Lawrence Livermore National Laboratory

Ten Year Site Plan

FY14

July 2013

UCRL-AR-143313-13

About the Cover

Front: LLNL foundational infrastructure capabilities in engineering materials, precision engineering fabrication, and high performance computing directly support the U.S. strategic deterrent.

Back: Nuclear chemistry infrastructure is a central capability in supporting arms control and treaty verification, nonproliferation, nuclear counterterrorism, and nuclear forensics. Radiochemistry is also a central discipline in sustainment and certification of the stockpile without nuclear test. Recently, LLNL has made world class advances in basic research by codiscovering element 116 livermorium.

Acknowledgments

Responsible Organizations

Operations and Business Principal Directorate
Laboratory Strategic Infrastructure Office

Responsible Manager Cliff Shang

Publication Directors Paul Chu and Rich Shonfeld

Publication Manager Marleen Emig

Art Director George Kitrinos

Contributing Authors

Chris Adams
Tom Ainsworth
Anna Maria Bailey
Carey Bailey
Camille Bibeau
Jeff Brenner
Mark Bronson
Jeff Brunetti
Kim Budil
Betsy Cantwell
Ray Chin
Diane Chinn
Paul Chrzanowski
Mark Costella
Bill DeHope
Margaret Dempster
Mark Dietrich
John Estill
Lou Ferranti
Hank Glauser
Bill Howing
Eddy Johnson
Kelly Keane
Jackie Kenneally
Dan Knight
Katy Lu
Jon Maienschein
Mark Mintz
Matt Mlekush
Cynthia Nitta
Mike Payne
Jose Pineda
Peter Raboin
Valerie Roberts
Mark Sueksdorf
Paul Swyers
Tri Tran
Sky Tsan
Keith Waller
Richard Ward
Matt Wraith
Derek Wapman
Dean Yoshida
Bonnie Zucca

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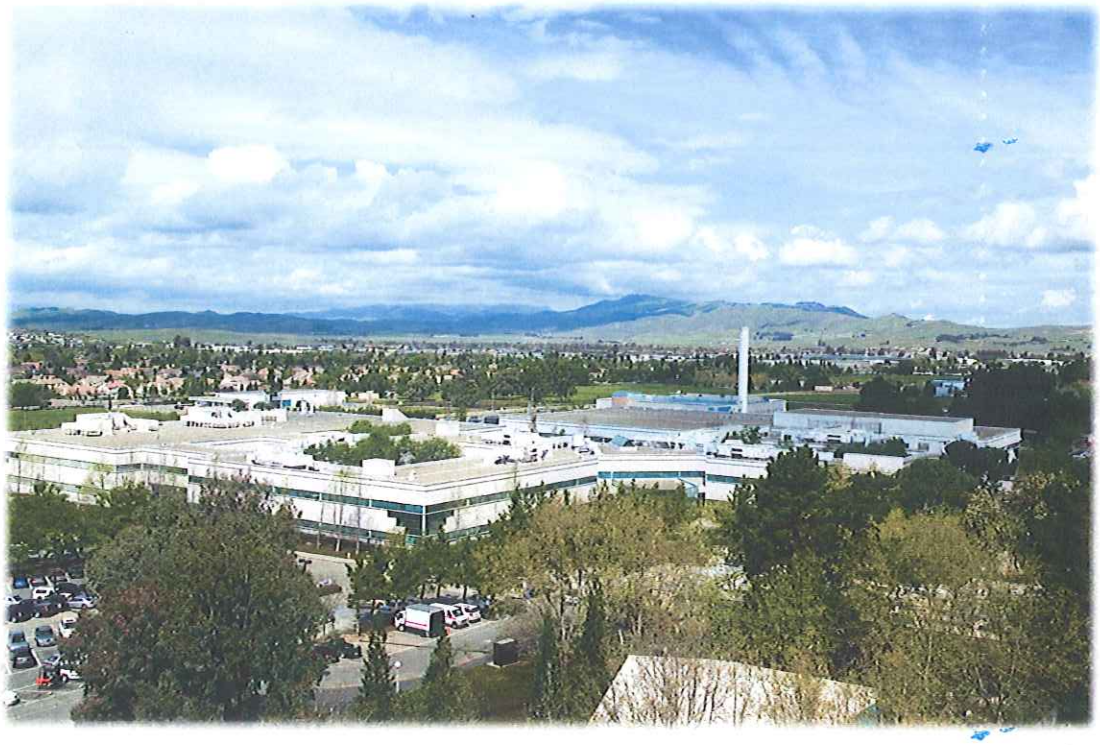

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FY14 Ten Year Site Plan

June 25, 2013

Approved by:

Penrose Albright, Director
Lawrence Livermore National Laboratory

Concurrence:

Kimberly Davis Lebak, Manager
U.S. Department of Energy
National Nuclear Security Administration
Livermore Field Office

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List of Acronyms

CAS	Condition Assessment Survey
CD	critical decision
CIF	Capabilities and Infrastructure Framework
CFF	Contained Firing Facility
CHE	conventional high explosives
CMF	Component Maturation Framework
DM	deferred maintenance
DoD	U.S. Department of Defense
DOE	U.S. Department of Energy
ECAR	Electrical Capacity and Reliability Project
EMPC	Energetic Materials Processing Complex
F&I	facilities and infrastructure
FCI	facility condition index
FDP	facilities disposition prioritization
FIMS	Facility Information Management System
FIRP	Facility and Infrastructure Recapitalization Program
FITS	Facility Information Tracking System
FYNSP	Future Years Nuclear Security Program
FXR	flash X-ray
GAA	general access area
gsf	gross square feet
HE	high explosives
HEAF	High Explosives Applications Facility
HED	high energy density
HEDP	High Energy Density Physics
HPC	high-performance computing
ICF	inertial confinement fusion
IGPP	Institutional General Plant Project
IGSC	Integrated Global Security Center
IHE	insensitive high explosives
IT	information technology
LANL	Los Alamos National Laboratory
LEED	Leadership in Energy and Environmental Design
LEP	Life Extension Program
LFO	NNSA Livermore Field Office
LLMDA	Lawrence Livermore Microbial Detection Array
LLNL	Lawrence Livermore National Laboratory
LLNS	Lawrence Livermore National Security, LLC
LRSO	Long Range Standoff
Lv	livermorium
LVOC	Livermore Valley Open Campus
NCT	nuclear counterterrorism
NEP	nuclear explosive package
NIF	National Ignition Facility
NIRF	Network Intelligence Research Facility
NNSA	National Nuclear Security Administration
NNSS	Nevada National Security Site
NSE	Nuclear Security Enterprise
NSSC	Nuclear Security Science Center
PCF	Predictive Capability Framework
PPA	Power Purchase Agreement
PTD	Precision Targets and Diagnostics Facility
R&D	research and development
RFI	request for information
RTBF	Readiness in Technical Base and Facilities
SA	Supplement Analysis
SCADA	supervisory control and data acquisition
SFE	special facilities and equipment
SNL	Sandia National Laboratories
SNM	special nuclear materials
SSMP	Stockpile Stewardship Management Plan
SSP	Stockpile Stewardship Program
ST&E	science, technology, and engineering
STS	stockpile to target sequence
SWEIS	Site-Wide Environmental Impact Statement
TBSTP	Technical Basis for Stockpile Transformation Planning
T&D	transition and disposition
TYSP	Ten Year Site Plan
WAPA	Western Area Power Administration
WMD	weapons of mass destruction

Section 1
Executive Summary

The Lawrence Livermore National Laboratory is dedicated to the national security mission. By applying world-class science, technology, and engineering, LLNL maintains the U.S. strategic deterrent and enhances national defense; reduces the global threat from terrorism, weapons of mass destruction, and nuclear proliferation; and, more broadly, responds to scientific issues of national importance.

The Laboratory's resources and capabilities fully align with the National Nuclear Security Administration mission and program plans. The Laboratory is committed to deliver on a safe, secure, and reliable nuclear weapons stockpile, and to address the challenges associated with nuclear nonproliferation through innovation and excellence in science, technology, and engineering. Investments are required in facilities and infrastructure to sustain core capabilities and expertise.

This TYSP lays out a balanced infrastructure lifecycle portfolio of acquisition, modernization and sustainment, consolidation, repurposing, and transition and disposition. The plan and the proposed investments embrace both real property, and special facilities and equipment.

The plan describes LLNL's integrated strategy to modernize and sustain enduring infrastructure to support continuing mission, repurpose quality facilities to optimize utilization, replace buildings when they are well beyond end-of-life, and dispose of legacy facilities to mitigate risk.

The implementation of national policy, stakeholder requirements and the program of record suggest the following investment priorities within the planning horizon.

Modernization and sustainment revitalization priorities

- Replacement and modernization of equipment to support warhead assessment and life extension programs
- High explosives enterprise
- Nuclear/radiochemistry
- Precision fabrication and advanced engineering manufacturing
- Special nuclear materials—plutonium and tritium
- High performance computing

Acquisition priorities

- Electrical distribution system rehabilitation
- Emergency operations center replacement
- Site 300 revitalization to support nuclear security mission
- Engineering and materials replacement building to support stockpile life extension programs

Consolidation and repurposing priorities

- Precision targets and diagnostics
- Engineering complex consolidation

Institutional priorities

- Livermore Valley Open Campus
- Facilities and infrastructure sustainment
- Environmental and site stewardship

This infrastructure plan enables the Laboratory to lead the nation in nuclear weapons stockpile science, modernization, and sustainment; be the foremost national security laboratory for addressing the nation's most challenging problems; and be the premier destination for the very best scientists and engineers.

Prior Year Accomplishments

Over the past year, LLNL researchers achieved many accomplishments in support of its nuclear security and broader national security missions. Major accomplishments include:

- Progress made by LLNL in the W78/88-1 Phase 6.2/6.2A study is supporting an early down-select of a preferred option for the Life Extension Program (LEP), and the Laboratory developed a spectrum of nuclear explosive package (NEP) design approaches for the Air Force-led Long Range Standoff (LRSO) warhead study.
- LLNL brought into operation the 20-petaflops Sequoia supercomputer, which transitioned to classified use in April 2013, and has begun running detailed simulations in support of stockpile stewardship.
- During FY12, LLNL conducted three technically challenging integrated weapons hydrotests at the Contained Firing Facility, carried out the 100th special nuclear material (SNM) experiment at JASPER, and reported new results from ongoing plutonium aging studies that indicate that the material continues to age gracefully.
- In FY12, the National Ignition Facility (NIF) achieved record-breaking performance in laser energy and power, completed the transition to become a national user facility, and conducted 332 system shots—supporting the Stockpile Stewardship Program (SSP) and other applications and making significant progress toward fusion ignition.
- Completed deinventory of plutonium at the Superblock, and transitioned to Category III operations.
- LLNL led the modeling and data analysis for the "Pele" test, which was conducted to assess the ability of various technologies to distinguish signatures for weapon development from other activities for effective treaty verification and monitoring.
- The Laboratory's analytic techniques for detecting small nuclear explosions were called into action in February 2013 as seismic signals were detected within minutes of the later announcement of a North Korean nuclear test.
- To improve space situational awareness, a "nano-satellite" was launched in September 2012 that contains an LLNL-developed optical system for tracking space debris with high precision.
- Working with the National Nuclear Security Administration (NNSA) and the Departments of Defense and Homeland Security, LLNL leads the nation in the development of new materials for radiation detection and discrimination to replace legacy (poorly performing) systems.
- Received six R&D 100 Awards, the equivalent of an Academy Award for science and engineering innovation.
- Licensing of the Lawrence Livermore Microbial Detection Array (LLMDA) will enable law enforcement, food-safety professionals, and physicians to detect within 24 hours any of thousands of bacteria, viruses, or toxins that have been sequenced.
- The International Union of Pure and Applied Chemistry officially approved livermorium (Lv) as the new name for element 116, one of the six heavy elements discovered by an LLNL–Dubna, Russia collaboration.

Current State of Site

The infrastructure portfolio at LLNL has growing gaps that constrain the Laboratory's ability to meet rapidly evolving mission demands. Many of the Laboratory's permanent facilities are reaching their end-of-lifecycle, requiring refurbishment, modernization, or replacement. Targeted infrastructure reinvestment is required to meet mission deliverables and sustain mission-supportive ST&E excellence and LLNL's special multidisciplinary capabilities.

With Readiness in Technical Base and Facilities (RTBF) support, LLNL has been able to sustain nearly 100% availability of its mission-critical and mission-dependent facilities managed under the RTBF program. Future RTBF funding projections are challenging for LLNL to strike a balance with the needs for reinvestment in an aging infrastructure.

The removal of Security Category I/II SNM from the Laboratory site was completed in FY12. The physical security features for the Protected Area and Material Access Area have been deactivated, but will be left in place in an inactive state.

NNSA and LLNL successfully completed an eleven year, $260M backlog reduction program associated with the Facility and Infrastructure Recapitalization Program (FIRP). The most recent investments have been used to provide power capacity for high-performance computing, upgrade electrical reliability and safety in selected facilities, improve utility systems reliability, and eliminate seismic issues in mission-critical facilities.

With continued investment, LLNL will continue to focus on real property sustainment, major system replacements, required modernization and consolidation with associated and demolition of antiquated and unused facilities. Without a balanced investment portfolio, the deferred maintenance (DM) backlog will continue to grow and degrade LLNL's ability to accomplish mission.

Transition and disposition (T&D) is another integral element of infrastructure lifecycle management. LLNL has an inventory of single-use facilities well beyond end-of-life and in a cold and dark state that prohibit efficient use of the site.

The Livermore Valley Open Campus (LVOC) at the LLNL and Sandia National Laboratories (SNL) sites is a new initiative that will facilitate expanded external partnerships to help the laboratories meet mission needs, sustain excellence in ST&E, and continue to attract the very best scientists and engineers.

The Livermore Computing Facility houses Sequoia, the Advanced Simulation and Computing program's largest advanced development system for performing high-fidelity weapon physics simulations and uncertainty-quantification studies in support of the SSP. Building 453, a Leadership in Energy and Environmental Design (LEED)-Gold facility, is one of LLNL's five facilities that have achieved LEED certification.

Future Plans for the Ten Year Horizon

To meet mission deliverables and sustain LLNL's core capabilities needed to achieve NNSA's strategic goals, a prioritized set of projects is proposed to be accomplished in the ten- and twenty-year horizons. Both state-of-the-art facilities with advanced capabilities and office space to replace substandard housing are needed to continue to attract top-notch employees and to expand partnerships and collaborations.

LLNL's has a firm commitment to protecting the health and safety of our workers, the public, and the environment, including the incorporation of modern safety and sustainability features into the design of new facilities. In 2011, LLNL completed a Supplement Analysis (SA) under the National Environmental Policy Act of the 2005 LLNL Site-Wide Environmental Impact Statement (SWEIS). The SA examined proposed new and modified plans, projects, facilities, and operations through 2015 including those identified in the LLNL FY13 Twenty-Five Year Site Plan. In August 2011, the U.S. Department of Energy (DOE)/ NNSA determined that a supplement to the 2005 SWEIS or a new SWEIS was not needed; the proposed modifications were consistent with those analyzed in the 2005 SWEIS.

With the completion of Security Category I/II SNM removal and the LVOC development progressing, the Livermore site will undergo significant changes in its security posture. A portion of the site along the southeastern perimeter is expected to be converted to General Access Area (GAA) with fence line reconfiguration to accommodate new LVOC facilities and public access.

Changes, Issues, and Concerns

Readiness in Technical Base and Facilities (RTBF)

Developing a balanced RTBF funding profile is critical for RTBF program stewardship of the Laboratory infrastructure. Based on the current outyear projections of RTBF funding, the Laboratory will be unable to carry out facility risk reduction activities.

LLNL capabilities in high explosives (HE) operations, device fabrication and inspection, warhead surveillance, integral warhead test and evaluation, and nuclear chemistry have significantly degraded. Investments in both the physical infrastructure and special facilities and equipment will be required to maintain the robust readiness state of the full capabilities for the Laboratory design and certification activities, and ongoing warhead life extension programs. Going forward, the RTBF budget as currently envisioned by NNSA is not consistent with the expected site operational requirements over this time period.

The LVOC at the LLNL and SNL sites will facilitate expanded external partnerships to help the laboratories meet mission needs, sustain excellence in science, technology, and engineering (ST&E), and continue to attract the very best scientists and engineers. A variety of F&I financing options for LVOC development are being considered.

Facilities and Infrastructure Recapitalization Program (FIRP)

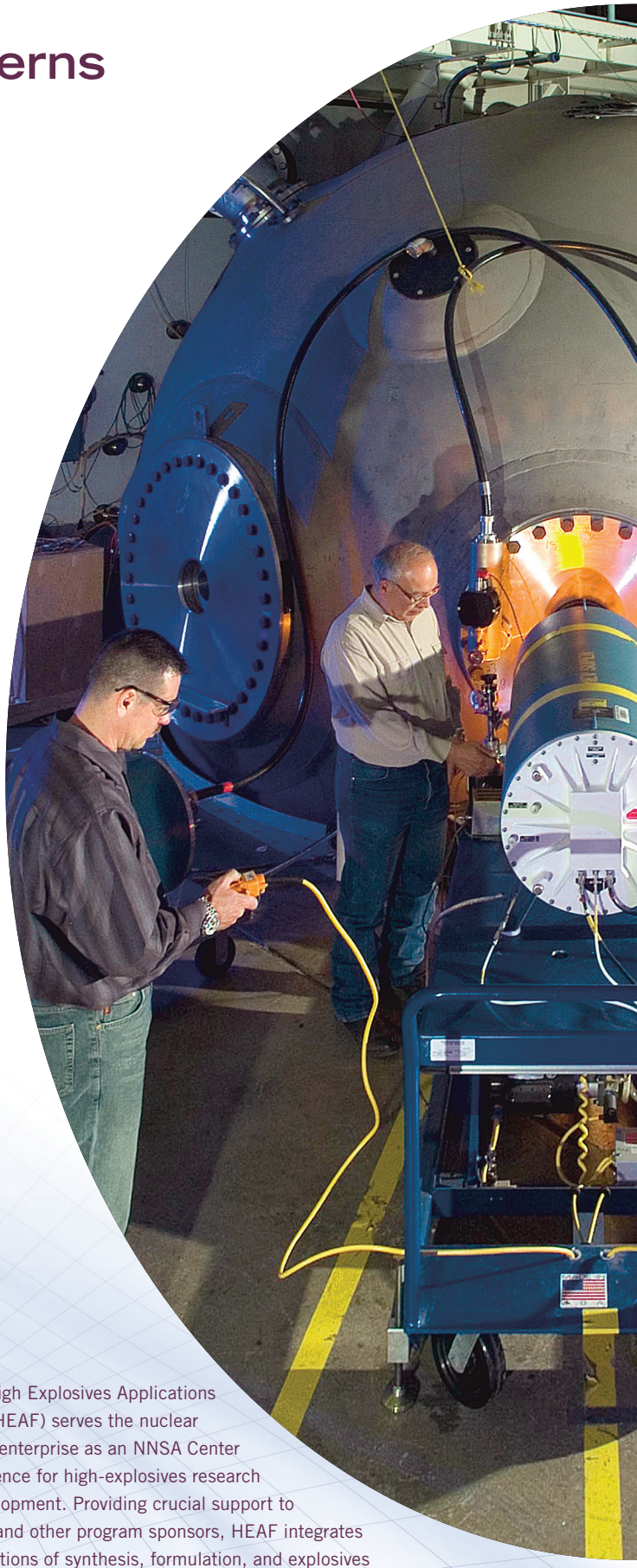
FIRP investments were enormously beneficial in significantly reducing deferred maintenance backlog. With FIRP's conclusion at the end of FY12, a follow-on recapitalization program is critical for future investment in the infrastructure that supports the NNSA mission. Without sustainment funding, LLNL's facilities and infrastructure condition is expected to degrade, which will present significant challenges to accomplishing mission. In addition, LLNL will continue to include seismic upgrades in its real property management planning.

Delayed Funding for LLNL Line Items

The Electrical Capability and Reliability project supports mission critical facilities at both LLNL main site and the neighboring Sandia campus. The Emergency Management Facility provides a replacement emergency operations facility. Funding for both projects has been delayed to FY15. It is important to maintain funding priority to ensure reliable infrastructure to support mission.

Facility Maintenance to Ensure Capabilities

In support of LLNL's F&I Five-Year Strategy, initiatives are being implemented to help define a robust asset portfolio with adequate flexibility in facilities and infrastructure (F&I) to support the types of capabilities needed for the current and future missions of the Laboratory. However, continuing budget reductions will severely limit the ability to implement improvements to the portfolio.



LLNL's High Explosives Applications Facility (HEAF) serves the nuclear weapons enterprise as an NNSA Center of Excellence for high-explosives research and development. Providing crucial support to the SSP and other program sponsors, HEAF integrates the operations of synthesis, formulation, and explosives testing in a single facility.

Section 2
Site Overview and Snapshot

Location: Livermore, California

Type: Multi-Program Site

Website: https://www.llnl.gov

Contract Operator: Lawrence Livermore National Security, LLC

Responsible Field Office: NNSA Livermore Field Office

Site Manager: Kimberly Davis Lebak

LLNL is located about 50 miles east of San Francisco at the outskirts of the City of Livermore in Alameda County. It has been in operation since 1952 on the one mile-square main site at Livermore (Site 200), and since 1955 at Site 300, a 7,000-acre remote test site 17 miles east of Livermore.

The Laboratory has been operated by Lawrence Livermore National Security, LLC (LLNS) since 2007. LLNS offers a team of five world-class organizations including Bechtel National, University of California, Babcock and Wilcox, the Washington Division of URS Corporation, and Battelle.

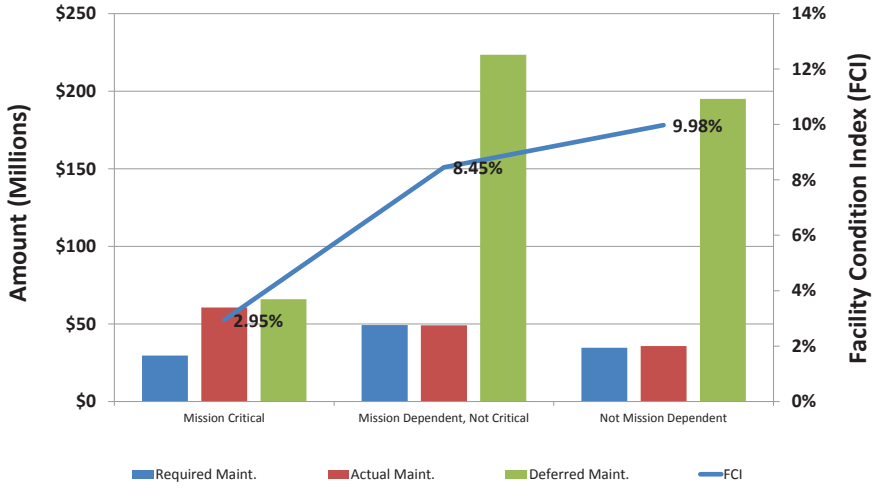
LLNL's workforce, including ~3,900 technical staff and ~3,100 support staff, operate within a matrix framework to foster efficient transfer of knowledge among programs, enable staff members to develop wide-ranging sets of skills, and infuse projects with diverse ideas and solutions.

The Laboratory's current NNSA core capabilities include design, certification, testing, surveillance, and an ST&E base; plutonium research and development (R&D); tritium operations and R&D; high explosives R&D; infrastructure support facilities; nuclear counterterrorism; nuclear nonproliferation; and support to other sites.

Real Property:

- 7,727 acres (owned)
- 490 buildings/trailers
  - 6,363,217 gsf active and operational
  - 566,869 gsf non-operational
  - 29,932 gsf leased
- Replacement plant value: $6,836,994,531
- Deferred maintenance: $484,529,077
- Facility condition index (FCI): 7.09% (adequate)
  - Mission critical: 2.95% (excellent)
  - Mission dependent: 8.45% (adequate)
  - Asset utilization index (overall): 82.90%

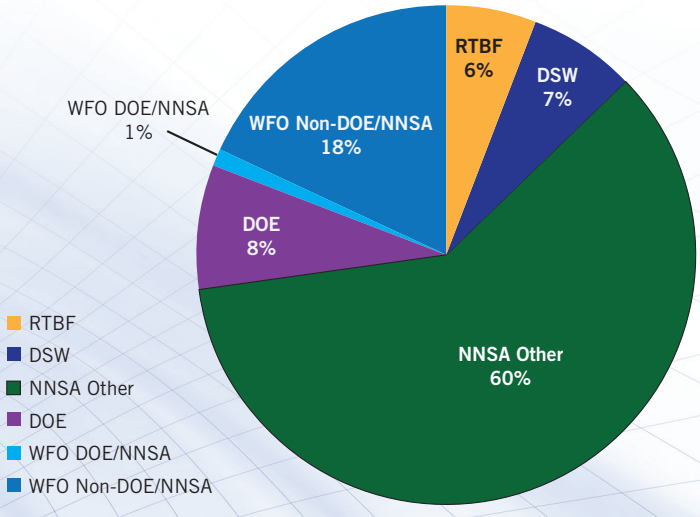
Maintenance and FCI by mission dependency



Includes Site 200 and Site 300.

FY2012 Funding by Source:

- FY2012 total site operating cost: $1,658.9M
- FY2012 total NNSA funding: $1,224.3M
- FY2012 total DOE (non-NNSA) funding: $128.1M
- FY2012 total other funding: $321.2M



Section 3
Assumptions

Program of record is specified by the FY13 Stockpile Stewardship Management Plan (SSMP) and is consistent with the Nuclear Weapons Council Strategic Baseline. Section 4 of the SSMP describes the baseline infrastructure lifecycle management requirement and activities for NNSA's eight Management and Operations sites including LLNL. Key assumptions about the Laboratory's mission and vision for the future that affect F&I planning at the site follow.

LLNL will continue to operate as a multiprogram, continuing mission site, with a primary focus on stockpile stewardship as part of the DOE/NNSA integrated program of surveillance, assessment, and life-extension of weapons in the nuclear stockpile. LLNL's mission includes crucial responsibilities to sustain a safe, secure, and effective nuclear deterrent and prevent nuclear proliferation and terrorism.

F&I investment proposals align with important needs—reaffirmed by the 2010 Nuclear Posture Review—to modernize the stockpile as well as the nuclear weapons enterprise infrastructure and to sustain the ST&E base at the Laboratory. Proposals are coordinated with the existing RTBF Program and its associated subprograms and planned project construction at LLNL, which is assumed to be funded as scheduled.

As a national security laboratory, LLNL has the mission responsibilities and core competencies to continue to address significant challenges utilizing scientific and technological capabilities bolstered by an agile, modern, and efficient infrastructure. As the Laboratory removes legacy substandard facilities, there will be corresponding investments in space consolidation, recapitalization, and modernization to reduce future maintenance and support costs.

Important national ST&E challenges and LLNL's unique multidisciplinary capabilities together provide expanding opportunities to engage in national security programs for non-NNSA federal sponsors, projects for other-interagency sponsors, and partnerships to enhance the competitiveness of U.S. industry.

The physical site and its security posture will continue to evolve as LLNL adapts to a continuing role for Superblock to support LEPs and plutonium science, NIF as a national user facility, expansion of high-performance computing capabilities, the information technology (IT) needs of next-generation employees, 24/7 operational support in several mission areas, and a general access for LVOC, an increasing diversity of research partners and programs for other-agency sponsors.

The development of anchor facilities for LVOC will greatly enhance means for LLNL/SNL to broaden R&D partnerships to help meet national security mission objectives, stay at the forefront of ST&E, and attract and retain a top-notch workforce. A variety of financing options will be explored for the development of LVOC.

Sustainability goals, identified in the LLNL Site Sustainability Plan, will factor into decision making about the scope of facility improvements and mission-driven changes to the site.

Further portfolio balancing adjustments will be needed to carry out facility risk-reduction activities. The Laboratory has lost significant capability in HE operations, device fabrication and inspection, warhead surveillance, and integral test and evaluation. Under current facility sustainment profiles, the facility condition is expected to degrade in the next decade.

Section 4
Changes from Prior Year TYSP

Infrastructure Recapitalization
With the end of FIRP, the RTBF program will invest in mission critical/mission dependent facilities life extension, utility, sustainability, fire protection, and related projects. In the current year, we consider both real property and programmatic equipment for modernization activities. Programmatic equipment projects will revitalize foundational and obsolete equipment necessary to accomplish stockpile LEPs. Because of constrained budgets, LLNL investment strategies for enduring facilities have shifted from planned-life to risk-based assessments for mission consequence.

Electrical Capacity and Reliability Project
This project supports mission critical facilities at both LLNL main site and the neighboring Sandia campus. Project funding has been delayed, and CD-2/3 approval is targeted for FY15. It is important to maintain funding priority to ensure reliable infrastructure to support mission.

Emergency Response
The Emergency Management Facility Line Item has received CD-0 approval. Project funding has been delayed, and CD-1 approval is targeted for the fourth quarter of FY14, pending adequate funding. Training and response to global emergencies will be enhanced by planned R&D investments in ST&E and programs in related mission areas. It is critical to receive project authorization to move emergency operations from the current temporary location, which is on the second floor of a facility located in an earthquake zone, to a facility with full-range capabilities required to manage emergency situations.

Livermore Valley Open Campus (LVOC)
LVOC received CD-0 approval in April 2013 and is proceeding with CD-1 document preparation. LLNL recently released an initial request for information (RFI) from parties interested in potential leases at the LVOC, and will analyze leasing and design-build opportunity from participants' response to develop a subsequent RFI with specific projects of interest. LVOC is designed to enhance and accelerate international scientific collaboration and partnership with U.S. government agencies, industry and academia in areas of energy and environmental security, biosecurity and medical devices, economic security, cyber security, high performance computing, and non-proliferation. The activities will be supported by key Laboratory facilities and serve to strengthen institutional core competencies.

Sustainability
Beginning in 2013, a 10-acre, ground-mounted, 2-3 MW solar photovoltaic project, is to be designed, financed, installed, operated and maintained by a solar energy project vendor in the northwest buffer of LLNL. The vendor will enter specific agreements including a Power Purchase Agreement (PPA) with the Western Area Power Administration (WAPA) for purchase of the electricity generated by the system, and a no-cost License Agreement with DOE/NNSA for access to the land for installation, operation, and maintenance activities for a period of at least 20 years.

Site Security
Deinventory of Security Category I/II SNM was completed, and the site has transitioned to Category III operations. However, budget allocations are not yet aligned with requirements for Category III operations; there is a process in the PB-15 formulation for mitigation.

Section 5

Future Vision and Core Capabilities

NNSA Core Capabilities

C1	Design, Certification, Testing, Surveillance, and ST&E Base
C2	Plutonium
C3	Uranium
C4	Tritium
C5	High Explosives
C6	Nonnuclear
C7	Weapons Assembly/Disassembly
C8	Transportation
C9	Special Nuclear Material Accountability, Storage, Protection, Handling and Disposition
C10	Enabling Infrastructure
C11	Counterterrorism and Counterproliferation
C12	Support of Other Mission/Program Capability
C13	Federal Management and Oversight
C14	Reserve Real Property Assets

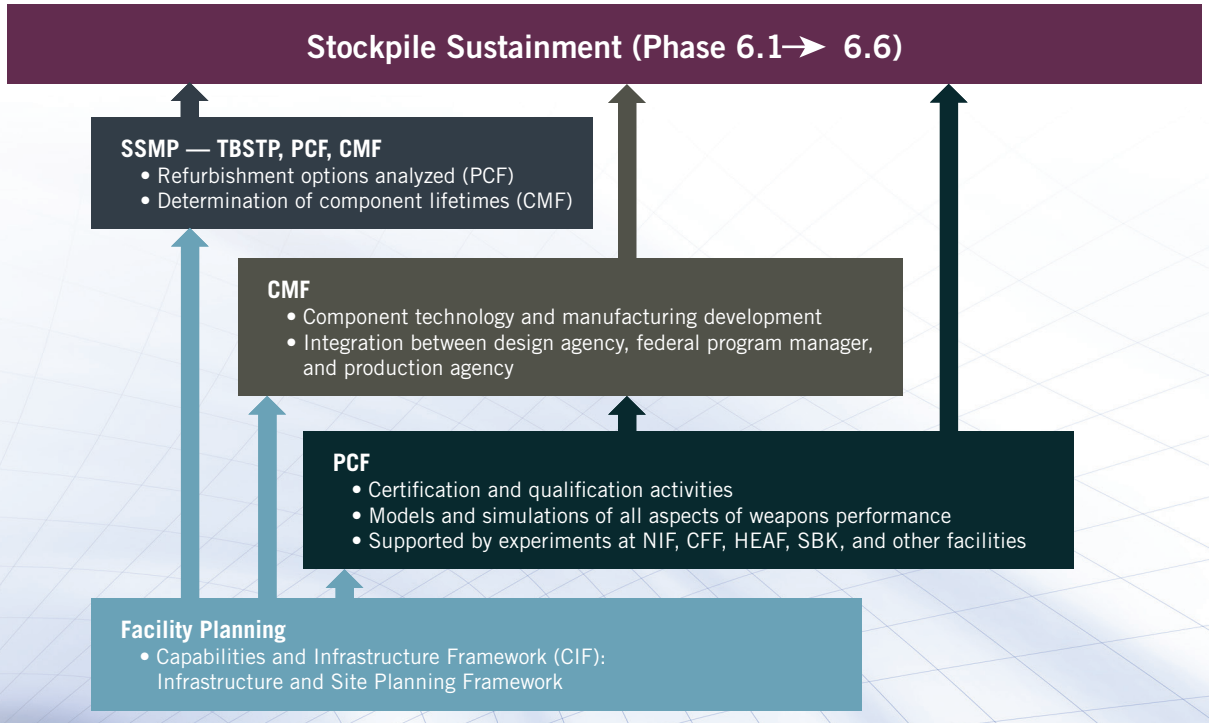
LLNL contributes to seven of NNSA's fourteen core capabilities.

C1 Design, Certification, Testing, Experiments, Surveillance, and Science, Technology and Engineering Base

This core capability is central to LLNL's historical, current, and future missions to provide the nation with safe, secure, and reliable nuclear weapon systems as it supports the NNSA mission. As stated in the *Infrastructure Sustainment and Modernization Report, February 1, 2010*, released by the NNSA Office of Defense Programs, LLNL's mission as a design agency is to develop and sustain design, simulation, modeling, and experimental capabilities and competencies with the required fidelity to ensure stockpile confidence without nuclear testing, and to sustain the nation's stockpile consistent with national policy.

Project planning is integrated with SSMP, Technical Basis for Stockpile Transformation Planning (TBSTP), Predictive Capability Framework (PCF), Component Maturation Framework (CMF), and Capabilities and Infrastructure Framework (CIF). The TBSTP is derived from stockpile weapon needs (lifetimes, performance, and surety) and provides a future requirements basis for PCF, CMF and CIF. The PCF is a context for integrating the science investments to support the nuclear design and certification mission with a focus on uncertainty quantification. The tactical investments listed in this section align with investment criteria. The CMF describes the stockpile materials and technology maturation investments needed for life-extension programs and sustainment of the U.S. deterrent. The tactical infrastructure investments listed below are tightly integrated to both of these frameworks through the Integrated Priority List.

The SSMP and its components—PCF, CMF, and other elements—provide the detailed flow of information, analysis, and certification needed to construct and execute the LEP process.



The NNSA 2008 NNSA Complex Transformation Record of Decision specifies two LLNL centers of excellence: (1) nuclear design and engineering; and (2) high explosives research, development, test, and evaluation (see Core Capability C5 in this section). The core capabilities for the Nuclear Design and Engineering Center of Excellence are:

– Nuclear design physics

– Advanced physics and engineering simulation

– High Energy Density (HED) Science

– Radiochemistry

– Weapons engineering

– Prototyping, manufacturing, and inspection

– Environmental and hydrodynamic testing and evaluation

– Warhead surveillance

– High-performance computing

– Materials synthesis and characterization

The primary objective in the continued advancement of this Center of Excellence is to enable successful execution of SSMP deliverables while simultaneously strengthening the core capabilities. These core capabilities also support other missions, including nonproliferation and homeland security, advanced manufacturing, energy and environmental security, bioscience and biotechnology, and basic fundamental science and advanced technologies.

Tactical Planning Horizon (FYNSP of last President's Budget +5 years)

LLNL has developed objectives (listed below) to meet our mission goals. Investment into LLNL's infrastructure at both Site 200 and Site 300 is essential to the success of meeting these objectives.

Nuclear Weapons Stockpile Stewardship

LLNL's core nuclear weapons infrastructure has a capitalized value of over $3.6B in conventional facility and Special Facilities and Equipment (SFE), with $500M of deferred maintenance and recapitalization backlog. Stockpile stewardship supports ongoing activities for the W78/88-1 and the Long Range Standoff Warhead LEPs. Associated infrastructure projects include the LEP and Warhead Assessment Facilities Revitalization efforts and the thermal and dynamic environmental test facilities for design and certification.

- LEP and Warhead Assessment SFE Revitalization

LEP and Warhead Assessment SFE Revitalization

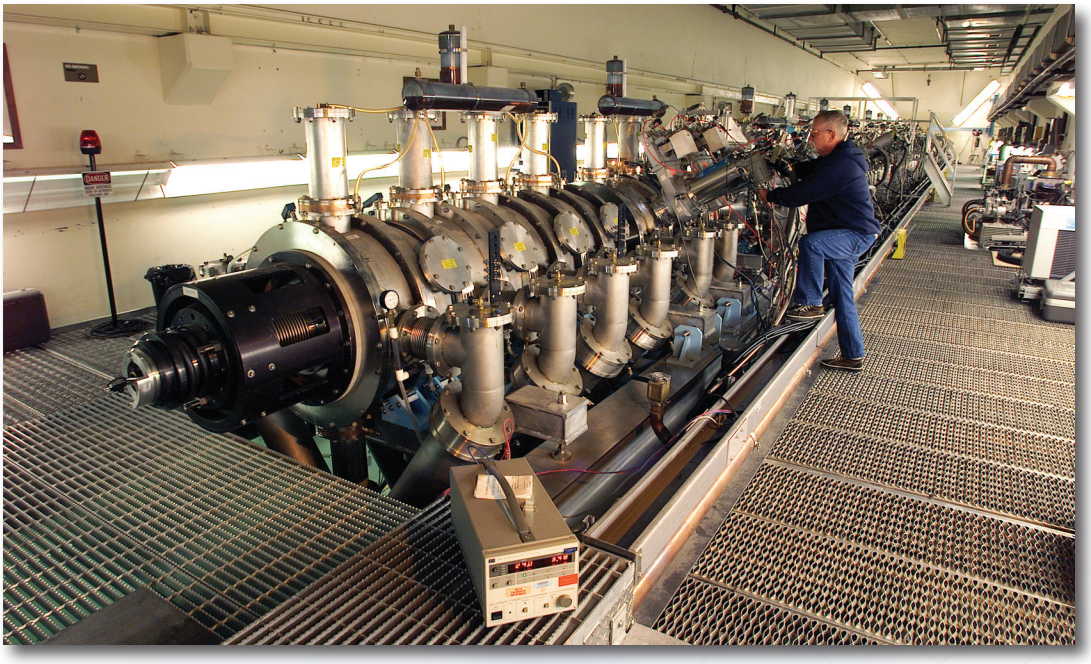
This project provides foundational equipment and infrastructure required to test and develop weapon designs for an LEP. The project started in FY13 in order to support Phase 6.3-6.5 (research, development, test and evaluation activities) LEP development activities.

Invest in infrastructure to support design physics and weapons engineering capabilities.

- Insensitive High Explosives (IHE) Qualification Facilities Recapitalization (description in C5)
- Flash X-Ray (FXR) Modernization
- Radiochemistry Laboratories Recapitalization
- High Energy Density Physics (HEDP) Precision Targets and Diagnostics (PTD) Facility

Flash X-Ray Modernization

Flash X-Ray (FXR) radiography is an essential diagnostic used at the Contained Firing Facility (CFF) for mock nuclear explosive experiments for multiple NNSA Life Extension Programs (W78/88-1 LEP, B61 LEP, and LRSO), counterterrorism and nonproliferation. The machine is over thirty years old and requires a major maintenance overhaul, as the dwindling supply of custom spare parts cannot be easily reproduced and support systems have technically improved multifold in the last decade. This project, along with enabling FXR to maintain its firing reliability, will enhance the machine capabilities such as increasing radiographic resolution and enabling full use of the radiographic beam. For the Nuclear Security Complex, this will enable more accurate modeling of the hydrodynamics of the weapon systems, reducing modeling uncertainties and thereby increasing confidence in weapon reliability assessments. Technical expertise in radiographic machines is a national resource, and this project would simultaneously aid in the development of the next generation of accelerator physicists to carry on the tradition of LLNL radiographic excellence that helped to deliver the DARHT II multipulse capabilities to the NNSA community.



Radiochemistry Laboratories Recapitalization

This project will recapitalize and consolidate radiochemistry activities into one facility. Facility improvements are needed to support stockpile stewardship, nuclear nonproliferation, and nuclear counterterrorism. While radiochemical data and analyses directly impact the accuracy and precision of our stockpile certification for current and future weapon systems, these laboratories also underpin pre- and post-detonation forensics, and provide unique capability to nonproliferation and treaty verification.

The existing conventional facilities and infrastructure for radiochemistry activities are aging, obsolete, and limited in capacity. Investment in these laboratories will modernize capabilities housed within the 45 year old facility.

The existing radiochemistry laboratories and SFE require modernization to support multiple NNSA missions.

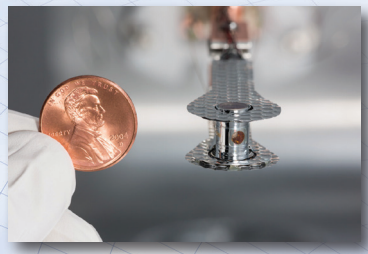
High Energy Density Physics (HEDP) Precision Targets and Diagnostics (PTD) Facility

The HEDP PTD project will significantly enhance HED platform capabilities by providing reliable precision target manufacturing and consolidated diagnostics production in an integrated facility. Currently, program components are developed in six different facilities, all near capacity for the number and types of targets and diagnostics needed to meet weapons physics experimental program to support annual certification. The impacts of continuing without this consolidation include:

- Reduced ability to solve complex platform design, fabrication, maintenance and calibration problems
- Inability to meet ever-increasing demand for new and more complex platforms and diagnostics
- Reduced shot rate due to limited ability to reconfigure/repair diagnostics instruments
- Reduced experimental capabilities that can be provided to the Program
- Undue risk of incident related to transportation of activated/contaminated components on public roads

The project features repurposing an existing mission critical facility, consolidating work performed both on and off site, and avoiding overdue seismic retrofits. By incorporating off-site operations, we will respect DOE's existing vendor arrangements and be able to reduce both cost and risk.

A NIF target contains a polished capsule about two millimeters in diameter, filled with cryogenic (super-cooled) hydrogen fuel.

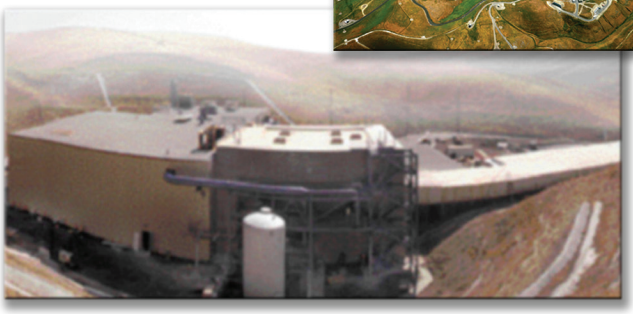


Complement nuclear design with engineering and materials capabilities.

- Site 300 Nuclear Security Complex Modernization
- Stockpile to Target Sequence (STS) Test and Evaluation Laboratory
- Nuclear Explosive Package (NEP) Engineering and Materials Complex Replacement
- Superblock Recapitalization (discussion in Section 5 C2)

Site 300 Nuclear Security Complex Modernization

The Contained Firing Facility at Site 300 houses the Flash X-Ray Machine.



This project will enhance LLNL's mission to test full-scaled mock nuclear weapons through hydrodynamic and environmental tests. Warhead design, U.S. stockpile systems certification, and evaluation and mitigation of foreign capabilities rely on LLNL's Site 300 experimental capabilities and engineering infrastructure. This is accomplished by testing assemblies with large high explosive quantities using the outdoor firing facility, the indoor Contained Firing Facility, and multiple environmental testing facilities.

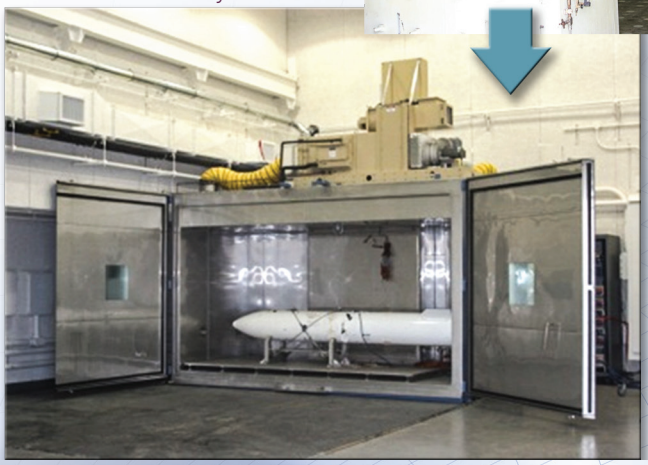
The last capital line item project focusing on Site 300 real property building systems was almost 25 years ago. Since then, facilities have generally received insufficient support resulting in degraded and outdated infrastructure. This project will focus on replacing the most critical programmatic capability gaps involving antiquated computer controls and network systems, outdated electrical-mechanical systems, and firing facilities' support systems and infrastructure.

STS Test and Evaluation Laboratory

B836 C Cell circa 1980s

B834 C Cell circa 2011

B834 C Cell circa today

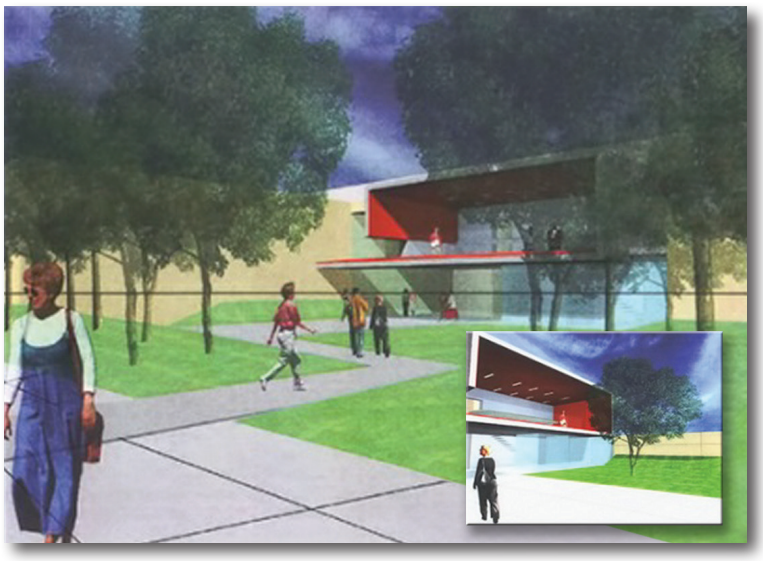


The STS Test and Evaluation Laboratory Project will revitalize aging and obsolete environmental test facilities. These facilities test large capacity HE assemblies in environments encountered in a stockpile to target sequence.

Environmental testing of nuclear weapons is necessary to meet STS and Military Characteristics requirements and is an integral part of the nuclear weapon design and certification process for an LEP. Site 300 allows for the largest HE loading (200 lbs per test cell) of all environmental test facilities within the Nuclear Security Enterprise (NSE), and LLNL is the only national laboratory capable of performing environmental tests on Special Nuclear Material test articles. These test facilities average 45 years of age and, due to their frequent use, are showing signs of significant atrophy, including loss of some capabilities. This project will initiate the revitalization of environmental test facilities and infrastructure.

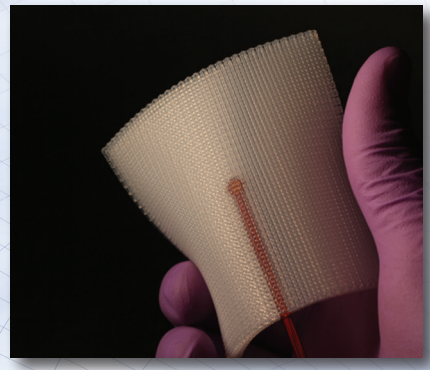
Nuclear Explosive Package (NEP) Engineering and Materials Complex Replacement

This replacement facility will continue to house metal, ceramic, and polymeric material capabilities to support NEP development for the nuclear weapons program and will have a smaller and more efficient footprint by consolidating technologies and leveraging other facilities. The complex will consolidate foundational technologies including metallurgy, material mechanics, material deposition and joining, polymer processing, and material characterization, and will also house advanced material engineering and fabrication capabilities. Research at this facility will strengthen weapons engineering expertise and ensure S&T expertise remains current and technologically advanced.



The existing substandard facility is sixty years old, has a large maintenance backlog, and has extremely low seismic performance. It lacks hot water and has vintage infrastructure where replacement parts cannot be found, and leaking boiler water lines consistently run into computer network rooms.

In additive manufacturing, parts are fabricated by adding successive thin layers of material. Unlike traditional machining, material is added instead of removed. This technology will revolutionize component manufacturing throughout the NNSA complex for Stockpile Stewardship, LEPs, and National Security Programs.



A polymer pad additively manufactured provides a more uniform and controllable behavior than existing foam structures used in weapons systems. This pad has an embedded pressure sensor to record load history.

Continue infrastructure support for high-performance computing; deploy capacity and capability computing platforms (e.g., Sequoia).

The Twenty-Five Year Livermore Computing Master Plan provides a comprehensive strategy for assessing the probability (and then assuring) that future computing systems can be sited to sustain mission. Facilities have been evaluated for required infrastructure based on their ability to site various classes of computing systems from advanced development to commodity computing systems. Livermore Computing computational services reside in a range of facilities, from dedicated computer rooms to retrofitted, yet currently inefficient space. Some of the infrastructure is nearly 65 years old and is not sustainable or efficient for future computational systems without major networking, structural, mechanical and/or electrical upgrades. In some cases, modernization is impossible.

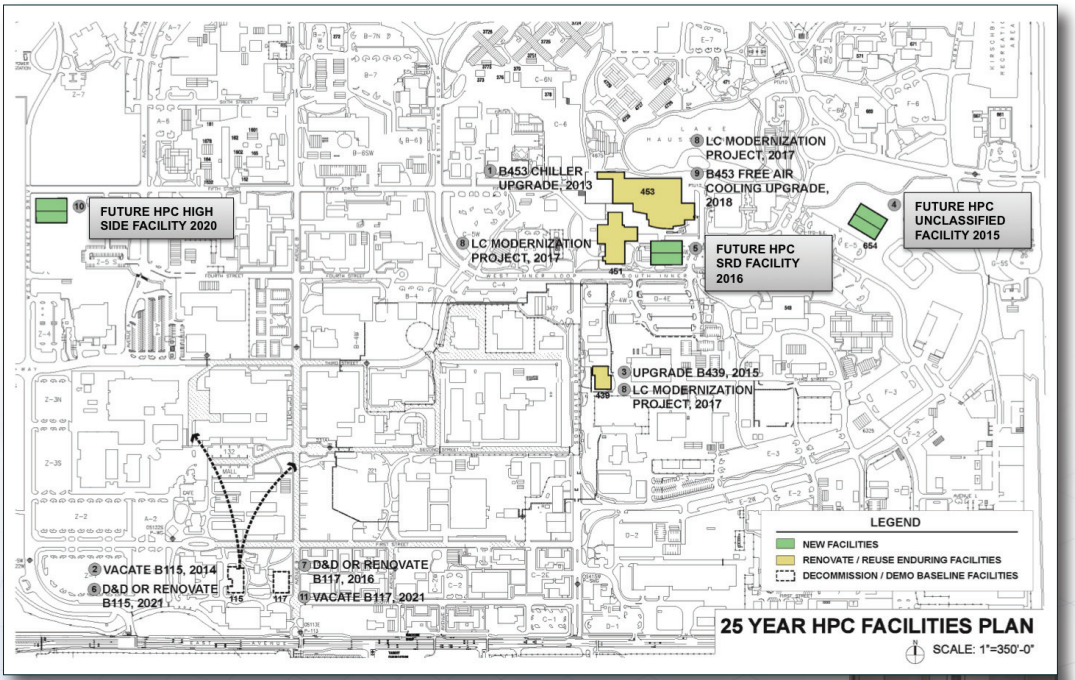
- Livermore Computing Complex Modernization
- Sustainable Livermore Computing Center

Laser and photon science has a specialized set of requirements and associated facilities and equipment needed to support the SSMP. Execution of the envisioned experimental program requires enhancements to existing NIF infrastructure in the areas of optics, target fabrication, and diagnostics. Security upgrades and additional infrastructure to support the international NIF user community are also required. In addition, an enhancement of NIF laser energy and radiation shielding is proposed to broaden the range of ignition-related experiments executable at the facility. Proposed projects include a mix of refurbishment and upgrades of current facilities, as well as new facilities.

- NIF Security Upgrades
- Optical Materials R&D/Production Facility
- High Energy Density Physics (HEDP) Collaboration with LLNL and Los Alamos National Laboratory (LANL)

Livermore Computing Complex Modernization

This project will modernize and consolidate the Livermore Computing Complex into existing enduring complex facilities. Additionally, it will shut down inadequate spaces. The long-term strategy is to assemble sustainable facilities and transition and disposition nonenduring facilities in accordance with the Twenty-Five Year Livermore Computing Master Plan.



Twenty-Five Year Livermore Computing Master Plan

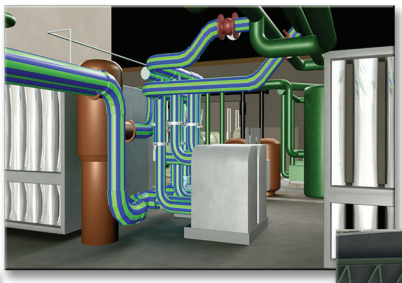
Existing Livermore Computing facilities with aging and failing equipment

Sustainable Livermore Computing Center

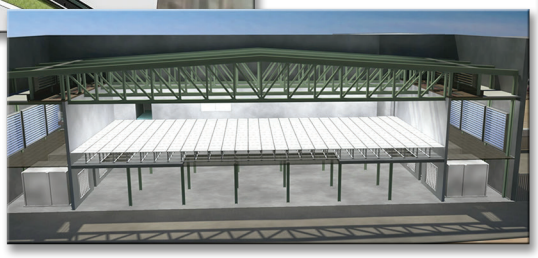
The Sustainable Livermore Computing Center will house systems whose siting requirements surpass existing enduring facility modernization capabilities. This new facility will deploy free cooling, warm water cooling, and AC/DC electrical distribution to assure the most efficient and adaptable operations. This project will also include the transition and disposition of nonenduring facilities in accordance with the Twenty-Five Year Livermore Computing Master Plan.

Sustainable scalable high-performance computing solution

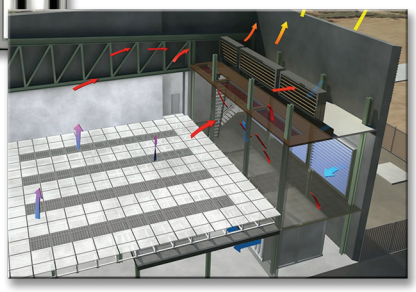
Advanced liquid cooling solutions



Section view of new facility



Free air cooling features



Optical Materials R&D/Production Facility

This project is a strategic replacement of buildings that will be well past their useful life. The mission is currently being met through adaptive reuse of aging buildings that will become increasingly more costly to run, and there are no other buildings available for continued adaptive reuse in proximity to the NIF.

The mission gap consists of three interrelated areas: custom optics demand, overall cost efficiency and optics processing (both production and performance improvement) rate and capacity. These capability gaps constrain the ability to meet the needs of the scientific user community across all programs.

The processing capacity is a constraint on planned programs, particularly the high energy experiments requested by the HED Council and the Inertial Confinement Fusion (ICF) Program, which limits the numbers and types of experiments that can be performed on the NIF.

Strategic Planning Horizon (FYNSP of last President's Budget + 20 years)

LLNL will continue to rely on its core capabilities as a design agency for its nuclear weapons system and ST&E base to fulfill its role as a national asset, meeting and addressing the nation's security challenges in the 10- to 20-year horizon. The same mission areas are expected to continue with changes anticipated to the focus of each mission.

Nuclear Weapons Stockpile Stewardship

Retire legacy facility liabilities; transform Superblock security categorization; develop, deploy, and exploit future high performance computing architectures.

Collocate and integrate program physics and engineering staff in the long term.

- Nuclear Weapons R&D Complex
- High Energy Density (HED) South Science and Engineering Building
- Integration of Building 131 Replacement/Recapitalization

Enhance NIF capability: construct a second target chamber to ultimately support 12 experiments per year at yields of up to 500 megajoules per experiment.

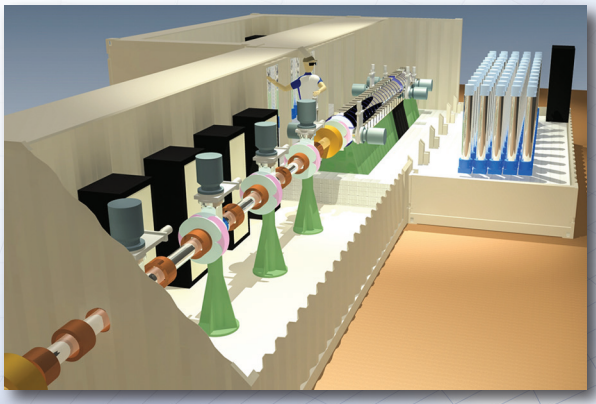
- NIF Experimental Operations Center

Develop advanced radiography technology facility to support hydrodynamic experiments.

- Diagnostic X
- Pulsed Power Facility

Diagnostic X: Next-Generation Radiography

Existing high powered radiography machines, such as FXR at LLNL and DARHT at LANL, were costly to construct and exist as fixed, dedicated facilities with limited end-point energy and dose variability. This project would build a new radiography machine with similar radiographic capabilities as the existing machines, but would be portable, modular, and considerably less expensive to fabricate. This portability would provide new capabilities for the NSE, such as radiography capabilities for hydrodynamic tests of special nuclear materials at the Nevada National Security Site (NNSS) underground facilities. Additionally, the machine would be capable of providing an extra imaging view at existing hydrodynamic test facilities.



Nuclear Weapons R&D Complex

E.O. Lawrence and the founders of LLNL recognized the importance of close collaboration and integration of the personnel and facilities within the weapons programs, as close integration has historically facilitated faster and better weapon development for the nation. Having primary designers, secondary designers, experimentalists, and code physicists in the same location enables better communication and collaboration that is essential for innovation and stockpile assurance. This project proposes to consolidate design and weapons engineering into a single facility.

Pulsed Power Facility

A flexible pulsed power and electromagnetics laboratory supports material characterization at extreme temperatures and pressures, provides critical data incorporated by weapons computer codes, and enables new technologies for national security needs in modern electronic warfare, asset defense, fleet modernization, and counterterrorism. This project would upgrade the existing pulsed power/electromagnetics laboratory with modern SFE and infrastructure.

C2 Plutonium

The LLNL core capability associated with plutonium operations is principally centered within the facility complex referred to as the Superblock. The current budget of record proposal (President's Budget 2013) specifies at least a five-year delay in acquisition of the Chemistry and Metallurgy Research Replacement Facility at LANL. A U.S. interim plutonium plan will feature plutonium capability equities at LLNL in the FYNSP +5. At the end of FY12, LLNL fulfilled the requirement of removing Security Category I/II SNM, however, the plutonium capability within Superblock is still required, operating under Security Category III, for the continuing SSP as well as the growing mission to address nuclear counterterrorism (NCT) and nonproliferation.

Tactical Planning Horizon (FYNSP of last President's Budget +5 years)

Following deinventory in FY12, the security posture for the Superblock has been lowered. Superblock's plutonium capability in part fabrication, process development, material characterization and chemical analysis is required to support the ongoing Stockpile Stewardship Program. The facility will remain capable and ready to support additional programmatic needs as required.

The other major missions supported with LLNL plutonium capabilities are NCT and nonproliferation. These specific missions will rely on the unique capability within the Superblock for nuclear forensics (pre- and post-detonation), diagnostic/detector developments, and training associated with nuclear materials.

Nuclear Weapons Stockpile Stewardship

Support the enduring activities of plutonium material property studies, advanced nuclear materials manufacturing, pit surveillance, and surety technology studies with an infrastructure recapitalization project.

- Superblock Recapitalization

Nonproliferation and Homeland Security

Use nuclear expertise to meet the increasing global threat of improper use of nuclear materials and technology.

Address continued growth of NCT requirements.

- Forensic Science Center

Strategic Planning Horizon (FYNSP of last President's Budget +20 years)

LLNL will continue to rely on its core capabilities as a design agency for its nuclear weapons system and ST&E base to fulfill its role as a national asset, meeting and addressing the nation's security challenges in the 10- to 20-year horizon. The same mission areas are expected to continue with changes anticipated to the focus of each mission. Potential changes to LLNL infrastructure to support these missions with regard to the plutonium core capability are listed below.

Weapons Stockpile Stewardship Scope

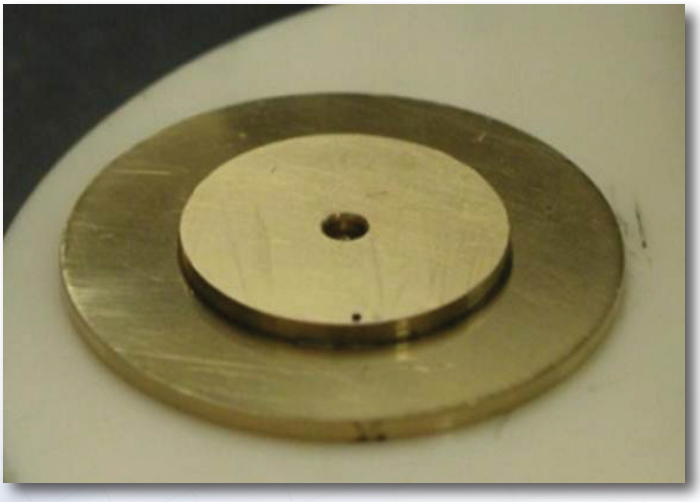
Retire legacy facility liabilities.

Utilize Superblock assets to meet ongoing SSP needs.

Manage recapitalization of SNM facilities.

Nonproliferation and Homeland Security

Sustain existing facilities to grow capability to address NCT and nonproliferation.



These plutonium JASPER targets, with surfaces lapped to 0.0001" flat and parallel over a 1.3" diameter, were used to achieve the highest quality plutonium data ever accomplished for Stockpile Stewardship. They were machined and assembled at the Superblock.

C4 Tritium

The tritium core capability at LLNL resides in a Hazard Category 3 nuclear facility, the LLNL Tritium Facility, located within the Superblock complex. Its current primary mission is to support HED stockpile experiments and fusion energy experiments at the NIF and at the Omega facility at the Laboratory for Laser Energetics of the University of Rochester. Tritium R&D work in support of enduring nuclear weapon stockpile activities is conducted in conjunction with Sandia National Laboratories, California, along with basic research applicable to fusion energy tritium issues. Tritiated targets are developed through LLNL's Laboratory Directed Research and Development collaborations and Work For Others agreements. The tritium capability also supports the Containers Program with maintenance and recertification of selected containers, as well as tritium recovery operations for the U.S. Department of Defense (DoD) and other government and private entities.

Tactical Planning Horizon (FYNSP of last President's Budget +5 years)

The number and complexity of experiments using tritium will continue to increase in support of the HED stockpile, fusion energy, neutron generator, and other R&D activities. To meet this program requirement, existing capabilities and assets provided by the LLNL tritium facility will need to be maintained and remain operational with high reliability. An additional tritium facility capability, the Diffusion Fill System, will be completed and operated in support of Inertial Confinement Fusion (ICF) experiments on NIF and Omega.

Tritium recovery operations from DoD and an expanded list of governmental and private entities are expected to significantly increase while container maintenance and surveillance activities diminish, somewhat due to the expected retirement of the certified shipping containers used for tritium payloads.

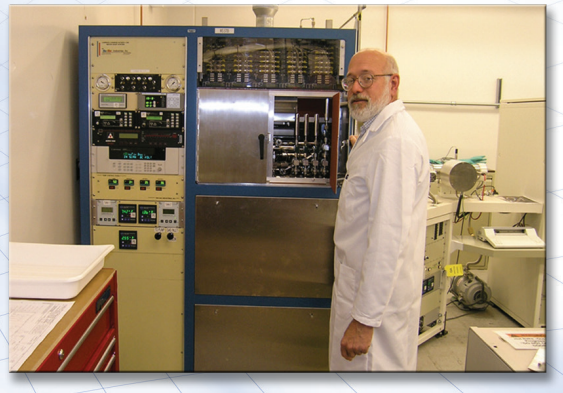
Strategic Planning Horizon (FYNSP of last President's Budget + 20 years)

With NIF's expected lifetime of 30 years and continued ICF program target needs LLNL will need to maintain target fill and other tritium support capability. Tritium recovery operations, mostly from obsolete illumination devices, are expected to continue, as are container maintenance and surveillance activities.

Tritium processing glovebox

Tritium recovery system

Sector Mass Spectrometer optimizes for light isotopes



C5 High Explosives

The high explosives (HE) program at LLNL is an integral element of NNSA's design and development effort supporting the nuclear weapons program and its broader national security missions. The explosive program has been a focal point for research and development using a multidisciplinary approach and designated as an NNSA Center of Excellence for synthesis, formulation, characterization, processing, and testing of energetic materials, components and subassemblies.

The research, development, and engineering applications of HE technology include both experimental and modeling efforts at a wide range of physical scales. In addition to the HE core weapon capabilities, the program also leverages its expertise to conduct R&D that addresses broad national and international security needs such as the development of conventional, novel, and low-collateral damage explosives for DoD, as well as improvised explosives to support Homeland Security initiatives.

LLNL has several facilities at its High Explosives Applications Facility (HEAF) at Site 200, Site 300, and also at the Nevada National Security Site (NNSS). HEAF is unique because of its collocation of R&D personnel along with an array of laboratories and contained firing tanks. Site 300 provides capabilities including hydrodynamic test and evaluation at its Contained Firing Facility, as well as HE synthesis, formulation, casting, machining, radiography, assembly, storage, and waste disposal. The ability to cast very large, high precision HE charges is a unique capability for the U.S. that resides at Site 300.

Tactical Planning Horizon (FYNSP of last President's Budget +5 years)

LLNL must maintain, sustain, and enhance existing HE facilities to meet current missions and objectives, while also being strategically positioned to address future needs.

Nuclear Weapons Stockpile Stewardship

Support W78/88-1 and LRSO LEPs requirements for reproduced as well as new insensitive HE with investments in equipment and integration of facilities for development qualification, engineering assessments, and testing.

- Insensitive High Explosives (IHE) Qualification Facilities Recapitalization

Insensitive High Explosives Qualification Facilities Recapitalization

Ongoing LEPs require qualification and certification of reproduced IHEs, as well as new IHEs. This project will support IHE technology maturation and weaponization activities by recapitalizing associated facilities and experimental capabilities, which have not been fully exercised in over 30 years. These recapitalization activities must be operational in time to support Phases 6.3-6.5 of the W78/88-1 and LRSO LEP.

Photos compare conventional high explosives (CHE) and IHE bullet impact tests. The photos (from left to right) are of a CHE test configuration before and following bullet impact, respectively, and the intact IHE charge following multiple bullet impacts.

Upgrade electrical and mechanical systems of multiple facilities for large-scale explosives tests, pressing and machining, operations, environmental and hydrodynamic evaluations, and prototyping of HE subassemblies to revitalize this integrated capability of the HE enterprise.

- Site 300 Nuclear Security Complex Modernization
- High Explosives Center of Excellence Recapitalization and Consolidation

Provide stockpile stewardship of existing HE and detonator inventories.

Develop new materials including highly survivable, conventional, and insensitive HE.

Provide safety, physics and engineering performance determination.

Revitalize and replace existing special facilities and equipment to support stockpile needs.

Expand HEAF office space to advance and enhance research efforts by collocating appropriate staff.

- HEAF Building 191 Office Extension

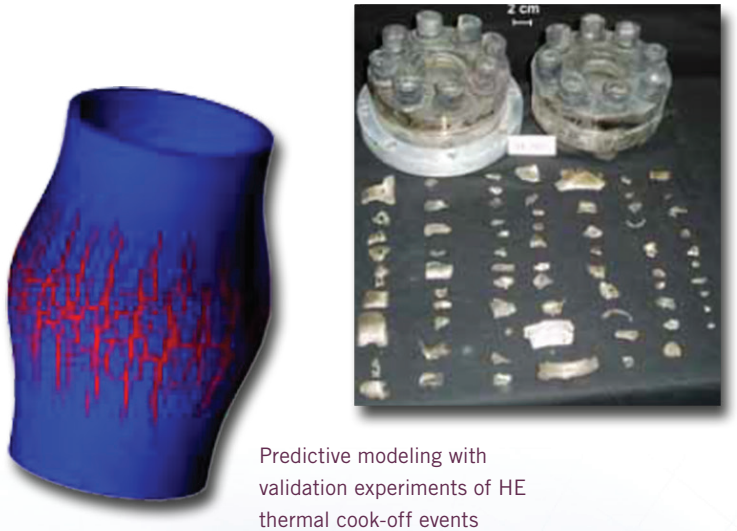
Nonproliferation and Homeland Security

Support the counterterrorism, emergency response, and transportation missions associated with DoD, Department of Homeland Security, Transportation Security Administration, and Federal Bureau of Investigation.

Fundamental Science and Engineering R&D

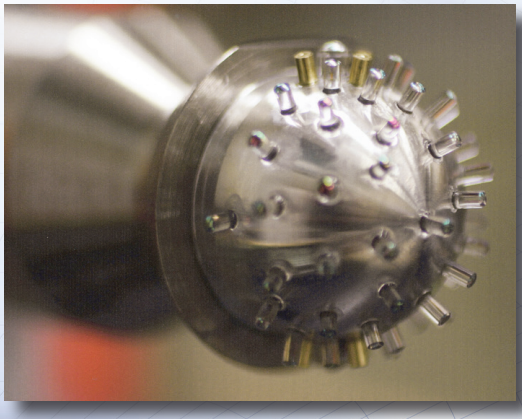
Develop and qualify new explosives.

Support DoD in conventional weapons including third-generation weapons.



Predictive modeling with validation experiments of HE thermal cook-off events

Unique capability in U.S. to make precision large charges



LLNL-developed Photonic Doppler Velocimetry (PDV) technique for HE-driven experiments

Strategic Planning Horizon (FYNSP of last President's Budget + 20 years)

With continued reliance on LLNL as a center of excellence, revitalization and modernization of existing facilities will be required to support an enduring HE mission. Continued growth in the mission areas of nonproliferation, nuclear counterterrorism (NCT), and homeland security will require additional capability.

Nuclear Weapons Stockpile Stewardship

Provide stockpile stewardship to the nuclear weapon stockpile with surveillance, annual assessments and reviews, and nuclear weapon studies and Lifetime Extension Programs.

Develop and qualify nuclear weapon technology sub-systems for weapon performance, safety, security: new materials and fabrication, detonation systems, and sensors.

Qualify new insensitive HE to support stockpile sustainment alternatives and safety initiatives.

Consolidate and replace facilities with added capabilities to address future mission requirements.

- Energetic Materials Processing Complex (EMPC)

Provide stockpile stewardship for existing HE and detonator inventories.

Manage Site 300 real property to realize operational efficiencies.

Recapitalize equipment at HEAF and Site 300 to support mission requirements.

Nonproliferation and Homeland Security

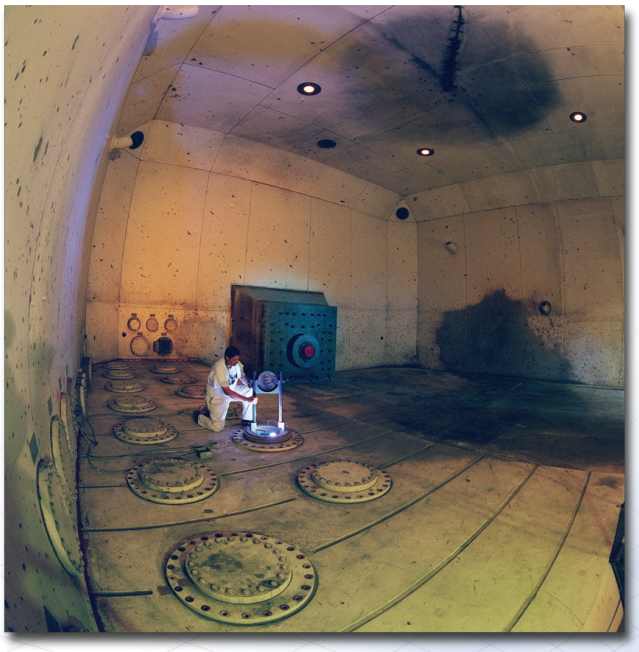
Support the counterterrorism, emergency response, and transportation missions associated with both national and international stakeholders within an integrated threat(s) definition and problem-solving paradigm regarding HE detection, defeat, and remediation.

Fundamental Science and Engineering R&D

Develop new explosives.

Apply innovative explosives.

Support DoD.



Contained Firing Facility (CFF) for testing explosive quantities of up to 60 kgs

HEAF Spherical Firing Tank for explosive quantities up to 10 kgs

High Explosives Applications Facility (HEAF)

C10 Enabling Infrastructure

LLNL supports its infrastructure and facilities enabling its short- and long-term mission goals to be achieved with little or no hindrance to ongoing and future programmatic missions. LLNL supports identifying the long-term, sustainable benefits to facility and infrastructure endurance, from both a financial and environmental perspective.

Tactical Planning Horizon (FYNSP of last President's Budget +5 years)

Combined investments in site-wide infrastructure projects are necessary to enable the accomplishment of programmatic deliverables. Modern, efficient, and sustainable utility systems, facilities, and information technology infrastructure help ensure that the Laboratory can meet mission goals cost-effectively, safely, and securely.

Operations and Business

Ensure the reliability of utility systems, allow for preventive maintenance without major planned outages and interruptions to mission critical facilities, and replace aging equipment with site-wide infrastructure projects.

- Electrical Infrastructure Upgrades Project
- Electrical Capacity and Reliability (ECAR) Project
- LLNL City Water System Rehabilitation
- East Site Infrastructure
- Alarms/Supervisory Control and Data Acquisition (SCADA) Infrastructure Reliability Facility
- Site 300 Infrastructure Revitalization
- Site 300 Storm Drain Rehabilitation

Demolish legacy facilities to clear the site for redevelopment; eliminate maintenance backlog and environment, safety, health, and security risks; reduce surveillance and maintenance costs; support sustainability goals by eliminating the energy and water usage of excess facilities; and improve the site's appearance to attract and retain the next-generation workforce.

- Transition and Demolition Projects (discussion in Section 6)

Electrical Infrastructure Upgrades Project

This project will increase the reliability and capability of the existing electrical distribution system at the Livermore Site. The scope includes new electrical duct bank, new load grid switchgear and sectionalizing switches. CD-1 was approved February 2012.

Western Livermore Substation

LLNL City Water System Rehabilitation

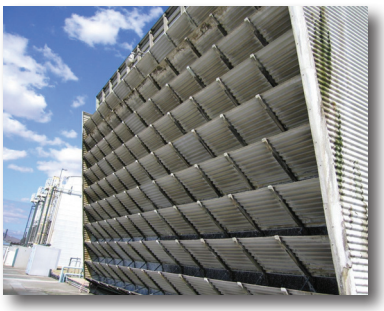
Low-Conductivity Water System Rehabilitation

CT-325 North Cooling Towers

Air-inlet modules are under severe structural strain due to clogging, and the increased weight of the modules from scale build-up will lead to eventual collapse of either the module itself or the air inlet support system.

CT-325 South Cooling Tower

The structure is in poor condition and has lost up to 20% of their structural surface due to erosion.



Horizontal fill support ties have almost completely washed away at the exterior faces of the tower.

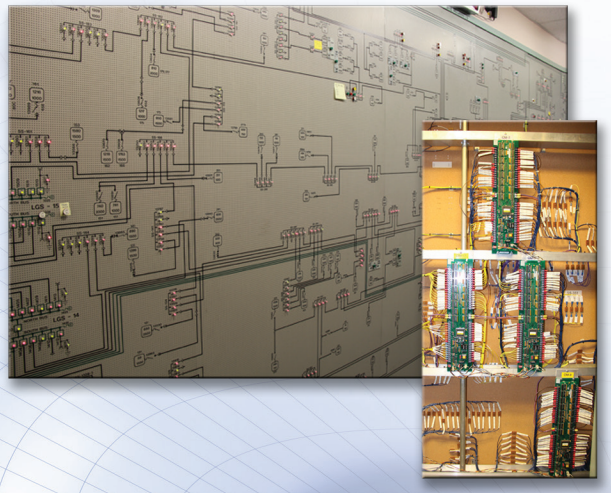
The remains of a plywood column splice. The condition of the connecting hardware is poor.

U325 LCW Make-Up Valves

U328 Motor Control Centers

Alarms/SCADA Infrastructure Reliability Facility

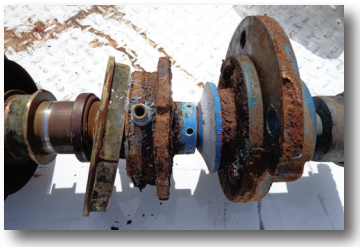
The LLNL Electric Utility SCADA system display board is comprised of vinyl tape representing distribution/feeder conductors and LED lights indicating an open or closed switch position. When changes are made to the configuration of the utility through routine maintenance work or planned construction activities, the display board is manually updated. These manual updates include deleting or adding vinyl tape and modifying the hundreds of feet of wiring providing indication to the LED lights.



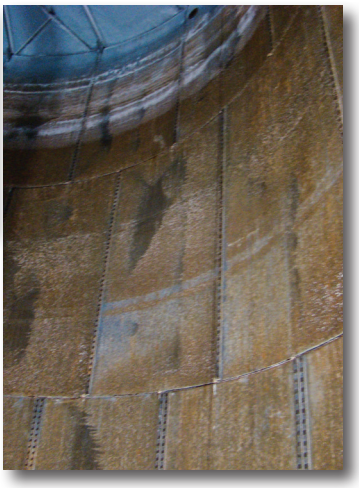
Site 300 Infrastructure Revitalization

Cooling tower heat exchanger full of algae (Contained Firing Facility, Explosives Testing)

Electric panel with water damage (High Explosives Shipping and Receiving)

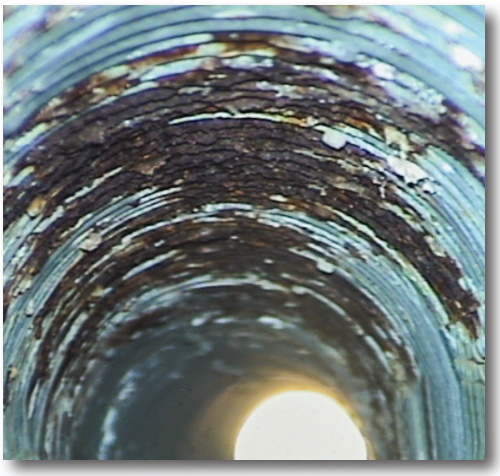


City Water Transfer Pump



City water tanks have lost galvanized protection inside tanks

Site 300 Storm Drain Rehabilitation



Interior photos of this Site 300 drainpipe shows corrosion at the flowline and a "band of corrosion" around the upper surface of the pipe. It is believed this situation combined with significant soil erosion resulted in a section of pipe collapse in 2010. Interior photos of multiple pipes have shown this condition.

Fifty-five year old metal storm drain pipes appear to corrode from outside in and inside out. The drainage outfall and holes from corrosion in the bottom of the pipes eventually erode the soil beneath the pipe and road, creating voids under the road and erosion on the hillside. These conditions are threatening the integrity of Site 300 roads. With over 450 aging drain pipes under Site 300 roads, this situation is very common at Site 300 today.

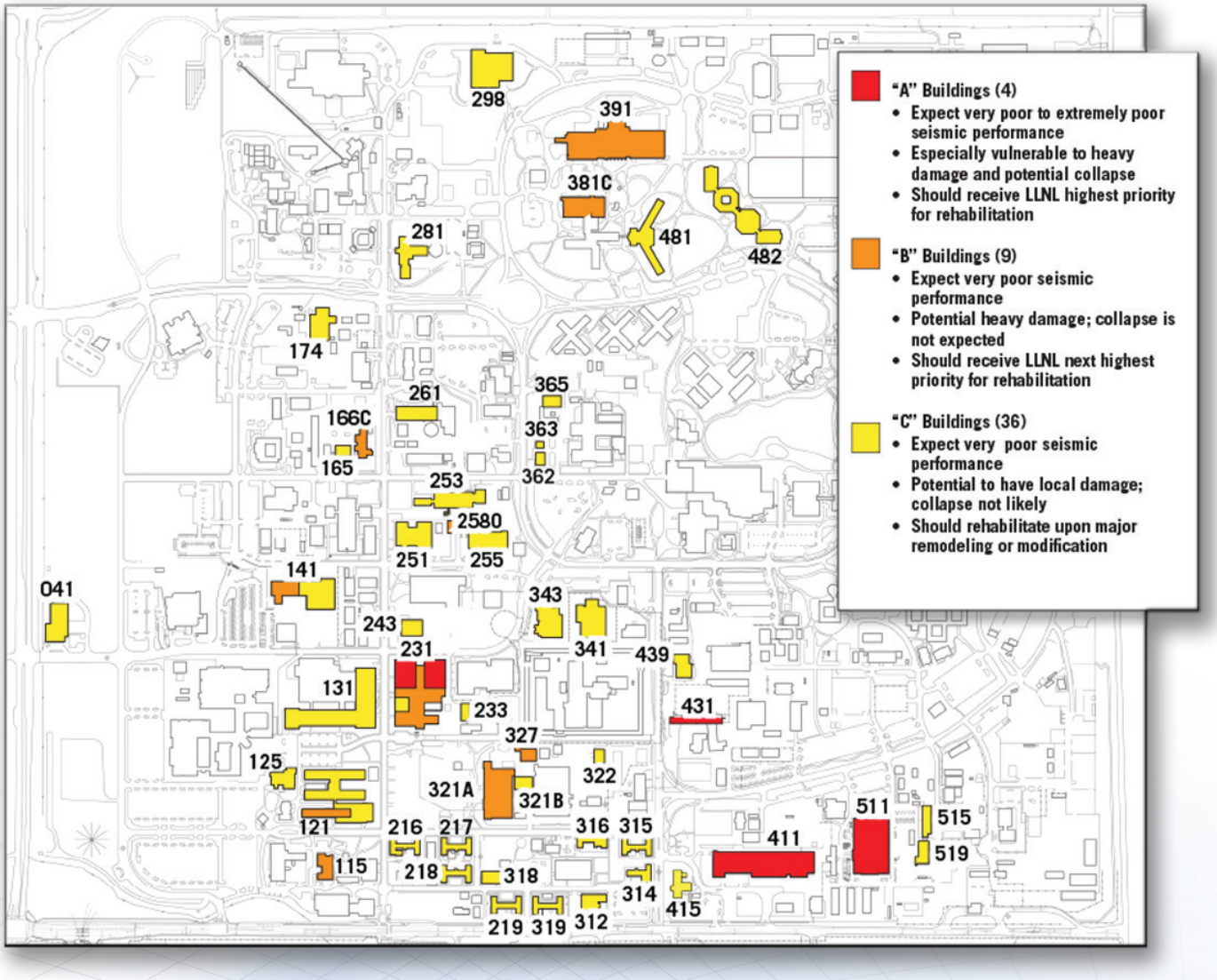
Provide safety compliance retrofit of enduring facilities.

- Seismic Rehabilitation

Replace substandard WWII era buildings. LEED–certified Institutional General Plant Project (IGPP) replacement facility projects will provide a dual benefit by eliminating maintenance backlog and providing quality space to accommodate the need for laboratory and office housing. Office modules will collocate dispersed groups to improve operational cost and efficiency. Laboratory units will be designed and configured for shared limited-term use rather than a multitude of single-use dedicated facilities.

- Replacement Office Building
- Shared-Use General Purpose Laboratory
- Maintenance Operations Center

Seismic Rehabilitation



Map identifies all buildings at the LLNL Site 200 campus that have been shown by structural evaluation to have an expected seismic performance of poor to very poor. These buildings require various levels of seismic rehabilitation to mitigate life-safety hazards for their occupants during earthquakes.

Coordinate operations to comply with DOE and all state and federal regulatory requirements, provide interface with NNSA/ Livermore Field Office on emergency program issues, plan and execute on-site emergency exercises, and liaise with local community emergency response.

- Emergency Management Facility (EMF) (formerly known as Emergency Operations Center)

Information Technology

Provide big data capability (networks supporting magnitude order jumps in demand) through a distributed-computing model with redundant on-site data centers and redundant off-site recovery centers. The distributed-networking model will have distributed nodes throughout the network.

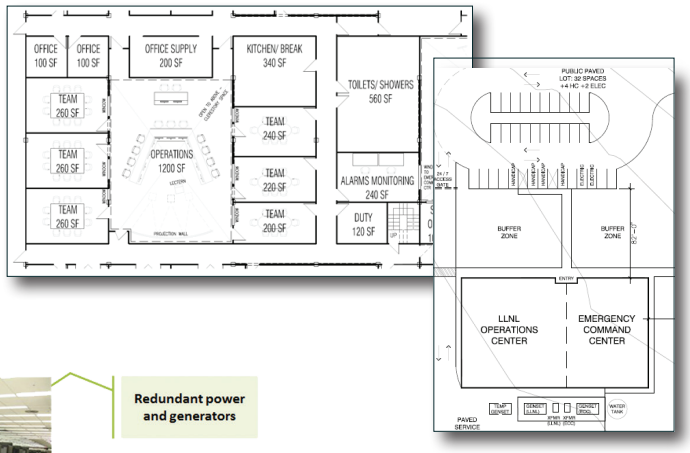
- Data Network Modernization

Strategic Planning Horizon (FYNSP of last President's Budget + 20 years)

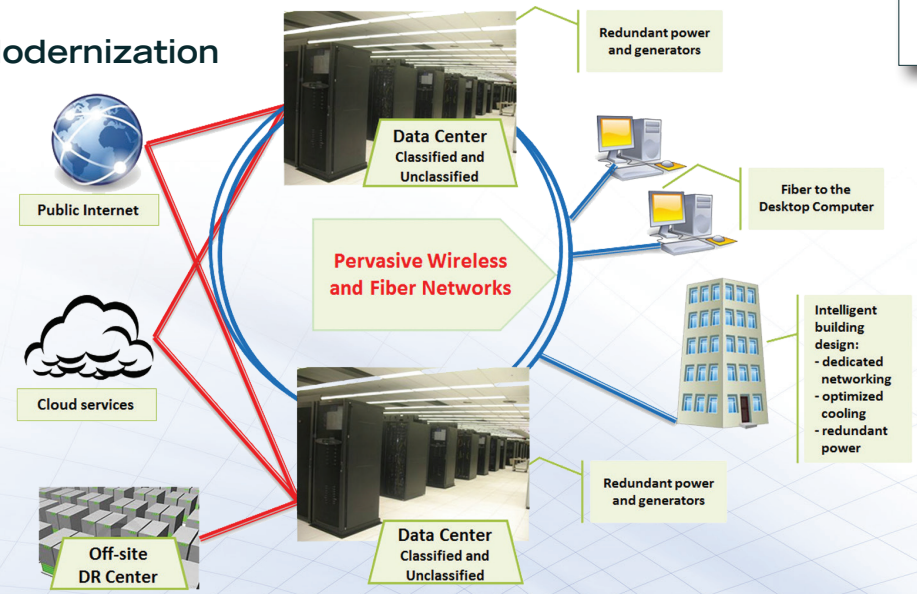
LLNL has the goal of constructing one institutional general-purpose facility per year until personnel are no longer housed in substandard trailers and WWII barracks buildings. It will continue to rely on its infrastructure support and facilities to meet the long-term challenges facing the nation and the world. It is anticipated that, as resources are further constrained, the threats to national and global stability will increase, resulting in both state and non-state organizations seeking preeminence. The same mission areas are expected to endure; however, changes anticipated in the specific mission focus within these areas are based upon an evolving social and political landscape.

Emergency Management Facility (EMF)

LLNL's emergency operations are currently housed in a temporary EMF that does not have the capacity and full-range capabilities required to manage emergency conditions. The new EMF will consolidate key emergency management and response functions into a single dedicated space. The project is proceeding since receiving CD-0 approval, however, funding for has been delayed to FY15.



Data Network Modernization



Distributed computing

Featuring complete data center centralization into two modern, scalable, redundant on-site data centers as well as scalable, distributed cloud computing, services, and storage and off-premesis data recovery centers.

Distributed networking

Featuring modern, pervasive fiber and wireless networks with fault-tolerant, distributed network nodes. Particular strategic emphasis is placed on pervasive wireless access for employees, collaborators, and guests throughout the campus.

C11 Counterterrorism and Counterproliferation

Nuclear Counterterrorism

LLNL has an integrated nuclear counterterrorism program, part of a national program to address the threat posed by nuclear and radiological devices. LLNL applies its expertise in nuclear weapons design to enable assessments related to all types of nuclear technologies. In keeping with the vision of One NNSA, this program is critically dependent on the infrastructure investments and capability stewardship provided by Defense Programs (NA-10) supporting the programmatic requirements of the Nuclear Counterterrorism Incident Response Program.

Counterproliferation

The Nonproliferation Program at LLNL supports NNSA's nonproliferation mission by providing technical leadership to advance technologies to monitor, detect, and limit or prevent the proliferation of materials, technology, and expertise relating to weapons of mass destruction (WMD) worldwide. The program also provides technical leadership to eliminate or secure inventories of surplus materials and infrastructure usable for nuclear weapons. In keeping with the vision of One NNSA, this program is critically dependent upon the infrastructure investments and capability stewardship provided by Defense Programs (NA-10) supporting the programmatic requirements of Defense Nuclear Nonproliferation. LLNL uses unique capabilities in computing, materials development, and sensor technologies as well as its nuclear weapons expertise to support the nonproliferation mission.

Tactical Planning Horizon (FYNSP of last President's Budget +5 years)

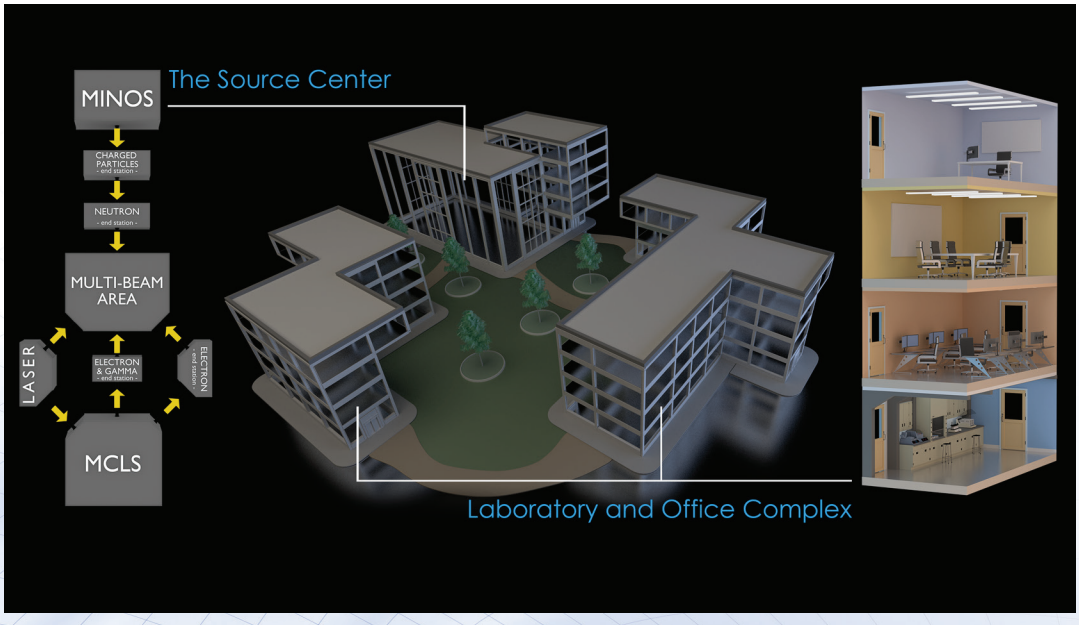
Nuclear Counterterrorism

Develop, enhance, and apply the expertise and capabilities to analyze nuclear technologies; develop nuclear detection and countermeasures strategies and hardware; provide expertise, analysis and disablement technologies in support of emergency response; and perform the full range of nuclear materials analysis and pre- and post-detonation nuclear forensics to support attribution and consequence management.

- Nuclear Security Science Center
- 24/7 Operational National Atmospheric Release Advisory Center (NARAC)

Nuclear Security Science Center (NSSC)

The proposed project will create a facility for state-of-the-art capabilities to work with nuclear materials, radioactive samples, and intense particle and photon sources. A 300,000 square foot facility will be constructed to encompass offices, laboratories, meeting rooms and other support space. The facility will be used to establish new, transformational experimental capabilities to drive innovative research and development, and foster communication and collaboration across the nuclear security community. The NSSC would bring together signature experimental capabilities in support of actinide science, nuclear detection, forensics, and diagnostics.



Counterproliferation

Eliminate or secure inventories of surplus materials and infrastructure usable for nuclear weapons.

Advance technologies to monitor and detect the proliferation of WMD worldwide.

- Nuclear Security Science Center

Limit or prevent the spread of materials, technology, and expertise relating to WMD.

- Network Intelligence Research Facility (NIRF) coupled with a Sustainable High Performance Computing (HPC) Infrastructure

Strategic Planning Horizon (FYNSP of last President's Budget + 20 years)

Nuclear Counterterrorism

Nuclear counterterrorism is only one part of the overall mission of the national program to address the threat—both domestic and international—posed by nuclear technologies in the hands of terrorists. LLNL uses its significant multidisciplinary science and engineering expertise and nuclear weapons design knowledge to create an integrated approach to the broad spectrum of nuclear security challenges. In the long term, a facility is proposed that would integrate diverse teams (e.g., academia, sponsors, end-users) to anticipate threats and to innovate solutions.

Counterproliferation

Nonproliferation and Homeland Security are only a portion of the overall Global Security mission, including countering both domestic and international threats. LLNL utilizes its significant systems engineering expertise to create integrated countermeasures to varied and, at times, coupled threats. In the long term, an integrated facility would bring together diverse teams to anticipate threats, innovate solutions and create deployable systems of countermeasures.

- Integrated Global Security Center (IGSC)

C12 Support of Other Mission/Program Capability

LLNL is a premier applied ST&E laboratory, with broad capability in the physical sciences, and life sciences. The multiprogram missions require complementary infrastructure to support basic energy research, energy security, environmental research, advanced materials research, design and synthesis, manufacturing, atmospheric research, biosciences, and other basic research areas. The complementary infrastructure also provides support to the mission needs of non-nuclear counterproliferation, homeland security, cyber security and intelligence analysis.

Near- and Long-Term Mission and Objective

Support to other Nuclear Security Enterprise Sites

Both the near- and long-term mission and objective capabilities supporting other U.S. Nuclear Security Enterprise sites is captured in the previous six core capabilities.

Fundamental Science and Engineering R&D

LLNL must maintain expertise in fields ranging from materials science and detector and diagnostic development to focused aspects of the fundamental supporting disciplines in physics, chemistry, biology, and earth sciences.

Strategic planning initiatives emphasize a science and technology corridor, or "hub," having multidisciplinary infrastructure with coordinated facilities investment that would support the widest swath of ST&E and programs at LLNL. This collection of ST&E facilities, along with the NEP Engineering and Materials Complex, Nuclear Security Science Center, and a stand-alone Forensic Science Center, will provide the science and engineering capabilities needed by LLNL to meet the demanding needs as well as have the ability to adeptly respond to changing programmatic mission space. The collection of ST&E facilities included in the hub follows:

- Materials Integration Facility
- Biosecurity and Biosciences Research Facility
- Earth Science Facility
- Energy and Climate Complex
- Pulsed Power Facility
- Diodes Facility
- Renewable Energy Center

Non-Nuclear Counterproliferation and Homeland Security

Continue to leverage capabilities to assist national stakeholders in meeting the challenges posed by threats to national security. In addition to the nuclear threat, the U.S. is faced with other areas of concern including chemical, biological, radiological, high explosives, and cyber-attacks which can be addressed through capabilities and expertise developed within the core missions of the Laboratory. LLNL envisions the needs for R&D facilities with multiple security levels possessing an experimental and testing infrastructure configured for developmental applications from concept to fabrication through operational prototypes. These facilities would possess the entire suite of R&D capabilities in both laboratory and fabrication technologies.

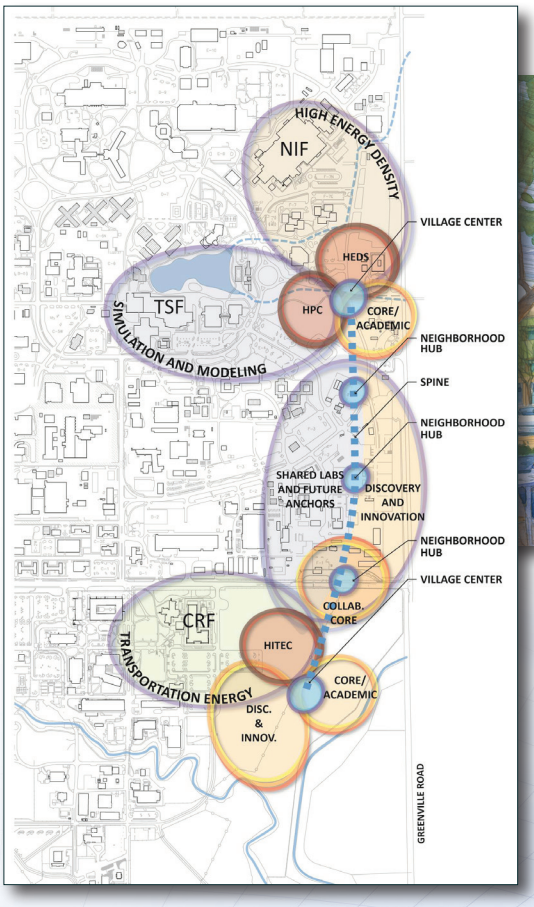
- Counterproliferation R&D Laboratory
- Center for National Security Photonics

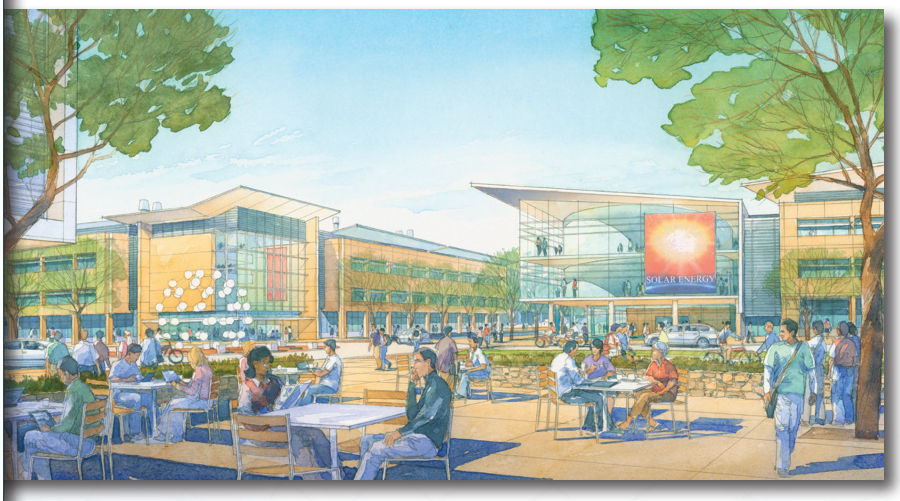
Livermore Valley Open Campus (LVOC)

By creating a venue specifically designed to facilitate and enhance collaborations with industry and academia, the LVOC enables LLNL's technical workforce to pursue key scientific challenges in fundamental science and applied technology in areas of mutual interest to all partners. The LVOC concept of an unclassified campus environment co-located alongside LLNL's gated research campus allows side-by-side collaborations with the outside scientific community in technical areas that directly benefit DOE and NNSA missions. These areas include energy, environment, transportation, cyber-security, bio-security non-proliferation, advanced manufacturing, high performance computing and big data. Furthermore, dual-use technologies developed will benefit the U.S. economy through technology transfer and commercialization paths.

- High-Performance Computing Innovation Center Replacement Office Buildings
- Collaboration Center
- Sustainable High Performance Computing Center
- Office and Light Lab Incubator
- Hertz Hall Revitalization
- Manufacturing Learning Lab
- Institute for Translational Biomedicine Center
- Southeast Campus Revitalization

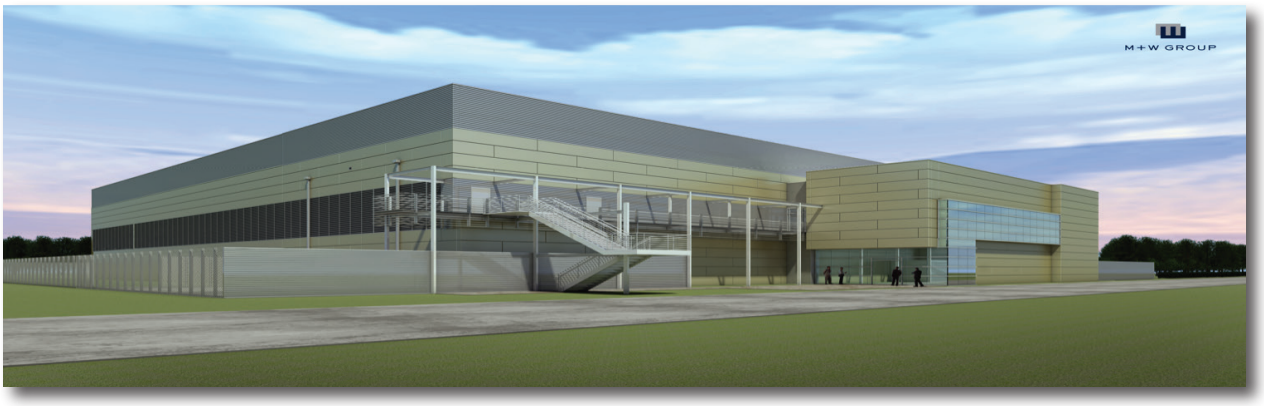
Livermore Valley Open Campus (LVOC)





The campus development concept is a series of science-related villages based on functional relationships to existing research facilities at LLNL and SNL; a center at each village shares core functions and amenities. The villages are linked with intermediate neighborhoods of other facilities along a circulation spine to facilitate an interactive community environment.

LVOC Sustainable High Performance Computing Center



The proposed computing center would focus on sustainability and energy efficiency through flexibility with modules and a scalable footprint, allowing it to respond to computational technology. The computing center would be one of the key enterprises in the LVOC concept to support emerging projects that leverage HPC resources and capabilities at LLNL.

Researchers at IBM and LLNL formed an HPC collaboration called Deep Computing Solutions to take place within LLNL's High Performance Computing Innovation Center. Under the agreement, IBM and LLNL will broaden their 20-year collaboration in HPC by joining efforts to work with industrial partners to help boost their competitiveness in the global economy.

LVOC Hertz Hall Revitalization

Hertz Hall was established in collaboration with UC Davis and for many years served as the home for the Department of Applied Science. A revitalized Hertz Hall will provide offices and collaborative research spaces for faculty and students as well as classrooms and videoconference facilities for delivery of university courses. The facility will enable broad interactions with the university community.

Major Planned Projects

Map shows conceptual locations of proposed projects on current site map (site-wide and multiple location projects are not shown). Locations may also indicate a redevelopment area with existing facilities to be demolished for new construction. Locations to be adjusted pending final project scope definitions. Projects are listed in alphabetical order.

C1: Design, Certification, Testing, Surveillance, and ST&E Base

Tactical Planning Horizon

1A FXR Modernization (at Site 300)
1B HEDP Precision Target Diagnostic Facility (PTD)
1C HEDP Collaboration with LLNL and LANL
1D IHE Qualification Facilities Recapitalization
1E LEP and Warhead Assessment SFE Revitalization
1F Livermore Computing Complex Modernization
1G NEP Engineering and Materials Complex Replacement
1H NIF Security Upgrade
1J Optical Materials R&D/Production Facility
1K Radiochemistry Laboratories Recapitalization
1L Site 300 Nuclear Security Complex Modernization
1M STS Test and Evaluation Laboratory
1N Superblock Recapitalization
1P Sustainable Livermore Computing Center

Strategic Planning Horizon

1Q Diagnostic X
1R HED South Science and Engineering Building
1S Integration of Bldg 131 Replacement/Recapitalization
1T NIF Experimental Operations Center
1U Nuclear Weapons R&D Complex

C2: Plutonium

Tactical Planning Horizon

2A ForensicScience Center
(1N) Superblock Recapitalization

C5: High Explosives

Tactical Planning Horizon

5A HEAF Bldg 191 Office Extension
5B High Explosive Center of Excellence Recapitalization and Consolidation
(1D) IHE Qualification Facilities Recapitalization
(1L) Site 300 Nuclear Security Complex Modernization

Strategic Planning Horizon

5C Energetic Materials Processing Complex (EMPC)

C10: Enabling Infrastructure

Tactical Planning Horizon

10A Alarms/SCADA Infrastructure Reliability Facility
10B Data Network Modernization
10C East Site Infrastructure
10D Electrical Infrastructure Upgrades Project
10E Electrical Capacity and Reliability
10F Emergency Management Facility (EMF)
10G LLNL City Water System Rehabilitation
10H Maintenance Operations Center
10J Replacement Office Building
10K Seismic Rehabilitation
10L Shared-use General Purpose Laboratory
10M Site 300 Infrastructure Revitalization
10N Site 300 Storm Drain Rehabilitation
10P Transition and Demolition Projects

C11: Counterterrorism and Counterproliferatio

Tactical Planning Horizon

11A Network Intelligence Research Facility (NIRF) coupled with a Sustainable HPC Infrastructure
11B Nuclear Security Science Center (NSSC)
11C 24/7 Operational NARAC/IMAAC Facility

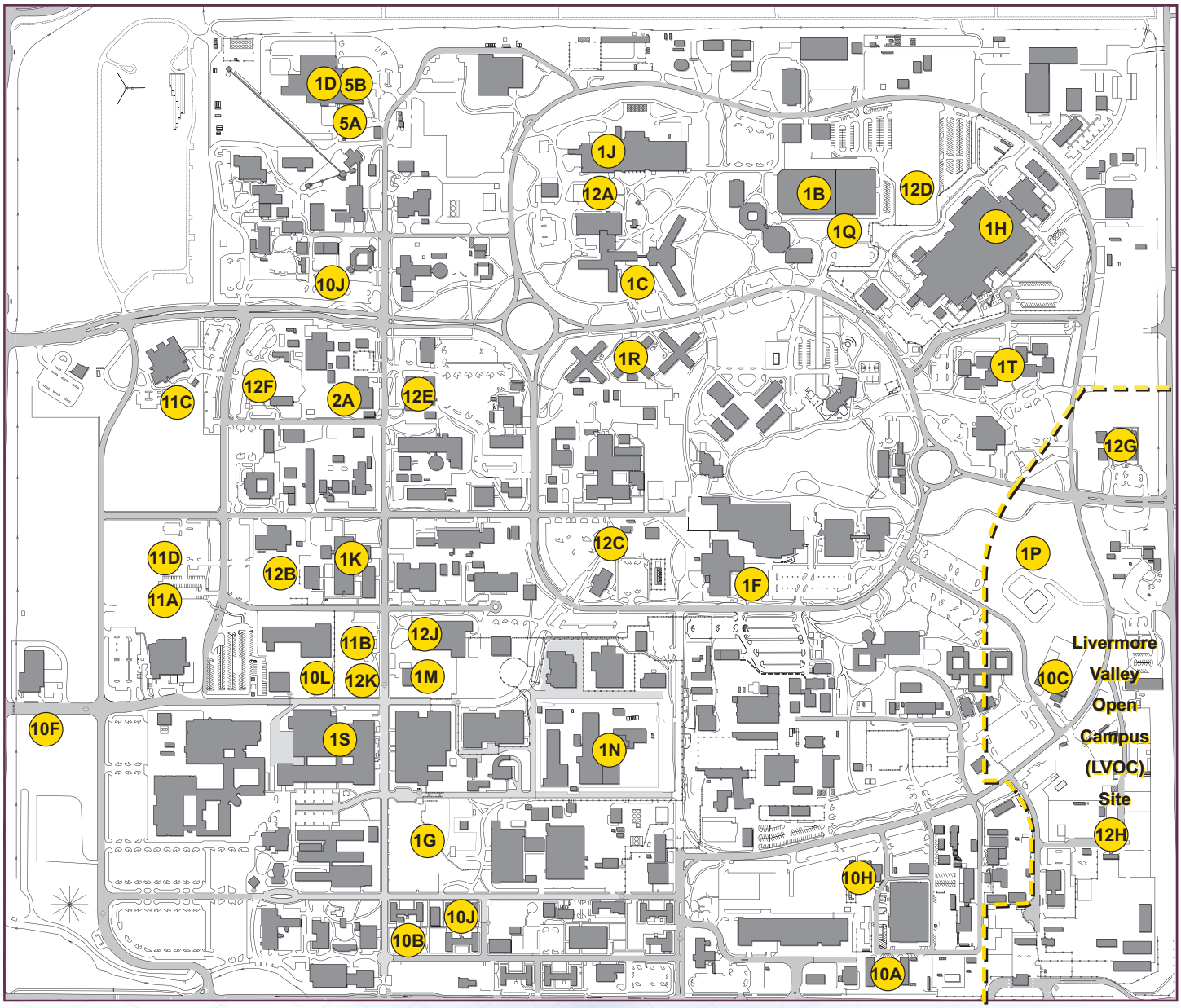
Strategic Planning Horizon

11D Integrated Global Security center (IGSC)

C12: Support of Other Mission/Program Capability

12A Center for National Security Photonics Collaborative Center
12B Counterproliferation R&D
12C BioSecurity and BioScience Research Facility
12D Diodes Facility
12E Earth Science Facility
12F Energy and Climate Complex
12G Hertz Hall Revitalization
12H LVOC location includes:
Office & Light Lab Incubator
High Performance Computer Innovation Center (HPCIC) Replacement Buildings
Institute for Translational Biomedicine Center
Manufacturing Learning Lab
Southeast Campus Revitalization
12J Materials Integration Facility
(1G) NEP Engineering and Materials Complex Replacement
12K Pulsed-Power Facility
12L Renewable Energy Center (at Site 300)
(1P) Sustainable Livermore Computing Center

Major Planned Projects



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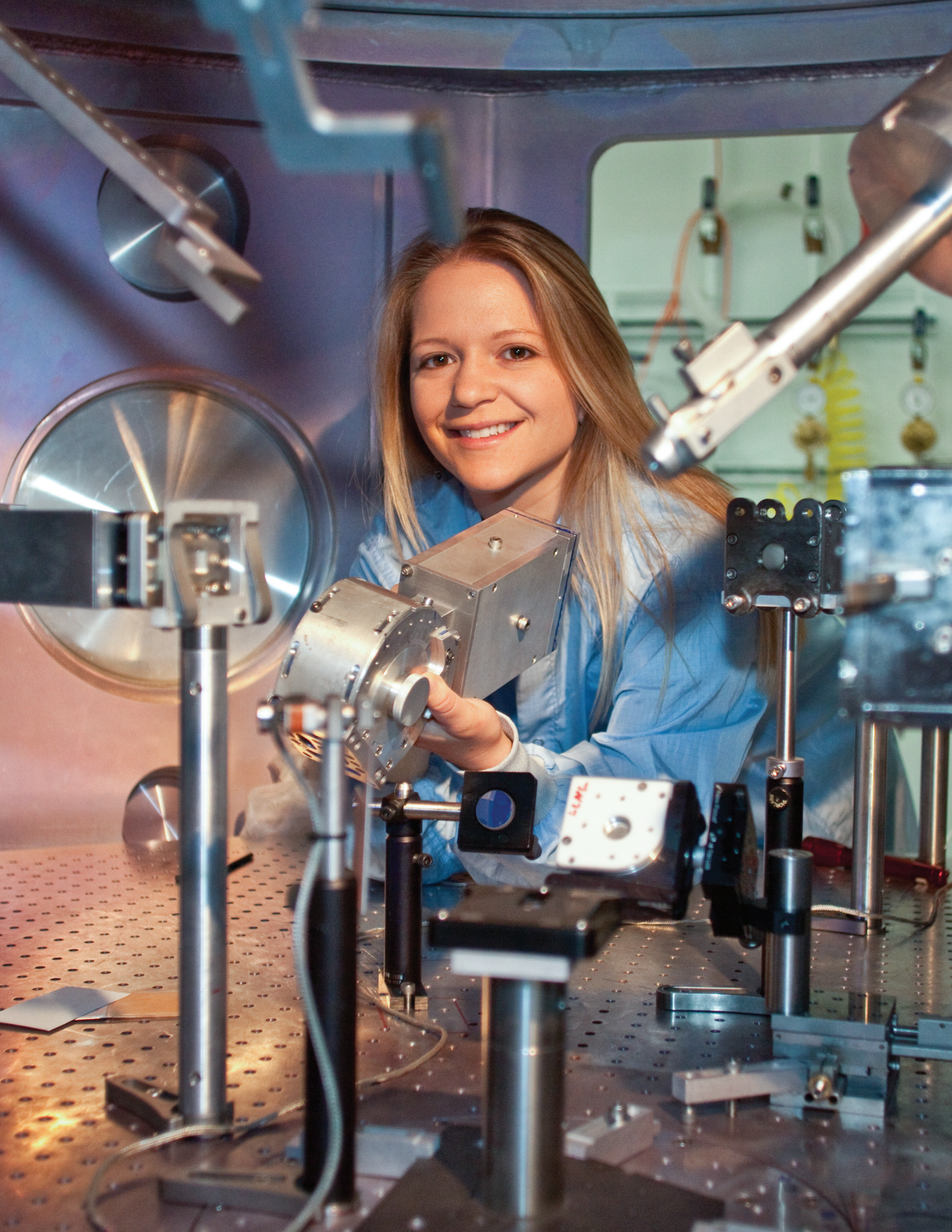


Section 6

Real Property Asset Management

To meet DOE Order 430.1B Real Property Asset Management, and to support NNSA real property performance goals, LLNL has established a corporate, holistic, and performance-based real property lifecycle asset management program. The program links real property asset planning, programming, budgeting, and evaluation to program mission projections and performance outcomes. Its process includes the prioritization of all real property related to preventive, corrective, and replacement maintenance activities, and ensures that these activities are performed in a safe, secure, compliant, and cost-effective manner that supports and enables world class science and technology.

To further enhance LLNL's asset management program, an effort is under way to migrate to a new top-rated off-the-shelf computerized asset management software, InforEAM. The software functionality is extremely robust, with capabilities of incorporating many of LLNL's current systems. This will ultimately pave the way for future enhancements and improve efficiencies.

The Laboratory's facility management organization is responsible for ensuring that operable and well-maintained infrastructure and facilities assets are in place to support site research missions and objectives.

Replacement Plant Value (RPV)		$ 6,837	Million		
Total Deferred Maintenance (DM)		$ 484	Million		
Site Wide Facility Condition Index (FCI)		7.09%			
		Facility Condition Index (FCI)	Asset Utilization Index (AUI)	# of Assets	Gross Square Feet (GSF) Buildings & Trailers (000's) **
Mission Dependency	Mission Critical	2.95%	93.87%	29	2,409
	Mission Dependent	8.45%	90.23%	253	1,848
	Not Mission Dependent	9.98%	68.15%	402	2,703
Facility Use *	Office	5.28%	83.76%	160	2,383
	Warehouse	7.25%	89.25%	86	261
	Laboratory	4.47%	81.69%	107	272
	Housing	0.00%	0.00%	0	0

Real property and asset management. All information in this chart includes both Site 200 and 300. "# of assets" column includes buildings, trailers, and other structures and facilities.

* Not all LLNL facilities are represented by the listed categories.

** Only includes gross square feet for buildings and trailers.

Site Footprint (Current and Future)

A footprint reduction initiative was completed that included moving operations out of underutilized and lower-quality, end-of-lifecycle facilities, thus reducing operating costs while improving work efficiency and safety. Pending demolition of vacated facilities, nonessential maintenance is suspended in these vacated facilities. This effort includes deactivating utilities (electrical, communications, gas, and compressed air) and tailoring surveillance to the lowest cost while maintaining safe conditions and regulatory compliance. The Laboratory has been banking reduced square footage in facilities since 2003, consistent with NNSA's one-for-one footprint policy.

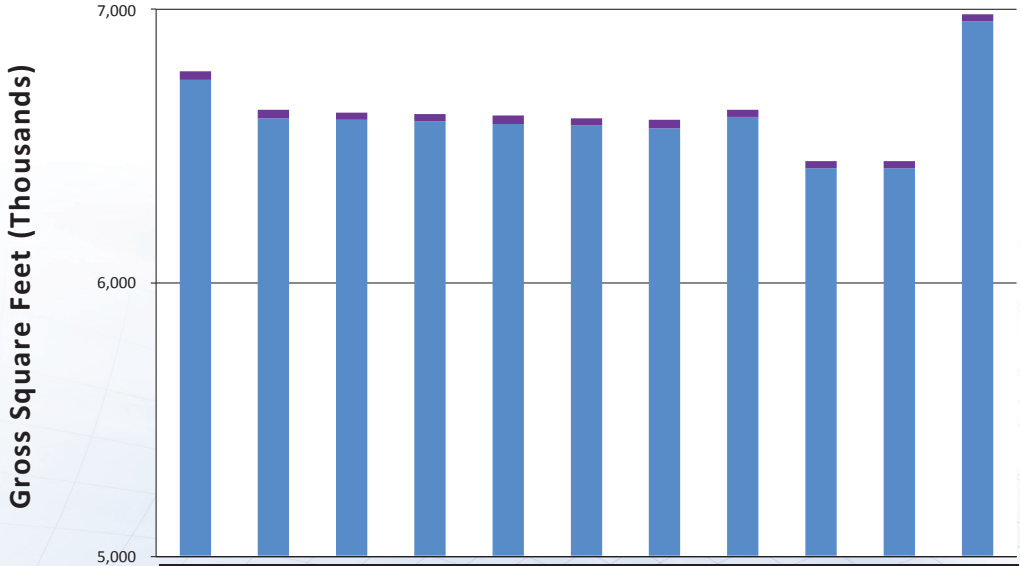
The Laboratory has made over-target progress in the aggressive Strategic Space Consolidation Initiative since 2007. From FY08 through completion in FY12, over 900K gross square feet (gsf) have been vacated and shut down. This level of consolidation is being maintained in FY13, however, fluctuations in population and program activities may require reactivation of some facilities to accommodate their business needs.

To address future needs, LLNL continues to consolidate program activities and optimize the use of permanent buildings while targeting temporary vacated and substandard facilities for excess. However, most of the permanent facilities are reaching their end-of-lifecycle, requiring refurbishment, modernization, or replacement. Given the high cost to repair seismic and technological deficiencies, in addition to the size of the backlog in deferred maintenance, building a new facility is often the most cost-effective solution to providing the needed capabilities while simultaneously reducing the deferred maintenance backlog.

Among the identified ST&E areas that constitute strategic priorities, state-of-the-art facilities are needed to allow LLNL to draw collaborative partners required to advance capabilities and provide the ability to requisite world-class forensics support in nuclear threat countermeasures. The Laboratory is pursuing new facilities to address the shortage of adequate office housing and to replace those in substandard conditions beyond the end of facility lifecycle. The long-term strategy is to vacate all WWII barracks and trailer facilities in conjunction with pursuing line-item projects for seismic upgrades and modernization of permanent enduring facilities.

New projects are proposed to address mission gap and the envisioned footprint location for site development planning. LLNL assesses the viability for facility consolidation and reassignment or recommends final disposition to await decontamination and demolition funding.

LLNL Footprint Projection (Buildings and Trailers)



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023-2038
Contractor Leased	-	-	-	-	-	-	-	-	-	-	-
DOE/NNSA Leased	30	30	30	30	30	30	30	30	30	30	30
Outgranted	-	-	-	-	-	-	-	-	-	-	-
DOE/NNSA Owned	6,741	6,600	6,593	6,588	6,578	6,572	6,566	6,603	6,416	6,416	6,952

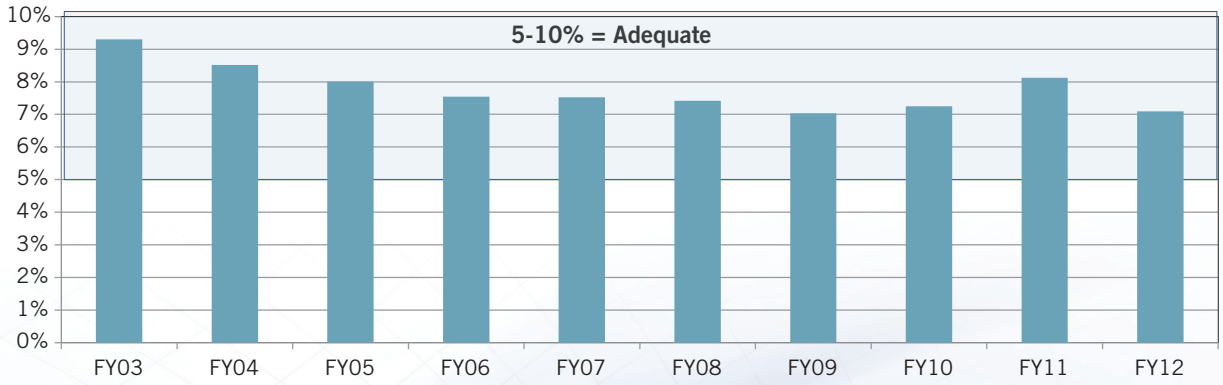
Facility Condition

Best practices developed at LLNL, in conjunction with FIRP, have resulted in LLNL exceeding the NNSA corporate goal developed early in FY07 for mission critical facilities to have an overall FCI of 5% or less. The FY12 FCI for mission critical facilities is 2.95%, which far exceeds the stated goal. LLNL has also met the NNSA FY12 goal for mission dependent, not critical facilities to have an overall FCI of 8.5% or less. LLNL's FY12 FCI for mission dependent, not critical facilities is 8.45%. It should be noted that as the NNSA FIRP ends, along with LLNL's limited funding, the ability to reduce and maintain a stabilized DM backlog and NNSA's FCI goals will be significantly impacted. It is anticipated that an NNSA recapitalization/modernization program would continue to contribute the needed resources to achieve the sustainment.

LLNL's fire alarm systems, emergency voice alarm systems, and direct digital control of HVAC systems are between 10 to 40 years old, and many systems are no longer supported by their vendors.

Building sprinkler systems require replacement of sprinkler heads at the 50 year mark which will impact many facilities in the next 10 years. Major investments are required to prevent major system failures. The electric utility system deferred maintenance backlog has been greatly reduced over the past ten years by replacing aged and obsolete components, however, it is expected that over the next ten years a significant amount of electric utility system equipment will require replacement as it will either be at the end of its useful life or become obsolete as technology changes. The overall 2014-2024 electrical demand forecast for LLNL will exceed the existing electric utility system substation gross capacity, and electric utility system substation capacity reinforcements will be required. Mechanical utility systems will require significant near term investments such as: refurbishment/replacement of cooling towers, pumps, and electrical gear.

LLNL Historical Facility Condition Index FY03-FY12



The addition of NIF to LLNL's FCI in FY12 significantly lowered LLNL's overall FCI.

To maintain the conditions of facilities and infrastructure to meet current and future mission needs, advancements must be made to clearly identify sustainment requirements. LLNL is working with DOE/NNSA and collaborating with the U.S. Army Corps of Engineers to develop and implement inspection-based facility sustainment modeling. Inspection-based methodology includes accurate estimating of sustainment requirements and related costs by assets throughout their lifecycles. LLNL plans to continue to develop, refine, and share this process as a tool, partnering with its DOE sponsors and other DOE sites. This type of modeling has the ability to identify, forecast, and plan preventive, major repair and replacement maintenance requirements.

Sustainment modeling holds the key that unlocks the door towards acquiring funding for effective and efficient facility stewardship across the complex. LLNL has also developed a set of time-dependent, full lifecycle models for real property and programmatic equipment. These computer models will be used to project infrastructure resource requirements from acquisition through mission lifecycle (operations, maintenance and repair, recapitalization) and transition and disposition.

Facility condition. FCI only provides metrics on a facility's existing building systems and does not include other negative contributors to facility adequacy such as seismic and contamination issues. Even with adequate resources to keep up the current level of maintenance, facilities face technical obsolescence amidst rapidly advancing technologies. F&I investment must balance cost-effectiveness of new construction against modernization of enduring facilities to ensure efficient sustainment of capabilities and meet mission requirements.

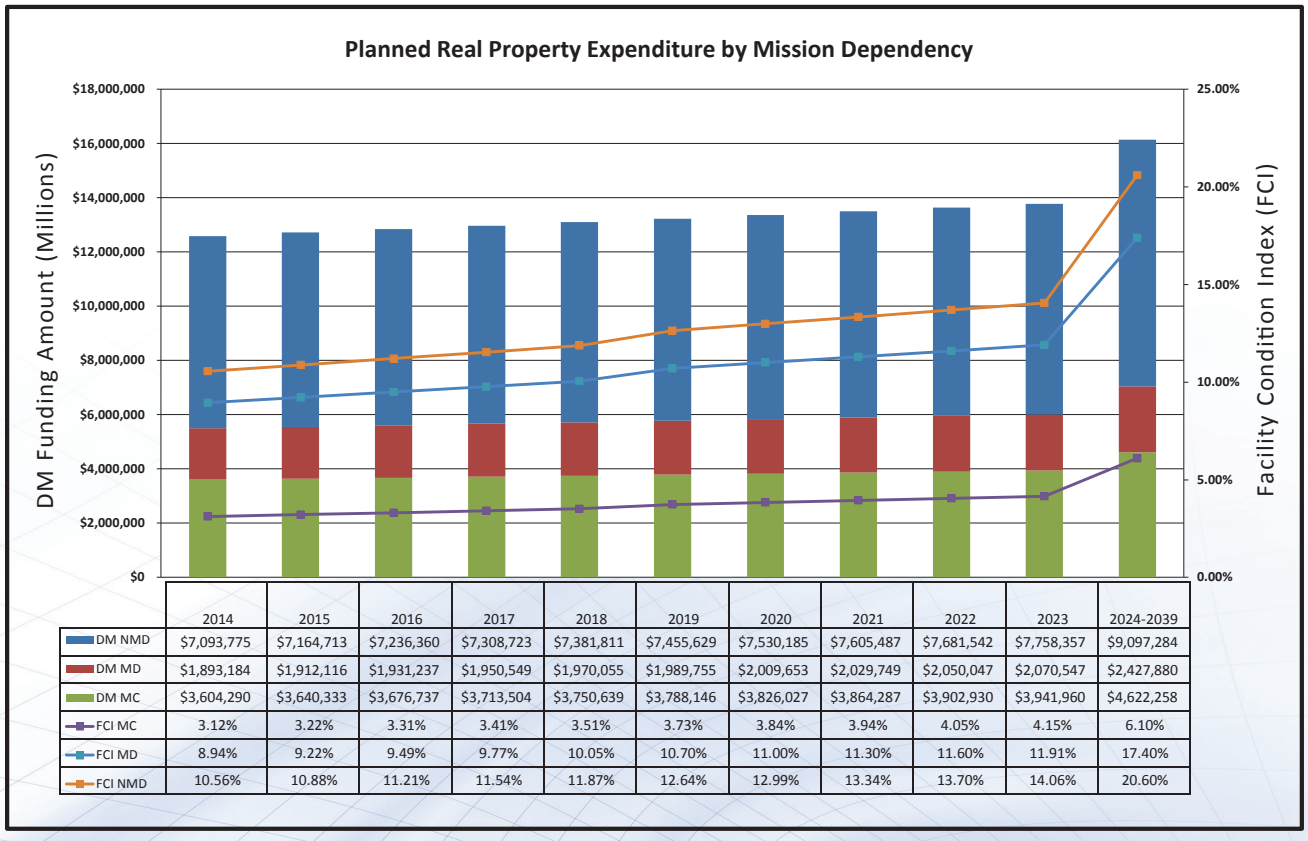
Deferred Maintenance Reduction

DM is managed by identifying and maintaining a comprehensive deficiency inventory based on field condition assessments. The Condition Assessment Survey (CAS) process at LLNL—identified as a best practice by the Government Accountability Office and the National Research Council—includes a detailed inspection and evaluation of all facilities on a continuing three-year cycle. Also, nuclear facilities and facilities with special hazards remain on an annual inspection cycle. Each inspected asset is tracked by multidiscipline inspection efforts (i.e., mechanical, electrical, architectural, roofing, and civil surveys).

In the past, LLNL could stabilize its DM through effective facility management practices, including an aggressive internal reinvestment program. However,current budget of record projections do not allow this level of flexibility. Currently, major trade-offs relating to 'run to fail' versus replacement maintenance are being made. These trade-offs have longer term impacts on the capability of many F&I assets to support enduring missions, such as execution of stockpile life extension programs and broader national security activities. LLNL continues to annually prioritize every deficiency in its total DM using the same mission-owner rating process with maintenance-specific ranking definitions. This prioritization process has become a best practice that allows LLNL to direct its limited funding to its most important maintenance replacements.

LLNL has been a significant contributor to NNSA's overall FIRP goal to reduce the FY03 DM adjusted baseline by $900M. The projects funded by FIRP at LLNL are linked to specific CAS FY03 baseline DM deficiencies. Of NNSA's $900M, LLNL's total FIRP reductions will reach $126M in FY03 baseline dollars by the end of FY13. When all funding sources are included, LLNL estimates it will contribute over $200M in total reductions to the FY03 DM baseline by the end of FIRP. The information in DOE's Facility Information Management System (FIMS) for LLNL can be verified and is consistent with all reported data elements in this TYSP.

Although current site DM has been significantly reduced, it now stands at $485M and is expected to grow through FYNSP 2015. The projected calculation is shown in the graph below.



	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024-2039
DM NMD	$7,093,775	$7,164,713	$7,236,360	$7,308,723	$7,381,811	$7,455,629	$7,530,185	$7,605,487	$7,681,542	$7,758,357	$9,097,284
DM MD	$1,893,184	$1,912,116	$1,931,237	$1,950,549	$1,970,055	$1,989,755	$2,009,653	$2,029,749	$2,050,047	$2,070,547	$2,427,880
DM MC	$3,604,290	$3,640,333	$3,676,737	$3,713,504	$3,750,639	$3,788,146	$3,826,027	$3,864,287	$3,902,930	$3,941,960	$4,622,258
FCI MC	3.12%	3.22%	3.31%	3.41%	3.51%	3.73%	3.84%	3.94%	4.05%	4.15%	6.10%
FCI MD	8.94%	9.22%	9.49%	9.77%	10.05%	10.70%	11.00%	11.30%	11.60%	11.91%	17.40%
FCI NMD	10.56%	10.88%	11.21%	11.54%	11.87%	12.64%	12.99%	13.34%	13.70%	14.06%	20.60%

Space Utilization and Consolidation

Historical, current, and projected space requirements are analyzed and presented using office space metrics and directorate-specific portfolios. This comparative analysis is made within Laboratory organizations and also with other multiprogram continuing mission sites. Each directorate portfolio is updated on an annual basis. The facilities portfolio and space utilization data are linked directly to LLNL's Facility Information Tracking System (FITS) and DOE's FIMS for use in the overall real property management.

The Laboratory organizations review their space needs to reduce underutilized space and returning surplus facilities to the institution for shut-down. The organization-specific space-tracking process assists in strategic space planning, feasibility studies, and migration plans, as well as developing workstation standards and requirements for space repurposing and consolidation scenarios.

LLNL uses a single point-of-contact governance board for facility reassignments and re-use of space, and facilitates the Laboratory's continuing efforts in consolidation.

Sustainability/Energy

As defined in the LLNL FY13 Site Sustainability Plan, the Laboratory vision for site sustainability is to supply its programs with optimal conditions for success while undergoing continual improvement to existing energy infrastructure; to collaborate with growing mission areas to identify ways to move toward more energy-efficient solutions for energy-intensive facilities; to pursue innovative renewable energy generation both for on-site use and as an ongoing research area; and to incorporate energy efficiency improvements into LLNL's on-going energy management and facility operations.

LLNL will continue to identify methods to reduce greenhouse gases (with priority on sulfur hexafluoride [SF6] emissions in utility components) and to develop "green" buildings: four buildings are currently LEED–certified; an additional 13 buildings have met the guiding principles for the federal High Performance Sustainable Buildings requirements.

While LLNL's current contracted cost of delivered electricity is very low (~$0.05 per kilowatt hour), LLNL has renewed its efforts to identify private-sector funding for renewable projects to provide power and is committed to executing its Site Sustainability Plan. Land use on site would evolve with opportunities to implement sustainability projects such as solar array installations at the site perimeter or on other existing land within the boundaries of the Livermore Site and Site 300.

Existing resources will be leveraged as much as possible to achieve LLNL's sustainability goals. Indirect funding will be used to replace and upgrade aged F&I equipment with the most energy-efficient and cost-effective replacements.

LLNL is facing an on-going energy challenge as the Laboratory is poised to grow in mission areas that are particularly energy-intensive. This is indicative of the Lab's successful efforts in research and technology development. However, LLNL's success will impact its energy intensity and greenhouse-gas emissions.

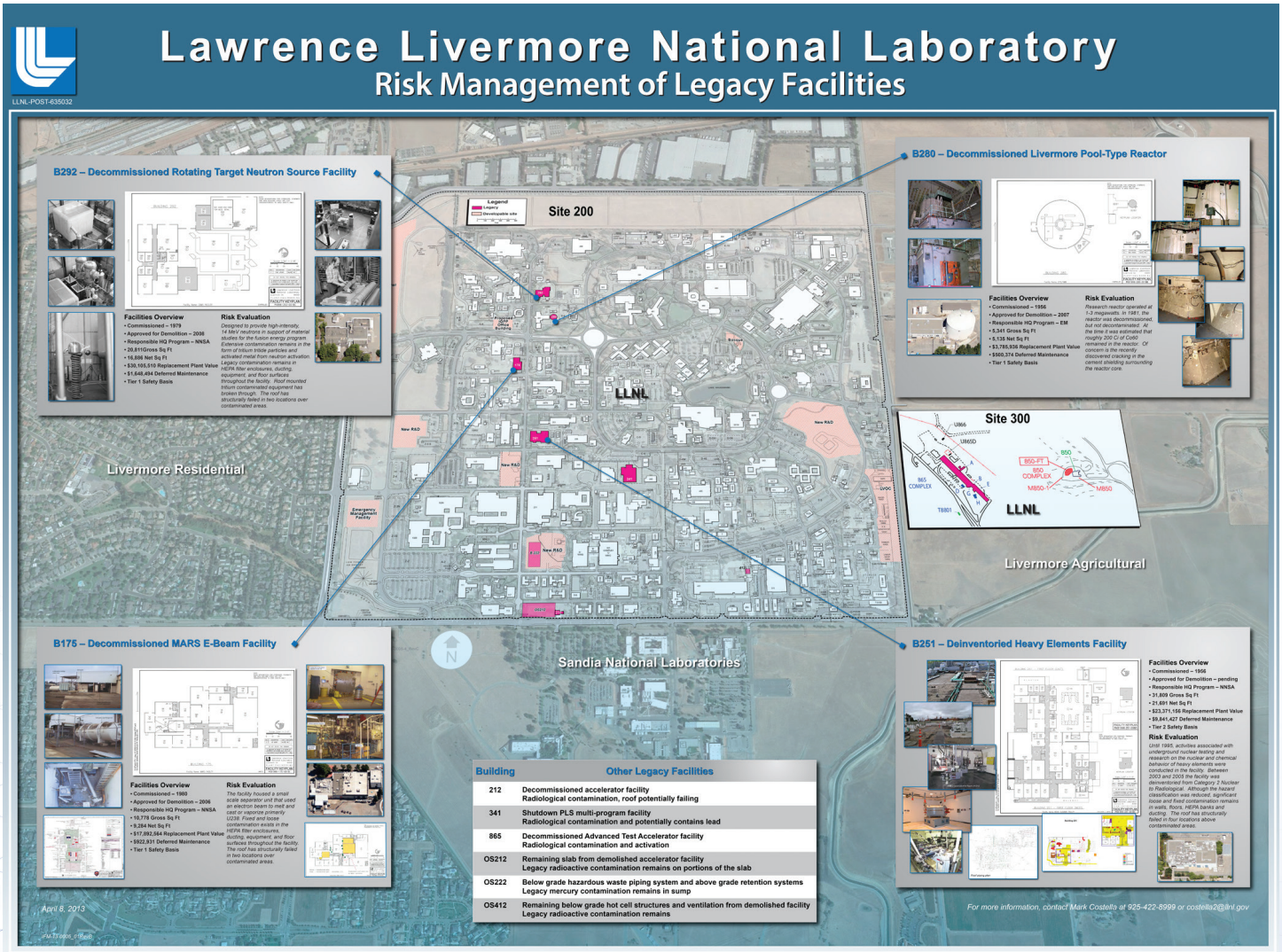
The above scenario will be the case even as new computing centers and prospective new facilities are designed and built to be as efficient as possible. Another set of challenges are driven by regulatory compliance from local agencies, such as the Bay Area Air Quality Management District, necessitating early replacement of a large portfolio of boilers for heating of buildings.

Transition, Disposition, and Long-Term Stewardship

Overview

As LLNL carries out its national security missions, the Laboratory strives to assure its facilities portfolio meets the latest technologies and enables infrastructure needs. Past mission objectives have left the Laboratory with many process contaminated, failing, and obsolete facilities. These facilities were closed through LLNL's strategic consolidation effort in support of NNSA's enterprise-wide footprint reduction directive and in concurrence with the NNSA Livermore Field Office (LFO). A subset of these facilities have been deemed "legacy encumbered" facilities; those requiring significant safety systems and ES&H oversight to ensure containment, monitoring, as well as limited remediation of legacy contamination. Access to these facilities is limited to trained and authorized personnel only.

Because site stewardship is of the highest priority at LLNL, the Laboratory is committed to removing legacy contamination from the workplace and provide a safe and secure work environment for Laboratory employees and visitors. For example, several areas in Building 321C, a mission critical engineering facility, are contaminated with beryllium and a decontamination project is underway to restore 32,000 square feet of space.



Delivery

LLNL assures the protection of workers, public, and the environment from existing and future hazards; provides an informed platform from which to develop transition, disposition, and stewardship actions; and aligns the transition, disposition, and long-term stewardship effort with new and evolving mission needs.

While the facilities await final demolition funding, the following transition, disposition, and stewardship actions have been implemented:

- operating and maintenance costs have been reduced by achieving inactive state;
- required safety controls are being maintained; and
- monitoring and surveillance is being performed.

Compliance

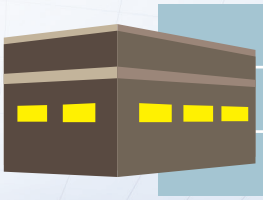
Activities are required to protect workers, the public, and the environment from hazards associated with closed facilities while:

- mission operations are closed out;
- near-term mitigation and stabilization activities are conducted;
- baseline characterization is determined; and
- long-term stewardship is established.

Evaluation, assessment, and documentation are governed by the following:

- Federal directives
  - DOE G 430.1–2, "Implementation Guide for Surveillance and Maintenance during Facility Transition and Disposition"
  - DOE G 430.1–3, "Deactivation Implementation Guide"
  - DOE O 430.1B, "Real Property Asset Management"
- LLNL requirements
  - ES&H Manual Document 12.7, "Shutdown or Transfer of Facilities, Operations or Associated Equipment"
  - ES&H Manual Document 12.8, "Decontamination and Disposition of Process-Contaminated Facilities and Associated Equipment"

Decontamination activities in Building 321.



Total closed facilities	Facilities (of the total) that pose significant risk to ongoing mission, workers, the public, and/or the environment
127 facilities	32 facilities
769,478 GSF	584,395 GSF
$706,359,783 RPV	$491,271,374 RPV

Headquarters Collaboration

LLNL is an active participant and supporter of the NA-00-20 Facilities Disposition Prioritization (FDP) Working Group. Great strides have been made in establishing an enterprise-wide legacy facilities risk prioritization process. At the request of NNSA, 2012 efforts established a footprint prioritization process which was updated in 2013 to reflect a risk based prioritization.

LLNL has ranked its legacy facilities using the FDP Working Group criteria, which focuses on risk, cost and political consequence. The complete list was communicated to NNSA with a focus on the top ten legacy facilities. This list has been consistently presented in the rank order shown in the table below.

Top 10 Legacy Facilities

	Facility	Gross Sq. Ft.	Net Sq. Ft.	Federal Owner	Status
1	251*	31,128	21,968	NNSA	Legacy Encumbered
2	292	20,811	16,886	NNSA	Legacy Encumbered
3	280	5,469	5,307	EM	Legacy Encumbered
4	175	10,778	9,284	NNSA	Legacy Encumbered
5	212	3,770	2,761	NNSA	Legacy Encumbered
6	341	44,184	33,091	NNSA	Legacy Encumbered
7	865	61,360	54,923	NNSA	Legacy Encumbered
8	OS212	71,001	71,001	NNSA	Legacy Site Aspect
9	OS222	0	0,	EM	Legacy Site Aspect
10	OS412	13,700	13,720	NNSA	Legacy Site Aspect

* Recognized by the FDP in the Integrated Project List as a top candidate for action as funds become available.

Legacy Encumbered: Abandoned contaminated programmatic equipment and/or buildings requiring some level of facilities management and/or ES&H monitoring and surveillance.

Legacy Site Aspect: Generally a residual slab or below grade system; managed similarly to Legacy Encumbered.

Constraints and Actions Forward

Federal funding is not anticipated until FY15. In the interim, risk and consequence data is continually being updated, envelope and contamination control issues are being tightly monitored, and response to system and controls failures are acted upon discovery.

In response to the DOE mandated "Freeze the Footprint" directive from the Executive Office of the President, Danny Werfel, March 14, 2013, LLNL has developed a tighter integration to tie the needs of emerging and innovative science and the constraints posed by closed facilities and legacy aspects.

Completed Risk Mitigation Projects

Recent site funding addressed a few high-risk mitigation projects.

HVAC on roof before and after removal

B221 — Chemistry and Material Science Office Facility

Risk: HVAC unit falling through failing unstable roof

Mitigation: Removed unit. Transitioned building to cold and dark status.

Lead vault before and after clean out

B281 — Support Facility to 280 LPTR

Risk: Deteriorating condition of rad sources and samples in lead lined vault abandoned by program

Mitigation: Characterized and disposed of inventory. Sealed vault.

Before and after application of protective cover

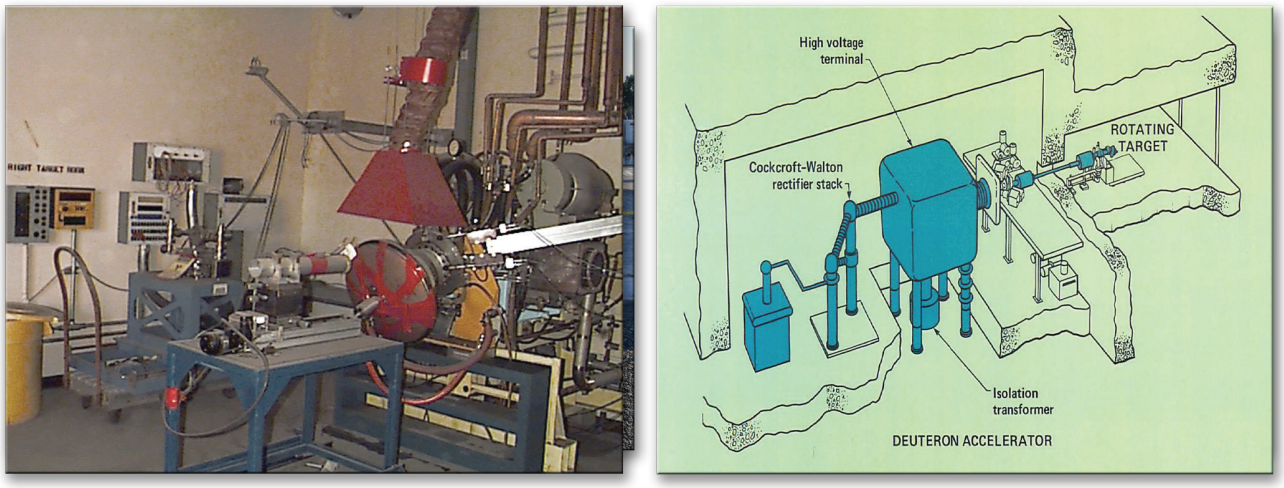
OS412 — Remains of B412 – Hot Cells

Risk: Water infiltration into below grade hot cell bases

Mitigation: Installed new roof

The scope of remediation activities includes real property as well as process equipment.

B251 roof failure



B292 target rooms; characterization and systems stabilization

B292 roof failure

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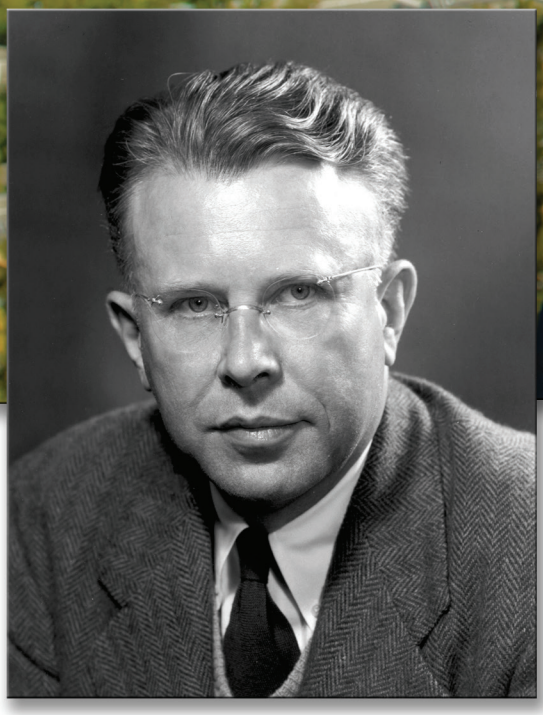
"People come here because they want to work with the very best—the best people, the best facilities, the best workplace environment."

—Penrose "Parney" C. Albright



"Scientific achievement is rooted in the past, is cultivated by contemporaries, and flourishes only in a favorable environment. No individual is alone responsible for a single stepping stone along the path of progress."

—Ernest O. Lawrence


103
Lr
lawrencium
116
Lv
livermorium