Instead, it says: "The Secretary [of Commerce] may use not to exceed $10,000,000 for each of the fiscal years 2015 through 2019 to carry out this section from amounts appropriated for economic

Conclusion

The United States Government does not have a single, unified strategy for the development and deployment of new technologies. Instead, it has many federal agencies – both R&D agencies and non-R&D S&T agencies – that influence the development and use of advanced technologies. This situation leads to a complex and fragmented national technology strategy, but it also allows different agencies to try different policies and programs and allows agencies to design programs that help achieve their particular goals. The White House and Congressional laws provide some coordination for these agency technology programs, but the White House mainly adds Presidential priorities to the many activities already undertaken by S&T agencies.

U.S. officials use a combination of formal budget procedures and informal consultation with the technical community – including the National Academies – to revise the strategies and operations of existing R&D programs. Policy entrepreneurs also try, sometimes successfully, to persuade government officials to create new technology programs and entirely new technology agencies.

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development assistance programs." This provision suggests that the money should come from funds appropriated for the Commerce Department's Economic Development Administration (EDA). However, it is not clear that either the House and Senate Appropriations Committees or the Obama Administration would agree to moving money from EDA to the manufacturing program. Also, $10 million per year is a small amount of money for such a program. A summary of H.R. 2996, as passed by the House, is available at: https://www.congress.gov/bill/113th-congress/house-bill/2996?q={%22search%22%3A[%22hr+2996%22]}.