Exceptional service in the national interest

Sandia National Laboratories

Ten-Year Site Plan

Fiscal Year 2016

U.S. DEPARTMENT OF ENERGY | NNSA National Nuclear Security Administration

Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000. **SAND2015-2392 R**

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APR 0 3 2015

MEMORANDUM FOR JEFFERSON G. UNDERWOOD
OFFICE OF INFRASTRUCTURE AND CAPITAL PLANNING

For Brad Stevens

FROM: GEOFFREY L. BEAUSOLEIL
MANAGER

SUBJECT: Approval and Submittal of Ten Year Site Plan for Sandia National Laboratories

The Ten Year Site Plan (TYSP) for Sandia National Laboratories is attached for your review and acceptance. The TYSP has been reviewed and approved by the Sandia Field Office. We look forward to review of the TYSP by National Nuclear Security Administration Headquarters. Any comments you provide will be coordinated and included in a revision of the TYSP as may be requested by your office.

If you have questions, please contact Jeanette Norte at (505) 845-4435 or me at (505) 845-6036.

Attachment

cc w/o attachment:
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Table of Contents

List of Figures

List of Tables

Acronyms and Definitions

Acronym	Definition
ACRR	Annular Core Research Reactor
ALT	Alteration
ARG	Accident Response Group
AUI	Asset Utilization Index
B&T	Building and Trailer
BSI	Building System Item
CHIP^2	Center for Heterogeneous Integration Packaging and Processing
CREATE	Collaboration in Research and Engineering Advanced Technology and Education
D&D	Decontamination and Demolition
DM	Deferred Maintenance
DoD	Department of Defense
DOE	Department of Energy
DOS	Department of State
DSA	Defense Systems and Assessments
EC	Energy, Climate, and Infrastructure Security
EORC	Emergency Operations and Response Center
ETG	Explosives Technology Group
F&I	Facilities and Infrastructure
FCI	Facility Condition Index
FIMS	Facilities Information Management System
FIRSt	Five-Year Facilities and Infrastructure Recapitalization and Sustainment
FMOC	Facilities Management and Operations Center
FY	Fiscal Year
GPP	General Plant Project
GSF	Gross Square Feet
HE	High Explosive
IDS	Infrastructure Data Sheet
IGPP	Institutional General Plant Project
IHE	Insensitive High Explosives
IHNS	International, Homeland, and Nuclear Security
IM	Information Management
IMS	Integrated Mission Support
IT	Information Technology
JTOT	Joint Tactical Operations Team
KTF	Kauai Test Facility
LEP	Life Extension Program
LI	Line Item
LRDF	Long-Range Development Framework
LRSP	Long-Range Sustainment Plan
LVOC	Livermore Valley Open Campus

Acronym	Definition
MESA	Microsystems and Engineering Sciences Applications
NG	Neutron Generator
NNSA	National Nuclear Security Administration
NSE	Nuclear Security Enterprise
NW	Nuclear Weapons
OMB	Office of Management and Budget
OSF	Other Structures and Facilities
OST	Office of Secure Transportation
PMU	Program Management Unit
PSL	Primary Standards Laboratory
R&D	Research and Development
RPV	Replacement Plant Value
S&T	Science and Technology
SNL	Sandia National Laboratories
SPP	Strategic Partnership Projects
SSiFR	Sandia Silicon Fabrication Revitalization
SSP	Site Sustainability Plan
SSPP	Strategic Sustainability Performance Plan
STE	Science, Technology, and Engineering
TA	Technical Area
TCR	Test Capabilities Revitalization
TTR	Tonopah Test Range
TYSP	Ten-Year Site Plan
U.S.	United States
WEF	Weapons Engineering Facility
WMD	Weapons of Mass Destruction

1.0 Executive Summary

1.1 Background

Sandia National Laboratories (SNL) is a United States (U.S.) Department of Energy (DOE)/National Nuclear Security Administration (NNSA) multi-program national security laboratory managed and operated by Sandia Corporation (Sandia), a wholly owned subsidiary of Lockheed Martin Corporation. In fiscal year (FY) 2014, Sandia had a revenue of $2.78 billion and a workforce of 11,200 located primarily at its four operating sites situated in New Mexico, California, Nevada, and Hawaii.

Within the U.S. nuclear weapons (NW) enterprise, Sandia is uniquely responsible for systems engineering and integration of the NW stockpile and for the design, development, qualification, sustainment, and retirement of non-nuclear components of NW. While NW represents Sandia's core mission, the science, technology, engineering, and business professional capabilities required to support this mission position the Laboratories to support other aspects of national security as well. There is a natural and increasingly significant synergy between our core mission and our broader national security work. This broader role involves research and development (R&D) in nonproliferation, counterterrorism, energy security, defense, and homeland security (Figure 1.1). The diversity of Sandia's missions is directly related to the current and emerging national security environment consistent with government and DOE/NNSA policies that authorize special access to the Laboratories' unique capabilities. In its FY 2014–2018 Strategic Plan, Sandia articulated its core purpose:

> *Rendering "exceptional service in the national interest" has been Sandia's core purpose since 1949. The Labs' original mission, to provide engineering design, systems engineering, and integration for the non-nuclear components of the nation's nuclear weapons, continues today. The nuclear weapons mission is our reason for being; it is what makes the organization unique and it creates a foundation from which we leverage our capabilities and provide support to address other national security challenges."*

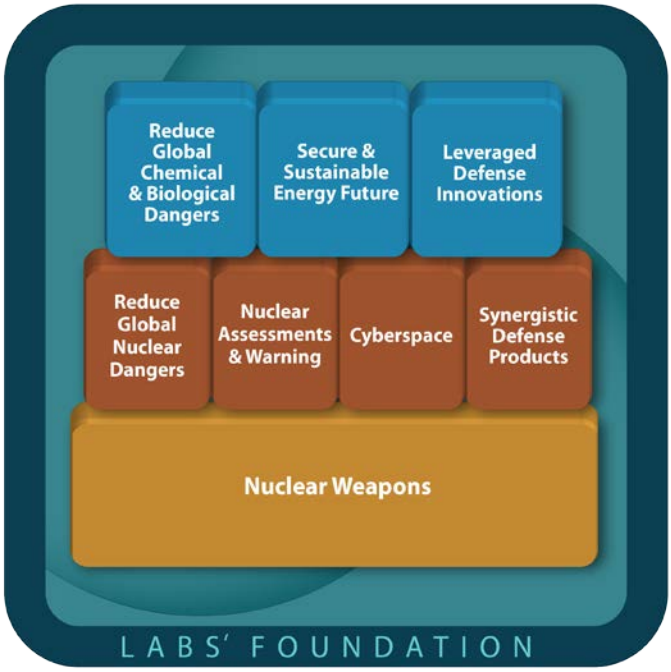


Figure 1.1. SNL Mission Areas

1.2 Accomplishments

During FY 2014, Sandia's collaborative approach to mission support and pursuit of R&D, test, and evaluation excellence in engineering and science has resulted in numerous noteworthy accomplishments, including some of particular interest to NNSA.

- **B61-12 Life Extension Program (LEP):** The B61-12 LEP completed all key program milestones in accordance with the schedule for full-scale engineering development. The team demonstrated systems engineering rigor through successful completion of multiple component-level conceptual design review involving numerous Sandia NW design organizations. Figure 1.2 depicts the B61-12 design.

Figure 1.2. B61-12 Design

- **Independent Surety Assessment:** Initial surety assessments were completed on the B61-12 LEP and W88 Alteration (Alt) 370 system conceptual designs. The assessments addressed identification of risk and opportunities for improvement in nuclear safety, use control, reliability, surveillance, and engineering quality using the NW Program Management Unit's (PMU) Assert, Challenge, Conclude process. Results are reviewed with the Weapon Project Teams and senior NW management and are documented in formal assessment reports.

- **Sandia Rocket Sled Test Facility:** Most notable was the first sled track test in support of the B61-12 LEP. A large steel-encased concrete mass was accelerated along Sandia's 10,000-foot rocket sled track to impact a suspended B61-12 test assembly. The data collected in this experiment is used to demonstrate weapon system performance in an abnormal environment scenario while also providing model validation data to the design teams. Figure 1.3 depicts the test assembly at moment of impact.

Figure 1.3. B61-12 Test Assembly at Impact

- **Test Capabilities Revitalization (TCR) Project, Phase II:** In March 2014, the TCR Phase II successfully achieved its final project milestone, finishing the work begun in 2005. TCR Phase II addressed critical infrastructure and equipment needs in the 10,000-foot sled track facility, the large-scale centrifuge facility, the mechanical shock facility, the two large-scale vibration facilities, and the Aero-sciences facility.

1.3 Facilities and Infrastructure Strategy

Sandia continues to pursue a "capability-based" approach to site stewardship to attain the Program of Record; it is both responsive to the mission needs of its diverse customer base and fiscally responsible for the multi-billion dollar federal investment in real property assets. Sandia's FY 2014–2018 Strategic Plan articulates and further emphasizes the basis for its real-property management strategy, which provides mission-enabling infrastructure to address and support Sandia's five strategic objectives:

1. Deliver with excellence on our commitments to the unique NW mission.
2. Amplify our national security impact.
3. Lead the Complex as a model 21st-century government-owned/contractor-operated national laboratory.
4. Excel in the practice of engineering.
5. Commit to a learning, inclusive, and engaging environment for our people.

Proactive stewardship of the Laboratories' facilities and infrastructure (F&I) is central to achieving these objectives; however, Sandia's stewardship faces many technical challenges, competing interests, administrative requirements, and severely constrained resources. Further discussion of Sandia's Five-Year Facilities and Infrastructure Recapitalization and Sustainment (FIRSt) Plan is covered in Section 5.4.

Sandia's F&I strategy and planning flow is tied to and derived from the NNSA's Program of Record, as depicted in Figure 1.4. Sandia's approach includes efforts to increase productivity, reduce long-term operational costs and energy use, and demonstrate a fiscally responsible approach to ensure adequate cost control for customers.

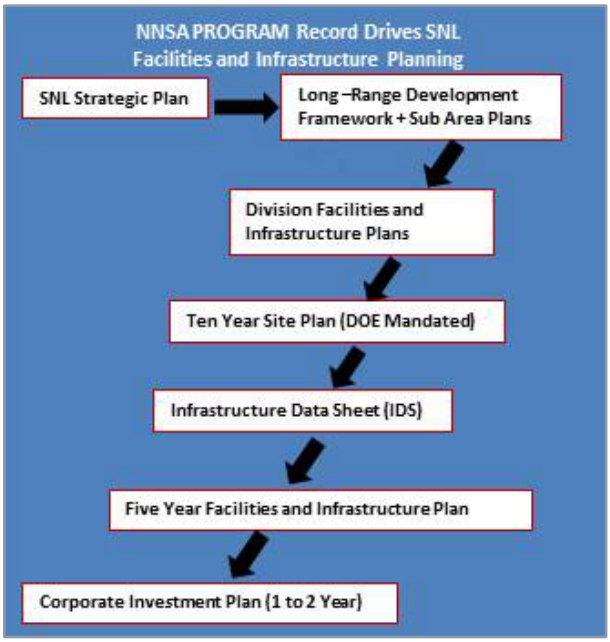


Figure 1.4. SNL F&I Planning Flow

Sandia established the following objectives to guide its planning and prioritization:

- Remove or remodel substandard space.
- Improve productivity of mission through collocation and improvements to space quality.
- Improve the facility condition index (FCI) by reducing deferred maintenance (DM).
- Increase space utilization for office, laboratories, and storage.
- Explore the feasibility of nontraditional funding strategies, such as third-party financing.

Regardless of the funding source, mission, or customer, the F&I supporting Sandia's technology base will require revitalization; continued renewal and replacement of aging infrastructure; replacement and modification of buildings, structures, and utility systems; refurbishment of fire protection systems; and improvement or installation of modern telecommunications systems to meet increasingly stringent security and data transfer demands. F&I investment and recapitalization are integral to mission support and require management vigilance and stewardship discipline.

The future state of SNL is more than a collection of individual projects, just as Sandia is more than a collection of programs and organizations. Building on the foundation established by the Ten-Year Site Plan (TYSP) and DOE Order 430.1B, *Real Property Asset Management*, Sandia has formally implemented master planning principles that are currently embedded in its internal Long-Range Development Framework (LRDF). The LRDF is a planning tool that provides the overall framework and guidance for land and infrastructure development through the application of high-level principles and strategies. The LRDF also sets the stage for the attendant sub-area plans. Figures 1.5 and 1.6 reflect the mission capability areas for both the SNL/NM and SNL/CA sites, which will provide the foundation for future development plans and investments.

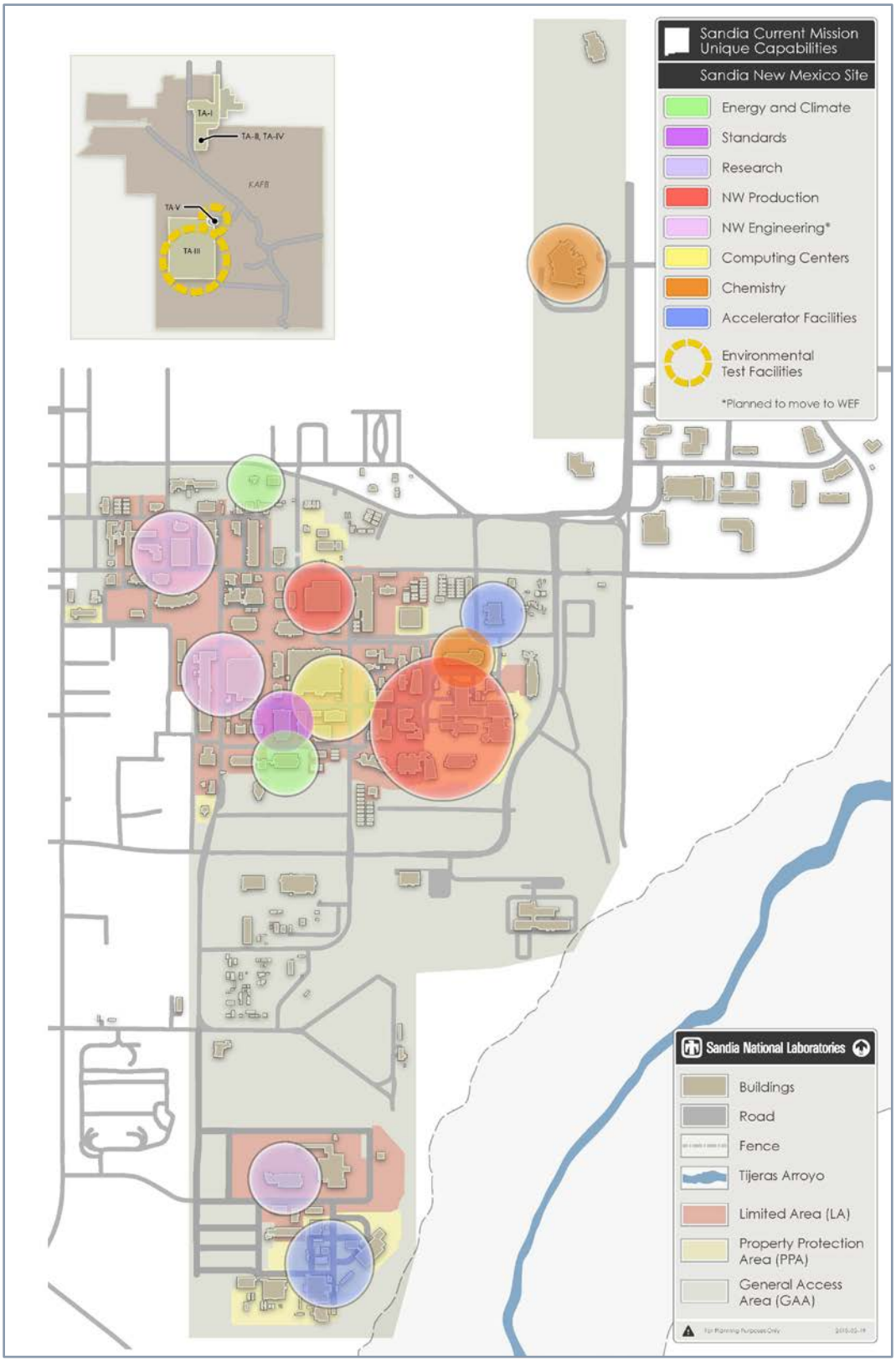


Figure 1.5. SNL/NM Mission Capability Areas

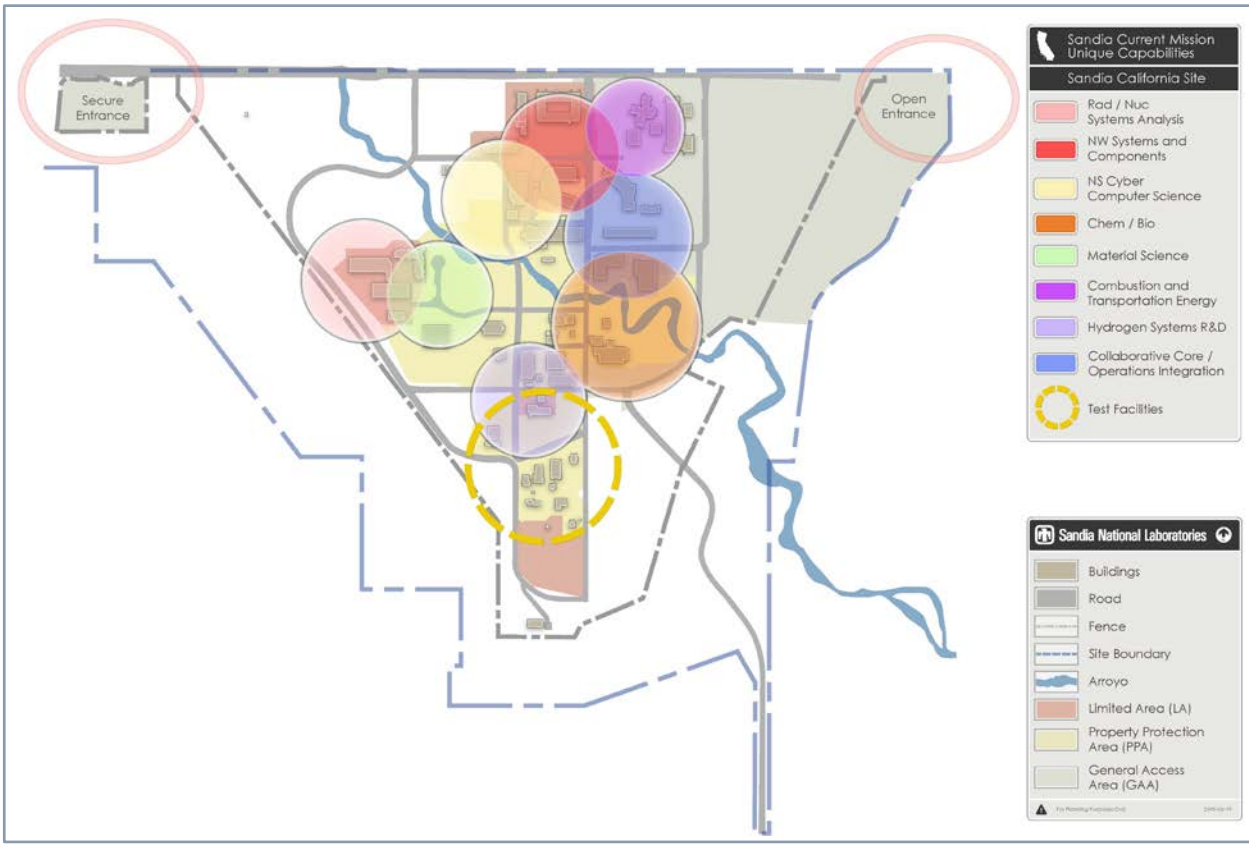


Figure 1.6. SNL/CA Mission Capability Areas

The LRDF provides a sound strategic framework for decision-making recommendations pertaining to capital investments in real property assets and site infrastructure. Customer, land use, transportation, security, environmental, and sustainability considerations, when considered together, will enable Sandia to shape the design of development projects in ways that benefit project customers, the workforce, the company, the nation, and the environment.

Sandia addresses the following specific strategies in its master planning processes:

- Sustainability
- Overall growth
- Land use and development
- Internal circulation and interaction
- Gateways and approaches
- Security and safety
- Site utilization
- Surety

Sandia's F&I vision is to provide a smaller, safer, more secure, and less expensive enterprise that leverages the scientific and technical capabilities of the workforce and meets national security requirements. Following the current federal objectives and regulatory requirements, Sandia must analyze the tradeoffs to ensure each new investment complies.

1.4 Current State

Sandia recognizes that, as its F&I ages and its recapitalization needs grow, NNSA's resources will be level, at best, and funding for capital investments across the Nuclear Security Enterprise (NSE) will become more difficult to obtain. Because SNL is a multi-program laboratory, it continues to struggle with the challenge of securing the necessary capital to invest in integrated mission work F&I, which supports the total national security mission.

In the upcoming decade, Sandia will face challenges to meet its commitments to the NSE and other national security mission work, which also benefit the NW Program. NNSA and Sandia continue to evolve strategies seeking alternative approaches to fund capital investments and further advance the NSE science, technology, and engineering (STE) base along with Strategic Partnership Projects (SPP). As SNL facilities and enabling infrastructure age, support for NNSA core capabilities and future mission-related deliverable is at risk, requiring significant recapitalization, while the pressure to reduce the federal budget increases. This may result in the lack of agility to reliably support the NNSA's Program of Record and other growth envisioned for the national security mission. To build a sustainable future, Sandia must work closely with NNSA/DOE on innovative capital investment and reinvestment strategies to support both the NNSA and broader national security missions.

1.5 Focus Areas for the 10-Year Planning Horizon

During the next 10 years, Sandia's most critical investments are as follows:

- Complete the Sandia Silicon Fabrication Revitalization (SSiFR) initiative to replace outdated microelectronics production tools, capital equipment, and processes at the Microsystems and Engineering Sciences Applications (MESA) Complex.
- Plan, design, and construct the Rad Hard Foundry to sustain the microelectronics-trusted foundry capability in support of critical microsystems science and technology (S&T) for NNSA and SPP.
- Plan, design, and construct the Weapons Engineering Facility (WEF) to recapitalize core NW capabilities in R&D facilities and excess major buildings that are at the end of their designed service lives.
- Plan, design, and construct the Emergency Operations and Response Center (EORC) to provide emergency incident management from a modern facility that serves and supports both local and national response teams.
- Continue to facilitate the deactivation and eventual renovation or demolition of Building 892, a 60-year old facility that is rapidly approaching functional obsolescence (Figure 1.7).

Figure 1.7. Building 892

Over the next decade, Sandia must address the following critical challenges:

- Secure sufficient F&I investment, reinvestment, and disposition funds to maintain mission-critical and mission-dependent facilities in a "fit for mission use" condition that promotes operational safety, worker health, environmental compliance, property preservation, facility performance, and overall cost effectiveness.
- Negotiate a management approach that will comply with the Office of Management and Budget's (OMB) "freeze the footprint" directive and allow Sandia to effectively manage its F&I investments.
- Create and sustain support for line item (LI) priorities to solve the Laboratories' mission-driven capital needs.
- Seek approval to develop the Collaboration and Research in Engineering for Advanced Technology and Education (CREATE) facility through alternative financing initiatives .
- Develop alternative financing opportunities and/or sponsors for significant multi-program and non-NW major construction investment projects.
- Develop strategies and solutions to the rapidly changing needs of the information technology (IT) infrastructure while continuing to securely support our mission areas and achieve sustainability goals.
- Reduce DM.

2.0 Site Overview and Snapshot

Sandia captured the essence of its history and evolution in its FY 2014–2018 Strategic Plan:

> *Sandia National Laboratories' roots trace back to World War II's Manhattan Project and the development of the first atomic bombs. It became an independent laboratory in 1949, with responsibility for nuclear weapon ordnance engineering and production coordination. Our 62-year history reflects the evolving national security needs of postwar America.*
>
> *Throughout the Cold War, Sandia played a pivotal role in ensuring the safety, security, and reliability of the nation's growing nuclear arsenal. We developed unique expertise in systems engineering with responsibility for the research, design, and development of more than 90 percent of the approximately 6,500 non-nuclear components of a modern nuclear weapon. These components have included security systems, arming and fuzing mechanisms, safety systems, neutron generators, gas transfer systems, and instrumentation.*
>
> *In 1992, Sandia faced new challenges when the United States stopped producing new warheads and halted nuclear testing, the ultimate guarantee of reliability and performance. The era of science-based stockpile stewardship required new predictive capabilities to certify performance of aging weapons and ensure the weapons would remain safe and effective following any redesign or component replacement. We used our advanced computer capabilities to simulate weapon performance and created new facilities to conduct acute non-nuclear tests of whole weapons systems to validate the computer simulations. One such facility is Sandia's Z machine, the world's most powerful X-ray source, which is used to study the physics involved in nuclear reactions and survivability issues related to the nuclear stockpile. Recent challenges include the W76 and B61 LEPs, which involve the redesign and replacement of numerous aging components to ensure the weapons remain safe, secure, and reliable for the foreseeable future. Today's*

highly specialized electrical, microelectronic, and electromechanical weapons components can have more than 200 parts in a volume the size of a cellular telephone.

Sandia has evolved into a multi-program national security laboratory that provides technologies to protect the nation's infrastructure, including its transportation, energy, telecommunications, and financial networks; ensure clean, abundant, and affordable energy and water; reduce the proliferation of weapons of mass destruction; help maintain U.S. military systems superiority; and defend our nation against terrorist attacks.

Sandia manages and executes its programmatic work through its four PMUs, as described in Table 2.1.

Table 2.1. PMU Descriptions

Program Management Units	
Nuclear Weapons (NW)	The NW PMU is responsible for full lifecycle stewardship of the nation's NW stockpile in partnership with other laboratories and production facilities in the NW enterprise. This requires a balanced approach to the program's three imperatives: steward the current nuclear stockpile; modernize the stockpile through LEPs and Alts; and advance our foundational S&T capabilities, business and management tools, staff, and F&I.
Defense Systems and Assessments (DSA)	The DSA PMU fosters invention, innovation, maturation, and demonstration of technologies to enable future force capabilities and find opportunities to transition technical capabilities to our armed forces. The DSA PMU's primary mission is to deliver advanced S&T solutions to deter, detect, track, defeat, and defend against threats to national security. The DSA PMU analyzes adversaries' vulnerabilities and develops innovative systems, sensors, and technologies for the defense and national security community.
Energy, Climate, and Infrastructure Security (EC)	The EC PMU's vision is to enhance the nation's security and prosperity through sustainable, transformative approaches to our most challenging energy, climate, and infrastructure problems. The EC PMU's goals and objectives seek to both leverage and enhance key competencies associated with Sandia's NW mission to amplify our contributions to broader national security in energy generation and distribution, while responding to climate change. The EC PMU works to further Sandia engineering excellence with an emphasis on connecting deep science to engineering solutions.
International, Homeland, and Nuclear Security (IHNS)	The IHNS PMU's mission responsibilities include advancing weapons of mass destruction (WMDs) nonproliferation goals; securing and safeguarding WMD materials and facilities; countering, responding to, and recovering from WMD use by terrorists or others; ensuring the resilience of critical U.S. physical and cyber infrastructures; and reducing the risk to our nation from significant national incidents. The IHNS PMU works for many domestic and international sponsors, applying numerous capabilities to address key risks across dynamic and complex interdependent systems.

In FY 2014, Sandia managed a total revenue of just over $2.7 billion. Figure 2.1 provides a funding breakdown by source, and Figure 2.2 provides a funding breakdown by PMU.

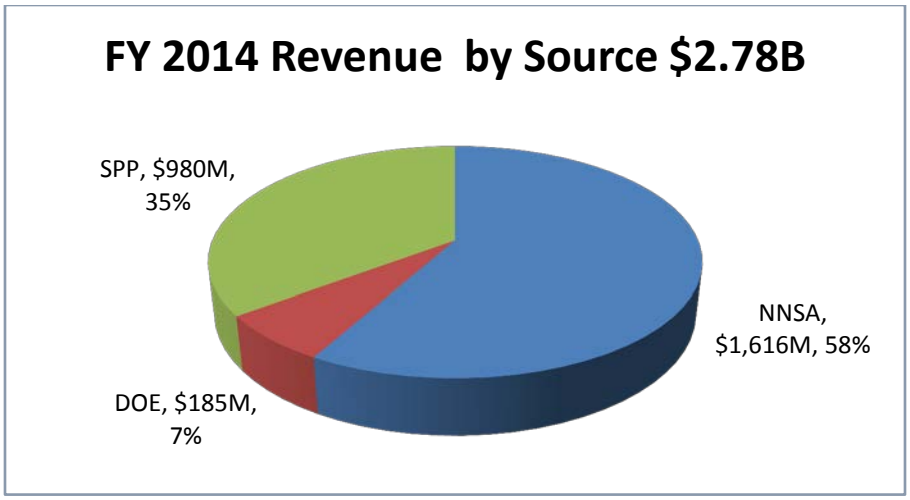


Figure 2.1. Revenue by Source

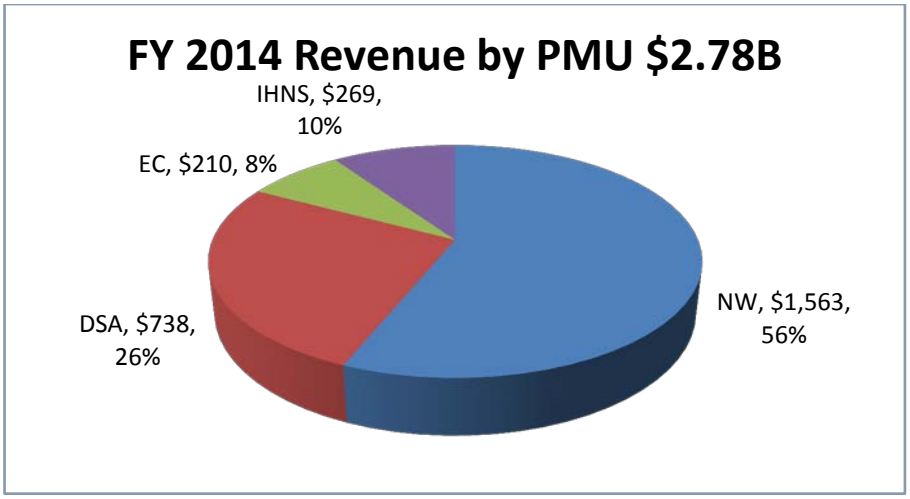


Figure 2.2. Revenue by PMU

Sandia currently has an onsite management and operating contractor workforce (with regular and limited-term employees as well as staff augmentation contractors) of approximately 11,200 with 10,150 regular employees and a gross annual payroll of almost $1.1 billion.

Table 2.2 provides an overview of real property distribution at Sandia's four primary locations and its leased and permitted facilities. In aggregate, SNL comprises more than 7.2 million gross square feet (GSF) of real property assets (owned, permitted, and leased space) in 1,222 buildings and structures on 193,501 acres, with a calculated replacement plant value (RPV) in excess of $6.0 billion and an associated DM backlog of more than $600 million.

Table 2.2. Real Property Distribution at SNL

Location	Number of Buildings and Trailers	Number of Other Structures and Facilities (OSFs)	Acres	Gross Square Feet (GSF)	Deferred Maintenance (DM)	Replacement Plant Value (RPV)
Albuquerque, NM	697	61	13,758	5,951,905	$421,298,655	$4,814,976,740
Livermore, CA	77	36	410	881,216	$108,073,608	$879,925,756
Tonopah Test Range (TTR), NV	82	58	179,200	121,937	$51,780,885	$333,689,247
Kauai Test Facility (KTF) and Maui, HI	56	53	133	50,317	$22,290,751	$99,611,692
Leases	18	1	19	397,876	—	$115,519,174
Permits	98	2	—	216,019	—	—
SNL Total	**1,028**	**211**	**193,520**	**7,619,270**	**603,443,899**	**$6,243,722,608**

Note: Data was pulled from the FY 2014 FIMS Snapshot. DM values are low and they do not reflect SNL's FY 2014 RPV site factor changes required from the FY 2014 FIMS data validation.

Of the 17 core capabilities established by the NNSA in its current TYSP guidance, Sandia supports the capabilities identified in Table 2.3.

Table 2.3. Sandia-Supported Mission Capabilities

Mission Capabilities	
C1.1	Design; Certification; Testing; Experiments; Surveillance; and STE Base
C1.2	Experiments
C1.3	Simulation
C1.4	Testing
C1.5	Surveillance
C5	High Explosives
C6	Non-Nuclear
C8	Transportation
C11	Counterterrorism and Counter-Proliferation
C12	Support of Other Mission/Program Capability
C14	Nonproliferation
C16	Emergency Response
C17	Strategic Partnership Projects

3.0 Assumptions

Development of this TYSP included the following assumptions:

1. NW-related work will continue as Sandia's fundamental and foundational national security mission, and its role in the NSE will serve as SNL's strategic planning cornerstone.
2. Although SNL is a multi-site, multi-program laboratory with numerous customers, it is managed and operated as a single, integrated, and unified organization dedicated to the advancement of national security. Sandia is singularly "all missions, all sites." Figure 3.1 provides an aerial view of one of Sandia's four main sites, the SNL/CA campus.

Figure 3.1. SNL/CA Campus (Looking South)

3. From a real property investment perspective, the NNSA's NA-10 (Defense Programs) retains primary programmatic responsibility for NW-centric facilities, while NA-50 (Safety Infrastructure and Operations) assumes primary programmatic responsibility for NNSA facilities and enabling infrastructure.
4. LI (major construction) projects identified in the FY 2014 Future Years Nuclear Security Plan include the Rad Hard Foundry design, which starts as early as FY 2021 (NA-10); WEF (NA-10), which initiates design in FY 2019; and the EORC (NA-50), which initiates design in FY 2018.
5. Sandia must maintain the capability to rapidly develop new technologies or novel uses for existing technologies in response to unanticipated national security threats, particularly new robust design and production technologies applicable to the current and future mission work for NNSA and other government agencies.
6. Sandia's workforce and F&I will be sized to meet its DOE, NNSA, and SPP programmatic objectives within budgetary constraints.
7. Sandia will continue to experience near-term growth in terms of funding and required staffing for DOE, NNSA, and SPP missions. This increase has placed considerable pressure on already constricted amounts of available office and laboratory space.
8. Sandia will strive to reduce its footprint as mission activities and associated F&I are consolidated over the planning period across all sites.
9. Sandia must comply with the OMB Memorandum M-12-12 "freeze the footprint" directive. This directive will have an impact on the methods by which Sandia plans to pursue future building investments.

4.0 Changes from the Prior Year TYSP

Due to other NNSA priorities, the FY 2015 TYSP submittal was a limited update that did not include all the sections and elements of this document. As such, the items listed below represent the most significant changes from Sandia's FY 2014 TYSP.

1. Staffing needs of the B61-12, W88 ALT, W80-4, and Common Fuze programs, coupled with strong growth in workload projections for DSA programs, has placed considerable pressure on providing the necessary office and laboratory space at SNL. Sandia is aggressively realigning the internal distribution of existing space to support its current NW growth as it continues to execute its institutional general plant project (IGPP) space strategy.
2. The selection and delivery of all current Sandia LI projects have changed, with several start dates moving to a later FY due to the limited resources available for major federal capital acquisitions.
3. Sandia continues to explore third-party financing options for its Livermore Valley Open Campus (LVOC) initiative (Figure 4.2) and received Critical Decision 0 approval in April 2013 for the initial project, entitled CREATE. Critical Decision 1 was submitted in March of 2014.

5.0 Future Vision and Core Capabilities

Sandia realizes our nation's security depends not only on its NW stockpile but also its energy and infrastructure assurance, nonproliferation and assessment, control of and defense against WMDs, and other defense and intelligence activities. Developing these missions in one multi-site laboratory has produced an integrated network of capabilities and matrixing of personnel who share knowledge and scientific insights between the NNSA, DOE, and their SPP partners.

As stated in the SNL Strategic Plan:

> *Sandia's ability to deliver on its national security mission is built on a strong foundation, which owes its origin to the early days of the Laboratories' nuclear weapons program. Within the foundation are several vital resources—people, research, and facilities and tools—in which we invest to build a unique set of capabilities that enables mission delivery.*
>
> *Capabilities—The resources just described are the quintessential elements that generate a unique set of technical competencies that we nurture and advance to provide an exceptional value to the nation. Our capabilities define us for who we are. Listed below, Sandia's key technical capabilities have proved their uniqueness time and time again, through decades of our experience in delivering to customers.*
>
> - *High-reliability engineering*
> - *Sensors and sensing systems*
> - *Cyber technology*
> - *Reverse engineering*
> - *Micro- and nano-devices and systems*
> - *Modeling and simulation and experiment*
> - *Natural and engineered materials*
> - *Pathfinders*
> - *Safety, risk, and vulnerability analysis*

These capabilities are shaped by our technical approach to the work with which the nation has entrusted us.

5.1 Design, Certification, Testing, Experiments, Surveillance, and STE Base (C1.1, C1.2, C1.3, C1.4, C1.5)

Since SNL's founding more than 65 years ago, NW work has defined Sandia. Figure 5.1 represents Sandia's planning framework in support of our NW mission.

Figure 5.1. NW PMU Integrated Planning Framework

The essential capabilities presented in Figure 5.1 represent the STE base that supports the design, development, production, qualification, surveillance, assessment, and certification necessary for the sustainment and modernization of the NW stockpile. Sandia is NNSA's designated Center of Excellence for Major Environmental Testing.

NW surety (systems performance, reliability, safety, and security) is a key mission assignment for Sandia and is integral to Sandia's role in transforming the NW stockpile. Sandia continues to pursue a long-term strategy to consolidate common, collaborative program and technical work; for NW mission work, the consolidation will occur around the MESA Complex. Sandia intends to utilize the MESA Complex as an engineering magnet for consolidating NW operations.

In recent years, the most significant LI capital investment was the TCR Phase II project, completed in FY 2014, one component of which is shown in Figure 5.2.

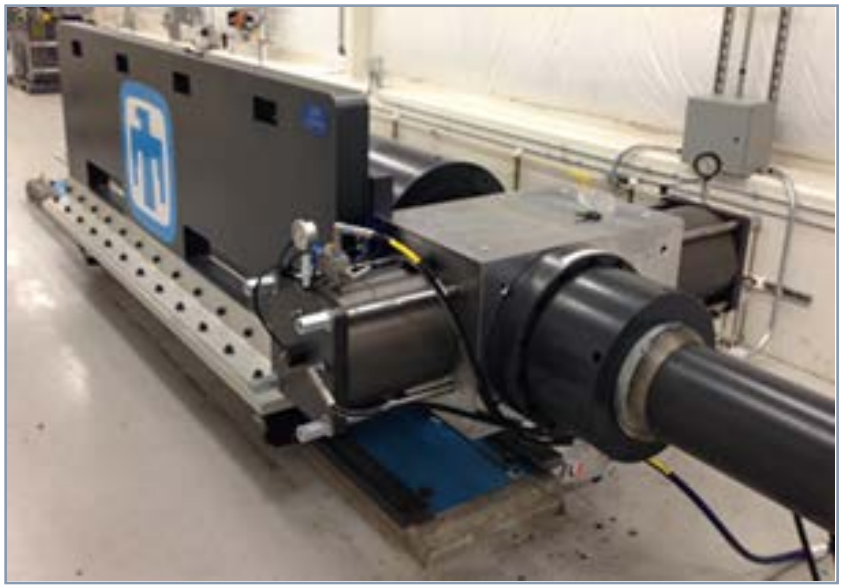


Figure 5.2. High-Speed Gas Gun, TCR Phase II

Over the next 10 years, the F&I supporting these capabilities will require continued revitalization of SNL's major environmental test capabilities not addressed with the reinvestment associated with the TCR project. Extended revitalization includes improved and expanded remote site IT and information management (IM) support, microsystems development and fabrication, testing range maintenance, specialized laboratory space (high bay) revitalization, and campaign mode staging of equipment along with a continued aggressive maintenance program.

F&I initiatives during the tactical planning horizon (next 10 years) include the following:

- **F&I Revitalization – TTR:** Conduct an incremental investment intended to sustain and update the core real property assets and infrastructure aligned with the increasing NW mission work at TTR, including the following:
  - Main distribution hub
  - Control tower electrical/mechanical upgrade
  - Mission support facility
- **IGPP Strategy:** Construct IGPP office/light laboratory facilities using corporate indirect funding for buildings that would serve as turnaround space for renovations intended to extend the lives of a number of existing major structures in TA-1. In addition, construct an IGPP office/light laboratory facility at SNL/CA to facilitate renovation of major buildings on the California campus.
- **Building 827 Weapons Primary Standards Laboratory (PSL) – Refurbishments:** Execute critical recapitalization projects in support of the PSL mission.
- **C912 Renovation:** Execute a renovation effort to revitalize and extend the service life of this SNL/CA facility (Figure 5.3).
- **C911 Repurposing:** Reconfigure the perimeter fence line to move C911 into the Limited Area.
- **C914 Seismic Retrofit:** Upgrade the facility structure to meet current seismic code. (Figure 5.3).

Figure 5.3. SNL/CA Buildings C912 and C914

- **Building 6588 Annular Core Research Reactor (ACRR) Facility Refurbishments:** Replace aging programmatic equipment and safety critical systems and recapitalize the basic facility backbone (Figure 5.4).
- **Technical Area (TA)-IV "Z" Support building:** Construct a new general support facility for the mission critical Z machine (Building 983).

Figure 5.4. ACRR

The following F&I initiatives are included within the strategic planning horizon (10–25 years):

- **Mission Support S&T Laboratory:** Integrates existing and emerging S&T with directed stockpile work by providing materials science research in the areas of gas transfer systems, surety core products, power systems, and stockpile materials
- **Gravity Weapons Certification/TTR, Sandia/NM:** Replaces core facilities and infrastructure at TTR that are rapidly exceeding their service lives and preserves the location's unique testing and certification capabilities
- **Robust Secure Communication Laboratory:** Provides an expanded, novel, and integrated research facility for robust and secure communications development and testing using advanced laboratories designed to offer disruptive testing, jamming, and harsh or hostile environments
- **Consolidated Environmental Test Facility:** Upgrades, modernizes, and consolidates environmental testing capabilities at SNL/NM in support of LEP activities and limited-life components associated with the enduring NW stockpile
- **Research Reactor Facility:** Replaces the facility housing the ACRR with a modern facility, significantly reducing the risk to reactor capability for testing in experimental environments that are critical to the development, qualification, and assessment of the NW stockpile to meet the military's hostile and fratricide operational requirement.
- **TA-III Classified Solid Waste Landfill:** Secures funding for remediation of this legacy NW site.

5.2 High Explosives (C5)

The Explosives Technology Group (ETG) has mission leadership responsibility (cradle-to-grave) for non-nuclear explosive components that are used within current NW stockpile systems and planned for future

LEPs. Fundamental to meeting this mission assignment is sustainment and growth of Sandia's advanced high explosives (HE) and energetic materials R&D core capability and competencies.

The NNSA's planned LEPs have increased the demand for advanced technologies in the near term that will meet new requirements for enhanced safety, reliability, and performance of SNL's non-nuclear explosive components and subassemblies. This demand requires that Sandia continue to explore the science basis behind its designs and components, requiring the ETG to expand its R&D capability by investing in additional personnel and infrastructure.

ETG facilities have several challenges. The three main issues are as follows:

- There is a lack of space for growing programs.
  - The ETG has been steadily increasing its science and engineering staff, pushing its occupancy and utilization beyond capacity, which requires new building construction with additional supporting infrastructure.
  - Disassembly of neutron generators (NGs), pressing of explosive pellets, and builds of timer drivers are performed in a bunker that is too small to accommodate these activities efficiently and does not permit the effective physical staging of NW components.
- New mission scope and requirements have pushed existing facilities past their original intent; therefore, the LEP qualification activities scheduled through FY 2024 will further exceed existing ETG facility capabilities.
  - New test requirements are designed to simulate hostile shock loading conditions to evaluate the response of weapon components containing insensitive high explosives (IHE) in contrast to current component tests that contain either no IHE or mock IHE. The current facilities cannot accommodate these requirements.
  - The scope of work has expanded to include energetic component and energetic materials evaluation and testing for development, qualification, and surveillance activities and has created increased safety and programmatic risk as well as operating limitations.
  - The disassembly of thermal batteries to accommodate surveillance testing of NW components will likely be required and cannot be accommodated in existing facilities.
- Aging infrastructure has become a major problem.
  - The communications system at several remote ETG facilities is unreliable and has limited transmission capacity and speed given its current use of microwave technology.
  - A lack of electrical power has adversely affected test control and data acquisition for remote outdoor testing.

An outgrowth of the NNSA's investment in Sandia's HE and energetic materials R&D that addresses national security needs has increased growth in areas that include nuclear nonproliferation, counterterrorism, and emergency response. Future growth is expected in the area of developing the S&T base to respond to the threat of dispersal devices that couple explosives with biological, chemical, or radiological elements. This planned growth is consistent with the HE and energetic materials R&D core capability that is fundamental to the ETG and NW mission.

F&I initiatives during the next 10-year tactical planning horizon include the following:

- **Building 905 Explosive Component Facility:** Office space addition combined with renovation of existing office and laboratory space

- **Explosives R&D and Training Facilities:** Evaluation, upgrades, and renovation of existing R&D and training facilities in TA-III and the remote areas to improve safety and consolidate operations
- **Building 6715 Light-Initiated HE Test Facility Upgrades:** Upgrades and renovation of existing light-initiated HE facility testing capabilities to support qualification, model validation, and surveillance
- **9960 Explosives Machining Facility:** Upgrades and renovation of existing explosives machining facility to enhance efficiency and accommodate assembly and disassembly of explosive components and thermal batteries in the Coyote Canyon test complex.
- **Building 6750 Terminal Ballistics Infrastructure Upgrades:** Upgrades and renovation of existing terminal ballistics facility and infrastructure to increase safety and quality of testing to support several NW programs.

5.3 Non-Nuclear (C6)

Non-nuclear components of a weapon comprise three broad categories: mechanical, electrical, and energetic-material components. Examples of components in each of these categories include mechanical, such as safety mechanisms, strong links, and launch sensors; electrical, such as arming, fuzing, and firing components, including radiation-hardened integrated circuits and transistors; and energetic components, such as NGs, thermal batteries, detonators, ignitors, actuators, spin rocket motors, and impact fuzes. In each of these component categories, major changes are occurring in both their manufacturing processes and the materials used. The movement of many manufacturing companies overseas has affected the number of suppliers willing to undertake the manufacturing of these components given the significant quality and low volume requirements for these parts. As commercial industry drives the technology of components, many of the legacy component manufacturing technologies and materials previously used to produce these components are being replaced or simply made obsolete. This causes programs requiring new or replacement components to identify new suppliers, train these new suppliers to operate to the necessary levels of quality required of NW components, and establish different or significantly modified manufacturing processes to realize these components. Furthermore, changes in production processes because of environmental regulations and concern about the health and safety of workers further alter the legacy manufacturing processes used for component production.

Given all these changes, it is essential that the component designers adequately characterize and model component performance, materials, and production processes to ensure new components meet stockpile requirements related to safety, security, longevity, and performance with adequate margin.

SNL is responsible for designing and developing many of the non-nuclear components that are external to the nuclear explosive package to support maintenance; life extension; and the safety, security, and use-control modernization of the NW stockpile. Production of these components is done in concert with the National Security Campus in Kansas City and SNL production facilities or it is outsourced under the oversight of the responsible NNSA site. Sandia operates and maintains numerous facilities dedicated to the development, design, evaluation, qualification, certification, and surveillance of its non-nuclear components; however, Sandia also has and executes a production mission associated with radiation-hardened microelectronics and NGs.

The resulting overlap of both design and production deliverables across multiple systems over the next several years has driven SNL to develop and deploy several formal systems to ensure the most efficient allocation of resources for product development and physical production. It is also important to note that NG design and production business models, in which a single organization is responsible for the entire NG product lifecycle, has been key to bringing the necessary resources to bear on the design and

production problems in an efficient manner via seamless integration of S&T, design, and production assets.

In conjunction with modernizing manufacturing capabilities, maintenance and recapitalization of other production and support activities across the NSE are essential. Recapitalization of major science and experimental facilities will be required both to qualify and certify LEPs without returning to underground testing and to support the surveillance program. Recapitalization of the equipment for the R&D and production of microelectromechanical systems and radiation-hardened microelectronics must also take place within the next few years because the current generation of equipment has become obsolete in the microelectronic industry and can no longer be maintained. These components and this capability are vitally important to the LEPs and provide a degree of assurance of supply chain security that is not otherwise available.

The MESA Complex (Figure 5.5) provides capabilities for the design, prototyping, and fabrication of microelectronics and microsystems integral to NW performance. MESA also provides capabilities for microelectronic component packages for national security partners, which includes the Department of Defense (DoD), the Intelligence Community, and S&T programs in other government agencies. MESA leverages its capabilities to address joint programs while remaining ready for LEPs and other NW mission requirements.

Figure 5.5. View of the MESA Complex from the South

Sandia recently updated the MESA Long-Range Sustainment Plan (LRSP) to modernize the physical infrastructure of the MESA Complex over the next 30+ years. The original MESA LRSP was in response to the 2010 NNSA Corporate Physical Infrastructure Business Plan Red Tag Facilities list. The 2014 MESA LRSP Update concluded that sustainment of the facilities would fall within one of four broad investment categories:

1. F&I rehabilitation programs that can be completed while the facility is occupied
2. Construction of new facilities to replace existing facilities that have reached the end of their design life and cannot be renovated while in use
3. Major renovation or reconstruction requiring closure of the facility to complete the work
4. Repurposing existing MESA facilities for microelectronics or a new/emerging program or partnership following replacement of existing facilities independent of current mission needs

In addition to major capital investments in these four categories, a continual program of tooling investments, as well as ongoing F&I sustainment, is essential to keep the MESA Complex within the trailing edge horizon with respect to material supply, processes, and tooling in microelectronics technology. This continued annual investment in capital equipment and associated facility modernization would allow Sandia to leverage technology costs to keep its capabilities on the "trailing edge" of the industry.

As a result of the LRSP analysis and conclusions, ongoing mission deliverables, and upcoming LEP/ALT activities, NA-10 has recently supported continued replacement of existing facilities in the form of the Center for Heterogeneous Integration Packaging and Processing ($CHIP^2$) overall strategy. The first phase of this overall strategy is to replace the aging Silicon Fab (Building 858N) and associated facilities, tools, and processes with the Rad Hard Foundry, currently listed in the 2015 Stockpile Stewardship Management Plan Integrated Projects List as an LI investment. In response to the support by NA-10, SNL has been directed to proceed with Critical Decision 0 planning in FY 2016.

Sandia's NG production capability supports weapons systems for NW and other national security missions. Customer needs are met through integrated planning, lean manufacturing, testing, and certification of NGs. Sandia's capability develops and maintains qualified product definition to support field products and provides design support for products in or near production. Materials operations support production through material engineering, materials planning, inventory management, and tooling design and development.

F&I initiatives of particular interest during the tactical planning horizon include the following:

- **SSiFR:** Modifications to facilities and capital equipment to modernize and replace outdated high-risk fabrication process equipment in the MESA Complex
- **Building 840 Renovation and Reuse:** Modifications and occupancy construction for NW and SPP customers
- **WEF:** LI investment to enable weapon systems engineering, advanced power sources, and stockpile surveillance work to be consolidated in a modern facility or facilities. Currently, WEF is being scoped to potentially replace multiple buildings (specifically Buildings 809, 835, 836, 892, and 894) (see Figure 5.6)

Figure 5.6. Weapons Engineering Facility

- **Rad Hard Foundry:** LI investment that replaces Building 858N and sustains the microelectronics-trusted foundry capability in critical support of radiation-hardened microelectronics and microsystems S&T for the NNSA and SPP
- **Building 894 Sustainment:** Installation of process and mission equipment to sustain operations in Building 894 until WEF is ready for occupancy, at which time it will enter a final disposition phase
- **Building 1012 Battery Test Facility:** A new battery test facility that will relocate hazardous lithium battery aging test activities from Building 894 and will be designed with appropriate engineered controls.
- **Building 870 NG Production Facility:** Execution of critical recapitalization projects in support of the NG production mission in TA-I
- **Building 878 Refurbishments:** A recapitalization/renovation effort to sustain core capabilities for the Advanced Manufacturing Processes Laboratory

F&I initiatives during the strategic planning horizon include the following:

- **Modern Threat Abeyance Center:** Focuses and consolidates the surety engineering mission at SNL/CA and its related R&D capabilities and supporting infrastructure

5.4 Enabling Infrastructure

Ensuring core capabilities are able to perform at optimal levels requires a balanced, realistic strategy that addresses the F&I that support mission work across SNL operating locations. Often considered secondary to facilities in which mission work is performed, utilities and other support facilities are integral to and enable successful mission performance in mission critical space.

Much of Sandia's current work takes place in facilities and uses infrastructure originally built to support Cold War NW programs. Many facilities are either at, nearing, or beyond the end of their designed service lives of roughly 50 years. Future NSE mission work will be defined by flexible, modular, system architectures that support the evolving nature of mission requirements and constrained funding.

In light of this fact, Sandia needs to upgrade and recapitalize existing enabling infrastructure to support current missions and provide for and anticipate future NW and SPP requirements. The scattered nature of critical functions among many dispersed and deficient facilities results in inefficiencies in space utilization that impede the NNSA's stated transformation goal of reducing the size and associated costs of the NSE. Sandia's vision for helping resolve this gap is inherent in the planning principles identified in Section 1.3 through consolidation of mission work with facilities and enabling infrastructures to provide similar capabilities and collaborative possibilities.

The core of Sandia's FIRSt Plan seeks to maintain long-term affordability of real property assets to support the mission effectively by managing the amount and condition of the inventory and by renovating, consolidating, replacing, and removing unneeded assets. Reinvestment in F&I will be based, to a greater extent in the future, on prioritized mission direction and risk to capabilities. Key F&I investment-related principles contained in Sandia's FIRSt Plan include the following:

- Embrace an enduring Integrated Mission Support (IMS) Recapitalization Program.
  - Address major building and institutional infrastructure modernization, sustainment, and decontamination and demolition (D&D).

    - Address capability enhancements (explosives consolidation, secure space at SNL/CA, high bay space within TA-I, seismic upgrades, etc.).
    - Ensure the program is strategically aligned with mission areas.
    - Identify sustainable funding from multiple sources.
- Optimize utilization of existing space.
    - Accommodate near-term growth with existing office space capacity.
    - Recognize and treat space as a laboratories-wide asset.
    - Partner with capability owners to identify laboratory and storage space opportunities.
    - Improve facilities' operational efficiency.
- Effectively manage laboratory footprint.
    - Vacate and prep substandard space for removal from inventory.
    - Consider full life-cycle cost when adding footprint (initial investment plus operations and maintenance).
    - Conduct long-range planning.

Many of Sandia's missions and associated programs are heavily dependent upon state-of-the-art IT/IM applications and capabilities. Most of these capabilities are well established at the Laboratories, although they require frequent updating and renewal to reflect the latest advances in IT/IM and any requirements for increased responsiveness.

Programs that require renewal of the IT/IM infrastructure to avoid technological obsolescence include the following:

- High-speed computational R&D as well as modeling and simulation for weapons and non-weapons design and testing
- Advanced test capabilities for model validation and system certification
- Microsystems and related technology R&D, design, and applications
- Nanotechnology R&D, design, and applications behavior
- High-energy density physics experimentation
- Enhanced surveillance and surety technologies
- Chemical and biological sensor detection for national security applications
- Engineering and technology solutions for security issues and threats

All of these programs require a sustained investment and reinvestment in F&I and equipment to maintain the advanced R&D, design, and application of technology leadership that Sandia has established. Further, high-speed, secure connectivity within and between SNL locations will be required to realize NSE transformation goals.

F&I initiatives included on the integrated project list during the tactical planning horizon include the following:

- **EORC:** This LI investment will enable Sandia to provide emergency incident management from a modern facility that serves and supports both local and national response teams, and promotes the protection and emergency response for Sandia assets from accident, attack, or natural phenomenon.

- **TA-IV Chilled Water Loop:** This equipment establishes a district chilled water system for TA-IV, which includes mission critical facilities and provides lifecycle cost savings through reduced energy consumption and operating cost avoidance associated with the facility cooling concept of "economies of scale."
- **Storm Drainage and Sanitary Sewer Improvements:** These improvements address and mitigate site-wide issues associated with excessive erosion and its damage to existing sewer lines.
- **Building 862 Standby Power Plant – System Upgrades:** These changes will replace and upgrade SNL/NM's standby generator system and associated equipment.
- **899 Data Center Infrastructure Redundancy:** This initiative will add redundancy to provide backup data capabilities, thus consolidating smaller intermediate distribution rooms and other computer rooms into this single facility.
- **TA-III, TA-V, and Remote Sites Renovations:** These facility modifications will help maintain strong engineering testing capabilities, including nuclear reactor, pressure, and solar energy testing.
- **Potable/Fire Water Refurbishment (SNL/CA):** This will replace the existing underground main lateral distribution piping and building feed connections on the California campus.
- **Sanitary Sewer Refurbishment (SNL/CA):** This project will replace the aged piping, abate asbestos containing transite piping and reconfigure trunk lines to provide proper flows.
- **LVOC Infrastructure Development:** This is a joint laboratories initiative with Lawrence Livermore National Laboratory to plan and install utility infrastructure trunks, vehicle circulation, and site development improvements to create a dynamic, open environment that facilitates broader partnerships and engagement with academic, industry, and international collaborators.
- **CREATE:** This initiative establishes a multipurpose hub for the LVOC with a multi-partner academic alliance that includes administrative and badging offices, a library, and a café along with collaborative workspace for unclassified hydrogen science and technology for energy applications, cybersecurity, advanced engineering, and manufacturing (Figure 5.7).

Figure 5.7. CREATE Conceptual Image

Other F&I initiatives in the strategic planning horizon include the following:

- **Telecommunications Utility Refurbishment:** This refurbishment will replace the existing underground copper-cabling communications system with a fiber-optic backbone throughout TAs -II, -III, -IV, and -V as well as remote areas.
- **Reshaping the NNSA Security Perimeter:** This effort will move the current Limited Area and Kirtland Air Force Base boundaries to improve opportunities for site development with higher security in select areas, while reducing Sandia's overall security footprint, enhancing collaboration opportunities, improving vehicular access, and extending sustainable site development.
- **Multi-Story Building "Clone" Recapitalization Program:** This effort represents the renovation and enhancements to the multi-story light lab/office buildings (nine total located in TA-I, TA-IV, and SNL/CA) that represent significant assets at SNL. Renovation of these assets will provide improved F&I for a variety of mission-enabling capabilities and represents the most likely scenario to provide up-to-date light laboratory and office functions in a constrained funding environment (Figure 5.8).

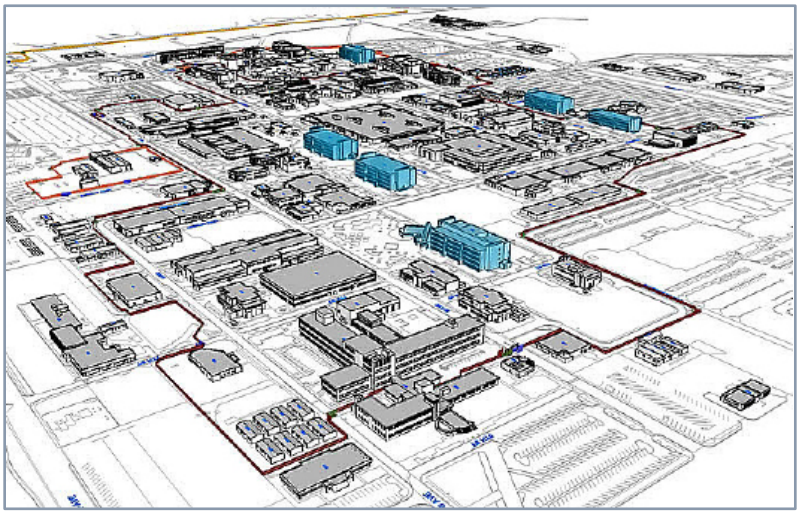


Figure 5.8. Six "Clone" Buildings in SNL/NM TA-I

5.5 Counterterrorism and Counter-Proliferation

For nearly 50 years, the NNSA Office of Nonproliferation R&D (NA-22) and its predecessors have been supporting the nation's nuclear proliferation detection and nuclear detonation detection missions. Throughout this period, Sandia has had a significant role providing advanced R&D to meet the evolving mission requirements from multiple stakeholders in the Department of State (DOS), DoD, and DOE, along with other federal agencies. Although the technological advancements span a wide variety of environments, none has been more enduring than the space-based assets. Beginning in the 1960s, Sandia has designed, developed, and supported the launch of more than 100 payloads into space for national security and scientific missions with many more planned for the near future.

As stated in the NNSA's goals, objectives, and requirements planning for the Satellite Program, it is imperative for national laboratories to provide technical leadership and leverage their collective S&T heritage, experience and expertise, and F&I for future space-related mission support. As is also true for the NW programs and LEPs in particular, product realization processes in support of the satellite programs are conducted in buildings that are more than 40 years old and at capacity for this type of work.

New threats and direct attacks on U.S. space-based assets are a serious concern. In order to anticipate and adapt to these threats, the NNSA needs to modify the technology and operational posture of its future space programs. Sandia is proposing the planning, design, and construction of a modern facility to promote and conduct the required technologically advanced work. In addition to global burst detector payloads, future missions will include the development of new NNSA R&D and demonstration/validation payloads, collaboration with other federal agencies, and rapid development and deployment of small space payloads.

The Center for Global Security and Cooperation, which has leased space in Sandia's Science and Technology Park, is a key asset in Sandia's work on international nonproliferation and cooperative threat reduction initiatives. As Sandia's programs in this field grow with increased support from the U.S. DOS, the Center for Global Security and Cooperation allows Sandia to house and communicate with individuals from all over the world, especially sensitive countries. This facility provides secure access to the Sandia Restricted Network while also allowing visitors and staff to use open networks and communication for large and small meetings (Figure 5.9).

Figure 5.9. Center for Global Security and Cooperation

The Nuclear Incident Response Program at SNL supports the NNSA's Accident Response Group (ARG) and the arming and firing element of the Joint Tactical Operations Team (JTOT). Both the ARG and JTOT access and leverage Sandia's NW expertise and capabilities in its facilities (e.g., SNL EORC) planning, provisioning, communications and training to respond to NW- and WMD-related accidents and acts of terrorism. Currently, the ARG and JTOT rely on system engineers and specialists from SNL's NW programs to ensure the viability of their respective programs.

F&I initiatives of particular interest include the pursuit of and investment in nonproliferation R&D required to consolidate activities, provide modern production space, and support operational and technologically required change.

F&I initiatives during the strategic planning horizon include the following:

- **Physical Security Campus of the Future:** This strategy consolidates Sandia's physical security functions.
- **Nonproliferation Science and Engineering Center:** This Center consolidates nonproliferation activities, including threat analysis, hardware for detection and monitoring systems, software for data analysis and generation of information for decision-making, and systems integration.
- **Facility for Advanced Radio Frequency and Algorithm Development:** This investment would provide a facility for radar development; integration and testing that will benefit NW arming and fuzing; as well as intelligence, surveillance and reconnaissance capabilities.

5.6 Support of Other Mission and Program Capabilities (C12)

Sandia provides engineering and design support for the NNSA Office of Secure Transportation (NA-15/OST) with its underlying "mission to provide a capability for the safe and secure transport of nuclear warheads, components, and materials that will meet projected DOE, DoD, and other customer requirements."

As a design agency for OST, Sandia supports the program through risk assessment, vulnerabilities characterization, engineering design development, and demonstration of innovative solutions for cyber, physical, and communications safety and security in a high-consequence mission environment.

Investments in supporting F&I will be required to prepare for the anticipated changes in workflow associated with this technological advancement. As a result of Sandia's recognized expertise in support of OST and secure transportation technologies, several opportunities within the NSE and transportation initiatives within the federal government are being pursued and developed. As previously discussed, SNL F&I support NW, other NNSA, other DOE, and several non-DOE programs, making SNL a true multi-program national laboratory focused on national security. In FY 2014, half of Sandia's operating funds came from non-NW activities with programmatic growth, evolution, and diversification expected across all SNL PMUs.

Sandia will continue to support counterterrorism, homeland security, and non-nuclear DoD initiatives by making the interchange of capabilities and expertise between the NSE and partners in the DoD, Department of Homeland Security, intelligence agencies, and law enforcement communities to further national security mission work. Such synergistic work strengthens Sandia's capabilities and makes cost-effective use of existing federal investments at SNL locations.

The capabilities developed through these non-NW activities have established expertise not found in industry or other government agencies. These opportunities to contribute technological solutions to agencies other than DOE/NNSA help to solve national security needs in addition to helping maintain Sandia's abilities to perform and further NNSA missions. Sandia's DSA, EC, and IHNS PMUs will continue to respond to increased federal, state, and local government agency interest in homeland defense-related applications for Sandia's security and surety technologies and systems. These initiatives cover their F&I costs through corporate site-support charges assessed to the funding programs. It is notable that all SNL organizations, including those that support SPP programs, pay space chargeback fees based on the space they occupy. Space chargeback fees are intended to recover the cost of landlord services, such as F&I maintenance and utility consumption. Sandia continues to examine current methods of cost sharing and is looking for opportunities to improve full cost recovery and transfer of landlord responsibilities, where appropriate.

The SPP is critical to SNL's vitality, synergy, and national security diversity; however, there is a higher degree of funding uncertainty associated with many of these programs, which has implications for planning and the resultant project execution. The underlying relationships associated with non-NW work require the application of resources (people and facilities) to a changing environment and the flexibility for both NNSA and other mission work.

Sandia and the NNSA will continue working together to explore and develop improved approaches for federal oversight of facilities and operations in support of SNL's total mission.

F&I initiatives during the tactical planning horizon include the following:

- **California Combustion Research Facility Complex Renovations:** These include modifications to the facility structure to meet current seismic code and modernization of aged infrastructure (Figure 5.10).
- **High-Security Spaces:** A number of facility modifications will provide high-security building space to existing buildings at multiple locations.
- **Building 895 Office, Staging, and Storage Addition:** This addition to Building 895 will optimize the use of the high bay laboratories for robotic and physical security systems development.

Figure 5.10. SNL/CA Building C904

F&I initiatives during the strategic planning horizon include the following:

- **National Cyber Security Trust Supply Chain Facility:** This investment would develop and provide a high-security building with high-performance computing capability to enhance cybersecurity.

6.0 Real Property Asset Management

Evolving missions, growing technology commercialization, newly emerging public-private partnerships, and new safety and security considerations are occurring at a time of constrained capital for space and infrastructure improvements. Integrated land use/facilities planning has become critical in light of DOE and NNSA policy and development considerations related to future site operations and future development of the nation's NSE in recognition of limited funding for capital improvements. Strategic planning assumptions derived from SNL, DOE, and NNSA planning documents continue to provide a basis to identify the relationship between programmatic needs and the impacts on physical F&I. As a result, Sandia has developed two strategic planning principles that guide future site development:

1. Preserve the investment in the current campuses while transforming them for new and expanding missions in a sustainable manner. In addition, optimize land use and minimize the overall development footprint for efficiency, cost savings, and environmental purposes.
2. Locate new developments where they are most advantageously supported by current or new infrastructure; this includes greater utilization of the campuses' land resources by intensifying

development through infill development, the use of space between existing structures for new structures or programmed activities, and consideration of multi-story megastructures.

These planning principles translate into the following three investment strategies that serve as the foundation for Sandia's tactical F&I planning and execution:

1. Renovate and reuse when possible.
2. Remove unneeded facilities from service.
3. Use capital investments in facility construction and building improvements.

6.1 Site Footprint: Current and Future

Table 6.1 provides a current overview of Sandia's facilities, focusing on mission dependency, facility use, FCI, and the Asset Utilization Index (AUI).

Table 6.1 Overview by Mission Dependency and Facility Use

Replacement Plant Value (RPV)	$6,244 Million
Total DM	$603 Million
Site-wide FCI	9.66%

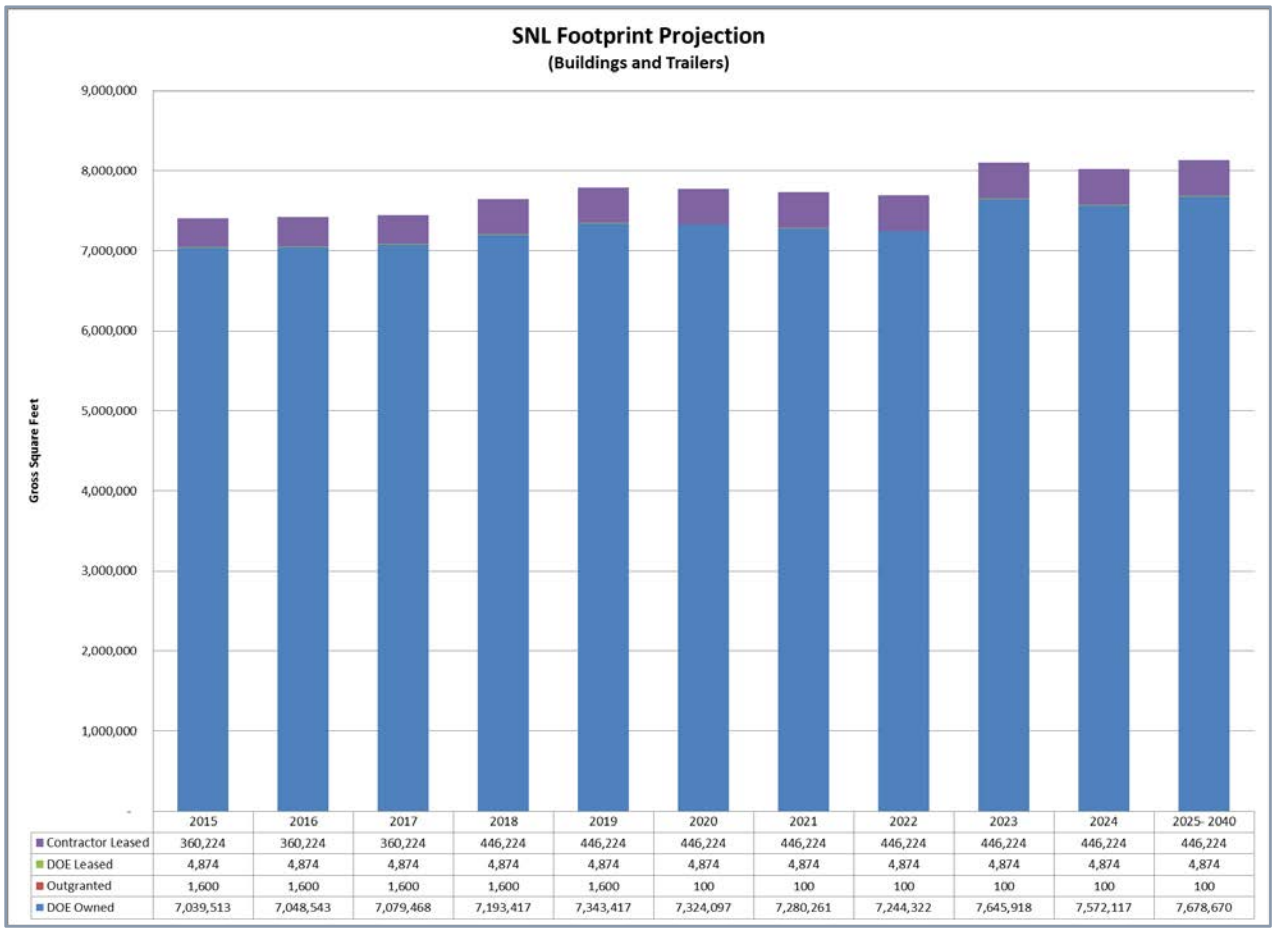
		FCI (Building and Trailer [B&T] and OSF)	Asset Condition Index (B&T and OSF)	AUI (B&T)	Number of Assets (B&T)	Thousands of Gross Square Feet (B&T)
Mission Dependency	Mission Critical	8.20%	91.80%	92.80%	41	1,395
	Mission Dependent	10.27%	89.73%	87.81%	228	4,459
	Not Mission Dependent	8.41%	91.59%	84.44%	661	1,549
Facility Use	Office	7.44%	92.56%	85.62%	223	2,083
	Warehouse	6.88%	93.12%	89.63%	342	449
	Laboratory	11.20%	88.80%	88.99%	363	4,861
	Housing	0.00%	100.00%	100.00%	2	10

Note: Data was pulled from the FY 2014 FIMS Snapshot. FCI values are lower due to low DM values.

Sandia's F&I Five-Year Plan addresses short-term, required investments and includes efforts to increase productivity, reduce long-term operational costs, reduce energy use, and demonstrate a fiscally responsible approach while ensuring adequate cost control for customers. Sandia established the following objectives to guide its planning and prioritization:

- Remove or remodel substandard space.
- Improve productivity of mission through collocation and improvements to space quality.
- Explore the feasibility of nontraditional funding strategies, such as third-party financing.
- Improve FCI by reducing DM.
- Increase space utilization (e.g., office, laboratories, and storage).

Sandia is currently experiencing growth in terms of funding and required staffing for its NW-related work associated with the B61-12 and W88 ALT programs as well as several of its SPPs. This increase has placed considerable pressure on already constricted amounts of available office and laboratory space. Using internally generated funds from its mission work, Sandia has initiated the construction of several IGPPs to maintain capabilities in support of NW LEP efforts, other national security programs, and mission-support work through the end of the decade. Figure 6.1 presents Sandia's anticipated change in its overall site footprint.



	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025- 2040
Contractor Leased	360,224	360,224	360,224	446,224	446,224	446,224	446,224	446,224	446,224	446,224	446,224
DOE Leased	4,874	4,874	4,874	4,874	4,874	4,874	4,874	4,874	4,874	4,874	4,874
Outgranted	1,600	1,600	1,600	1,600	1,600	100	100	100	100	100	100
DOE Owned	7,039,513	7,048,543	7,079,468	7,193,417	7,343,417	7,324,097	7,280,261	7,244,322	7,645,918	7,572,117	7,678,670

Figure 6.1. SNL Projected Footprint

Sandia's D&D management efforts focus on identifying space and structures that have become functionally obsolete or can no longer efficiently/effectively support mission requirements. Once identified, these real property assets are then slated for formal disposition in accordance with DOE guidance. Final disposition through demolition is dependent on the availability of funding.

As funding is provided for decontamination and demolition, and in attempt to eliminate substandard space, consolidate missions, and provide "banked space" for new construction, Sandia plans to dispose of the following major real property assets within the next decade:

- Mt. Haleakala Remote Communication Facility
- Select facilities at SNL/KTF and SNL/TTR (see Figure 6.2)

- MO324 and MO325
- Redwood Center Trailer complex (SNL/CA)
- Building 867 (Figure 6.3)
- Building 868
- Building 894

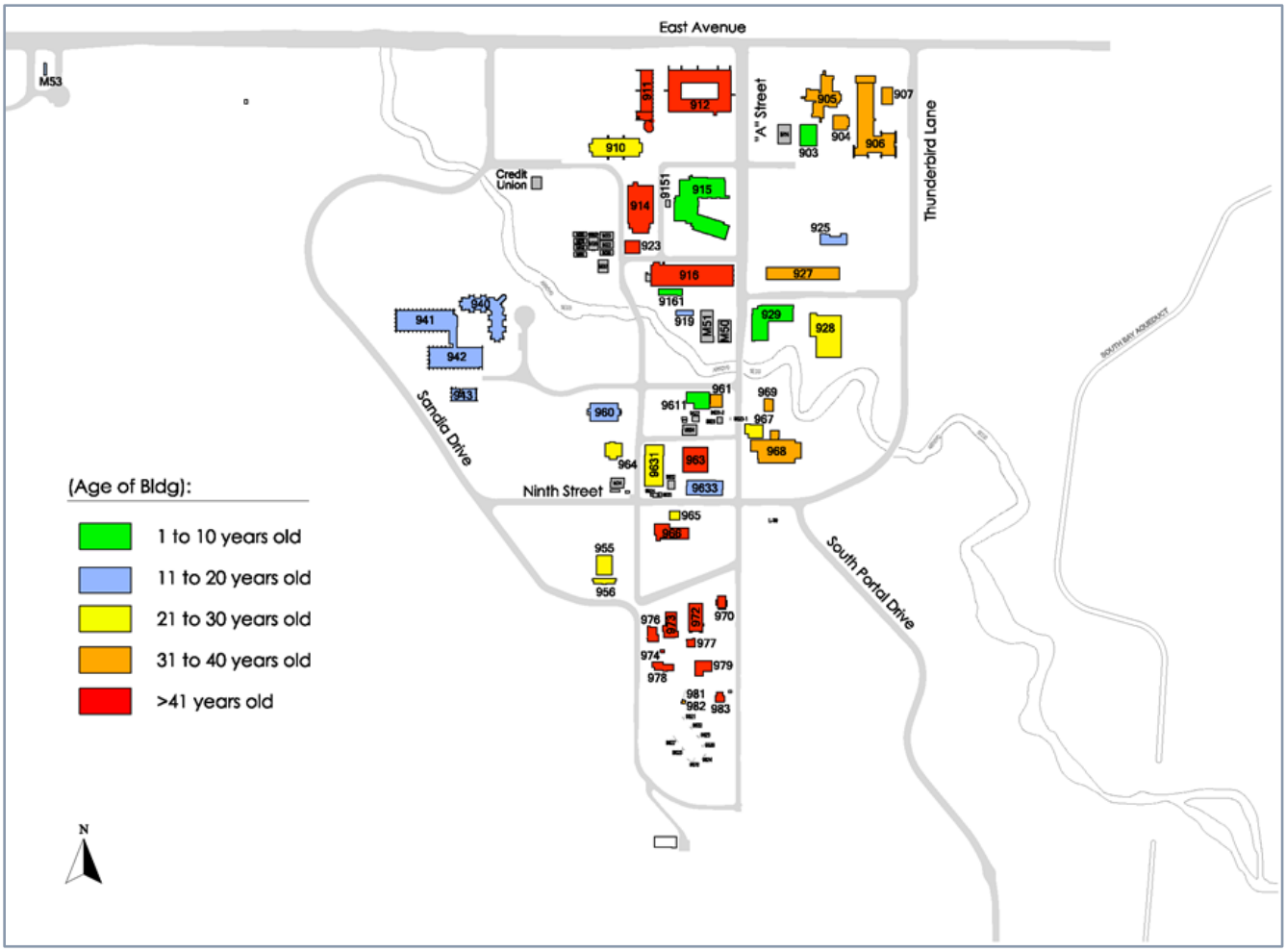
Figure 6.2. Tonopah Test Range

Figure 6.3. Building 867

The demand for modern technical space is presenting a challenge for SNL F&I. Numerous facilities at all SNL locations require concentrated maintenance attention and major renovation in order to provide infrastructure capabilities to support the mission work in a responsive timeframe. Many buildings throughout SNL are at capacity and approaching the end of their planned service lives. Figures 6.4 and 6.5 provide a building age overview for SNL/NM TA-I and SNL/CA, respectively.

Age Range	GSF	Percentage
0–10 Years	678,779	16%
11–20 Years	730,705	17%
21–30 Years	812,385	19%
31–40 Years	612,647	15%
41+ Years	1,345,482	32%
TOTAL	4,179,998	

Figure 6.4. Building Age Overview for SNL/NM TA-I



Age Range	Net Square Footage	Percentage
0–10 Years	46,579	5%
11–20 Years	132,030	15%
21–30 Years	260,419	29%
31–40 Years	167,619	19%
41+ Years	282,537	32%
TOTAL	889,184	

Figure 6.5. Building Age Overview for SNL/CA

6.2 Facility Condition and DM Reduction

SNL's physical infrastructure is managed by the Facilities Management and Operations Center (FMOC) using an approach that identifies key F&I and then focuses resources on the most critical systems and equipment in a prioritized manner. The Maintenance Management Program at SNL establishes activities, processes, and associated performance measures to ensure DOE/NNSA property is maintained in a "fit-for-mission-use" condition that promotes operational safety, worker health, environmental compliance, property preservation, facility performance, and overall cost effectiveness. This is accomplished through comprehensive condition assessment surveys, targeted funding of projects to reduce DM, proactive (preventive and predictive) and reliability-centered maintenance, and a work control system. The maintenance of programmatic property and capital equipment at SNL is the responsibility of the line organization.

Sandia's methodology for conducting condition assessment surveys has undergone a major restructuring to ensure that it is better aligned with the requirements and expectations in DOE Order 430.1B and more accurately represents the condition of SNL F&I. The new Condition Assessment Survey Program utilizes a graded approach based on a systems methodology. Condition assessments at SNL consist of a physical inspection of each real property asset using a graded approach based on asset type, size, and mission dependency, following the Uniformat II methodology. The graded approach involves two types of inspections: single rating and building system item (BSI). The single rating inspection is for smaller, less-complicated buildings not deemed mission critical; infrastructure assets; and OSFs. In the single rating method, the condition of the real property asset receives one rating based on a 1-to-5 scale. In the BSI inspection method, the real property asset is divided into nine separate subsystems, each of which are rated individually. The BSI method is used for larger, more complicated buildings and for mission-critical buildings regardless of size. All of SNL's real property assets have been evaluated using the system described above.

FCI targets and DM reduction are considered in the prioritization and scheduling of maintenance and projects. DM growth and reduction estimates for future years are based on projected deficiencies, projected funding, and historical averages. DM reduction is accomplished through four activities:

1. Expenditure of the corrective, preventive, and predictive maintenance budgets and performance of associated work
2. Disposition and elimination of substandard and excess F&I
3. Completion of capital projects, including LIs, general plant projects (GPPs), and IGPPs
4. Completion of operating-funded initiatives, including maintenance and repair, alterations, and betterments not meeting the capitalization criteria

FCI and DM calculations and projections have increased in the past year due to three factors:

1. Implementation of the new Condition Assessment Survey Program, as described above
2. Updates to some of the RPV models for key assets, such as SNL's radiation facilities, due to a change in mission function
3. Changes to DOE-mandated site factors—a variable in the RPV algorithm

The combination of these three factors has increased DM, FCI, and RPV, resulting in a new baseline for each of these metrics. Figure 6.6 presents Sandia's projected DM and resulting FCI by mission dependency. FY 2014 data is identical to the information reported in the Facilities Information Management System (FIMS) snapshot and represents the previous condition assessment survey methodology. FY 2015 data includes the changes noted above and is consistent with current FIMS information. This 25-year projection is based on historical trends and will be revised in the coming

months to include the new condition assessment survey methodology. With the improved condition assessment survey method and current constraints, such as limitations in footprint growth, reduced budget for capital investment DM buy-down (i.e., Facilities and Infrastructure Recapitalization Program), and D&D, Sandia expects DM and FCI to increase in the near term.

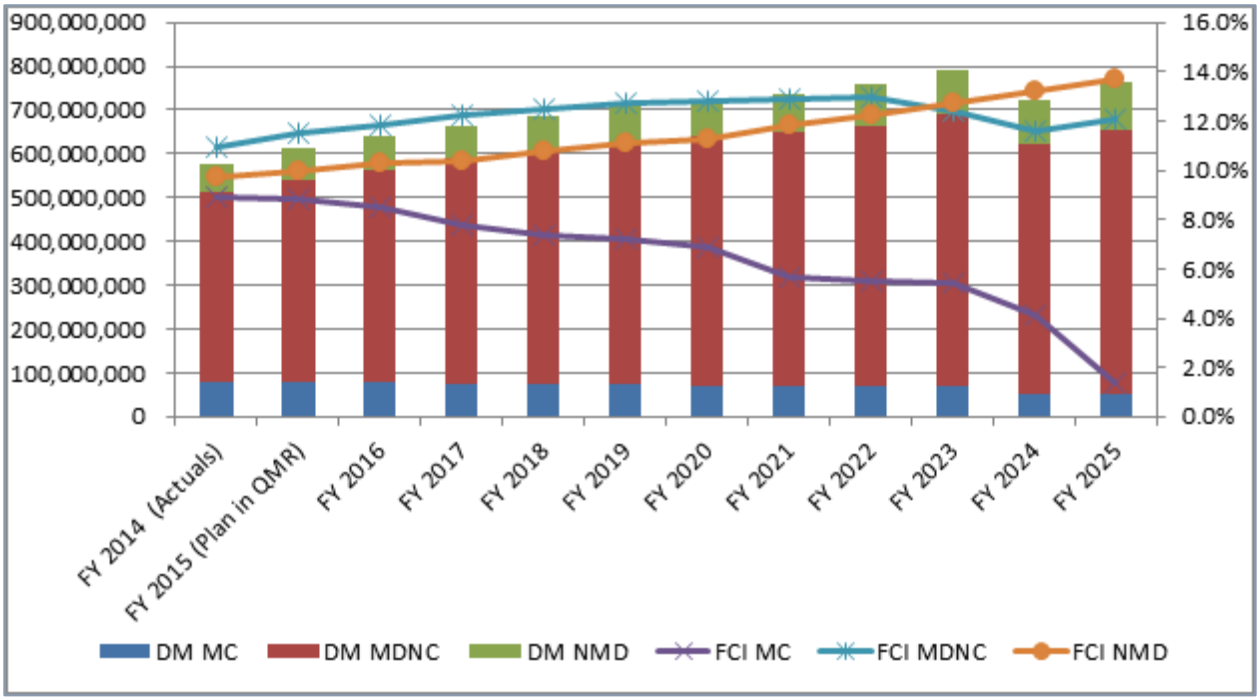


Figure 6.6. SNL Projected DM and FCI by Mission Dependency

6.3 Space Utilization and Consolidation

Over the planning period, Sandia anticipates that LI, GPP, and IGPP investments will add new space; the D&D Program will remove substandard space; and Sandia will continue to lease appropriate amounts of offsite space to support its missions. The FMOC works with the leaders of Sandia's PMUs and Divisions as well as Center representatives to understand mission capability needs and assess space requirements. The primary goal is to develop strategic space plans to best accommodate growth, consolidation, and relocation while ensuring the appropriate use of existing space, maintaining space, and developing opportunities to eliminate substandard space.

Sandia continues to analyze opportunities and will develop strategies to resolve current and future gaps in space needs. All options are reviewed and evaluated based on criteria, such as cost to the government (initial and lifecycle), effectiveness in supporting mission requirements, and longevity of the solution. These evaluations include developing a business case to ensure that space acquisition costs are equal to or less than other options, or that they generate revenues to offset any cost increases. Other criteria include space availability, funding availability, compatibility with Sandia's planning principles, compatibility with DOE/NNSA space offset requirements, and flexibility for future use.

Sandia currently leases space at several locations, including Albuquerque and Carlsbad, New Mexico; Washington, D.C.; Alaska; California; and Minnesota. Most leased space is primarily acquired on a short-term basis, and each lease is evaluated based on need and space availability criteria for the amount of

space requested. Onsite leased space at SNL/NM includes mobile offices (MOs) and office space in TA-I, TA-III, and the Burn Site as well as office and workshop space in TA-IV. Various off-site leases in the Sandia Science and Technology Park include the Innovation Parkway Office Center, International Programs Building, Computational Sciences Research Institute, and the Cyber Engineering Research Laboratory. As consolidation efforts continue, new leased space needs should diminish, although mission work often requires new space before long-term solutions or facilities can be provided. These needs must be promptly met for work to be accomplished.

6.4 Sustainability and Energy

The SNL Site Sustainability Plan (SSP) is prepared annually to support the DOE Strategic Sustainability Performance Plan (SSPP) and the NNSA sustainability goals and broader sustainability program. Accordingly, the content of the SSP covers the SNL contributions toward meeting the DOE sustainability goals cited in DOE's SSPP, as well as the DOE requirement to comply with Executive Orders 13423 and 13514.

As stated in its FY 2015 SSP, Sandia's vision is to lead "the DOE complex, the nation, and the world in innovative, large-scale institutional transformation to a sustainable, carbon-neutral environment while increasing mission effectiveness, resource reliability, and resource security." Sandia's SSP elaborates the proposed strategies for achieving SSPP sustainability goals by reducing its energy consumption, emission of greenhouse gases, and water usage through the following means:

- Reducing current demand (use less)
- Delivering resources to mission-critical activities reliably and securely
- Eliminating current demand (turn off or remove)
- Providing metering and control systems to track and trend performance
- Using resources efficiently (use fewer resources for the same task)
- Showcasing SNL-related R&D activities
- Managing future demand
- Promoting a sustainable business model
- Migrating to non-carbon-emitting energy sources
- Reducing transportation fossil fuel use
- Improving partnerships with external resource providers and collaborators

Sandia's plan further recognizes that "effectively managing future demand is critical if Sandia is to meet its objectives. Sandia's first priorities are mission performance and effectiveness. Mission growth, with associated growth in energy and water use, is anticipated over the planning period. Planning for mission growth before it occurs and managing growth during program implementation will increase the probability of sustainability success."

6.5 Challenge and Opportunity

Substantial capital investments will be required to improve and modernize existing structures, recapitalize infrastructure, construct new facilities, and maintain/enhance security and safety for evolving and changing missions. A restrictive funding environment and further administrative requirements affecting site management provides SNL with the challenge of leveraging investments to renew its major sites and provide the space and infrastructure required to maintain SNL's standard of excellence.

As resources and management options are constrained and funding for capital investments becomes more difficult to obtain, Sandia must analyze tradeoffs to ensure that each new investment does the following:

- Represents optimal long-term use of land and capital
- Provides the capacity and agility to meet current and future missions
- Maximizes efficiency/effectiveness and minimizes long-term operations and maintenance costs
- Contributes to a stronger and more vital intellectual and research community
- Enhances the quality of the environment and quality of life for those working at SNL
- Preserves and enhances the legacy of landscape and architecture
- Improves the synergy of the campus and community