

**GAO**

Report to the Subcommittee on Oversight of Government Management, the Federal Workforce, and the District of Columbia, Committee on Homeland Security and Governmental Affairs, U.S. Senate

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April 2012

# MODERNIZING THE NUCLEAR SECURITY ENTERPRISE

## Strategies and Challenges in Sustaining Critical Skills in Federal and Contractor Workforces



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Highlights of [GAO-12-468](#), a report to the Subcommittee on Oversight of Government Management, the Federal Workforce, and the District of Columbia, Committee on Homeland Security and Governmental Affairs, U.S. Senate

## Why GAO Did This Study

NNSA has primary responsibility for ensuring the safety, security, and reliability of the nation's nuclear weapons stockpile. NNSA carries out these activities at three national labs, four production sites, and one test site—collectively known as the nuclear security enterprise. Contractors operate these sites under management and operations (M&O) contracts. The enterprise workforces often possess certain critical skills that can only be developed through a minimum of 3 years of experience working in a secure, classified environment.

Because NNSA could have difficulty maintaining the critically skilled workforces necessary to ensure the safety, security, and reliability of the nation's nuclear weapons, GAO was asked to examine: (1) strategies NNSA and its M&O contractors use to recruit, develop, and retain critically skilled workforces; (2) how NNSA assesses the effectiveness of these strategies; and (3) challenges in recruiting, retaining, and developing this specialized workforce and efforts to mitigate these challenges. GAO reviewed NNSA's and its M&O contractors' human capital documents and interviewed officials.

## What GAO Recommends

GAO recommends that NNSA consider developing standardized definitions for human capital metrics across the enterprise to ensure NNSA and its M&O contractors gather consistent contractor data. NNSA concurred with GAO's recommendation.

View [GAO-12-468](#). For more information, contact Gene Aloise at (202) 512-3841 or [aloisee@gao.gov](mailto:aloisee@gao.gov).

April 2012

# MODERNIZING THE NUCLEAR SECURITY ENTERPRISE

## Strategies and Challenges in Sustaining Critical Skills in Federal and Contractor Workforces

### What GAO Found

The National Nuclear Security Administration (NNSA) and its M&O contractors have developed and implemented multifaceted strategies to recruit, develop, and retain both the federal and contractor workforces needed to preserve critical skills in the enterprise. NNSA's recruiting and retention efforts for its federal staff focus on attracting early career hires with competitive pay and development opportunities. Its development efforts generally rely on two key programs to develop its critically skilled workforce—one that identifies needs and another that identifies the qualifications necessary to meet them. For strategic planning purposes, NNSA is also undertaking a comprehensive reassessment and analysis of staffing requirements to ascertain future federal workforce requirements. M&O contractors' recruitment and retention strategies vary from site to site, but each site focuses on maintaining competitive compensation packages. Their development efforts vary in approach and scope and face some challenges—particularly in preserving underground nuclear testing skills.

To assess the effectiveness of its own—and its M&O contractors'—strategies for recruiting, developing, and retaining the workforces needed to preserve critical skills, NNSA monitors key human capital metrics. NNSA focuses on two key metrics in assessing its own strategies—the time it takes to hire a new employee and its attrition rates. To assess the effectiveness of its contractors' strategies, NNSA monitors key human capital metrics using data that M&O contractors collect, including acceptance rates, attrition rates, comparability of pay and benefits with peer institutions, and the ability to fill a critical skills position within a certain number of days. M&O contractors assess key human capital performance measures, but these metrics do not have standardized definitions. For example, one of the M&O contractors' key metrics—acceptance rates for offers of employment—may not be consistently measured across the enterprise. Without this information, NNSA's ability to monitor the effectiveness of its and its M&O contractors' strategies to recruit, develop, and retain the workforces needed to preserve critical skills may be hindered. In particular, without common enterprisewide definitions of human capital performance metrics, NNSA may not be able to collect consistent and comparable data across all eight sites in the enterprise.

The enterprise's work environments and site locations pose recruiting challenges, and NNSA and its M&O contractors face shortages of qualified candidates, among other challenges. For example, staff must often work in secure areas that prohibit the use of personal cell phones, e-mail, and social media, which is a disadvantage in attracting younger skilled candidates. In addition, many sites are geographically isolated and may offer limited career opportunities for candidates' spouses. Critically skilled positions also require security clearances—and therefore U.S. citizenship—and a large percentage of students graduating from top science, technology, and engineering programs are foreign nationals. The pool of qualified candidates is also attractive to high technology firms in the private sector, which may offer more desirable work environments. NNSA and its M&O contractors are taking actions to address these challenges where possible, including streamlining hiring and security clearance processes and taking actions to proactively identify new scientists and engineers to build a pipeline of critically skilled candidates.

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## Abbreviations

CHRD	Contractor Human Resources Division
DOE	Department of Energy
KPP	Knowledge Preservation Program
M&O	management and operations
NNSA	National Nuclear Security Administration
TQP	Technical Qualification Program

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United States Government Accountability Office  
Washington, DC 20548

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April 26, 2012

The Honorable Daniel K. Akaka  
Chairman  
The Honorable Ron Johnson  
Ranking Member  
Subcommittee on Oversight of Government Management,  
the Federal Workforce, and the District of Columbia  
Committee on Homeland Security and Governmental Affairs  
United States Senate

The National Nuclear Security Administration (NNSA)—a separately organized agency within the Department of Energy (DOE)—has primary responsibility for ensuring the safety, security, and reliability of the nation’s nuclear weapons stockpile.<sup>1</sup> NNSA carries out these activities at eight government-owned, contractor-operated sites, which include three national laboratories, four production plants, and one test site. Collectively, these sites are referred to as the nuclear security enterprise. The enterprise, formerly known as the nuclear weapons complex, has been a significant component of U.S. national security since the 1940s. Contractors operate sites within the enterprise under management and operations (M&O) contracts.<sup>2</sup> These contracts provide the contractor with broad discretion in carrying out the mission of the particular contract but grant the government the option to become much more directly involved in day-to-day management and operations.

Historically, confidence in the safety and reliability of the nuclear stockpile was derived through a continuous process of designing, testing, and deploying new weapons to replace older weapons. In 1992, at the end of the Cold War, and in response to a congressionally imposed U.S. nuclear

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<sup>1</sup>NNSA was created in 1999 under Title 32 of the National Defense Authorization Act for Fiscal Year 2000, Pub. L. No. 106-65, § 3201 *et seq.*

<sup>2</sup>M&O contracts are agreements under which the government contracts for the operation, maintenance, or support, on its behalf, of a government-owned or -controlled research, development, special production, or testing establishment wholly or principally devoted to one or more of the major programs of the contracting federal agency. Federal Acquisition Regulation, 48 C.F.R. § 17.601.

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test moratorium,<sup>3</sup> the United States ceased underground testing of nuclear weapons, and adopted the Stockpile Stewardship Program as an alternative to testing and producing new weapons. The Stockpile Stewardship Program primarily relies on analytical simulations and computer modeling to make expert judgments about the safety, security, and reliability of the nation's nuclear weapons. In addition, NNSA refurbishes weapons in the stockpile to extend their operational lives. Under current national policy, NNSA may also be called upon to resume underground nuclear testing at the Nevada National Security Site within a 3-year time frame under certain circumstances, including the accumulation of uncertainties about the reliability of the nuclear stockpile.

Currently, NNSA's workforce is made up of about 34,000 M&O contractor employees that span the enterprise, and about 2,400 federal employees directly employed by NNSA in its Washington headquarters, at site offices located at each of the eight enterprise sites, and at its Albuquerque, New Mexico, complex. NNSA's staff provide leadership and program management for the nuclear security enterprise and support and oversee its M&O contractors by providing business, technical, financial, legal, and management advice, including support for contractor workforce planning and restructuring, compensation, benefits, oversight of labor-management relations, and the quality of contractor deliverables such as nuclear weapons components. Many workers in the enterprise—both NNSA's staff and its M&O contractors—possess certain critical skills not readily available in the job market. These workers often have advanced degrees in scientific or engineering fields or experience in high-skill, advanced manufacturing techniques. In addition, certain critical skills are unique to the enterprise and, according to NNSA officials, can only be developed within its secure, classified environment. According to these officials, it generally takes a minimum of 3 years of on-the-job training to achieve the skills necessary to succeed in most critical skills positions. Some nuclear weapons expertise can take even longer to develop and must be gained through several years of mentoring, training, and on-the-job experience. For example, according to officials at Los Alamos National Laboratory, it takes 5 to 10 years to train a scientist or engineer with an advanced degree to be a fully qualified nuclear weaponeer.

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<sup>3</sup>The moratorium was begun pursuant to the Energy and Water Development Appropriations Act, 1993, Pub. L. No. 102-377, § 507 (1992). The Comprehensive Nuclear Test Ban Treaty, which would ban all nuclear explosions, was signed by the United States in September 1996 but has not been ratified by the U.S. Senate.

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Over the last 20 years, in an effort to operate more efficiently and at reduced cost, DOE has sharply reduced its enterprise contractor workforce—from approximately 52,000 in 1992 to its current level of about 34,000. This decrease raised concerns about preserving critical skills in the enterprise. In 1999, a report from a congressionally mandated commission warned that unless DOE acted quickly to recruit and retain its critically skilled staff and M&O contractor employees—and sharpen the expertise already available—the department could have difficulty ensuring the safety, security, and reliability of the nation’s nuclear weapons.<sup>4</sup> DOE, and later NNSA, took steps to correct these problems, and in February 2005, we reported that these efforts had been generally effective.<sup>5</sup> However, in February 2011, in a report assessing the extent to which NNSA has the data necessary to make informed, enterprisewide decisions,<sup>6</sup> we found that NNSA did not have comprehensive information on the status of its M&O contractor workforce. In particular, we reported that NNSA did not have data on the critical skills needed to maintain the Stockpile Stewardship Program’s capabilities. As a result, we recommended that NNSA establish a plan with time frames and milestones for the development of a comprehensive contractor workforce baseline that includes the identification of critical human capital skills, competencies, and levels needed to maintain the nation’s nuclear weapons strategy. NNSA stated that it understood all of our recommendations in that report and believed that it could implement them. As of March 2012, NNSA had completed a draft plan and was incorporating stakeholders’ comments. NNSA officials said that they expect to complete the final contractor workforce baseline plan by May 2012.

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<sup>4</sup>In 1997, the National Defense Authorization Act, Pub. L. No. 104-201 §3162 (1996) established the Commission on Maintaining U.S. Nuclear Weapons Expertise (known as the “Chiles Commission”) and directed it to assess and report to Congress on, among other things, DOE’s ongoing efforts to recruit and retain scientific, engineering, and technical personnel. The Commission’s 1999 report projected that large numbers of retirements over the next few years could further erode the experience and expertise of the critically skilled workforce. See *Report of the Commission on Maintaining U.S. Nuclear Weapons Expertise: Report to the Congress and Secretary of Energy* (Washington, D.C.: Mar. 1, 1999).

<sup>5</sup>GAO, *National Nuclear Security Administration: Contractors’ Strategies to Recruit and Retain Critically Skilled Workforce Are Generally Effective*, [GAO-05-164](#) (Feb. 2, 2005).

<sup>6</sup>GAO, *Nuclear Weapons: NNSA Needs More Comprehensive Infrastructure and Workforce Data to Improve Enterprise Decision-making*, [GAO-11-188](#) (Feb. 14, 2011).

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NNSA expressed concerns in its FY 2012 *Stockpile Stewardship Management Plan* about the state of both its federal and contractor workforces, stating that there was an urgent need to “refresh” both. In particular, NNSA noted that many employees have retired or are expected to retire soon. At the same time, NNSA’s mission has become even more dependent on high-level science, computer science, technology, and engineering skills as it has moved from underground testing as a means for assessing the safety and reliability of nuclear weapons to one dependent on advanced computer simulations, analyses, and nonnuclear tests. These changes make it even more important that NNSA and its M&O contractors preserve critical skills in their workforces. Additional concerns about human capital in the enterprise have been raised by the debate over—and eventual ratification of—the New Start Treaty,<sup>7</sup> which commits the United States to reduce the size of its strategic nuclear weapon stockpile from a maximum of 2,200 to 1,550 nuclear weapons. Reductions in the number of nuclear weapons make it all the more important that NNSA and contractor staff have the requisite critical skills to maintain the safety, security, and reliability of the remaining weapons. However, as the enterprise has contracted, NNSA officials note that training opportunities have been limited, leaving little or no redundancy in certain critical skills within the contractor workforce.

In this context, you asked us to examine NNSA’s human capital planning. Specifically, our objectives were to examine: (1) the strategies NNSA and its M&O contractors use to recruit, develop, and retain the workforces needed to preserve the critical skills in the enterprise; (2) how NNSA assesses the effectiveness of these strategies; and (3) challenges that NNSA and its M&O contractors face in recruiting, retaining, and developing this specialized workforce and their efforts to mitigate these challenges.

To address these three objectives, we conducted interviews with human capital planning officials at NNSA headquarters, the Albuquerque complex in New Mexico, and all eight NNSA site offices. We also obtained and reviewed NNSA information about recruiting and retention practices for critically skilled employees, as well as each site’s efforts to preserve knowledge needed to sustain critical capabilities. We visited six

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<sup>7</sup>The U.S. Senate passed the resolution of ratification for the New Start Treaty on December 22, 2010. President Obama signed the instrument of ratification on February 2, 2011.

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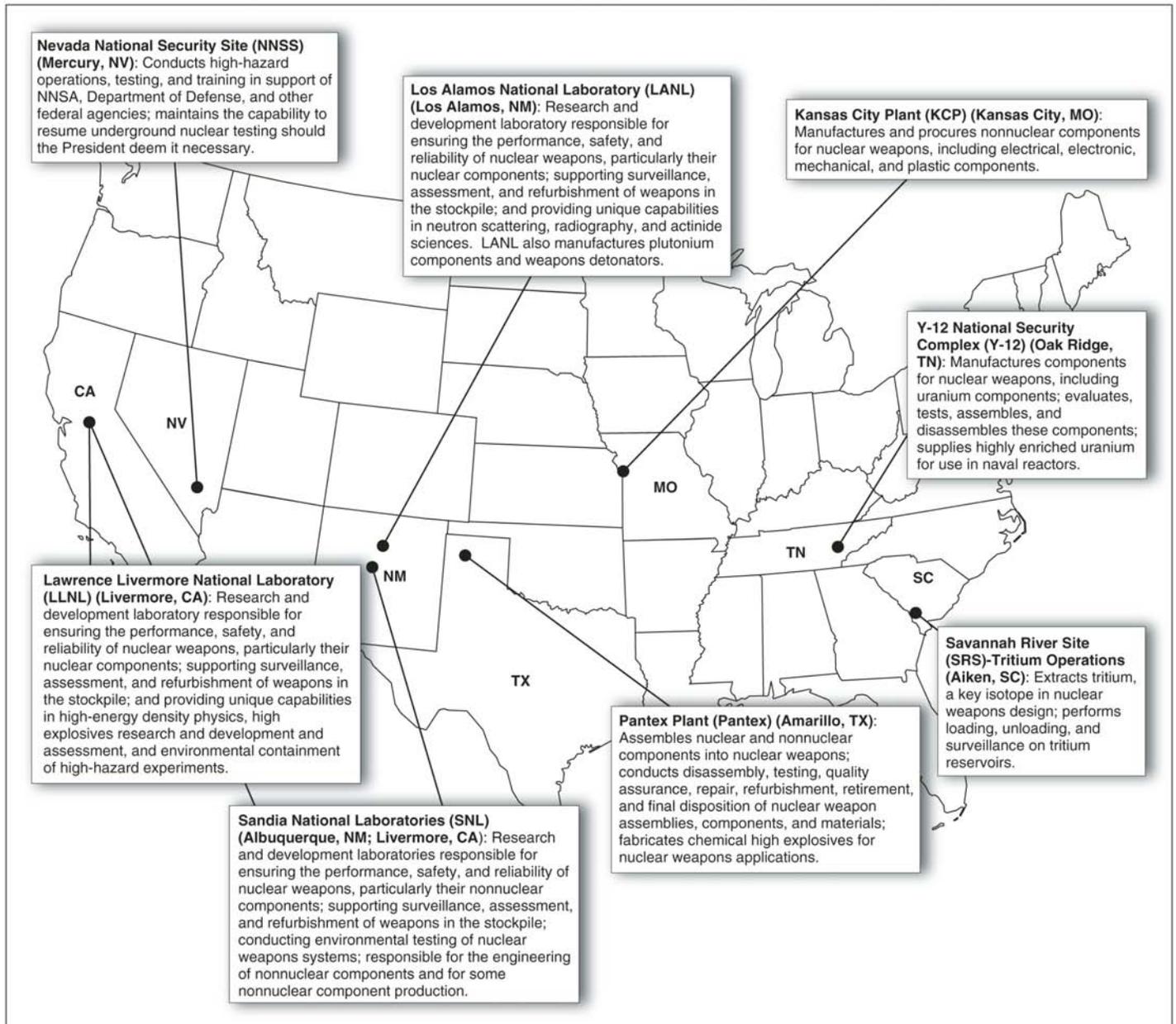
of the eight sites in the enterprise, including the three national laboratories, Los Alamos National Laboratory and Sandia National Laboratories in New Mexico and Lawrence Livermore National Laboratory in California; two of the production plants, the Pantex Plant in Texas and the Y-12 Plant in Tennessee; and the test site, Nevada National Security Site in Nevada. We conducted telephone interviews with human capital managers at the two other production plants, the Kansas City Plant in Missouri and the Savannah River Site in South Carolina. To examine the strategies NNSA and its M&O contractors use to recruit and retain critically skilled workers, we collected key workforce data from each facility, including NNSA and M&O contractor reports and other documents on the performance and progress made in meeting recruitment and retention targets. To identify challenges in retaining, recruiting, and developing the critical skills workforce, we sent a standardized set of questions about workforce planning efforts and challenges to each M&O contractor and NNSA site office, and analyzed their written responses. We also interviewed NNSA and M&O human capital officials at each site about site-specific workforce challenges and their efforts to address them. We reviewed two NNSA systems for managing human capital data; to assess the reliability of these systems, we interviewed knowledgeable NNSA officials to assess the reliability of these data and determined that they were sufficiently reliable for the purposes of this report. We conducted this performance audit from December 2010 through April 2012, 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.

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## Background

To ensure the safety, security, and reliability of the nation's nuclear weapons stockpile, NNSA relies on contractors who manage and operate government-owned laboratories, production plants, and a test site. NNSA's eight enterprise sites each perform a different function, all collectively working toward fulfilling NNSA's nuclear weapons-related mission. Figure 1 shows the locations of the sites and describes their functions.

**Figure 1: Nuclear Security Enterprise Sites**



Sources: NNSA; Map Resources (map).

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To provide support and oversight, NNSA locates between about 30 and 110 NNSA staff in a site office at each facility, and also draws on the resources of NNSA staff in headquarters and the Albuquerque complex. According to NNSA officials, this support and oversight requires that some NNSA staff have critical skills comparable to the contractors they support and oversee. For example, NNSA staff may need technical knowledge and expertise to accept and review deliverables from M&O contracts and, when presented with options, be able to determine how best to proceed to meet contract goals, mission, and objectives. They may also need skills related to the safe operation of sensitive defense nuclear facilities such as expertise in occupational safety and fire safety. For example, according to NNSA officials at the Livermore Site Office, most of the staff in critical skills positions there are focused on ensuring safety at the laboratory's nuclear facilities.

Maintaining critical skills within its workforce is not a challenge unique to NNSA. Every 2 years, we provide Congress with an update on GAO's high-risk program, under which GAO designates certain government operations as high risk due to their greater vulnerabilities to fraud, waste, abuse, and mismanagement, or their need for transformation to address economy, efficiency, or effectiveness challenges. In 2001, GAO designated strategic human capital management across the entire federal government as a high-risk area, in part because critical skill gaps could undermine agencies' abilities to accomplish their missions. We have also reported in the past that NNSA and its predecessor organizations' record of inadequate management and oversight of contractors has left the government vulnerable to fraud, waste, abuse, and mismanagement. Contract management at DOE has been on GAO's high risk list since 1990, the first year our high-risk list was published.<sup>8</sup> Progress has been made, but NNSA and DOE's Office of Environmental Management remain on our high-risk list.<sup>9</sup>

As of 2011, our most recent update of the high-risk list, significant steps had been taken to address some of the federal government's strategic human capital challenges. Strategic human capital management was designated a high-risk area 10 years earlier governmentwide and remains

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<sup>8</sup>GAO, *Government Financial Vulnerability: 14 Areas Needing Special Review*, OCG-90-1 (Washington, D.C.: Jan. 23, 1990).

<sup>9</sup>GAO, *High Risk Series: An Update*, GAO-11-278 (Feb. 16, 2011).

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on the high-risk list because of a need for all federal agencies to address current and emerging critical skills gaps that are or could undermine agencies' abilities to meet their vital missions. Specifically, across the federal government, we reported that resolving remaining high-risk human capital challenges will require three categories of actions:

- *Planning.* Agencies' workforce plans must define the root causes of skills gaps, identify effective solutions to skills shortages, and provide the steps necessary to implement solutions.
- *Implementation.* Agencies' recruitment, hiring, and development strategies must be responsive to changing applicant and workforce needs and expectations and also show the capacity to define and implement corrective measures to narrow skill shortages.
- *Measurement and evaluation.* Agencies need to measure the effects of key initiatives to address critical skills gaps, evaluate the performance of those initiatives, and make appropriate adjustments.

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## NNSA and Its M&O Contractors Use Multifaceted Strategies to Recruit, Develop, and Retain Their Workforces

NNSA and its M&O contractors have developed and implemented multifaceted strategies to recruit, develop, and retain both the federal and contractor workforces needed to preserve critical capabilities in the enterprise. NNSA focuses on attracting early career hires with competitive pay and development opportunities, and the agency is reassessing future enterprisewide workforce needs. M&O contractors' strategies vary from site to site, but each site focuses on maintaining competitive compensation packages.

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## NNSA Focuses on Attracting Early Career Federal Workforce Hires with Competitive Pay, Flexible Schedules, and Development Opportunities

NNSA takes various steps to recruit, develop, and retain a federal workforce with the necessary critical skills. NNSA's recruitment strategies are focused primarily on students and recent graduates in science and engineering programs. NNSA generally relies on two key programs to develop its critically skilled workforce—one that identifies needs and another that identifies the qualifications necessary to meet them. Its retention efforts focus on competitive pay, flexible schedules, and development opportunities. NNSA is also undertaking a comprehensive reassessment to ascertain future federal workforce requirements.

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NNSA's Recruitment Strategies  
Focus on Students and Recent  
Graduates in Science and  
Engineering Programs

NNSA has several programs targeted toward recruiting students and recent graduates, primarily in science and engineering fields. NNSA began these programs within the past 7 years as a means of succession planning.<sup>10</sup> NNSA's programs focused on recruiting students include the following:

- The Student Temporary Employment Program is a summer internship program for high school through graduate students of any discipline. Students participating in this program receive a salary while working at NNSA.
- The Student Career Experience Program is a program for graduate students in science, engineering, and other fields. This program aims to persuade skilled graduates to pursue careers in NNSA. Participants work for NNSA full-time during school breaks and part-time the rest of the year. These positions can be converted to full-time competitive appointments when participants receive their degrees.
- The Minority Serving Institutions Program aims to strengthen the diversity of the applicant pool by exposing younger minority students to technical fields and NNSA work early in their educational careers. This program focuses on students beginning in junior high school and continues through college entry and has cooperative agreements to enhance science, technology, engineering, and mathematics curricula at all levels at 29 minority-serving institutions. Since the program's inception in 2007, 167 minority students have participated in hands-on research at NNSA site offices and laboratories.

NNSA's key program for recruitment of recent graduates is its Future Leaders Program. NNSA established the program in 2005 to recruit recent U.S. citizen graduates of bachelor's and master's programs, primarily in engineering and science. The Future Leaders Program is a 2-year development program that requires participants to complete classroom and on-the-job training, in addition to developmental assignments outside their home office. NNSA hires about 30 recent graduates into this program each year. Applicants are hired into the

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<sup>10</sup>Succession planning is an ongoing, strategic process for identifying and developing a diverse pool of talent for an organization's potential future leaders. GAO, *Diversity Management: Expert-Identified Leading Practices and Agency Examples*, GAO-05-90 (Jan. 14, 2005).

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NNSA's Development  
Strategies Include Two Key  
Programs

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program offices where they will be permanently placed and are selected based on each program office's skills needs. According to NNSA officials, approximately two-thirds of the 175 program participants hired from 2005 through 2010 have engineering and science backgrounds that enable them to develop the technical critical skills NNSA needs to provide support and oversight of contractors. As their careers advance, some program participants are expected to become more focused on developing deep expertise in a particular technical area, and others will gravitate toward more senior management and leadership positions. NNSA officials told us they consider the program very successful because nearly 90 percent of all those hired into the program since 2005 remained at NNSA.

NNSA relies primarily on two programs to develop a federal workforce with the requisite critical skills—the Federal Technical Capability Program and the Technical Qualification Program (TQP). NNSA employees' critical skills generally fall into two broad categories: (1) technical skills related to managing the safe operation of nuclear facilities, and (2) technical knowledge and expertise necessary to accept and review contract deliverables. To ensure that it has sufficient numbers of federal employees with critical skills to manage the safe operation of nuclear facilities, NNSA relies on the Federal Technical Capability Program<sup>11</sup>—a DOE-wide effort to define requirements and responsibilities for meeting the department's commitment for recruiting, developing, and retaining the technically competent workforce necessary to achieve this mission. To implement the goals of the Federal Technical Capability Program at the site level, NNSA senior managers conduct annual workforce analyses and develop staffing plans that identify critical technical capabilities and positions that ensure the safe operation of nuclear facilities. For example, NNSA relies on senior managers to identify the fire safety needs for the National Ignition Facility, a stadium size research facility at Lawrence Livermore National Laboratory and to identify how many fire protection engineers are required to meet these needs. To help meet these goals, DOE established the TQP, which sets technical qualification requirements for NNSA positions related to the safe operation of nuclear facilities and tracks federal employees' progress in meeting these qualifications. More specifically, the TQP documents how NNSA:

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<sup>11</sup>DOE O 426.1, *Federal Technical Capability*, Sept. 20, 2011.

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- identifies needed positions,
  - tailors qualification standards for them,
  - establishes time and duty limitations for qualification,
  - describes the process to identify learning activities to achieve competency for the specific job duties, and
  - establishes methods for evaluating qualification.

NNSA officials told us that only federal employees in positions related to managing the safe operation of nuclear facilities are required to participate in the TQP. However, NNSA managers may also subject employees who accept and review contract deliverables to TQP requirements to help ensure that they have the skills necessary to evaluate technical criteria of contract deliverables.

Beyond the TQP, according to NNSA officials, human capital managers rely on annual human capital needs assessments to inform subsequent recruitment and hiring efforts to ensure the requisite mix of skills is present in the federal workforce. These assessments consider attrition and other demographic data, succession planning, and education and experience requirements. For example, NNSA officials told us that in 2011 its Office of Human Capital Management surveyed NNSA programs to identify needs for the Future Leaders Program. As part of this survey, they analyzed attrition in the federal workforce and used the information to assist in decisions about how many engineers to hire across the enterprise through the Future Leaders Program. Recruitment efforts in 2012 will focus on finding replacements for these engineers.

#### NNSA's Retention Strategies Focus on Competitive Pay, Flexible Schedules, and Career Development Opportunities

NNSA's retention strategies focus on offering new staff competitive pay, flexible schedules, and career development opportunities.

*Competitive pay.* According to NNSA officials, NNSA's retention efforts place a high priority on preserving the agency's capacity to offer competitive compensation. For example, for relatively new hires, such as those hired through the Future Leaders Program, NNSA can sometimes offer as much as \$6,000 in lump sum hiring bonuses and up to \$10,000 in student loan repayment in return for signing a service agreement. In some cases, NNSA is also able to offer retention bonuses of up to 25 percent of annual salary to employees that might otherwise leave federal service. In addition, NNSA has the flexibility to offer particularly desirable

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applicants higher starting salaries and reward top performers with higher pay.

For more senior employees, according to NNSA officials, DOE and NNSA sought, and were granted, authorities by Congress to offer higher pay to staff primarily in certain engineering and science fields. Specifically, to help it retain more experienced competitive service employees with critical skills—that is, employees in regular civil service positions—Congress granted exceptions to normal hiring regulations, including salary caps, under three excepted service authorities. First, under the Department of Energy Organization Act,<sup>12</sup> the Secretary of Energy is granted special excepted service hiring authorities to hire up to 200 highly skilled scientific, engineering, professional, and administrative individuals to upgrade the department's technical and professional capabilities. NNSA can use this authority in some cases to hire senior-level employees from outside the government or difficult-to-hire administrative staff. According to NNSA officials, there are presently 50 such individuals employed by NNSA. Second, under the National Defense Authorization Act,<sup>13</sup> the Secretary of Energy is also granted special excepted service hiring authorities to hire up to 200 highly skilled individuals—typically scientists, technicians and engineers with skills related to and necessary for the operation of nuclear facilities. According to NNSA officials, there are currently about 100 such individuals currently employed by NNSA. Third, under the National Nuclear Security Administration Act,<sup>14</sup> NNSA may hire up to 300 highly qualified scientists, engineers, and other technically skilled workers needed to support the missions of NNSA under similar excepted service hiring authorities. According to NNSA officials, NNSA has used this authority to hire and employ about 280 highly skilled individuals.<sup>15</sup> NNSA officials told us that all of these flexibilities are useful and help NNSA compete with the Nuclear Regulatory Commission and national laboratories.

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<sup>12</sup>Pub. L. No. 95-91 §621(d) (1977).

<sup>13</sup>Pub. L. No. 103-337 §3161 (1994).

<sup>14</sup>Pub. L. No. 106-65 §3241 (2000).

<sup>15</sup>For excepted service positions, each agency develops, within basic requirements prescribed by law or regulation, its own hiring system, which establishes the evaluation criteria to be used in filling these excepted positions.

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NNSA Is Undertaking a Comprehensive Reassessment to Ascertain Future Federal Workforce Requirements

*Flexible schedules.* NNSA's retention efforts also include a flexible schedule program that gives employees the opportunity to work a nontraditional schedule or vary their work hours from day to day. For example, employees with school-aged children may opt to work more than 8 hours some days and fewer hours other days in order to accommodate school early release days.

*Development opportunities.* NNSA offers some employees the opportunity to undertake career development opportunities such as rotational assignments and details. Integral parts of the Future Leaders Program are 30-day local rotational assignments and 60-day headquarters or field assignments away from their home locations. For example, a Future Leaders Program participant based in NNSA's Washington headquarters who is interested in a program run by Sandia National Laboratories in Albuquerque might be assigned for 60 days to related work at NNSA's Sandia Site Office or Albuquerque complex. In addition, NNSA has implemented a program called the In-Teach Program, which focuses on knowledge preservation and transfer by providing funding to train highly skilled senior employees to become more adept at transferring knowledge and skills to less skilled more junior employees.

NNSA is currently undertaking a comprehensive reassessment and analysis of the staffing requirements for its federal workforce through 2016 in headquarters and field locations. NNSA officials told us that the reassessment is needed for strategic planning purposes and will improve NNSA's efforts to ensure that its federal workforce has the skills necessary to carry out its missions, including technical, support, and oversight capabilities. The reassessment includes the following four phases:

- Describing and identifying organizational core competencies, and the workforce required for NNSA's future
- Analyzing the current workforce and gaps related to requirements for NNSA's future
- Developing a plan to close gaps between future requirements and the current workforce
- Developing and implementing a workforce management system which is integrated with legacy Department of Energy human capital information technology systems

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NNSA officials told us they expect the reassessment and resulting report to be complete in fiscal year 2013.

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**M&O Contractors’ Recruitment, Development, and Retention Strategies Vary but Generally Focus on Competitive Compensation Packages**

M&O contractors’ recruitment, development, and retention strategies are site-specific. Generally, their recruitment efforts vary by the type of employee needed—particularly, whether the position requires an advanced degree. Their development efforts vary in approach but are also site specific and face some challenges—particularly in preserving underground nuclear testing skills. Their retention efforts focus on maintaining competitive total compensation packages—salaries and benefits—but their strategies to mitigate attrition vary from site to site.

**M&O Contractors’ Recruitment, Development, and Retention Strategies Are Site-Specific**

NNSA’s M&O contractors have developed and implemented site-specific strategies to recruit, develop, and retain the workforces needed to preserve critical capabilities throughout the enterprise and accomplish NNSA’s mission. Accordingly, contractors have typically developed site-specific workforce planning systems that enable them to identify the kinds of candidates they need to recruit, develop, and retain in order to align projected nuclear weapons-related work and budget resources. Using these workforce planning systems, site managers can anticipate the nuclear weapons-related work NNSA has contracted for, how it will be funded, how many staff are required, and what skills will be needed, and can avoid potential shortages in staff or skills. For example, in the course of their 2- and 5-year planning processes, managers at Sandia National Laboratories use a four-step workforce planning tool, the Workforce Acquisition Project, to anticipate critical skills hiring needs based on the expected lab-wide business outlook and attrition. This early assessment of critical skills requirements ensures that the contractor has sufficient time to identify and recruit new staff as necessary and give new staff time—generally 2 to 5 or more years—to develop their skills.

**M&O Contractors’ Recruitment Strategies Vary According to the Types of Employees Needed**

M&O contractors’ strategies for recruitment vary according to the kinds of employees they need to hire—in particular, whether the position requires an advanced degree. For example, the weapons laboratories, which include Sandia, Los Alamos, and Lawrence Livermore National Laboratories, typically require highly skilled candidates with advanced degrees to replace physicists, engineers, and other experts who retire or leave for other jobs. M&O contractors at weapons laboratories thus focus their recruitment efforts on students and recent graduates of the nation’s leading graduate schools in science, engineering, and mathematics. Efforts to attract candidates begin with summer internship programs and continue with support for post-doctoral fellowships and direct offers of

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employment. Officials at the Lawrence Livermore National Laboratory told us that, in addition to these efforts to recruit students and recent graduates, they also recruit at the midcareer or higher level at professional meetings in science and technology fields and through the cooperative relationships with American universities and industries to broaden the prospective employee pool and enhance the intellectual vitality of its existing workforce.

According to M&O contractor officials, the critical skills needs at other enterprise production plants, such as the Y-12 National Security Complex and Pantex Plant, differ from those at the weapons laboratories, and their recruiting strategies reflect these differences. Unlike the weapons laboratories, production plants generally do not require candidates with advanced degrees; rather candidates typically need a bachelor's degree or, in the case of manufacturing and skilled craft positions, an associate's degree or skills in advanced manufacturing techniques. As such, M&O contractors at production plants can generally recruit regionally for the staff they need and have less need to recruit nationally. For example, M&O contractor officials at Y-12 told us that they recruit predominately bachelor's level candidates—predominately engineers—from universities within a 300-mile radius of Oak Ridge, particularly from the University of Tennessee in nearby Knoxville. Production plants are also generally well-established within their communities and focus most of their recruitment efforts for skilled manufacturing positions on the local area. For example, M&O contractor officials at the Pantex Plant told us that they have developed strong ties with local community colleges over the years and typically look for high school graduates and community college students and graduates with some specialized, skilled training or work experience. Nevertheless, according to Pantex officials, they have also taken advantage of opportunities to recruit from outside the local areas, seizing opportunities to recruit automotive workers with machine tool experience and highly skilled plant workers from another nuclear security enterprise production facility, the Savannah River Site, in the wake a reduction in force.

### M&O Contractors' Development Strategies Vary in Approach and Scope and Face Some Challenges

M&O contractors told us their strategies for development are often linked to recruitment because appealing development opportunities can encourage candidates to accept job offers. As with strategies for recruitment, those for development are tailored to the specific needs of each site's workforce, but many of the M&O contracting officials we spoke with cited continuing educational opportunities and the option to move within the organization as appealing development opportunities. For example, M&O contractor officials at Sandia National Laboratories told us

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that offering continuous training opportunities and the opportunity to move to different jobs within different components of the laboratory was very appealing to entry-level hires. Accordingly, Sandia's Corporate Learning and Professional Development Programs offer various training opportunities. Sandia officials told us that these opportunities help employees keep skills current, provide additional educational opportunities, and help laboratory management anticipate critical skills needs in the workforce. As part of these programs employees can also take training offered by Sandia's technical and compliance training group, which is focused on skills currently in demand at Sandia, or participate in university graduate degree programs, which Sandia will pay for. The Lawrence Livermore National Laboratory's Education Assistance Program provides up to \$50,000 in tuition assistance for coursework toward a higher degree.

Production plants also offer continuous learning and development opportunities. For example, the M&O contractor officials at the Kansas City Plant told us employees are encouraged to pursue higher education in areas where the plant has a skills gap. In such cases, the contractor will pay tuition and, if the employee attends school full-time, continue to pay 70 percent of the employee's base salary. Kansas City Plant employees may also participate in developmental programs at the entry or midcareer levels that allow participants to undertake three rotational assignments to support their targeted and tailored personal development plans. In addition, the Pantex plant offers employees support for technical training opportunities with local colleges. The Nevada National Security Site also offers a number of developmental opportunities to its staff, including a voluntary mentoring program for all employees, assistance with career planning, various training and certification programs, and attendance at seminars and conferences. M&O contractor employees also have access to online courses and books as well as CD-based training sessions on a wide variety of topics, including supervision, management and leadership; computer skills and certifications; communication; and mentoring.

M&O contractors told us that, in their development efforts, they rely on knowledge preservation and transfer programs, including recording the performance of high-skill critical tasks, formal classroom training, on-the-job training, and mentoring programs to preserve critical capabilities in the nuclear security enterprise. Knowledge preservation programs are focused on the physical preservation or recording of critical information and knowledge—typically in paper records, microfilm and microfiche, and in various audio and video media. Knowledge transfer programs seek to

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ensure that experienced laboratory or production plant employees successfully pass on the knowledge to replicate critical tasks to newer employees.

*Knowledge preservation.* All M&O contractors at nuclear security enterprise sites have taken steps to record critical knowledge. These knowledge preservation programs are broadly similar from site to site, whether laboratory or production plant. For example, Los Alamos National Laboratory officials report that their archives house information on weapons designs and experiments dating to the inception of the laboratory. This information is contained in documents and other media such as film, audio and videotape, drawings, and photographs. The information housed in the archives is still relevant and is used by researchers across the enterprise. It may also be used outside the enterprise by, for example, documentary filmmakers and occupational health researchers. More recently, in the 2000s, Los Alamos gathered and developed critical information in the course of the Reliable Replacement Warhead Program—a program that explored the possibility of developing new nuclear weapons designs. Los Alamos engineers and scientists documented all decisions in the Reliable Replacement Warhead design process through written and video documentation. The other weapons laboratories have also invested in electronic records and videos to preserve critical knowledge. According to Lawrence Livermore National Laboratory officials, Livermore maintains an extensive electronic archive of papers and reports, as well as tutorial lectures by experienced weaponeers on key areas of weapons knowledge. Sandia National Laboratories also has its Knowledge Management Streaming Assets Library program, which has recorded about 1,500 hours of classified exit interviews with retiring weaponeers and made them available to current staff.

M&O contractors at the weapons production plants report broadly similar efforts to preserve critical knowledge at their sites. For example, the Y-12 National Security Complex has the Knowledge Preservation Program (KPP). Similar to Sandia National Laboratories' knowledge preservation efforts, the KPP films retiring employees as they do their work and interviews them on how they do it, then archives the videos in an electronically searchable format. As employees approach retirement, a KPP video and interview is part of the retirement checklist. These videos are evaluated for accuracy by an expert before they are entered into the KPP system. Y-12 officials told us that other NNSA sites have created videos or archives for knowledge preservation but they are not as easily accessible. M&O contractors at the Pantex Plant have undertaken similar

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efforts, including creating and maintaining what Pantex officials call “picture books” on weapons assembly, and interviewing experienced Pantex workers to capture their knowledge in areas such as high explosives and making these interviews available as a training tool.

According to M&O contractor officials at the Nevada National Security Site, however, efforts to preserve critical knowledge regarding underground nuclear testing have faced challenges, as they have been limited and sporadic. These efforts have been complicated by two factors: (1) the need to protect vital national security information against unauthorized disclosure led to a practice of not keeping written documentation about the specifics of critical tasks; and (2) significant numbers of employees were laid off in the mid-1990s after U.S. underground nuclear testing ended. Until 2007, NNSA maintained a program that undertook substantial efforts to capture and record critical knowledge possessed by these workers, but NNSA and M&O contractor officials said these efforts were not comprehensive or systematic, and funding was discontinued.

*Knowledge transfer.* M&O contractors at the weapons laboratories rely on a range of approaches to transfer knowledge, while there is more similarity among the knowledge transfer programs of M&O contractors at production plants. Specifically, each of the three weapons laboratories uses a combination of classroom training, on-the-job training, and mentoring relationships to transfer critical nuclear weapons design information, but with varying reliance on each of these three components. For example, at one end of the spectrum, Sandia National Laboratories relies most heavily on a classroom-focused curriculum—its highly regarded Weapons Intern Program. According to Sandia officials, the 11-month Weapons Intern Program succeeds in transferring such knowledge and experience through a blended learning environment, consisting of live and multimedia-based classroom instruction, individual and team research projects, hands-on activities, and off-site facility and operations tours and briefings. The live instruction is provided through a large contingent of subject matter experts in the various weapon technology, design, evaluation, production, operations, policy, and management areas.

Lawrence Livermore National Laboratory is at the other end of the spectrum, relying mostly on mentoring programs and on-the-job-training opportunities to transfer advanced nuclear weapon design skills to new staff. According to Lawrence Livermore officials, their approach to developing critical skills expertise is to embed new employees into work

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groups directly engaged in important work, with an experienced employee acting as a mentor. As new employees gain skills and experience and demonstrate their readiness, they are assigned tasks of increasing levels of complexity and responsibility. Laboratory officials stated that, in their experience, employees supporting the weapons program must be exposed to years of work in the field to acquire the needed knowledge and judgment to be a fully qualified weaponeer. An extensive electronic archive of papers and reports is available, as well as tutorial lectures on key areas of weapons knowledge, but Livermore officials told us there is no substitute for hands-on experience with weapons.

Los Alamos National Laboratory's approach is not as classroom-focused as Sandia's program, nor is it as dependent on mentoring relationships and on-the-job training as Lawrence Livermore's. Specifically, Los Alamos officials told us that critical skills are being transferred through a combination of formal training opportunities, mentoring, and archiving programs. For example, the TITANS program, referred to informally as "nuclear design university" is a 3-year, credential-granting program with 2 years of coursework and 1 year of thesis research and writing under the direction of a mentor. Thesis projects can either be focused on learning new modeling techniques or on mastering the simulation of above-ground experiments. For example, one knowledge transfer technique is to reanalyze old data from actual experiments to teach newer employees to use modern simulation techniques to estimate the results of real testing. The results of the student's analysis are then compared to actual testing data. Los Alamos officials told us this practice is a very effective method for examining how well the student has mastered the use of computer simulation techniques—a very critical skill when live nuclear testing is not an option.

Knowledge transfer at weapons production facilities is focused more on having employees demonstrate that they can replicate specific tasks. For example, M&O contractor officials at the Pantex Plant told us that they are very aggressively taking steps to ensure that younger workers can carry on performing some of the same tasks after older workers retire. The centerpiece of the Pantex effort is the Retiree Corps. Through this program, recent retirees are brought back on a part-time basis—for a maximum of 800 hours a year, an average of a little less than 2 days a week—specifically to teach current Pantex employees how to do their high-skill critical task. Retirees host talks and seminars, provide a narrative to schematics of detailed procedures and photos, and are recorded and/or videotaped explaining their tasks. Pantex officials told us

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they verify the knowledge transfer by requiring the trainee to demonstrate that he or she can replicate the task.

Again, however, the M&O contractor at the Nevada National Security Site faces some challenges. The site has an active on-the-job training program and specialized training on specific diagnostic and recording techniques relevant to underground nuclear testing. However, according to M&O contractors, funding for this program has been minimal for several years. In addition, according to Nevada National Security Site M&O contractor officials, it is challenging to preserve some of the critical skills necessary for underground nuclear testing when there is no opportunity to provide any direct experience with such testing.

**M&O Contractors' Retention Strategies Focus on Maintaining Competitive Total Compensation Packages**

NNSA officials and M&O contractors told us that maintaining competitive total compensation packages—that is, combined salary and benefits—is crucial for achieving their strategies for recruiting, developing, and retaining the workforce with the skills necessary to sustain critical capabilities in the nuclear security enterprise, but that other factors are also useful in both attracting desirable candidates and mitigating attrition. For example, M&O contractor officials at Sandia National Laboratories told us that offering the highest salary is not required to attract top talent, but offering pay comparable to peer institutions is a necessity. Accordingly, NNSA officials work very closely with M&O contractors to ensure that contractor compensation remains comparable to other enterprise laboratories and plants, private laboratories, companies, and other government entities that recruit and try to retain similar talent. M&O contractors undertake compensation studies every year and comprehensive benefits evaluation surveys every 2 years. This compensation study is done using survey data from recognized regional, national, and international surveys as needed. Based on these data, M&O contractors may seek permission from NNSA to pay certain employees more by submitting a special request in the Compensation Increase Plan. If the plan is accepted by NNSA, salaries will be increased. In addition to raising salaries for M&O contractors to keep them competitive, NNSA will also authorize and pay for sign-on and retention bonuses, significant monetary recognition and awards programs, and special compensation packages for especially difficult-to-recruit and retain critical skills specialties. The biennial benefits evaluation compares the value of M&O contractor workforce benefits to 15 peer competitors for the same talent.

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According to DOE policy,<sup>16</sup> M&O contractors may offer benefits up to 105 percent of the value of peer institutions' benefits.

NNSA officials and M&O contractors told us that other factors are useful in both attracting desirable candidates and mitigating attrition. For example, the weapons laboratories in particular can offer scientists and engineers access to state-of-the-art equipment—such as the National Ignition Facility at Lawrence Livermore National Laboratory—and the opportunity to do cutting edge research that cannot be done outside the enterprise due to national security restrictions. Similarly, for the three production plants located in relatively remote, nonmetropolitan locations—particularly Pantex, Y-12, and the Savannah River Site—attrition rates are lower among candidates with ties to the local area. For example, M&O contractor officials at Y-12 told us that they recruit locally to the extent possible, because, historically, employees from nearby communities have been less likely to seek opportunities that would require them to relocate. These officials added that the local community is familiar with Y-12, and that about 35 percent of new applicants are employee referrals.

M&O contractors have broadly similar retention initiatives. While M&O officials at all sites in the enterprise told us that competitive total compensation packages—that is, salary and benefits—are ultimately the most important factors in employee retention, sites also typically offer a similar mix of other programs designed to encourage retention, such as work/life balance programs, flexible work schedules, and some form of continuous education and learning programs. In addition, some of the M&O contractors we spoke with told us that, to the extent they are able, they try to accommodate the desires and expectations of more recently hired employees for opportunities for faster advancement, meaningful and challenging assignments, and recognition of high performance.

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<sup>16</sup>DOE O 350.1, Contractor Human Resource Management Programs, Sept. 30, 1996.

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## NNSA Monitors Key Human Capital Metrics to Assess the Effectiveness of Strategies to Maintain Critically Skilled Workforces

To assess the effectiveness of its strategies for recruiting, developing, and retaining the NNSA staff and M&O contractors needed to preserve critical skills in the nuclear security enterprise, NNSA monitors key human capital metrics, including the length of time to hire employees and attrition. To assess the effectiveness of its M&O contractors' strategies, NNSA uses M&O contractors' data to monitor key human capital metrics, but these metrics do not have standardized definitions.

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## NNSA Monitors Key Human Capital Metrics for Its Staff

To assess the effectiveness of its strategies for recruiting, developing, and retaining the federal workforce with the requisite critical skills to support and oversee M&O contractors, NNSA focuses on monitoring two key metrics—the length of time it takes them to hire an employee and its attrition rates—and tracks employees' progress toward completing the required training and certifications through the TQP. NNSA officials told us the length of time it takes them to hire an employee is a useful metric because it is an indicator of the efficiency of their human capital management processes. Attrition rates, especially for those leaving NNSA for reasons other than retirement are a valid indicator of the relative attractiveness of NNSA employment. Increases in the time it takes to hire employees and increases in the attrition rate would indicate a potential problem that would eventually make it more difficult for NNSA to attract and retain the workforce it needs to achieve its mission.

Overall responsibility for maintaining a federal workforce with the necessary critical skills to carry out NNSA's mission resides in NNSA's Office of Human Capital Management, located at NNSA headquarters, and its site offices are also responsible for closely monitoring changes in their workforces and keeping NNSA headquarters informed of any changes. They also have direct responsibility for making sure that site office employees are maintaining the technical certifications required to perform their duties. NNSA's Office of Human Capital Management Services, located at the Albuquerque complex, may also assist both headquarters and site office staff in monitoring these issues.

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## NNSA Monitors M&O Contractors' Human Capital Data, but Some Metrics Do Not Have Standardized Definitions

### M&O Contractors Are Responsible for Managing Their Workforce Needs but NNSA Monitors Key Human Capital Metrics

To assess the effectiveness of its M&O contractors' strategies for recruiting, developing, and retaining their workforces, NNSA monitors key human capital metrics using data the contractors collect. M&O contractors assess key human capital metrics, but these metrics do not have standardized definitions.

NNSA generally gives M&O contractors the primary responsibility for identifying their workforce needs and taking the necessary steps to ensure they maintain workforces with the skills to meet the responsibilities outlined in their M&O contracts with NNSA. Accordingly, NNSA officials told us that, in 2005, they discontinued a requirement for M&O contractors to report on efforts to recruit and retain staff with critical skills, as well as more formal reporting requirements for workforce and succession planning. More specifically, according to NNSA officials, M&O contractors expect NNSA to instruct them on what they are required to do and what the contract deliverable and timeline is, but expect to be able to determine on their own how to meet their contractual obligations, including how to recruit, develop, and retain staff with the requisite critical skills.

Nonetheless, M&O contractors collect data on key human capital metrics for their workforces and provide these data to NNSA directly from their own human resource data systems. All contractors also undertake some level of workforce and succession planning, although there are no formal or specific requirements directing how they do so. According to NNSA officials, these metrics vary from site to site, but generally provide the same key information, including

- acceptance rates for offers of employment, which are benchmarked on a site-specific basis but are typically around 80 percent;
- attrition rates, both for retirement and non-retirement reasons, which are also benchmarked on a site-specific basis;
- pay comparability—whether salaries are competitive with peer institutions;
- benefits comparability—whether benefits are competitive with peer institutions; and
- ability to fill a critical skills position within a certain number of days—usually 48 to 90 days.

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According to NNSA officials, these five metrics are tracked very closely by M&O contractors at all sites, and attrition, employment acceptance rates, and pay and benefits comparability data are systematically collected at regular intervals enterprisewide. If any of these metrics indicate a problem in retention, for example, NNSA officials told us, action would be taken to address it. For example, these metrics were monitored very closely by NNSA and the M&O contractors at Los Alamos National Laboratory and Lawrence Livermore National Laboratory during their 2006 transition to a new M&O contract with less generous retirement and medical benefits. There were concerns that this change could lead to a spike in attrition among highly skilled staff that could in turn lead to difficulties in the laboratories meeting deadlines on project deliverables. Similarly, NNSA is now carefully watching the same metrics at Sandia National Laboratories because the M&O contractor substantially cut future retirement benefits that took effect for those employees who remained at the lab beyond the end of 2011. If the metrics indicate greater attrition than expected, the laboratory could adjust its recruiting strategies to hire more staff.

NNSA also maintains close, cooperative working relationships between its federal and contractor workforces. Much of NNSA's expertise in M&O contractor human capital issues resides in its Contractor Human Resources Division (CHRD) at its Albuquerque complex. According to NNSA officials, the work of CHRD is both critical and central to how NNSA manages human capital issues with the M&O contractors. CHRD staff are in day-to-day contact with the M&O contractors on a wide range of human capital issues, including those related to recruitment, development, and retention of employees with critical skills. For example, if an M&O contractor is having difficulty recruiting staff with particular critical skills, it can submit a supplementary Compensation Increase Plan to the NNSA site office for authorization to offer candidates higher salaries. When this occurs, NNSA headquarters and the relevant site office largely rely on CHRD to review, analyze, and make recommendations to senior management on whether to accept, amend, or reject such a request. Because most sites do not have full-time human capital subject matter expertise in residence, NNSA site office officials in particular rely heavily on CHRD both for such expertise and to monitor M&O contractors' human capital performance metrics at all nuclear security enterprise sites. For example, officials at the Sandia Site Office told us that there is no full-time subject matter expert on human capital issues at the site office, so the office relies heavily on a CHRD staff member to inform the office's oversight of Sandia National Laboratories on this issue. According to NNSA officials, if NNSA had concerns about what a contractor was doing or had doubts that the contractor was going

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to be able to continue meeting its contractual obligations because of weaknesses in its recruitment, development, and retention strategies for critically skilled workers, NNSA would raise such concerns and require that corrective actions be undertaken.

However, as we noted in our February 2011 report,<sup>17</sup> NNSA lacks comprehensive information on the status of its M&O contractor workforce. Specifically, the agency does not have an enterprisewide workforce baseline of critical human capital skills and levels for the M&O contractor workforce to effectively maintain the capabilities needed to achieve its mission. NNSA officials said this is primarily because NNSA relies on its contractors to track these critical skills. As a result, we recommended that NNSA establish a plan with time frames and milestones for the development of a comprehensive contractor workforce baseline that includes the identification of critical human capital skills, competencies, and levels needed to maintain the nation's nuclear weapons strategy. NNSA stated that it understood all of our recommendations in that report and believed that it could implement them. NNSA has taken some actions toward this recommendation. As of March 2012, NNSA had completed a draft plan and was incorporating stakeholders' comments. NNSA officials said that they expect to complete the final contractor workforce baseline plan by May 2012. While contractor efforts may be effective at a specific site, these efforts neither ensure long-term survival of these skills across the enterprise nor provide NNSA with the information needed to make enterprisewide decisions that have implications on human capital. NNSA officials told us that they have determined that, as the responsible federal oversight agency for its M&O contractors, they recognize that they need a comprehensive and enterprisewide outlook regarding M&O contractor workforce data, particularly the identification of the critical skills needed to maintain and sustain future capabilities, and to verify that strategies are, indeed, in place to meet future requirements.

Accordingly, NNSA officials told us that they are developing the Enterprise Modeling Consortium—an initiative to, among other things, develop the needed skills data and models necessary to help NNSA manage its contractor workforces in a more proactive manner. The consortium is designed to help NNSA undertake more integrated, enterprisewide M&O contractor workforce reporting and analysis and

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<sup>17</sup>[GAO-11-188](#).

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M&O Contractors Assess Key Human Capital Performance Measures, but These Metrics Do Not Have Standardized Definitions

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identify the skills and competencies needed by the workforce, as well as the necessary staffing levels, based on the known and projected integrated program requirements needed to implement the Stockpile Stewardship Management Plan and associated budgeted programs for NNSA, DOE, and other federal agencies. NNSA officials told us that NNSA provided \$400,000 to the Enterprise Modeling Consortium in fiscal year 2012 to fund further research and development on modeling. However, according to these officials, there is significant work left to do on the Consortium and they cannot provide an estimate for when the Consortium will be completed.

Each M&O contractor collects key human capital performance data; however, we found that there are no specific, enterprisewide definitions of these data. NNSA officials told us that they have not asked M&O contractors to standardize these definitions because they believe their current system is effective. We previously reported that the lack of standard definitions for performance measurement data can significantly hinder agencies' ability to use such data in planning and reporting.<sup>18</sup> NNSA officials also told us that they believe M&O contractors have effectively used the flexibilities provided in their contracts and have demonstrated that they can identify specific critical skills needed and take the steps needed to, by and large, sustain them. However, NNSA is now considering developing a more comprehensive enterprisewide system, the Enterprise Modeling Consortium, to track M&O contractor human capital performance metrics and other workforce data and common definitions of performance metrics may become more important. Specifically, without common enterprisewide definitions of human capital performance metrics, NNSA may not be able to collect consistent and comparable data across all eight sites in the enterprise. For example, one of the M&O contractors' key metrics—acceptance rates for offers of employment—may not be consistently measured across the enterprise. Human capital staff at one national laboratory told us they participated in a program they compared to “speed dating,” whereby candidates at a career fair may be interviewed for multiple positions and given offers of employment on the spot. However, job applicants may receive multiple offers of employment in a single day and may accept more than one offer to negotiate for a better salary or to have more time to consider their

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<sup>18</sup>GAO, *The Government Performance and Results Act: 1997 Governmentwide Implementation Will Be Uneven*, [GAO/GGD-97-109](#) (Washington, D.C.: June 2, 1997).

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options. In such a situation, the employment offer to a candidate could be counted as an acceptance even if that candidate never became a laboratory employee. When asked about this scenario, NNSA officials stated that it was their understanding that M&O contractors were only counting as accepted offers those who ultimately reported for work, but acknowledged there was no NNSA standard definition and that they did not know for certain how such offers were counted.

Successful human capital management and workforce planning depend on valid and reliable data. These data can help an agency determine: performance objectives, goals, and the appropriate number of employees, and can help develop strategies to address gaps in the number, deployment, and alignment of employees. However, NNSA has not identified or considered the potential inconsistencies in these human capital metrics; therefore, decision makers are relying on information that may not be consistently reported.

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## NNSA and Its M&O Contractors Face Challenges in Recruiting, Retaining, and Developing Their Workforces

NNSA and its M&O contractors face challenges in recruiting, retaining, and developing their workforces and are using several tools to address these challenges. NNSA and its M&O contractor work environments, site locations, and high costs of living pose recruiting challenges. NNSA and its M&O contractors also face shortages of qualified candidates, an aging workforce, and variable funding. NNSA and its M&O contractors are taking actions to address their current human capital challenges, where possible.

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## NNSA and Its M&O Contractor Work Environments, Site Locations, and High Costs of Living Pose Recruiting Challenges

Officials from NNSA site offices and M&O contractor work sites reported that their secure work environment and location make recruitment of advanced science and technology candidates more challenging. Due to the sensitive nature of nuclear weapons work, NNSA and M&O contractor sites must be more secure than most private sector laboratories or commercial plants. To meet this security requirement, laboratories and plants in the enterprise tend to be restrictive environments, isolated from security threats by geography and classification protocols. In addition to these potentially undesirable traits, in the view of some candidates, some sites are further constrained by a high cost of living.

*Restrictive environment.* Officials from most M&O contractors reported that the restrictive environment required for nuclear weapons research and maintenance is a disadvantage in recruiting new staff with the

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potential to become weapons experts. Staff typically need to acquire and maintain high-level clearances and must often work in secure areas that prohibit the use of personal cell phones, personal e-mail, and social media. In particular, they told us younger candidates typically expect to stay continuously connected to their peers via cell phone and social media. Furthermore, any research completed in classified work can only be seen within the classified community; for researchers who desire broader recognition of their work and opportunities for wider collaboration, academia or private industry may be more attractive. Because of these restrictions, most M&O contractor human resources staff told us that it was more difficult to recruit younger scientists and engineers.

*Isolation.* An isolated location may be desirable for building or maintaining nuclear weapons, but it may not appeal to some desirable candidates with advanced degrees in science, technology, and engineering. For example, Los Alamos National Laboratory officials told us that the laboratory's relative isolation—nearly 100 miles from Albuquerque, New Mexico— may make it less appealing to some candidates. In addition, the relative lack of other types of employment opportunities nearby may pose challenges for candidates with spouses in careers outside of science, technology and engineering. Officials at two of the three weapons laboratories told us they focus on recruiting top candidates nationwide to gain a wide breadth of thought and opinion among their staff. The laboratories track the proportion of job offers accepted but cannot always ascertain or be sure of the reason a candidate rejects an offer because, according to officials at Lawrence Livermore, candidates may simply state they declined an offer for “personal reasons.”

In addition, some of the production plants and the test site are also in isolated locations and face some of the same challenges as the laboratories. However, these sites require fewer candidates with advanced degrees and can generally rely on the local workforce to fill other types of critical skills positions. For example, Savannah River Site and Pantex are also both located far from other large cities. However, because of their relative isolation, they are among the biggest employers in these areas, and many local candidates are qualified and eager to accept positions in weapons manufacturing and maintenance. Pantex officials reported that they do not have difficulty finding most workers to perform weapons maintenance, which requires a shorter amount of on-the-job training than weapons design but nonetheless requires a set of critical skills. However, site staff have had to develop strategies to attract candidates to fill those positions that require advanced degrees. Unlike the laboratories, officials at all of the production plants told us that they

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focus their recruiting efforts for these positions at local and regional colleges and universities. Officials at Y-12, for example, have identified competitive science and engineering programs at universities within 300 miles of their plant in Oak Ridge, Tennessee. Y-12 officials reported that they have better results in both recruiting and retaining critically skilled workers when those workers have personal ties to the area. In contrast, M&O contractor officials from the laboratories told us that they needed to recruit from the top academic programs across the country.

*High cost and competition.* Two enterprise sites are located in areas with high costs of living, which can deter qualified candidates—Los Alamos and Lawrence Livermore. NNSA and its M&O contractors have flexibility to offer higher compensation for some critical skills, but some candidates are unwilling to live in high cost areas. For example, housing in Los Alamos is expensive and scarce. According to Los Alamos National Laboratory staff, some employees commute nearly 100 miles each way from Albuquerque every day partly due to cost of living constraints. Los Alamos Human Resources managers reported that high housing costs are a concern among current and prospective employees. Lawrence Livermore National Laboratory, located in the San Francisco Bay Area, is also a high cost area. NNSA has authorized higher salaries for some critically skilled M&O contractor employees but delays during the hiring process can give private sector recruiters an advantage with critically skilled candidates. Lawrence Livermore uses the flexibilities it has to negotiate competitive compensation, but a candidate interested in weapons work may be drawn to another site with a lower cost of living, such as Sandia National Laboratories in Albuquerque or one of the production plants.

Further complicating NNSA's recruiting efforts is the demand for qualified candidates in the private sector as well, and private sector jobs may offer a work environment that many candidates may find more desirable. The same pool of candidates who can excel in engineering, modeling, and simulation tasks is also attractive to high technology firms. For example, according to M&O contractor officials at Lawrence Livermore National Laboratory, a web-based provider of DVD rentals and streaming media uses computational scientists to predict consumers' preferences for films, which is the same skill set the weapons laboratories would use for modeling and simulation. However, this company does not have the constraints that a federal contractor has with compensation limits and a restrictive work environment.

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## NNSA and Its M&O Contractors Face Shortages of Qualified Candidates, an Aging Workforce, and Variable Funding

### Qualified Candidates Are in Short Supply and the Current Workforce Is Aging

NNSA and its M&O contractors are making workforce plans, but face shortages in qualified critically skilled candidates and an aging workforce. In addition, uncertainty about future funding makes long-term workforce development initiatives challenging to execute.

The laboratories have not yet experienced any critical shortages of critically skilled workers, but they all reported that finding candidates with the appropriate qualifications is a growing recruitment challenge and that a more mobile and aging workforce is a retention challenge.

*Shortages of qualified candidates.* NNSA officials told us that qualified candidates are in short supply and that competition from science and technology-related companies in the private sector poses additional challenges. Candidates for most critical skills positions at national laboratories must meet certain criteria, including (1) an advanced degree (master's or doctorate) in a scientific, technical, or engineering field; (2) the ability to obtain a high-level security clearance, which requires U.S. citizenship; and (3) an interest in and willingness to learn weapons design work. The requirement for U.S. citizenship in particular is becoming an increasingly difficult criterion to satisfy in the recruitment process. National laboratory officials told us that a large percentage of students graduating from top science, technology, and engineering programs are foreign nationals. M&O contractors can hire foreign nationals to work outside of weapons-related areas, but the citizenship requirement for working on programs supporting U.S. nuclear weapons is not negotiable.<sup>19</sup>

In addition, national laboratory recruiting staff noted hurdles finding candidates with an interest in and willingness to learn weapons design work. For example, officials at Sandia National Laboratories told us younger candidates with the necessary qualifications are often more interested in fields that contribute to improving the environment. In addition, because of the sensitive nature of weapons work, civilian graduate programs cannot teach weapons-specific skills, so would-be weaponeers may not know whether the work suits them until after they

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<sup>19</sup>To work with weapons, all candidates must be able to obtain a Q-level clearance, which has similar requirements to a top secret clearance in other defense-related agencies.

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have invested significant time working in the enterprise. Even if candidates accept a position, they do not actually have the authorization to design nuclear weapons; current policy allows them to refurbish components within the existing stockpile, and then only when funding is appropriated for that specific activity.

*A more mobile workforce.* NNSA and M&O contractor officials noted that a general shift from defined benefit retirement systems offering pensions to a defined contribution retirement system has made employees much more mobile and, therefore, harder to retain. A defined contribution retirement system makes employees much more mobile because, once the employee is vested—typically after a few years—their contributions to their retirement accounts are portable, therefore they no longer depend on tenure with a single employer. According to NNSA officials, M&O contractors no longer expect newly hired employees to spend their entire careers in the enterprise; rather, they expect them to work for a national laboratory or production plant for an average of 5 to 10 years.

*Aging workforce.* Many of the critically skilled employees currently filling these positions, both at the national laboratories and other NNSA sites, are at or near retirement age, which adds additional uncertainty to the projected human capital needs of the enterprise. NNSA officials told us that they are aware that many critically skilled employees are at or near retirement age, and they are tracking those retirements closely. Human capital staff from NNSA and its M&O contractors told us that it is difficult to anticipate retirement trends, especially during an economic recession. M&O contractor human resources staff said that they have found fewer staff retiring than they would have projected, due to uncertainties about their financial investments. These economic factors may have helped to preserve some critical skills within the enterprise, but officials are concerned that when the economy rebounds, eligible staff may retire at higher-than-projected levels. Such levels of attrition could leave a skills gap that would take years to replenish.

### Variable Funding Can Impede Workforce Development Efforts

Knowledge transfer activities in the nuclear security enterprise tend to require multiple years to complete, but contractors have been challenged to plan and maintain these development efforts because funding varies from year to year. NNSA officials typically do not dictate whether or how much funding goes toward knowledge transfer within contractor workforces, except for specific programs at Sandia, because NNSA prefers not to fence funding for particular contractor activities. Contractors use what NNSA calls science campaigns—which, among other things, fund research to improve the ability to assess warhead performance

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without nuclear testing and help to maintain the scientific infrastructure of the nuclear weapons laboratories—and life extension programs—which ensure weapons’ readiness and extend the life of existing warheads through design, certification, manufacture, and replacement of components—as a means for knowledge transfer, where more experienced weaponeers can train newer staff on weapons design and maintenance. Both science campaigns and life extension programs require long-term planning to ensure that the necessary resources are available.

According to NNSA and M&O contractor officials, funding for science campaigns and life extension programs has varied over the years. M&O contractor officials at both plants and laboratories told us their knowledge transfer plans have been adversely affected in years when funding has been reduced. In recent years, plans for certain life extension programs and science campaigns have been scaled back after plans have been made and contractor resources allocated. According to M&O contractors at the laboratories, reduced funding for life extension programs diminishes their opportunities to give their newer weaponeers hands-on experience. For example, weapons staff at Lawrence Livermore National Laboratory told us that they made knowledge transfer plans based on their approved warhead life extension projects, and that when those projects were sidelined; newer weaponeers were denied significant training opportunities. However, because funding decisions are beyond the M&O contractors’ purview, M&O contractor officials told us there is little they can do to prepare for or mitigate this challenge.

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### NNSA and Its M&O Contractors Are Addressing Their Current Human Capital Challenges, Where Possible

NNSA and its M&O contractors reported that they are taking actions to address their human capital challenges where possible. Specifically, NNSA and M&O contractor officials told us they engaged in workforce planning to avoid potential critical skill gaps in the enterprise. NNSA-wide workforce plans are not expected to be completed until 2013 according to NNSA officials, but certain components are already in practice at various sites, such as streamlined hiring and security clearance practices and “pipeline” building for critically skilled employees.

*Streamlined hiring and security clearance processes.* NNSA and its M&O contractors have streamlined human capital processes to attract and hire new critically skilled workers. In the past, federal hiring processes have caused longer waits, both for candidates awaiting a decision and for human capital officials awaiting security clearances for new hires. M&O contractor staff reported that delays had previously allowed strong

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candidates to find other opportunities, or if candidates were hired and waiting for a clearance, they could lose interest in the position before they started. M&O contractor staff told us that finding work for hired-but-uncleared staff to complete was frustrating for both the new staff and their supervisors. NNSA has made reducing cycle time a priority, and officials from several sites reported that they have been able to hire and obtain clearances for employees more quickly in recent years.

*Building a pipeline of critically skilled employees.* Both NNSA and its M&O contractor officials acknowledge that, due to the long period required for developing some critical skills employees, they need to anticipate their critical skills needs for multiple years in the future. All sites have recruiting and development plans to preserve critical skills in their workforce, which they refer to as a pipeline. Sites use pipelines in two ways to avoid critical skills gaps. First, they use training and project assignments to ensure that critical skills are being developed and preserved in newer employees. For example, Lawrence Livermore has assessed its employees' skill sets and experience, so it knows which are currently performing essential operations more than 25 percent of the time—called core employees—and which are being prepared to perform those operations—called pipe employees. They can augment a pipe employee's expertise in an area if management sees a shortage of core employees in that skill set. Second, in recruiting activities, human resources staff may maintain information about potential future candidates for weapons programs, either with contacts made in internship, fellowship, and coop programs or by keeping records of interested candidates who were not hired. For example, Sandia is building a database of potential candidates, so that in the future it is not relying exclusively on that year's graduating class from the top science and engineering programs.

*Succession planning can also inform pipeline decisions.* M&O contractor officials at some sites said that they have begun to analyze potential skills gaps if a specific retirement or separation were to occur. Those M&O contractors who are undertaking these analyses can rely on managers' assessments of their employees or software packages designed to facilitate succession planning. M&O contractors told us that this kind of planning is currently used in management or leadership capacities, but in the future it could be applied to other areas such as critical skills capacities. Each M&O contractor has a unique way of implementing its pipeline, but M&O contractor officials from all sites told us they all realize the need to consider future retirements and mission requirements in their current hiring and development plans. For example, a senior M&O contractor manager at Sandia National Laboratories responsible for

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building the laboratories' talent pipeline told us that Sandia is facing unprecedented hiring needs due in part to expected increases in retirements. He expects to experience 33 to 50 percent attrition in the next 4 to 5 years, while the total number of Sandia employees will need to remain about the same. Accordingly, Sandia officials told us they expect to have hired approximately 3,100 new employees in the 3 years ending in 2012—about 800 in 2010, 1,100 in 2011, and 1,200 in 2012.

Some of the human capital challenges facing the enterprise are beyond the control of NNSA and its M&O contractors, and in these cases, NNSA has authorized increased compensation to help the sites acquire or retain the personnel they require. The site locations are fixed, and site staff cannot change the number of U.S. citizens completing graduate science and technology programs. Similarly, NNSA and its contractors have no choice but to adapt to the increased mobility of their staff resulting from the shift to a defined contribution retirement systems. To mitigate these challenges, NNSA and its contractors continue to offer financial incentives to recruit and retain critically skilled employees, with competitive starting salaries. The scale of these financial incentives can vary by location and position, but NNSA reported that this strategy has thus far been adequate for recruiting and retaining the talent they need.

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## Conclusions

NNSA and its M&O contractors have taken a number of useful steps to sustain critical skills in the enterprise in the face of several challenges. NNSA has begun to implement the recommendation we made in our February 2011 report to establish a plan with time frames and milestones for the development of a comprehensive contractor workforce baseline that includes the identification of critical human capital skills, competencies, and levels needed to maintain the nation's nuclear weapons strategy. However, while contractor efforts may be effective at a specific site, they do not provide NNSA with the information needed to make enterprisewide decisions that have implications on human capital. Without this information, NNSA's ability to monitor the effectiveness of its and its M&O contractors' strategies to recruit, develop, and retain the workforces needed to preserve critical skills may be hindered. In particular, without common enterprisewide definitions of human capital performance metrics, NNSA may not be able to collect consistent and comparable M&O contractor human capital data across all eight sites in the enterprise. Since NNSA is now considering developing a more comprehensive enterprisewide system to track data on critical skills through its Enterprise Modeling Consortium, this may be an opportune

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time to explore establishing common, uniform definitions for the human capital metrics used in this system.

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## Recommendation for Executive Action

To improve NNSA's ability to monitor the effectiveness of its strategies—and its M&O contractors' strategies—to recruit, develop, and retain the workforces needed to preserve critical skills in the enterprise, we recommend that the Administrator of NNSA take the following action:

As it develops its Enterprise Modeling Consortium and other enterprisewide systems for tracking M&O contractor human capital performance metrics, NNSA should consider developing standardized definitions across the enterprise, especially across M&O contractors, to ensure they gather consistent data using human capital metrics with consistent, uniform definitions.

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## Agency Comments and Our Evaluation

We provided NNSA with a draft of this report for their review and comment. NNSA provided written comments, which are reproduced in appendix I. NNSA stated that it appreciated GAO's recognition of the significant challenges NNSA faces in sustaining critical skills in its workforce and the efforts NNSA is taking to identify critical human capital skills, competencies, and levels needed to maintain the nation's nuclear weapons strategy. In addition, NNSA stated that it agreed with the GAO's recommendation that NNSA should consider developing standardized definitions for human capital metrics across the enterprise to help ensure consistent and comparable data. NNSA also provided other additional technical information, which we incorporated where appropriate.

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We are sending copies of this report to the Secretary of Energy, the Administrator of NNSA, the appropriate congressional committees, and other interested parties. The report also is available at no charge on the GAO website at <http://www.gao.gov>.

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If you or your staff have any questions about this report, please contact me at (202) 512-3841 or [aloise@gao.gov](mailto:aloise@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 II.

A handwritten signature in black ink that reads "Gene Aloise". The signature is written in a cursive style with a large, looped initial "G".

Gene Aloise  
Director  
Natural Resources and Environment

# Appendix I: Comments from the National Nuclear Security Administration



Department of Energy  
National Nuclear Security Administration  
Washington, DC 20585  
APR 19 2012



Mr. Gene Aloise  
Director  
Natural Resources and Environment  
Government Accountability Office  
Washington, DC 20458

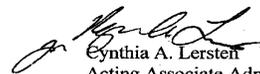
Dear Mr. Aloise:

The National Nuclear Security Administration (NNSA) appreciates the opportunity to review the Government Accountability Office's (GAO) report on *MODERNIZING THE NUCLEAR SECURITY ENTERPRISE: Strategies and Challenges in Sustaining Critical Skills in Federal and Contractor Workforces*, GAO-12-468. NNSA understands that at the request of the Senate Subcommittee on Oversight of Government Management, the Federal Workforce, and the District of Columbia from the Committee on Homeland Security and Governmental Affairs, GAO was asked to examine: (1) strategies NNSA and its M&O contractors use to recruit, develop, and retain critically skilled workforces; (2) how NNSA assesses the effectiveness of these strategies; and (3) challenges in recruiting, retaining, and developing this specialized workforce and efforts to mitigate these challenges.

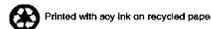
I appreciate the GAO's recognition of the significant challenges NNSA faces in sustaining critical skills in its workforce and the efforts NNSA is taking to develop a comprehensive contractor workforce baseline that includes the identification of critical human capital skills, competencies, and levels needed to maintain the Nation's nuclear weapons strategy. In addition, we agree with the GAO's recommendation that NNSA should consider developing standardized definitions for human capital metrics across the enterprise to help ensure consistent and comparable data. I have enclosed NNSA's formal response to the GAO's recommendation, as well as technical comments to help enhance the accuracy and clarity of the information provided in the report.

If you have any questions concerning this response, please contact Dean Childs, Director, Office of Internal Controls, at (301) 903-1341.

Sincerely,

  
Cynthia A. Lersten  
Acting Associate Administrator  
for Management and Budget

Enclosure



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# Appendix II: GAO Contact and Staff Acknowledgments

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## GAO Contact

Gene Aloise, (202) 512-3841 or aloisee@gao.gov

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## Staff Acknowledgments

In addition to the contact named above, Ned Woodward, Assistant Director; Dr. Timothy Persons, Chief Scientist; Don Cowan; Hayley Landes; and Kevin Tarmann made key contributions to this report. Yvonne Jones, Alison O'Neill, Cheryl Peterson, Rebecca Shea, Kiki Theodoropoulos, and Greg Wilmoth provided technical assistance.

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