



NNSA Safety-Infrastructure Integration

Jim McConnell
Associate Administrator for
Safety, Infrastructure and Operations
February 2017

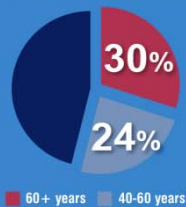
NNSA SAFETY, INFRASTRUCTURE & OPERATIONS

A VAST AND COMPLEX ENTERPRISE



THE CHALLENGE: AGING & DECLINING INFRASTRUCTURE

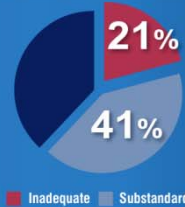
AGE OF FACILITIES



EXCESS FACILITIES



CONDITION OF FACILITIES



Vision

Safely operate and modernize our enterprise to meet demands now and in the future.

Mission

Maintain, Operate, and Modernize NNSA Infrastructure in a safe, secure, and cost-effective manner to enable program results.

41,000

LABORATORY & PLANT EMPLOYEES

2,000
miles of roads

NEARLY THE DRIVING DISTANCE FROM DC TO LOS ALAMOS



TRACK **400,000**
METRIC TONS OF
NUCLEAR MATERIALS



safety for **400**
nuclear facilities



2,160
square miles
of land area

ABOUT
THE SIZE
OF DELAWARE

36 Million
SQ. FEET OF
FACILITY SPACE



(~ six Pentagons worth)

15.2 MILLION FT³
OF HAZMAT

ENOUGH TO FILL - 15
WASHINGTON MONUMENTS



9.1 Trillion BTUs
ANNUAL ENERGY CONSUMPTION



enough to
power
~ 250,000
homes for
one year



Bottom Line Up Front



Challenges

- NNSA's infrastructure is too big, too old & too brittle
- Failures are increasing in frequency, severity & unpredictability
- Infrastructure risks become safety & program risks

Strategic Objectives

- Ensure safe operations
- Arrest the declining state of NNSA infrastructure
- Modernize NNSA facilities/equipment & halt the growth of Deferred Maintenance
- Deliver construction projects on time & under budget with safety designed-in
- Dispose of excess facilities

Progress

- Established the Office of Safety, Infrastructure & Operations
- Created new, data-driven, risk-informed management tools
- Integrated safety into the construction design & review process
- Increased Maintenance/Recapitalization funding & begun to achieve improvements
- Established Master Asset Planning process

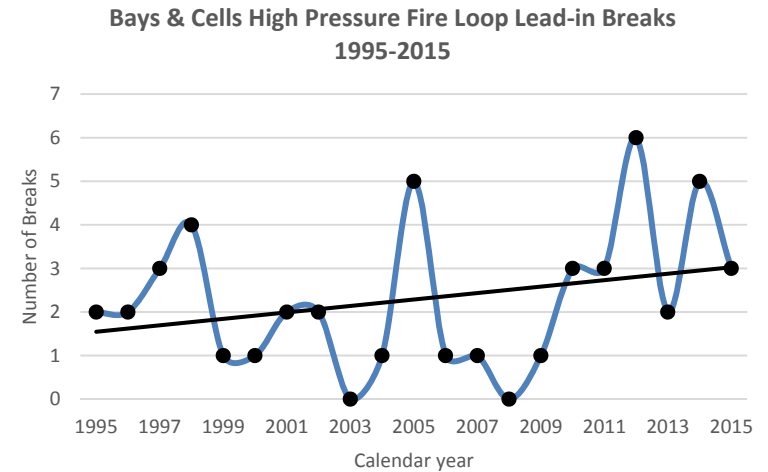
Investments are needed over 15-20 years to reach steady state



Infrastructure Challenges



- Risk & inefficiency posed by poor condition of operating & excess facilities
- Failures are increasing in frequency, severity & unpredictability
 - PX: High Pressure Fire Loop (HPFL) failure (July 2016)
 - LANL: Diesel Engine for Fire Water Pump failure at PF-4 (August 2016)
 - Y-12: Kathabar dehumidification unit in Beta-2 taken out of service due to failed exhaust duct clamp (September 2016)
- Infrastructure risk becomes safety & program risk



LANL Diesel Engine Failure



Y-12 Kathabar System Failure

NNSA infrastructure is too big, too old & too brittle



Nuclear Criticality Safety Program



- **DOE Nuclear Criticality Safety Program (NCSP)**
 - Goal: Continue to improve the criticality safety infrastructure necessary to ensure safe, efficient operations from a criticality safety perspective
 - NCSP provides sustainable expert leadership, direction, and the technical infrastructure to develop, maintain and disseminate essential technical tools, training, and data required to support safe, efficient fissionable material operations within the US DOE
- **NCSP provides funding for the National Criticality Experiments Research Center**
 - Conducts critical experiments and trains current and future nuclear criticality safety personnel.
- **NCSP five technical elements:**
 - Analytical Methods
 - Information Preservation & Dissemination
 - Integral Experiments
 - Nuclear Data
 - Training & Education
- **Three Technical Expertise Groups:**
 - Criticality Safety Support Group
 - Criticality Safety Coordinating Team
 - Nuclear Data Advisory Group
- **NCSP information:** <http://ncsc.llnl.gov/planMain.html>



Nuclear Safety Research & Development



- **Process is separate, but informed from DOE (AU-executed) NSRD process. Collaborate with NA-10 on ranking all R&D including Defense Stockpile Weapons**
- **On an annual basis, NNSA reviews proposals and top proposals are funded. Recent examples:**
 - Pipe Overpack testing at SNL
 - Nonlinear Soil-Structure Interaction Analysis (seismic)
 - Portable, Rapid, Interim Smoke Monitoring - Deployable wireless fire alarm system to monitor fire suppression system outages
 - In Situ NCS Holdup Monitoring (SNAPSHOT)

As a separate project, NA-51 is developing an effort to evaluate Nonlinear Dynamic Analysis (NLDA) of PF-4 seismic behavior

- Requirements and Criteria document for RFP being finalized
- NLDA RFP will be issued in FY 17
- Funding to be provided by NA-50
- NLDA may inform NNSA of best facility improvements for enhanced seismic safety



Operations & Maintenance



Scope

- Operations of facility functions including safety equipment
- Most ES&H functions (e.g., Safety Bases, ORRs, USQs) & Waste Management
- Preventive & Corrective Maintenance
- Source of funding for emerging issues, including nuclear & industrial safety

Initiatives

- Projectizing of major maintenance activities (e.g., Nuclear Facilities Electrical Modernization at Y-12)
- Centralized procurements under Asset Management Programs
- Safety professionals selected as HQ Site Portfolio Managers

New, Data-Driven, Risk-Informed Tools

- Mobile Maintenance Work Packages replacing paper at LANL (25% now; goal 90%)
- Implementing Computer Based Procedures and Video Procedures
- Integration of Mobile Work Packages; Computerized Maintenance Management Systems; and BUILDER



Recapitalization & Disposition



Prioritization

- Recapitalization & Disposition use risk-based prioritization that include safety
- Prioritization scores along with the M&O Partner's priority ranking & stakeholder interests are used as an aid for determining the final Integrated Priorities List
- The Recapitalization project prioritization criteria is shown in the chart below

Factors	Description	Weight
Safety Risk Reduction	Safety risks range from expensive, productivity limiting compensatory measures to significant events (e.g., accidents or environmental releases) which could shut down operations for extended periods. The calculation is based on the total Safety Risk Reduced divided by Total Project Cost (TPC).	35%
Program Risk Reduction	Program risks range from older systems with less capability and throughput than current models to obsolete systems with no replacement parts and frequent shutdowns for corrective maintenance. The calculation is based on the total Program Risk Reduction multiplied by Mission Dependency Index (MDI) divided by TPC.	35%
Sustainability & Productivity Return on Investment	Savings range from reduced resource consumption and lower annual operating costs. The calculation is based on the total sustainability, operating, and programmatic cost savings divided by TPC.	20%
Deferred Maintenance Reduction	The calculation is based on the Deferred Maintenance (DM) Reduction divided by TPC.	10%



Integrating Safety into the Design Process



- **Office of Safety (NA-51) provides dedicated support to NNSA Acquisition and Project Management (NA-APM), Program Offices, and the Project Management Executive (PME) in the oversight of nuclear facility design and construction.**
- **Chief, Defense Nuclear Safety (CDNS) responsibilities for design and construction activities are defined in DOE Order 413.3B, *Program and Project Management for the Acquisition of Capital Assets***
- **CDNS reviews the Safety Design Strategies (SDS) for nuclear projects and provides formal advice to the Safety Basis Approval Authority (SBAA) and the Federal Project Director (FPD).**
 - CDNS reviewed six Safety Design Strategies in 2016 and transmitted the associated Advice memos
- **CDNS staff manages the process and participates in the review of nuclear safety in design requirements during annual NA-APM reviews and DOE External Independent Reviews (EIRs) of NNSA nuclear construction projects.**
 - NA-51 routinely supports these project reviews with needed subject matter experts (Fire Protection, Criticality Safety, Quality Assurance, Industrial Hygiene, etc.)
 - The staff performed twelve reviews of NNSA nuclear construction projects in 2016, each of which included an evaluation of integration of safety into the design process.



Summary



Challenges

- NNSA's infrastructure is too big, too old & too brittle
- Failures are increasing in frequency, severity & unpredictability
- Infrastructure risks become safety & program risks

Strategic Objectives

- Ensure safe operations
- Arrest the declining state of NNSA infrastructure
- Modernize NNSA facilities/equipment & halt the growth of Deferred Maintenance
- Deliver construction projects on time & under budget with safety designed-in
- Dispose of excess facilities

Progress

- Established the Office of Safety, Infrastructure & Operations
- Created new, data-driven, risk-informed management tools
- Integrated safety into the construction design & review process
- Increased Maintenance/Recapitalization funding & begun to achieve improvements
- Established Master Asset Planning process

Investments are needed over 15-20 years to reach steady state



Backups





Results



Before

After

Y-12 Bldg. 9204-2 Oven Room Ceiling Repair



Pantex Bay/Cell and Lead In/Flame Detection System



NNSA Lead In Line Replacements



Results



SNL Tonopah Main Distribution Hub



Before



After

LANL Casa 3 Demolition



SRS Fire Suppression Modifications



LLNL B131 Chiller Replacement



Recapitalization Projects at TA-55



TA-55 Facility Control System Modifications

Install controllers, transmitters, and part replacement of embedded systems that monitor facility conditions and the safe operability of PF-4.



RLWTF Collection Ground Leak Detection Alarm Upgrade

Replace the 40 year old secondary leak detection alarms that are a requirement of the new Ground Water Discharge Permit to be issued by the State of New Mexico. PF-4 cannot operate without this system in operations.





(cont.) Recapitalization Projects at TA-55



TA-55 Seismic Event Safety Mitigations

Modifications performed to improve the shear capacity of the interior roof girders. The stirrup reinforcement prevents shear cracking and spalling of the girder



TA-55 Potable Water Loop Replacement

Replace the existing severely corroded steel pipe line that services domestic water needs for TA-55.

