



January 2015

FEDERAL RESEARCH

DOE Is Addressing Invention Disclosure and Other Challenges but Needs a Plan to Guide Data Management Improvements

Why GAO Did This Study

DOE provides funding to contractors for research and development of new technologies. To incentivize participation in federal research projects and promote the use of federally funded inventions, the 1980 Bayh-Dole Act and other laws and regulations allow contractors receiving federal research and development funds to retain ownership of inventions they create so long as they adhere to certain requirements, including disclosing inventions developed with agency funding. DOE's ability to protect its interests in these inventions—including their utilization and domestic manufacture—depends on its knowledge of their existence.

GAO was asked to review DOE efforts to protect its interests in agency funded inventions. This report examines: (1) DOE funding for contractor research for fiscal years 2009 through 2013 and how DOE ensures that contractors disclose agency funded inventions, (2) the challenges DOE faces in ensuring invention disclosure and actions it is taking to address them, and (3) the challenges DOE faces in protecting its interests in these inventions and the actions it is taking to address them. GAO reviewed laws, regulations, and other documents and interviewed DOE patent counsel responsible for intellectual property issues, representatives of organizations that facilitate the development of federally funded technology, and others.

What GAO Recommends

GAO recommends that DOE develop an implementation plan with milestones for improving its data management systems. DOE agreed with this recommendation.

View [GAO-15-212](#). For more information, contact John Neumann at (202) 512-3841 or neumannj@gao.gov.

FEDERAL RESEARCH

DOE Is Addressing Invention Disclosure and Other Challenges but Needs a Plan to Guide Data Management Improvements

What GAO Found

The U.S. Department of Energy (DOE) provided at least a total of \$11 billion (\$12 billion in fiscal year 2014 dollars) in research and development funding to contractors for fiscal years 2009 through 2013. Contractors reported about 5,800 inventions and 700 patents developed with DOE funding during this time period. To ensure disclosure of these agency funded inventions, DOE relies primarily on contractor self-reporting and financial assistance award closeout procedures. Contractors are generally required to adhere to specific time frames for invention disclosure. Following contractor invention disclosure, DOE patent counsel monitor the invention through the end of a financial assistance award to ensure contractor compliance with time frame requirements for electing to retain ownership and applying for patent protection of the invention.

DOE faces challenges in (1) ensuring that contractors disclose agency funded inventions and (2) managing information related to these disclosures and is taking steps to address them.

- **Limited ability to ensure invention disclosure after funding ends:** DOE does not have a documented process to ensure contractors disclose inventions after financial assistance awards end. To address this, DOE recently began two pilot efforts to determine the extent of undisclosed inventions. One is an audit of a sample of previously completed financial assistance awards and the other involves cross-referencing U.S. Patent and Trademark Office data against DOE information on inventions it funded. DOE is still implementing these efforts but reported identifying more than 100 potential undisclosed inventions. DOE will assess the results of the pilots to determine whether to continue them, according to DOE patent counsel.
- **Data management limitations:** DOE faces a challenge in managing information related to agency funded inventions because it relies on two different data systems that are outdated, unable to communicate with each other, and do not allow for electronic reporting. Under federal internal control standards, information should be recorded and communicated to management and others within the entity who need it and in a form and within a time frame that enables them to carry out their responsibilities. DOE is in the process of updating its data systems and is planning the development of an electronic reporting function but has not established an implementation plan with milestones against which it can track its progress toward completing these efforts. By developing such a plan, DOE would have greater assurance that it is making timely progress toward these efforts.

In addition, DOE faces challenges in its ability to monitor and influence the utilization and domestic manufacture of inventions it funded to protect its interests in them. DOE has proposed regulatory changes to address these challenges that would (1) require contractors to report on the utilization and domestic manufacture of agency funded inventions, (2) allow DOE to assess manufacturing plans as criteria for funding decisions, and (3) require contractors to obtain DOE authorization for changes in their control—including ownership—under certain circumstances. According to patent counsel, DOE expects to finalize these regulatory changes in fiscal year 2015.

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Abbreviations

CFIUS	Committee on Foreign Investment in the United States
DOE	U.S. Department of Energy
iEdison	Interagency Edison
IP	Intellectual Property
PATMIS	Patent Management Information System

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January 30, 2015

The Honorable Charles E. Grassley
Chairman
Committee on the Judiciary
United States Senate

The Honorable John R. Thune
United States Senate

Technological innovation is widely seen as responsible for much of the economic growth and increased standard of living in modern societies. Federal departments and agencies, such as the U.S. Department of Energy (DOE), support technological innovation through a wide range of research activities that focus on their mission needs. For example, DOE annually funds billions of dollars toward the nation's research in support of its mission to ensure America's security and prosperity by addressing its energy, environmental, and nuclear challenges through transformative science and technology solutions.

A large portion of DOE funded research is performed outside of the network of its 17 national laboratories through financial assistance awards with private sector or academic researchers, among others. The 1980 Bayh-Dole Act and other laws and implementing regulations provide the legal framework for the ownership of inventions developed by nonfederal recipients of federal research and development funding, commonly referred to as contractors.¹ To better transfer the results of federally funded research to the public, this framework allows contractors—rather

¹Under the Bayh-Dole Act, the term “contractor” means any person, small business firm, or nonprofit organization that is a party to a federal funding agreement, which includes contracts, grants, or cooperative agreements for the performance of experimental, developmental, or research work. 35 U.S.C. § 201(b)-(c). Section 9 of the Federal Nonnuclear Energy Research and Development Act of 1974 (42 U.S.C. § 5908), Section 152 of the Atomic Energy Act of 1954 (42 U.S.C. § 2182), and DOE's Patent Waiver Regulations (10 C.F.R. pt. 784), allow DOE to provide waivers to large businesses so that they may retain ownership of inventions developed with agency funding. For the purposes of this report, the term “contractor” includes large businesses receiving such waivers, as well as entities defined as contractors under the Bayh-Dole Act except when referring specifically to a contractor under a particular statute. In addition, this report does not address DOE management of all types of funding agreements, but only a subset of those—financial assistance awards.

than the government—to manage invention utilization by retaining ownership of inventions they develop with federal funds. At the same time, this framework requires contractors to take steps to protect the government’s interests in these inventions. Specifically, DOE has an interest in facilitating the utilization of inventions resulting from the research it funds because the public benefits when technological advances become new goods and services in the marketplace. Additionally, DOE generally has an interest in federally funded inventions being made in the United States. To help protect these interests, the Bayh-Dole Act and DOE’s large business patent waivers establish time frames in which contractors must disclose the development of federally funded inventions, determine whether to retain ownership, and apply for patent protection, among other things.² Contractor compliance with these requirements provides information on federally funded inventions that agencies can use to protect the government’s interests in them.

In recent years, some congressional hearings raised concerns about whether inventions funded by agencies, such as DOE, are being used to support U.S. economic growth and competitiveness. For example, a December 2012 congressional hearing raised several concerns about whether taxpayer-funded research and development benefits foreign entities when such entities purchase U.S. companies or their technology assets.³ In addition, a March 2012 congressional hearing raised concerns about U.S. firms that relocate their manufacturing efforts overseas, particularly when federal agencies helped to fund the technologies used by those firms.⁴

²A U.S. patent is an exclusive right granted, generally for 20 years, within the United States to someone who invents or discovers (1) a new and useful process, machine, manufacture, or composition of matter or (2) any new and useful improvement of such items. A patent owner can grant permission to use a patented invention by licensing others to use, make, or sell the patented invention on an exclusive or nonexclusive basis. The U.S. Patent and Trademark Office is the federal agency responsible for granting U.S. patents and registering trademarks to carry out Congress’ authority under Article I, Section 8, Clause 8, and Article I, Section 8, Clause 3, of the Constitution.

³*The Impact of International Technology Transfer on American Research and Development, Before the House Committee on Science, Space, and Technology, Subcommittee on Investigations and Oversight, 112th Congress, 3-10 (2012).*

⁴*Commerce, Justice, Science, and Related Agencies Appropriations for 2013, Before the House Committee on Appropriations, Subcommittee on Commerce, Justice, Science, and Related Agencies, 112th Congress, 364-366 (2012).*

You asked us to review DOE's efforts to protect its interests in agency funded inventions. This report examines (1) the extent to which DOE funds contractor research and how it ensures that contractors disclose inventions they develop with agency funding; (2) the challenges DOE faces in ensuring contractors disclose inventions, as well as the actions it is taking to address them; and (3) the challenges DOE faces in protecting its interests in agency funded inventions, as well as the actions it is taking to address them.

To examine how DOE ensures that contractors disclose inventions they develop with agency funding, we identified and reviewed laws, regulations, and agency documents associated with invention disclosure requirements and DOE's process to monitor contractor compliance with these requirements.⁵ We also interviewed DOE patent counsel responsible for monitoring contractor compliance with invention disclosure requirements.⁶ To examine the extent to which DOE funds contractor research, we collected and analyzed data on the extent to which DOE funded research by contractors subject to the provisions of the Bayh-Dole Act and other relevant laws and regulations from fiscal years 2009 through 2013.⁷ Additionally, we collected information from DOE on the number of contractor-disclosed inventions and patents during this same time period. We reviewed DOE's practices for recording this data and information and determined they were sufficiently reliable for our purposes.⁸ To examine the challenges that DOE faces in ensuring that contractors disclose inventions they develop with agency funding and any

⁵In reviewing how DOE ensures contractors disclose inventions developed with agency funding, we included activities related to DOE's civilian program offices but excluded the National Nuclear Security Administration given potential security and classification issues, as well as certain Bayh-Dole provisions that are specific to the activities of that agency.

⁶DOE patent counsel are located at various sites throughout the country and provide intellectual property law support to DOE's programs.

⁷We last reviewed the government's management of its interests in federally funded inventions in 2009, so this review focuses on the period since the issuance of our last report. See GAO, *Federal Research: Information on the Government's Right to Assert Ownership Control over Federally Funded Inventions*, [GAO-09-742](#) (Washington, D.C.: July 27, 2009).

⁸DOE indicated that the potential exists for contractor underreporting and duplicative DOE entries in the systems it uses to monitor invention disclosure, but we determined these data are suitable for presenting approximate data on the number of inventions developed and patents issued for fiscal years 2009 through 2013.

actions it is taking to address them, we reviewed applicable regulations, as well as DOE processes, procedures, and data systems for monitoring contractor compliance. We also reviewed documentation of DOE efforts to address the challenges it faces, and we interviewed DOE patent counsel. To examine the challenges that DOE faces in protecting its interests in agency funded inventions as well as the actions it is taking to address them, we reviewed laws, regulations, and agency documents associated with DOE's interests in these inventions and interviewed DOE patent counsel. To understand issues associated with the development and patenting of federally funded inventions that underlie our objectives, we interviewed officials from the U.S. Patent and Trademark Office, representatives from several industry organizations involved in facilitating the development of federally funded technology, and academic researchers who study the topic.

We conducted this performance audit from October 2013 to January 2015 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

Prior to the Bayh-Dole Act, the government generally retained ownership of federally funded inventions regardless of whether the research was performed in federal laboratories, at universities, or by individual companies, and only 5 percent of the patents on these inventions were ever used in the private sector, according to a Congressional Research Service report.⁹ The Bayh-Dole Act allows nonprofits, small businesses, and universities to retain ownership of federally funded inventions to promote the utilization of inventions created through federal research and development programs, and to provide an incentive for contractors to commercialize federally funded inventions for sale in the marketplace. The Bayh-Dole Act applies to universities, nonprofit organizations, and small businesses that receive federal research funding. Federal agencies that enter into financial assistance awards with these types of entities

⁹Congressional Research Service, *The Bayh-Dole Act: Selected Issues in Patent Policy and the Commercialization of Technology*, RL32076 (Washington, D.C.: Apr. 3, 2008).

must adhere to the requirements of the Bayh-Dole Act and its implementing regulation developed by the Department of Commerce.¹⁰ In particular, the Bayh-Dole Act requires agencies, including DOE, to incorporate specific provisions into research and development financial assistance awards that contractors must comply with to help protect the government's interests in any resulting inventions.

Additional laws and implementing regulations allow DOE to grant waivers to large businesses—if petitioned to do so—so that they will be able to retain ownership of inventions they develop under financial assistance awards. Specifically, the Federal Nonnuclear Energy Research and Development Act of 1974¹¹ and the Atomic Energy Act of 1954¹² provide DOE with the authority to waive its right to ownership of inventions developed with federal funding by contractors. Additionally, a presidential memorandum in 1983, followed by an executive order in 1987, directed federal agencies, to the extent permitted by laws such as these, to establish policies that are substantially the same as those contained in the Bayh-Dole Act for all businesses. To do so, DOE uses its Patent Waiver Regulation to grant waivers to large businesses so that they may retain ownership of inventions they develop with agency funding.¹³

DOE generally includes specific provisions in its financial assistance awards that require contractors to disclose inventions stemming from agency funding to the government and to meet certain time frames for taking action to protect these inventions. For example, according to these provisions, small businesses, nonprofits, and universities must

1. disclose any invention that results from agency funding within 2 months after learning the invention has been created,
2. notify the funding agency as to whether they elect to retain ownership of an invention within 2 years after they disclose it, and

¹⁰The Bayh-Dole Act directs the Department of Commerce to develop regulations to implement the provisions contained in the act. DOE also has regulations—DOE Financial Assistance Rules (see 10 C.F.R. pt. 600)—that provide the administrative requirements and operational rules for financial assistance award and administration.

¹¹Federal Nonnuclear Energy Research and Development Act of 1974 § 9, 42 U.S.C. § 5908.

¹²Atomic Energy Act of 1954 § 152, 42 U.S.C. § 2182.

¹³10 C.F.R. pt. 784.

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3. apply for a patent on an invention, typically within 1 year of electing to retain ownership.

DOE generally requires similar actions from large businesses in order to retain ownership of agency funded inventions, but the time frames can vary depending on the specific provisions of an individual financial assistance agreement.

Compliance with these provisions informs agencies, such as DOE, of an invention's existence, and helps ensure that a contractor takes timely steps to patent the intellectual property embodied in the invention, should the contractor wish to retain ownership of it. If a contractor does not comply with these requirements, agencies have the authority to demand ownership of a federally funded invention to provide the government the opportunity to take steps to protect its interests in it. Once contractors own a patented invention, they are generally free to use or transfer their patent rights at their discretion, in compliance with applicable laws, such as those regarding export control.¹⁴

The Bayh-Dole Act also identifies certain interests the government has in federally funded inventions, including their utilization and domestic manufacture. DOE's Patent Waiver Regulation does not explicitly identify these interests with regard to inventions developed by large business contractors, but the waivers themselves generally will outline specific requirements related to invention utilization and domestic manufacture as shown below.

- **Utilization.** DOE can use the authority, known as march-in authority, to require a contractor or licensee to grant a license to any responsible entity or entities when an agency determines that certain conditions identified in the act have been met.¹⁵ Additionally, the government has a nonexclusive royalty-free license to practice, and have practiced on its behalf, any invention created with federal funding.

¹⁴The government retains certain rights and interests in these inventions even if they are subsequently assigned, licensed, or otherwise transferred to others.

¹⁵A licensee, in this context, is an entity that gains a legal license to exercise a patent for an invention from its owner (i.e., a contractor). DOE has not exercised its march-in authority because, officials explained, the agency has not discovered or received information indicating that circumstances exist in which use of this authority might be warranted.

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- **Domestic manufacture.** Under the Bayh-Dole Act and DOE regulations and policy, DOE has established certain requirements in financial assistance awards for contractors to manufacture federally funded inventions in the United States. These requirements vary depending on the type of contractor involved in a financial assistance award.¹⁶ Domestic manufacture requirements for federally funded inventions include:
 - **U.S. Preference.** U.S. Preference provisions generally require small business and nonprofit contractors' exclusive licensees to substantially manufacture federally funded inventions domestically in order to use or sell the inventions in the United States.¹⁷ These requirements apply only to a contractor's exclusive licensee; the contractor that developed the invention faces no limitations on manufacturing location. Federal agencies may use their march-in authority in instances where contractors' licensees do not comply with U.S. Preference requirements.
 - **U.S. Competitiveness.** U.S. Competitiveness provisions generally require that the manufacture of inventions developed by large businesses must occur substantially in the United States unless otherwise approved by DOE. DOE may require forfeiture of invention ownership or refund of its investment when contractors do not comply with these requirements if such penalties are included in the patent rights clause of the financial assistance award.
 - **U.S. Manufacturing Plan.** U.S. Manufacturing Plan provisions generally require that contractors submit plans as part of a funding application specifying how they intend to domestically manufacture any potential inventions developed in the course of the financial assistance award.¹⁸ Where this provision is part of a financial assistance award, DOE may take ownership of the

¹⁶DOE may waive domestic manufacturing requirements if contractors or licensees show that reasonable but unsuccessful efforts have been made to substantially manufacture an invention in the United States or that, under existing circumstances, domestic manufacture is not commercially feasible.

¹⁷The Bayh-Dole Act and its implementing regulations do not define substantial domestic manufacturing.

¹⁸Under the Bayh-Dole Act, DOE may apply these provisions in instances where it determines that "exceptional circumstances" exist. 35 U.S.C. § 202(a)(ii). The Bayh-Dole Act provides the authority to make this determination in instances where certain additional or modified requirements in financial assistance awards would better promote the policy and objectives of the act. See *id.*

invention, require refund of its investment,¹⁹ or establish additional reporting requirements in instances of noncompliance.

In addition, DOE may include provisions within a financial assistance award that require reports from contractors to provide information on how federally funded inventions are utilized.²⁰ Specifically, DOE programs can request that contractors provide periodic reports with information regarding patent status (e.g., filing date, application number and title, and patent number and issue date), and invention utilization (e.g., the status of development, date of first commercial sale or use, and gross royalties received). DOE may request these reports at its discretion but not more than annually.

DOE Relies on Contractor Self-Reporting and Agency Procedures to Help Ensure Disclosure of Agency Funded Inventions

During fiscal years 2009 through 2013, DOE initiated nearly 6,000 financial assistance awards. DOE relies primarily on contractor self-reporting and financial assistance award closeout procedures to ensure that contractors disclose agency funded inventions.

During Fiscal Years 2009 through 2013, DOE Initiated Nearly 6,000 Financial Assistance Awards

During fiscal years 2009 through 2013, DOE initiated a total of nearly 6,000 financial assistance awards worth at least \$11 billion with contractors, according to data provided by DOE.²¹ During this period, according to DOE patent counsel, contractors reported approximately 5,800 inventions, elected to take ownership of about 2,800 inventions, and were issued more than 700 patents.²² Figures 1 and 2 show the

¹⁹DOE officials told us that the agency has not sought recoupment of agency funds for any breach of domestic manufacturing provisions.

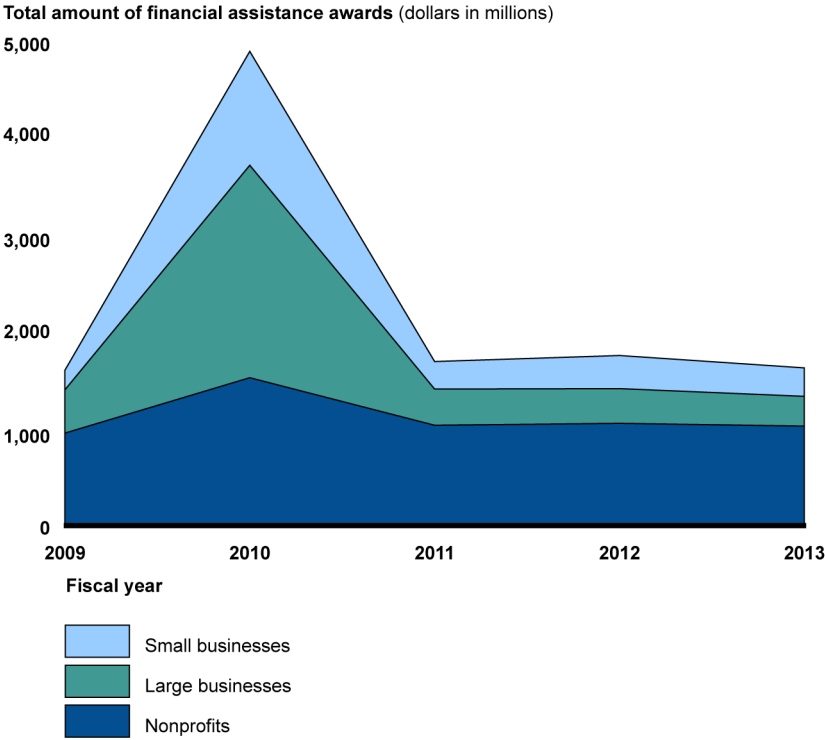
²⁰37 C.F.R. § 401.8. DOE's large business patent waivers may contain similar reporting requirements.

²¹At least \$12 billion in fiscal year 2014 dollars.

²²DOE patent counsel provided information on the number of contractor reported, owned, and patented inventions based on the information contained in DOE information systems for tracking agency funded inventions.

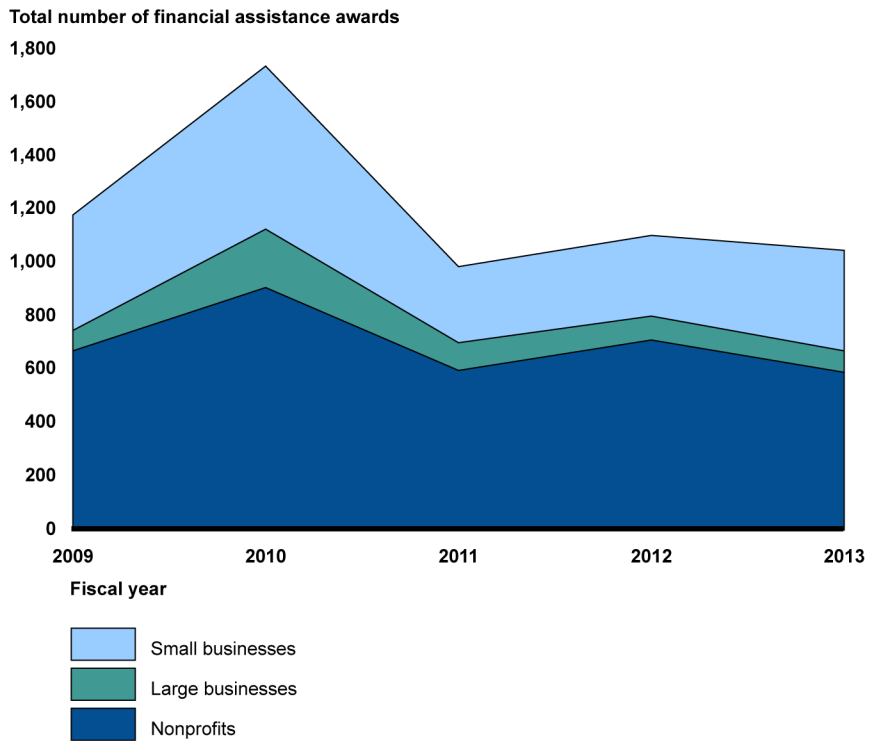
amount and number of financial assistance awards DOE established with different types of contractors for fiscal years 2009 through 2013. In fiscal year 2013, the most recent year data were available, DOE provided a majority of funds to universities and nonprofits (nearly \$1 billion across 580 agreements), followed by large businesses (approximately \$304 million across 79 agreements) and small businesses (approximately \$290 million across 370 agreements).

Figure 1: Amount of Department of Energy Financial Assistance Awards, by Contractor Type, Fiscal Years 2009-2013



Source: GAO analysis of Department of Energy data. | GAO-15-212

Figure 2: Number of Department of Energy Financial Assistance Awards, by Contractor Type, Fiscal Years 2009-2013



Source: GAO analysis of Department of Energy data. | GAO-15-212

DOE Relies on Contractor Self-Disclosure and Agency Procedures to Help Ensure Disclosure of Agency Funded Inventions

Contractors disclose agency funded inventions to DOE through a variety of reporting mechanisms including e-mail, regular mail, and Interagency Edison (iEdison)—which is an electronic reporting system that allows federal grantees and contractors to report federally funded inventions, patents, and utilization data.²³ According to DOE procedures, when a contractor discloses an invention developed with DOE funds, patent staff create a file for that invention. According to DOE procedures, patent counsel then monitor compliance with time frames related to the contractor's determination of whether to retain ownership and pursue

²³According to DOE patent counsel, contractors also, though infrequently, make such disclosures to DOE officials associated with managing the program through which they are receiving funds, and these program officials then forward such disclosures to DOE patent counsel.

patent protection. From this point forward, according to DOE procedures, whenever a contractor submits additional information about an invention, DOE patent counsel review the invention's file to ensure compliance with all invention disclosure provisions. If DOE patent counsel determine that a contractor has not met the specified time frames for disclosing and electing ownership of an invention, they send the contractor a letter—known as a demand letter—demanding that the contractor give DOE ownership of the invention.²⁴

To assist with the monitoring efforts, DOE patent counsel enter invention disclosure data into one of two data systems: (1) Intellectual Property (IP) Manager,²⁵ which patent counsel said they use to manage information regarding inventions funded by the Advanced Research Projects Agency-Energy and the National Nuclear Security Administration, and (2) Patent Management Information System (PATMIS), which patent counsel said they use to manage information about inventions funded by DOE's Offices of Science, Energy Efficiency and Renewable Energy, Fossil Energy, and Nuclear Energy.²⁶

DOE has specific closeout procedures it implements at the end of financial assistance awards, and DOE officials said these procedures are the main compliance check to ensure that agency funded inventions have been disclosed. DOE's Financial Assistance Rules state that a contractor has up to 3 months from the conclusion of a financial assistance award to submit all documents required to meet the terms of the award. Then, during closeout, DOE patent counsel conduct a final compliance check for invention disclosures and other required documentation. DOE patent counsel stated that they discover the vast majority of contractor

²⁴After a contractor receives a demand letter, it may request an extension to report the invention or provide evidence to DOE patent counsel that the invention in question is not subject to provisions of the financial assistance award, such as if the invention were developed without federal funding.

²⁵DOE patent counsel told us that they recently upgraded one of the agency's data management systems—IP Master—to a new system called IP Manager, which became operational in November 2014.

²⁶In 2007, the America Creating Opportunities to Meaningfully Promote Excellence in Technology, Education, and Science Act (Pub. L. No. 110-69, § 5012 (2007)) established the Advanced Research Projects Agency-Energy within DOE to overcome the long-term and high-risk technological barriers in the development of energy technologies. See GAO, *Department of Energy: Advanced Research Projects Agency-Energy Could Benefit from Information on Applicants' Prior Funding*, [GAO-12-112](#) (Washington, D.C.: Jan. 13, 2012).

noncompliance with invention disclosure requirements during closeout.²⁷ They added that nondisclosure, particularly from contractors with more limited resources, is generally inadvertent. They told us that nondisclosure is more often due to limited contractor familiarity with the legal requirements or experience in working with the federal government than an intentional attempt to avoid disclosing an agency funded invention. DOE patent counsel said if a contractor failed to disclose an agency funded invention but did so inadvertently, they would generally work with the contractor to meet disclosure requirements rather than demand ownership for noncompliance with disclosure requirements. They said that approach better meets their view of the intent of the Bayh-Dole Act to commercialize federally funded inventions, while ensuring the government protects its interests in them.

The closeout of a financial assistance award is also the point when DOE monitors whether contractors have patented agency funded inventions. For example, according to DOE procedures, a contractor must send DOE patent counsel a patent certification form—a document that discloses all inventions that resulted from the financial assistance award. In turn, according to DOE procedures, patent counsel use this information to ensure contractor compliance with the terms of the financial assistance award before issuing a patent clearance letter—a document in which DOE acknowledges the contractor's ownership of the patented invention. In addition to the required certification form, upon request from DOE, contractors must provide information about patents for any invention they elected to own. When a contractor submits such information, DOE patent counsel verify that the reported patents include a statement of government interest—standard language in a patent that acknowledges the government's role in funding its development—and that the invention's file is complete and up-to-date in the relevant data system.

²⁷ DOE patent counsel said that the agency does not track the overall number of undisclosed inventions it identifies during the course of financial assistance awards.

DOE Faces Challenges in Ensuring that Contractors Disclose Agency Funded Inventions and Is Taking Actions to Address Them

DOE faces challenges in ensuring that contractors disclose inventions they develop with agency funding and is taking actions to address them. Specifically, one challenge DOE faces is not having a documented process for ensuring that contractors disclose agency funded inventions after financial assistance awards end, and the agency has initiated two pilot projects to identify the extent of potentially undisclosed inventions. Additionally, DOE faces a challenge in managing invention disclosure information because its data systems for doing so have limited capabilities. While the agency has begun to upgrade those systems, DOE has not developed an implementation plan with specific milestones for certain key steps to guide these efforts.

DOE Is Implementing Pilot Projects to Address Challenges in Identifying Undisclosed Inventions

One challenge that DOE faces is not having a documented process for ensuring that contractors disclose agency funded inventions after financial assistance awards end. DOE's closeout procedures are designed to, among other things, ensure that contractors disclose all inventions developed during a DOE financial assistance award and that DOE's interests in them are documented. However, DOE has no documented process to monitor inventions after award closeout. Due to the time that may elapse between when a contractor files a patent application and when a patent is granted by the U.S. Patent and Trademark Office, DOE funded inventions may exist that are not identifiable through public searches at the time a financial assistance award ends. Under such a scenario, if the contractor did not voluntarily disclose an invention, the invention would not be identifiable during DOE's closeout procedures. Instead, DOE patent counsel told us they rely on contractors to voluntarily disclose such information following financial assistance award closeout. As a result, the potential exists for DOE to be unaware of inventions that it funded and in which it would retain interests.

To address this challenge, DOE recently launched two pilot projects aimed at better understanding the extent of undisclosed inventions. One pilot project is an audit of a sample of previously completed financial assistance awards to determine the extent to which contractors did not disclose DOE funded inventions. The second pilot project involves cross-referencing U.S. Patent and Trademark Office data against DOE information on inventions it funded.

In the first pilot project, which began in December 2013, DOE developed draft audit procedures to sample previously completed financial assistance awards and determine the extent to which contractors did not

disclose agency funded inventions. Under the draft audit procedures, DOE patent counsel (1) audit contractor activities for any indication of patents, patent applications, or inventions that might have been developed with DOE funding but were not disclosed to DOE; (2) submit demand letters to contractors to obtain ownership of any potentially undisclosed inventions; and (3) work with contractors, depending on the circumstances of nondisclosure, to allow them to retain ownership of the inventions.²⁸ The draft audit procedures set a target of annually sampling 100 randomly selected financial assistance awards completed during the previous 5 years, which represents approximately 5 percent of the agreements closed out during that period, according to DOE documentation. As of December 2014, DOE patent counsel told us that they had reviewed 99 financial assistance awards completed during the previous 5 years and identified three undisclosed inventions for which they sent demand letters to the relevant contractors. DOE patent counsel told us that they granted one of the contractors an extension of time to retain ownership of the undisclosed invention because DOE determined that the nondisclosure was an oversight. DOE patent counsel said that they resolved another as a data entry error. As of December 2014, DOE had not received a response to the third demand letter. DOE modified its draft audit procedures based on initial testing, and patent counsel told us that they might conduct another phase of pilot testing before assessing the overall results of the audit procedures and making a determination about whether to implement the pilot project on a permanent basis. They told us that this decision will depend on the extent to which the pilot project identifies undisclosed inventions compared with the resources—principally staff hours—necessary to conduct it. For example, if the audit procedures identify few undisclosed inventions, DOE could be less likely to implement it permanently.

DOE's second pilot project involves cross-referencing U.S. Patent and Trademark Office data against DOE information on inventions it funded. For this pilot project, DOE patent counsel analyzed data from a U.S. Patent and Trademark Office database to identify inventions or patents with a government interest clause indicating the patent stemmed from DOE funding. Then, DOE patent counsel reviewed the data to determine

²⁸DOE's draft audit procedures identify circumstances—including written certification from contractors that any omission to disclose inventions was either in good faith or unintentional—under which DOE may grant extensions of time to contractors so that they may submit the necessary documentation to retain ownership.

if information on issued patents or published patent applications also existed in DOE's PATMIS data system, with patent files not identified in DOE's data system representing possible unreported inventions or patents. For the pilot, DOE patent counsel told us that they reviewed 549 patented inventions that they identified as absent from DOE's data system. Through this effort, DOE patent counsel told us they identified 100 patented inventions that may have been undisclosed and issued 40 demand letters covering 64 undisclosed inventions to contractors.²⁹ As of December 2014, they said DOE resolved 16 demand letters—covering 22 inventions—and is awaiting response from the other 24—covering the remaining 42 inventions. According to DOE patent counsel, 11 of the contractors had not properly disclosed the patented inventions, generally due to misunderstandings regarding what their responsibilities were to the government. They told us that, in each instance, DOE determined that the contractor had acted in good faith and allowed an extension of time for the contractors to file the required disclosure paperwork to retain ownership. According to DOE patent counsel, the 5 other contractors to which DOE issued demand letters demonstrated that they had not failed to comply with invention disclosure requirements. DOE patent counsel explained that the related inventions were either disclosed to DOE but not logged into its data systems, or were logged incorrectly into its data systems, among other reasons. DOE patent counsel said that this effort helped DOE identify several inventions that were not properly disclosed. DOE patent counsel also indicated that the pilot revealed that the contractors' failure to report inventions to DOE appeared to have been in good faith, but that the contractors were unaware of all invention reporting obligations. DOE patent counsel told us that, in turn, the agency is reviewing the compliance assistance resources available to contractors and periodically reminds them of their obligations to DOE. They also said that, after these compliance assistance actions have been implemented, DOE anticipates reevaluating the usefulness of the pilot audit project.

²⁹According to DOE patent counsel, one of the potentially undisclosed inventions resulted from work at Los Alamos National Laboratory and was handled by the National Nuclear Security Administration. As of December 2014, DOE was in the process of determining how to proceed with regard to the other 35 potentially undisclosed inventions.

DOE Is Planning to Update Data Systems to Address Challenges in Managing Invention Disclosure Information but Does Not Have an Implementation Plan with Key Milestones

DOE faces a challenge in managing information on disclosed inventions, which underpins its ability to protect its interests in agency funded inventions. This is because, according to DOE patent counsel, the department's two older invention data management systems—IP Master and PATMIS—are outdated, unable to communicate with each other, and do not have functionality for electronically updating invention disclosure or patent status, hampering their ability to manage information and data related to inventions developed with DOE funding. For example, DOE patent counsel told us that IP Master will soon be obsolete because, among other reasons, the vendor is discontinuing support for it. Additionally, DOE patent counsel told us that the existence of two separate systems can lead to duplicative entries and make it difficult to track invention disclosures on a department-wide basis. Further, DOE patent counsel explained that the systems do not have the functionality for electronic reporting. That means contractors submit information—such as invention disclosure reports—in mail, faxes, and e-mails, and DOE patent counsel must then manually enter that information in DOE's systems. The DOE patent counsel described this as a time-consuming, labor-intensive process that can increase the likelihood of data errors.

DOE patent counsel stated that they recognized the need to transition to a unified data tracking and monitoring system with functionality for electronic reporting and have begun efforts to do so. Specifically, DOE patent counsel told us that they recently upgraded one of the agency's data management systems—IP Master—to a new system called IP Manager, which became operational in November 2014. DOE patent counsel said they intend to migrate the agency's other system—PATMIS—to the new IP Manager system in the near future so there will be only one data tracking and monitoring system. However, prior to any such migration of PATMIS, DOE officials told us that they want to ensure that there are no technical problems with the new IP Manager system and evaluate its performance in case modifications are necessary.

DOE patent counsel told us that integrating DOE's existing systems into the IP Manager system will provide a consolidated, DOE-wide invention management database that will significantly reduce administrative costs associated with invention management and improve data quality by reducing duplicative entry of inventions. Also, according to documentation DOE provided about the IP Manager system, some of its features may help address DOE's current data management challenges including automated generation of legal forms to reduce the need to draft unique documentation for every invention. Additionally, DOE plans to develop a "one click invention reporting" capability that would be designed to,

among other things, give contractors the ability to electronically report and update invention records directly from their own databases and provide DOE with enhanced reporting functions to monitor contractor actions, including invention disclosure.³⁰ DOE patent counsel explained that this would enhance DOE's ability to share invention information across the agency to better enable it to manage information to track contractor compliance with financial assistance award provisions. DOE patent counsel told us the agency has created a workgroup composed of representatives from federal agencies and DOE laboratories to determine the requirements for this new "one click invention reporting" capability and tentatively plans to begin software development in the spring of 2015, with an initial pilot capability scheduled for fall of 2015 and full deployment in early 2016, subject to available funding.

While DOE transitioned its IP Master system to IP Manager, and has developed an implementation plan with milestones for the additional capability it wants to add to the IP Manager system, DOE patent counsel said the agency does not have an implementation plan with milestones for when PATMIS would be migrated to IP Manager. They said that PATMIS contains the majority of the agency's invention records and estimated that, given the amount of data contained in the system, it could cost as much as \$100,000 to move the data from PATMIS into IP Manager. According to DOE patent counsel, as of November 2014, DOE had not prioritized funding to migrate the data and consolidate the databases. DOE also has not established milestones for its efforts to (1) identify requirements for the "one click invention reporting" capability it plans to add to IP Manager or (2) evaluate any system modifications necessary as a result of migrating IP Master to IP Manager and associated system requirements.

Under federal standards for internal control, information should be recorded and communicated to management and others within the entity who need it and in a form and within a time frame that enables them to carry out their internal control and other responsibilities.³¹ In addition, best

³⁰DOE intends for this software capability to be usable by any governmental agency that funds contractor-developed inventions. Therefore, DOE is including stakeholders from other governmental agencies in its development efforts.

³¹GAO, *Standards for Internal Control in the Federal Government*, [GAO/AIMD-00-21.3.1](#) (Washington, D.C.: November 1999).

practices for information technology system acquisition emphasize developing requirements, among other practices, to guide software engineering investments.³² By planning to transition to a unified data tracking and monitoring system with functionality for electronic reporting, DOE is taking a step in the right direction. Also, the implementation plan with milestones DOE developed for the additional capability it wants to add to the IP Manager system will help it track and communicate progress toward completing this effort. By developing a comprehensive implementation plan with milestones that cover all aspects of the steps DOE is taking to transition to a unified data tracking and monitoring system with functionality for electronic reporting, DOE would have greater assurance that it will be able to track progress toward completing all of these steps in a timely manner.

³²See, for example, Carnegie Mellon Software Engineering Institute, Capability Maturity Model® Integration for Development (CMMI-DEV), Version 1.3 (November 2010). The Software Engineering Institute is a federally funded research and development center operated by Carnegie Mellon University. Its mission is to advance software engineering and related disciplines to ensure the development and operation of systems with predictable and improved cost, schedule, and quality.

DOE Proposed Regulatory Changes to Address Challenges to Monitoring and Influencing Contractor Utilization and Domestic Manufacture of Agency Funded Inventions

DOE faces challenges in monitoring and influencing contractor utilization and domestic manufacture of agency funded inventions to protect its interests in them, and the agency has proposed regulatory changes to address these challenges.³³ Specifically, DOE does not have a standard for invention utilization and manufacture reporting, has a limited ability to compel domestic manufacture of agency funded inventions, and has a limited ability to influence changes in control of contractors receiving DOE funds. In turn, DOE's proposed regulatory changes address, with respect to for-profit contractors, the frequency and duration of invention utilization and manufacturing reporting, use of U.S. Manufacturing Plans, and DOE influence over changes in contractor control.³⁴ DOE patent counsel indicated that the agency anticipates issuing a final rule to implement these changes in fiscal year 2015.

DOE Does Not Have a Standard for Invention Utilization and Manufacture Reporting

DOE faces a challenge in understanding how inventions it funds are utilized and manufactured because it does not have a standard for collecting such information from contractors. Currently, DOE can, at its discretion, request such information, but DOE regulations do not specify the duration of this reporting. DOE patent counsel told us that there are no established procedures regarding the frequency and duration of requests for information on invention utilization and manufacturing of agency funded inventions, which could hamper DOE's efforts to protect its interests. To address this challenge, DOE's proposed regulatory change would require annual contractor reporting on the utilization and manufacture of any products that use a DOE funded invention.³⁵ This reporting would include information on the status of technology development, date of first commercial sale or use, gross royalties received, and manufacturing locations of those products, and it would be required for at least 10 years following invention disclosure. DOE patent

³³79 Fed. Reg. 27,795 (May 15, 2014). The proposed regulations apply only to for-profit contractors. The public comment period for DOE's proposed regulatory changes ended in July 2014.

³⁴Change in control of contractors includes the ownership of the contractor.

³⁵The proposed regulations would allow DOE, at its discretion, to require more frequent than annual contractor reporting.

counsel said that requiring this reporting for all DOE financial assistance awards to for-profit contractors would enhance the agency's ability to protect its interests by providing it additional information with which to monitor compliance with financial assistance award provisions.

DOE Has Limited Ability to Compel Domestic Manufacture of Agency Funded Inventions

DOE faces a challenge in protecting the agency's interest in the domestic manufacture of agency funded inventions. DOE patent counsel stated that the agency's ability to compel domestic manufacture of agency funded inventions is limited because the agency can only require substantial domestic manufacture from certain contractors under certain circumstances. In particular, they said that the process for determining an "exceptional circumstance"—which DOE can use to broaden the domestic manufacture requirements beyond those included in award provisions—can be difficult. Specifically, they noted that it is not a routine process and often requires substantial internal agency analysis, as well as coordination with other agencies, including the Department of Commerce. Additionally, any broadened requirements apply only to the specific programs or activities covered by the determination.³⁶ For example, in 2011, DOE determined that an exceptional circumstance existed regarding DOE's SunShot Initiative.³⁷ Specifically, DOE proposed requiring a certain level of domestic manufacture for all inventions developed under the SunShot Initiative by all contractors, as well as their licensees.³⁸ However, this proposed requirement was not implemented following a review to identify international trade and other issues,

³⁶In September 2013, DOE made a determination of exceptional circumstance under which applicants for funding from two DOE organizations—the Advanced Research Projects Agency-Energy and the Office of Energy Efficiency and Renewable Energy—may be required to include a U.S. Manufacturing Plan as part of their proposal. However, DOE patent counsel stated that it is too soon to determine how this action will affect the domestic manufacture of inventions funded by those DOE organizations because development, patent, and commercialization time frames can each span years.

³⁷The SunShot Initiative's mission is to make solar energy fully cost-competitive with traditional energy sources and supports efforts by private companies, universities, and national laboratories to reduce solar technology and grid integration costs, and accelerate solar deployment nationwide.

³⁸The proposed domestic manufacturing provision stipulated that (1) at least 51 percent of the fair market value of each individual product embodying an invention or produced through the use of an elected invention shall be manufactured in the United States or (2) at least 51 percent of the all products embodying an invention or produced through the use of an invention shall be wholly manufactured in the United States.

according to DOE patent counsel. DOE patent counsel also said that the limitations of U.S. Preference provisions—which apply to small businesses, academia, and nonprofits—constitute a challenge to protecting the agency’s interest in domestic manufacture. Specifically, such provisions require the exclusive licensees of contractors, but not the contractors themselves, to substantially manufacture agency funded inventions domestically. To address this limitation, DOE’s proposed regulatory change would allow programs to require that potential for-profit contractors submit a U.S. Manufacturing Plan as part of any funding proposal.³⁹ In turn, DOE would be able to use these plans as criteria in assessing funding proposals and making financial assistance award decisions. Under the proposed regulatory change, and consistent with applicable law, DOE could make such plans binding for any licensee or entity that subsequently acquired ownership of an invention or technology developed under a DOE financial assistance award. DOE patent counsel explained that requiring and enforcing U.S. Manufacturing Plans increases the agency’s ability to influence the domestic manufacture of inventions it funded.

DOE Has Limited Ability to Influence Changes in Control of Contractors

DOE faces a challenge in influencing the change in control—such as ownership—of contractors engaged in DOE financial assistance awards. A change in control may affect a contractor’s ability to carry out the project that DOE is funding and, according to DOE patent counsel, the agency currently does not require contractors to notify it of such changes. DOE’s proposed regulation would require contractors to notify the agency of changes in their control in certain circumstances.⁴⁰ The proposed regulation would establish procedures for the change of control, including ownership, of a contractor that received a DOE funding award of more

³⁹The proposed regulation explicitly states that all contractors must comply with all applicable U.S. laws regarding export control.

⁴⁰The proposed regulation defines “change of control” as including: (1) any event by which any individual or entity other than the recipient becomes the beneficial owner of more than 50 percent of the total voting power of the voting stock of the recipient; (2) the recipient merges with or into any entity other than in a transaction in which the shares of the recipient’s voting stock are converted into a majority of the voting stock of the surviving entity; (3) the sale, lease or transfer of all or substantially all of the assets of the recipient to any individual or entity other than the recipient in one or a series of related transactions; (4) the adoption of a plan relating to the liquidation or dissolution of the recipient; or (5) where the recipient is a wholly owned subsidiary at the time of award and the recipient’s parent entity undergoes a change of control.

than \$10 million. The affected contractor would be required to notify the agency within 30 days of a change of control, or within 30 days if the contractor had a reason to know that such a change is likely.⁴¹ Failure to notify DOE would be grounds for suspension or termination of the financial assistance award. Further, without DOE authorization of the change of control, the award funding could cease to continue.⁴² However, such penalties would only apply to the current award.

Conclusions

DOE is taking actions to update its data systems and move to a consolidated, DOE-wide invention management database to improve its ability to monitor and manage information regarding contractor disclosure of agency funded inventions. Currently, its two data systems are outdated, unable to communicate with each other, and do not have functionality for electronically updating invention disclosure or patent status, hampering DOE's ability to manage information and data on agency funded inventions. DOE recently upgraded one of its data systems—IP Master—to a new system called IP Manager, which became operational in November 2014 and has developed an implementation plan with milestones for the additional capability it wants to add to the IP Manager system. However, DOE has not developed an implementation plan with appropriate milestones to help assess its progress toward completing key steps, such as moving the data in its primary PATMIS database—which contains the majority of the agency's invention records—into the new IP Manager system, or for defining the requirements for planned or potential upgrades to that system. Without such a plan, DOE may not have assurance that it is making timely progress toward obtaining the information management capabilities it needs to protect its interests in agency funded inventions by monitoring information regarding contractor disclosure of these inventions.

⁴¹According to DOE's proposed regulation, the \$10 million threshold was selected so that it would apply to demonstration and large research and development projects but not smaller-scale financial assistance awards.

⁴²The interagency Committee on Foreign Investment in the United States (CFIUS) also reviews transactions that could result in control of a U.S. business by a foreign person to determine their effect on the national security of the United States. If CFIUS finds that a covered transaction presents national security risks and that other provisions of law do not provide adequate authority to address the risks, then CFIUS may enter into an agreement with, or impose conditions on, parties to mitigate such risks or may refer the case to the President for action.

Recommendation for Executive Action

To help provide greater assurance that DOE is making timely progress toward obtaining the information management capabilities it needs to protect its interests by monitoring contractor disclosure of agency funded inventions, we recommend that the Secretary of Energy develop an implementation plan, including appropriate milestones, to guide DOE's efforts to improve its data management capabilities.

Agency Comments

We provided a draft of this report to the Department of Energy and Department of Commerce for review and comment. In its written comments, the Department of Energy agreed with our findings and recommendation. The Department indicated that it would develop an implementation plan to guide data management improvements. The Department of Commerce neither agreed nor disagreed with our findings but noted that it provided background information on intellectual property issues related to the review. The Department of Energy's and Department of Commerce's written comments are reproduced in appendixes I and II, respectively. Both agencies also provided technical comments that we incorporated, as appropriate.

As agreed with your offices, unless you publicly announce the contents of this report earlier, we plan no further distribution until 30 days from the report date. At that time, we will send copies to the appropriate congressional committees, the Secretary of Energy, the Secretary of Commerce, and other interested parties. In addition, the report will be available at no charge on the GAO website at <http://www.gao.gov>.

If you or your staff members have any questions about this report, please contact me at (202) 512-3841 or neumannj@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made major contributions to this report are listed in appendix III.



John Neumann
Director, Natural Resources and Environment

Appendix I: Comments from the Department of Energy



Department of Energy
Washington, DC 20585

January 20, 2015

Mr. John Neumann
Director
Natural Resources and Environment
Government Accountability Office
Washington, DC 20458

Dear Mr. Neumann:

Thank you for the opportunity to review the Government Accountability Office (GAO) draft report entitled *DOE is Addressing Invention Disclosure and Other Challenges but Needs a Plan to Guide Data Management Improvements*, GAO-15-212. We appreciate the GAO's review of the Department of Energy's (DOE) intellectual property management and its finding that DOE is addressing invention disclosure and other intellectual property related challenges.

The GAO's recommendation will help the Department further strengthen its ability to accurately track DOE funded technologies and is consistent with our commitment to make continuous improvements to our management systems. Enclosed is our response to the recommendation and technical comments on the report.

Sincerely,

A handwritten signature in black ink, appearing to read "S.P. Croley", is written over a horizontal line.

Steven P. Croley
General Counsel

Enclosure



Printed with soy ink on recycled paper

Response to Report Recommendation

Recommendation 1: To help provide greater assurance that DOE is making timely progress toward obtaining the information management capabilities it needs to protect its interests by monitoring contractor disclosure of agency funding inventions, we recommend that the Secretary of Energy develop an implementation plan, including appropriate milestones, to guide DOE's efforts to improve its data management capabilities.

Management Response:

DOE concurs with this recommendation. DOE will develop an implementation plan to guide the Department's ongoing efforts to improve its data management capabilities related to invention management.

Target Date of Action: DOE will develop an implementation within **120** days of the report date.

Appendix II: Comments from the Department of Commerce



UNITED STATES PATENT AND TRADEMARK OFFICE

Deputy Under Secretary of Commerce for Intellectual Property and
Deputy Director of the United States Patent and Trademark Office

JAN 16 2015

MEMORANDUM FOR John Neumann
Director, Natural Resources and Environment
Government Accountability Office

FROM: Michelle Lee *Michelle K. Lee*
Deputy Under Secretary of Commerce for Intellectual Property and
Deputy Director of the U.S. Patent and Trademark Office

SUBJECT: Comments on Draft Report GAO-15-212 "*Federal Research: DOE is Addressing Invention Disclosure and Other Challenges but Needs a Plan to Guide Data Management Improvements*" (January 2015)

The United States Patent and Trademark Office (USPTO) appreciates the opportunity to review and provide comments on the subject report. USPTO initially was identified as a participant in this engagement, however the focus of this review changed to a review of the Department of Energy's intellectual property program. USPTO subsequently provided background information on intellectual property to assist GAO during this engagement.

We have carefully reviewed the draft report and provide the attached technical comments for your consideration. Again, we thank the Director of Natural Resources and Environment for the report.

Attachment: USPTO Technical Comments

P.O. Box 1450, Alexandria, Virginia 22313-1450 - www.USPTO.GOV

Appendix III: GAO Contact and Staff Acknowledgments

GAO Contact

John Neumann, (202) 512-3841 or neumannj@gao.gov

Staff Acknowledgments

In addition to the individual named above, Christopher Murray, Assistant Director; Richard P. Johnson; Gerald B. Leverich; Matthew D. Tabbert; and Michelle R. Wong made significant contributions to this report. Cheryl Arvidson and Kiki Theodoropoulos provided technical assistance.

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