October 2009

National Nuclear Security Administration Monthly News

U.S -RUSSIA COOPERATION: Rosatom Director General Sergei Kiriyenko (center) is given a demonstration of the rackable can storage system by B&W Y-12's President and General Manager Darrel Kohlhorst (far right) at the Highly Enriched Uranium Materials Facility, Y-12's newly built storage facility.

First Meeting of U.S.-Russian Nuclear Energy and Nuclear Security Working Group

Deputy Secretary of Energy Daniel Poneman and Director General of the State Atomic Energy Corporation (Rosatom) Sergei Kiriyenko held the first meetings of the joint U.S.-Russian Nuclear Energy and Nuclear Security Working Group in late September.

The meetings opened with a session hosted by U.S. Secretary of Energy Steven Chu – who met with Kiriyenko and Poneman to discuss a broad range of nuclear issues – and concluded with a plenary session co-chaired by Poneman and Kiriyenko. This was the first meeting of the working group since it was established under the U.S.-Russia Bilateral Presidential Commission during the July 2009 Presidential Summit.

"The United States and Russia have a long and successful track record of cooperation in the area of nuclear security," Poneman said. "These meetings demonstrate how seriously our countries take our

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President Presents Top Science, Technology Award

This month President Obama presented Dr. Berni Alder, a retired physicist from Lawrence Livermore National Laboratory, with the National Medal of Science and awarded the National Medal of Technology and Innovation to IBM for its Blue Gene series of supercomputers, developed in partnership with NNSA. The awards are the nation's most prestigious honors in the fields of science and technology innovation.

Alder is widely regarded as the founder of molecular dynamics, a type of computer simulation used for studying the motions and interactions of atoms over time. His contributions include changing kinetic molecular theory by showing that simulations can significantly affect a scientific field. In 1980, Alder was one of the pioneers who used large-scale simulations to solve quantum mechanics problems.

To learn more about NNSA's Blue Gene computers, see *The Science of Nuclear Security* on page 6.

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Administrator's Corner

One of the best things about serving as NNSA Administrator is having the opportunity to see our terrific programs in action. All across the enterprise – in fact, all around the world – the men and women serving in our organization are doing incredible work.

This month, I had the opportunity to see that first-hand when I addressed a conference we co-hosted on Next Generation Safeguards in Japan.

When Secretary Chu spoke to the International Atomic Energy Agency in September, he talked about our nation's commitment to promoting peaceful uses of nuclear energy while strengthening international safeguards.

As part of his speech, he highlighted NNSA's Next Generation Safeguards Initiative, a cutting edge program that is working to develop new techniques and technologies for preventing countries from diverting nuclear materials and technologies to military purposes.

That is not an easy challenge. But leveraging the best science and technology in the world to tackle tough challenges is what we do.

We see it in the scientists and engineers working on the Lifetime Extension Programs that are ensuring the safety, security and effectiveness of the nuclear deterrent.

We see it in our supercomputing platforms, one of which was just awarded the National Medal of Technology and Innovation – the nation's most prestigious honor for technological innovators (see page 6).

We see it in the security forces protecting our sites and in our emergency response programs – the men and women who spend their time thinking about the unthinkable so we can provide our nation the best nuclear incident response capabilities in the world.

When I look across the nuclear security enterprise, I am proud to see that our nation's investment in nuclear security is providing the tools to tackle the biggest challenges facing our country and our planet. I hope you are, too.

Thank you all very much, and keep up the good work.

Tom D'Agostino

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First Meeting of U.S.-Russian Nuclear Energy and Nuclear Security Working Group

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shared responsibility to promote peaceful uses of nuclear energy while combating nuclear dangers. I look forward to continuing this record by expanding our cooperation in fulfillment of our Presidents' Joint Statement."

"This visit is devoted to an in-depth discussion of the issues of nuclear energy and nuclear security as stipulated by the mandate from the Presidents of the Russian Federation and the United States," Kiriyenko said. "We are looking forward to the expansion of our bilateral cooperation on these issues."

After their meeting with Secretary Chu, Poneman and Kiriyenko flew to Tennessee to visit Oak Ridge National Laboratory (ORNL) and the Y-12 National Security Complex, where they observed a joint nuclear security training exercise. They also discussed nuclear materials management issues and toured the recently completed Highly Enriched Uranium Materials Facility.

While Poneman and Kiriyenko toured ORNL and Y-12, the remaining U.S. and Russian members of the working group met in Washington to discuss a wide range of topics, including cooperation on nuclear security, export controls, nuclear safeguards, nuclear materials consolidation and disposition, nuclear emergency operations, and civil nuclear energy cooperation.

As a result of the meeting, a joint action plan formulated by the working group will be forwarded to Presidents Obama and Medvedev through the Bilateral Commission Coordinators, U.S. Secretary of State Hillary Clinton and Russian Foreign Minister Sergey Lavrov.

Nuclear Explosion Monitoring Technologies

NNSA's Office of Nonproliferation Research and Development and the U.S. Air Force Research Laboratory (AFRL) co-sponsored the annual 2009 Monitoring Research Review (MRR) late September in Tucson, Ariz.

The meeting showcased nuclear explosion monitoring research and provided opportunities for scientific and programmatic interactions among researchers funded by NNSA, AFRL and other national and international agencies. Scientists from Sandia, Los Alamos, Lawrence Livermore, Pacific Northwest national laboratories, academia, and industry presented results of recent research. Additionally, the directors of the Comprehensive Nuclear Test Ban Treaty Organization's International Monitoring System and International Data Center presented their programs' status and future research needs.

"Technical conferences such as the MRR are crucial to advancing both national and international methods to detect nuclear detonations," said Principal Assistant Deputy Administrator for Defense Nuclear Nonproliferation Ken Baker. "Research in this area facilitates and augments our ongoing efforts to strengthen nonproliferation efforts worldwide."

The research results presented at the MRR encompassed all nuclear explosion monitoring technology fields, including seismic, infrasound and radionuclide, as well as hydroacoustic.

Sandia Robots to Bolster Troop Capabilities

Boston Dynamics, which has developed advanced dynamic robots such as BigDog and PETMAN, has been awarded a contract by NNSA's Sandia National Laboratories to develop the next generation of the Precision Urban Hopper, meaning Sandia's hopping robots may soon be in combat.

When fully operational, the four-wheeled hopper robots will navigate autonomously by wheel and jump – using one powerful leg – onto or over obstacles more than 25 feet high, said Jon Salton, a Sandia program manager.

"The Precision Urban Hopper is part of a broad effort to bolster the capabilities of troops and special forces engaged in urban combat, giving them new ways to operate unfettered in the urban canyon," Salton said.

The development program, funded by Defense Advanced Research Projects Agency (DARPA), Department of Defense's advanced technology organization, has a 12-month design phase followed by a six-month build phase, with testing and delivery planned for late 2010. As part of the ongoing DARPA project, Sandia developed the shoebox-sized, GPS-guided, unmanned ground robots.

HOPPING ROBOTS - Brig. Gen. Garrett Harencak, NNSA principal assistant deputy administrator for military application, discusses the Sandia National Laboratories hopping robot with Russ Skocypec, from Sandia's Homeland Security & Defense Strategic Management Unit. The four-wheeled Sandia hopper robots will navigate autonomously by wheel and jump — using one powerful leg — onto or over obstacles of more than 25 feet.

The demonstrated hopping capability of the robots allows the small unmanned ground vehicles to overcome as many as 30 obstacles that are 40-60 times their own size. Hopping mobility has been shown to be five times more efficient than hovering when traversing obstacles at heights under 10 meters, which allows longer station keeping time for the same amount of fuel.

The wheeled robotic platform adapts to the urban environment in real time and provides precision payload deployment to any point of the urban jungle while remaining lightweight and small.

Researchers addressed several technical challenges, including appropriate management of shock forces during landing, controlling hop height from varying terrain including concrete, asphalt, sand and vegetation, and controlling landings to limit tumbling.

Kansas City Plant Mainframe Shutdown SignalsTechnology Transition

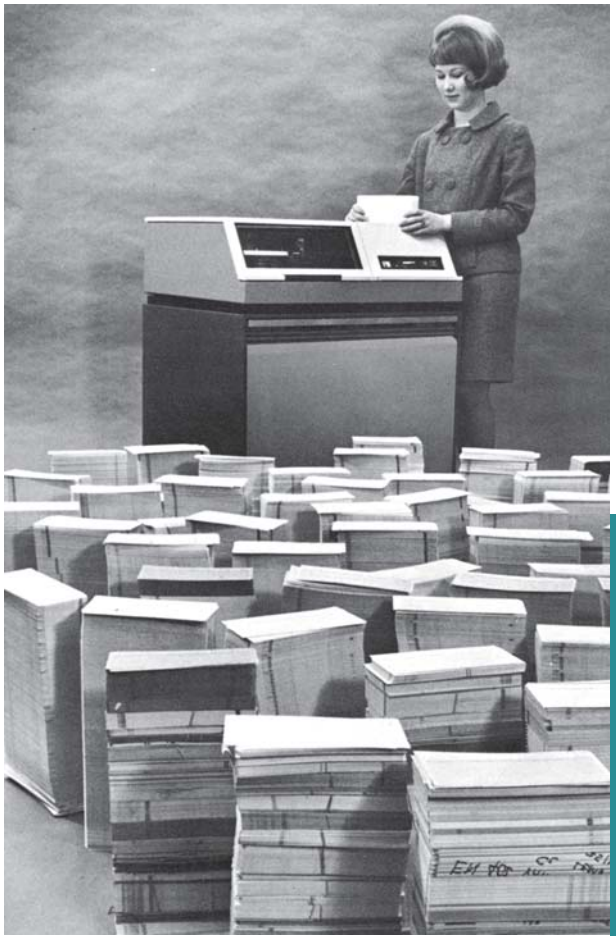
With the flip of the switch, NNSA's Kansas City Plant (KCP) powered down the last legacy IBM mainframe computing system, marking the transition to a 21st century Weapons Information System (WIS) that can effectively manage the inventory and finances of the nuclear weapons stockpile.

"As we transform from a Cold War-era nuclear weapons complex to a 21st Century nuclear security enterprise, everything about the way we operate is changing for the better," said NNSA Administrator Thomas D'Agostino. "This significant information technology milestone ensures the continued safety, security and reliability of our nuclear weapons stockpile. We congratulate the Kansas City Plant on their smooth transition to a modernized system."

WIS is now the system of record for managing the inventory and finances of the nuclear weapons stockpile. NNSA replaced the legacy mainframe with a set of modern Sun Microsystems servers that will be cheaper, faster, more energy efficient, and easier to maintain, while increasing the reliability of the system.

During a brief ceremony in the KCP's Data Center to recognize the completion of the modernization of the last remaining systems on the IBM mainframe Kansas City Site Office Acting Manager Mark Holecek commended the team for a job well done. "This is a significant milestone in the progression of information technology and its support of the safety, security and reliability of our nation's nuclear weapons stockpile," said Holecek.

Since the first one arrived at KCP in 1966,



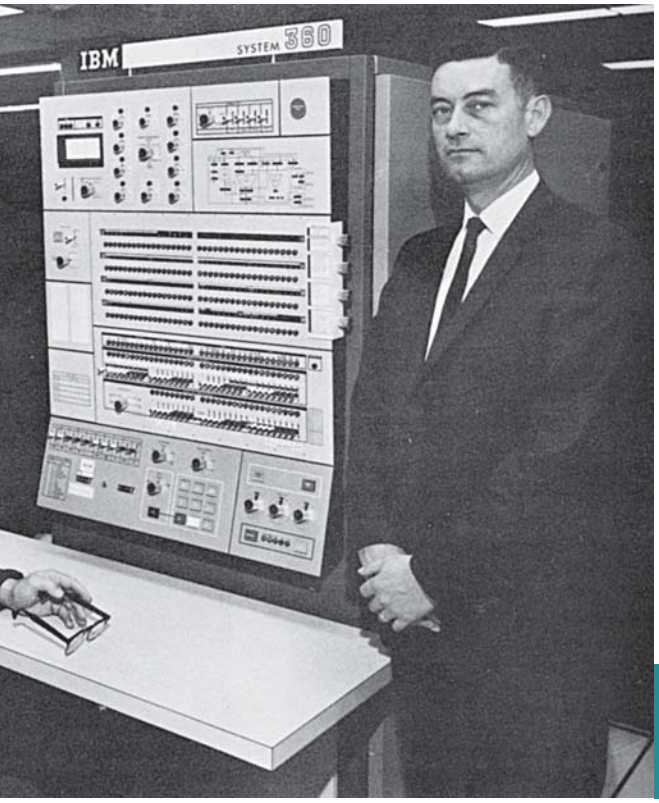
DATA PROCESSING STRIDES: The first IBM 360 Model 40 used disk drives, a tremendous technology jump from the data processing cards. Shown here, approximately 100,000 data processing cards were needed to accommodate the same amount of information stored on five disks.

TECHNOLOGY TRANSITION: Kansas City Site Office Acting Manager Mark Holecek turned off the last IBM Mainframe at the Kansas City Plant.

mainframe computers have taken the lead in serving many of NNSA's computational needs, from printing paychecks, running financial systems, scheduling manufacturing, to managing nuclear weapons inventory.

The retired IBM Mainframe contained the work of thousands of personnel around the nuclear security enterprise, meticulously cataloged, audited and stored within a Weapons Information System to ensure the preservation of some of the most important artifacts of our nuclear deterrent and our national security.

"There are many people around NNSA and within the Department of Defense, who have labored to conceptualize, develop, build, and test the new Weapons Information System," said Robert Brese, NNSA deputy chief information officer. "We commend them for their work, both individually and collectively. Without them, these records and our strategic deterrent would be at risk. "



"As we transform from a Cold War-era nuclear weapons complex to a 21st Century nuclear security enterprise, everything about the way we operate is changing for the better."

Thomas D'Agostino - NNSA Administrator

THE IBM 360: In 1966, employees marveled at the speed at the original IBM 360 mainframe. Its three printers could print out 50 feet of paper containing 2,870 lines of data in just three minutes.

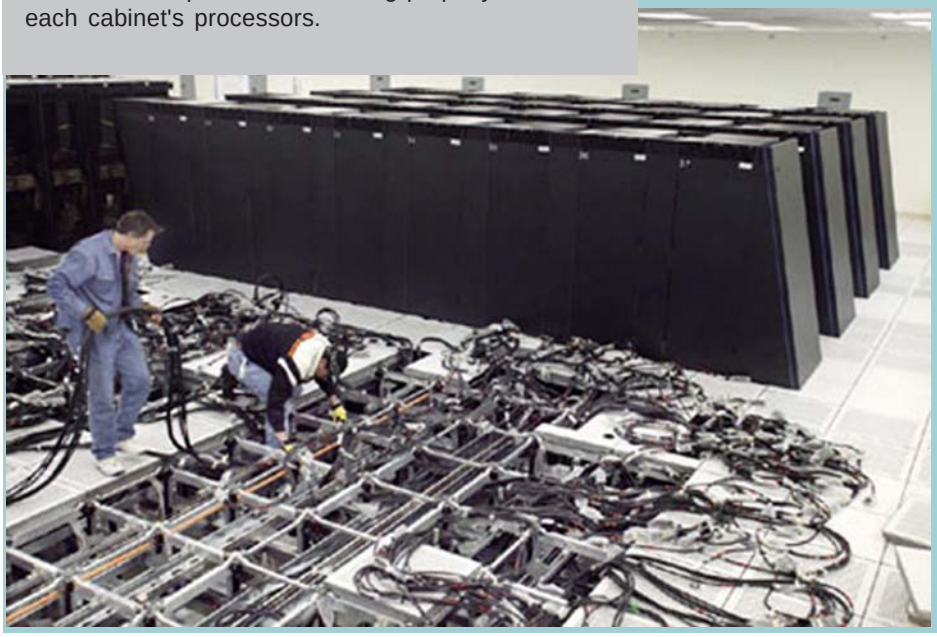
The Science of Nuclear Security

NNSA Blue Gene Partnership Receives Top Presidential Technology Award

At a White House ceremony early this month, President Obama awarded the National Medal of Technology and Innovation to IBM for its Blue Gene series of computers, developed in partnership with NNSA. The award is the nation's most prestigious honor for innovators in technological achievement.

Originally developed to provide the capability to maintain the safety, security and reliability of an aging nuclear stockpile without testing, the first computer in the Blue Gene series, Blue Gene/L, was developed through a partnership with NNSA's Lawrence Livermore National Laboratory. The Blue Gene architecture has since been replicated and employed in some of the fastest supercomputers in the world.

INVESTMENT IN NUCLEAR SECURITY: The unusual slant to BlueGene/L's cabinets is a necessary design element to keep cooled air flowing properly around each cabinet's processors.



In 2004, the Department of Energy's Argonne National Laboratory, which houses a second generation Blue Gene/P system, and IBM jointly created the Blue Gene Consortium, an international group of laboratory, university and industrial researchers collaborating to evaluate the platform and technology and provide critical feedback for future Blue Gene designs.

"The Blue Gene supercomputers are an outstanding example of our investment in nuclear security providing the tools to tackle broader national challenges," said NNSA Administrator Thomas D'Agostino. "This machine, which was originally developed to ensure the safety and reliability of our nuclear stockpile without testing, has led to amazing advances in science and discovery."

Blue Gene systems have helped map the human genome, investigated medical therapies, replicated brain power, pinpointed tumors, and predicted climate trends.

In addition to its many applications, Blue Gene represents tremendous progress in energy efficiency because it dramatically shrank the physical size and energy needs of a computing system whose processing speed would have otherwise required a dedicated power plant capable of generating power to thousands of homes.

ADMINISTRATOR VISITS SAVANNAH RIVER SITE: NNSA Administrator Thomas D'Agostino (left) toured the Savannah River Site in late September and received updates on several projects there, including the Tritium Facilities and the K Area. The Tritium Facilities at SRS are designed and operated to process tritium, a radioactive form of hydrogen gas that is a vital component of nuclear weapons. Nuclear Materials Management has two facilities at SRS designated for extended safe storage of plutonium: the K Area Material Storage (KAMS) facility, located in 105-K; and the 235-F facility. The 105-K building formerly housed K Reactor, which produced nuclear materials to support the United States during the Cold War for nearly four decades. It was the United States last operating production reactor, shutting down for the last time in 1992. Sachiko McAlhany (far right), NNSA, briefs the Administrator on the proposed plutonium process modifications in the K Area Complex.

Secret Keeper: After 57 Years, Oak Ridge Technical Expert Retires

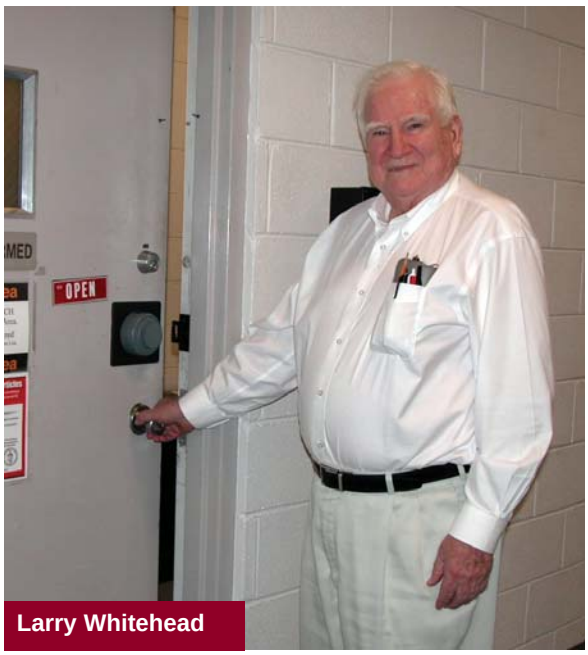
Larry Whitehead is a human vault, the keeper of elite secrets known by a few to protect the many.

Over the span of more than half a century, Whitehead has reviewed countless scientific and technical documents and worked with leading researchers. The twist? His career focused almost entirely on the nation's nuclear weapons program and the plethora of classified information related to it.

Whitehead began his career in nuclear security with the Atomic Energy Commission in 1952, worked through the Cold War years, and witnessed the massive transformation that followed and is still underway. He retired this month from the Department of Energy's Office of Scientific and Technical Information (OSTI) at Oak Ridge National Laboratory after 57 years of public service.

In a Knoxville News story about Whitehead's retirement, David Bellis, the classified program manager at OSTI, said, "When Larry walks out the door, a valuable knowledge base that cannot be duplicated, captured or even described is walking out as well. His expertise, patriotism and service to the people and to the government of the United States of America are greatly appreciated. He will be missed."

Whitehead, who turns 80 in November, plans to join his wife at a lakeside retirement home in West Tennessee now that his career in public service has ended. He also intends to teach math and science at the community college level. NNSA salutes him for his commitment to nuclear security and public service and for devoting his career to the safety of our nation.



Larry Whitehead

Sandia's Z Machine Helps Safeguard Stockpile

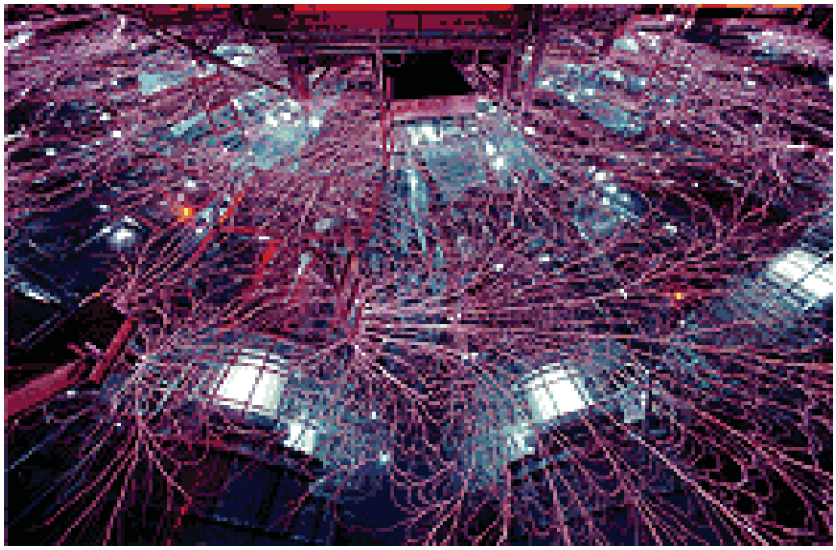
The Z machine at Sandia National Laboratories met its goal for the 2009 fiscal year by conducting 51 test shots in the last quarter, more than doubling the number of shots for the same period last year. This re-establishes the Z machine shot rate capability after its refurbishment in 2007.

The data from Z machine firings, which are used in supercomputer applications to simulate the effect of nuclear weapons, are a critical part of the NNSA's Stockpile Stewardship Program.

"The Z machine is an integral part of our commitment to maintaining a safe, secure and reliable stockpile without nuclear testing," said NNSA Administrator Thomas D'Agostino. "I congratulate the Sandia Z machine team for their work in getting to this goal. Their commitment to nuclear security is one of the reasons we can verify the effectiveness of the stockpile each year."

The Z machine is the world's largest and most powerful laboratory Z-pinch X-ray source. With the 2007 refurbishment of the Z machine, X-ray energies greater than 2 million joules and X-ray powers exceeding 300 trillion watts have been produced, as well as producing pressures greater than those at the center of the Earth. Working in concert with the National Ignition Facility at Lawrence Livermore National Laboratory – the world's largest laser – and the Omega laser at the University of Rochester, Z machine is helping to advance the frontiers of science and discovery while addressing our nation's critical national security priorities.

Sandia's Z machine, which routinely reaches the temperature of the sun, has melted a diamond, shot tiny plates faster than the earth moves through space, and created temperature and pressures that have allowed astronomers to better estimate aspects of the core of Jupiter, the surface of Neptune, and the X-ray patterns around black holes in space.



NNSA NUCLEAR SECURITY COMMITMENT: Z Machine simulations at Sandia National Laboratories are integral to maintaining a realiable stockpile without nuclear tests.

SES GRADS: DOE Secretary Steven Chu and NNSA Administrator Thomas D'Agostino recently presided over the Washington, D.C., graduation ceremony of the Senior Executive Service (SES) Candidate Development Program Class of 2009. The candidates have received their Office of Personnel Management (OPM) Qualifications Review Board certifications and are eligible to be placed directly into SES level positions.

The Office of the Chief Human Capital Officer designed and implemented the candidate development program to create a pipeline of highly skilled people who can help DOE's workforce meet the challenges of the 21st Century. Out of more than 200 candidates, forty-eight were selected for participation in an intensive OPM Assessment Center and DOE SES Panel Interviews. Twenty-one individuals were then selected to participate in the program – ten from various DOE elements and nine from NNSA. Two external candidates were also selected.