Applying Agile Development Techniques to Improve Program, Portfolio & Enterprise Management

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NATIONAL NUCLEAR SECURITY ADMINISTRATION (NNSA)
DEPARTMENT OF ENERGY (DOE)

National Nuclear Security Administration

NNSA History

1948 The Atomic Energy Commission (AEC) formed

1977 The DOE Organization Act of 1977

1940 1950 1960 1970 1980 1990 2000 2010

1942 Manhattan Project underway

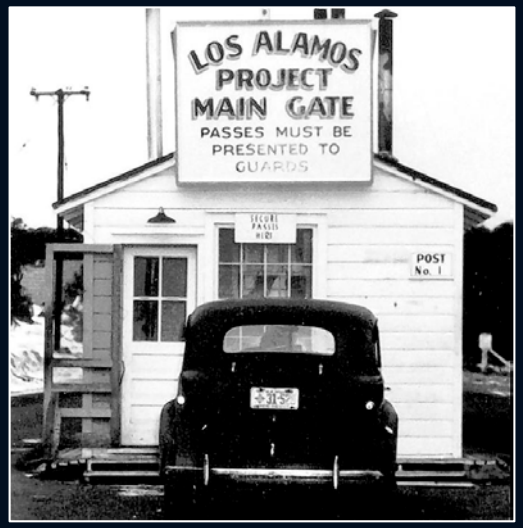
1954 The Atomic Energy Act of 1954

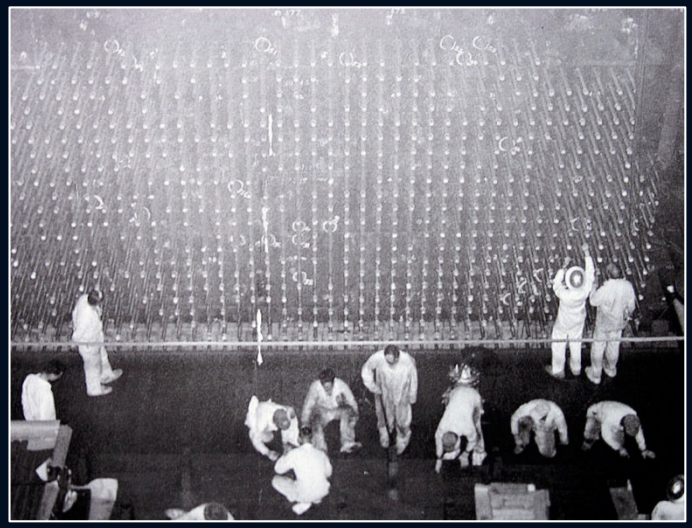
President Eisenhower signs the bill in an official signing ceremony. The Atomic Energy Act of 1954

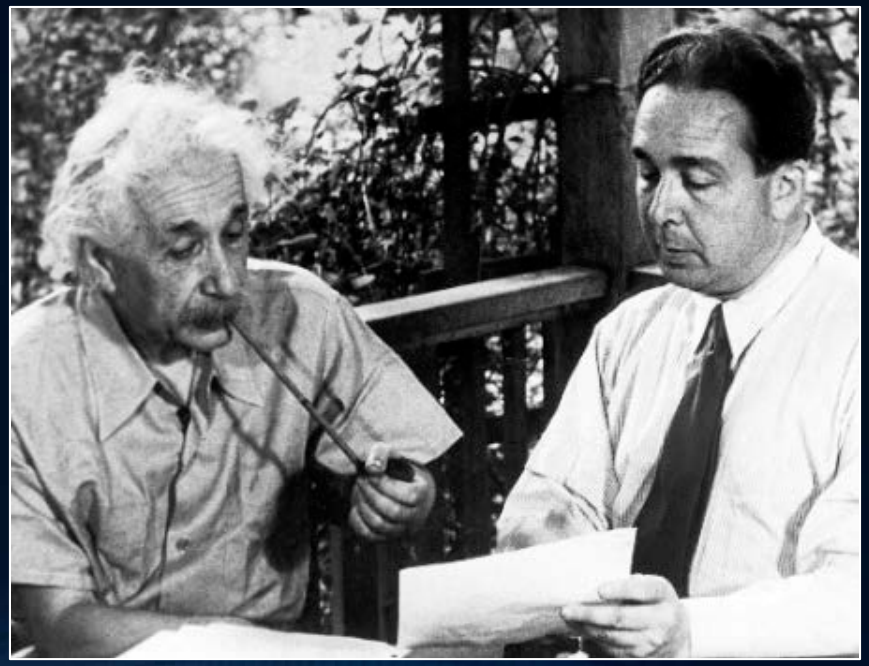
2000 National Nuclear Security Administration (NNSA) established

National Nuclear Security Administration

Manhattan Project







NNSA Mission

- Maintaining the safety, security & effectiveness of the nuclear deterrent
- Preventing, countering & responding to proliferation and terrorism threats
- Providing operational support for naval nuclear propulsion plants

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

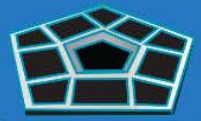
TRACK **400,000** METRIC TONS OF NUCLEAR MATERIAL TRANSACTIONS

safety for **400** nuclear facilities

2,160 square miles of land area

ABOUT THE SIZE OF DELAWARE

36 Million SQUARE FEET OF FACILITY SPACE



(~six Pentagons worth)

15.2 MILLION FT³ OF HAZMAT

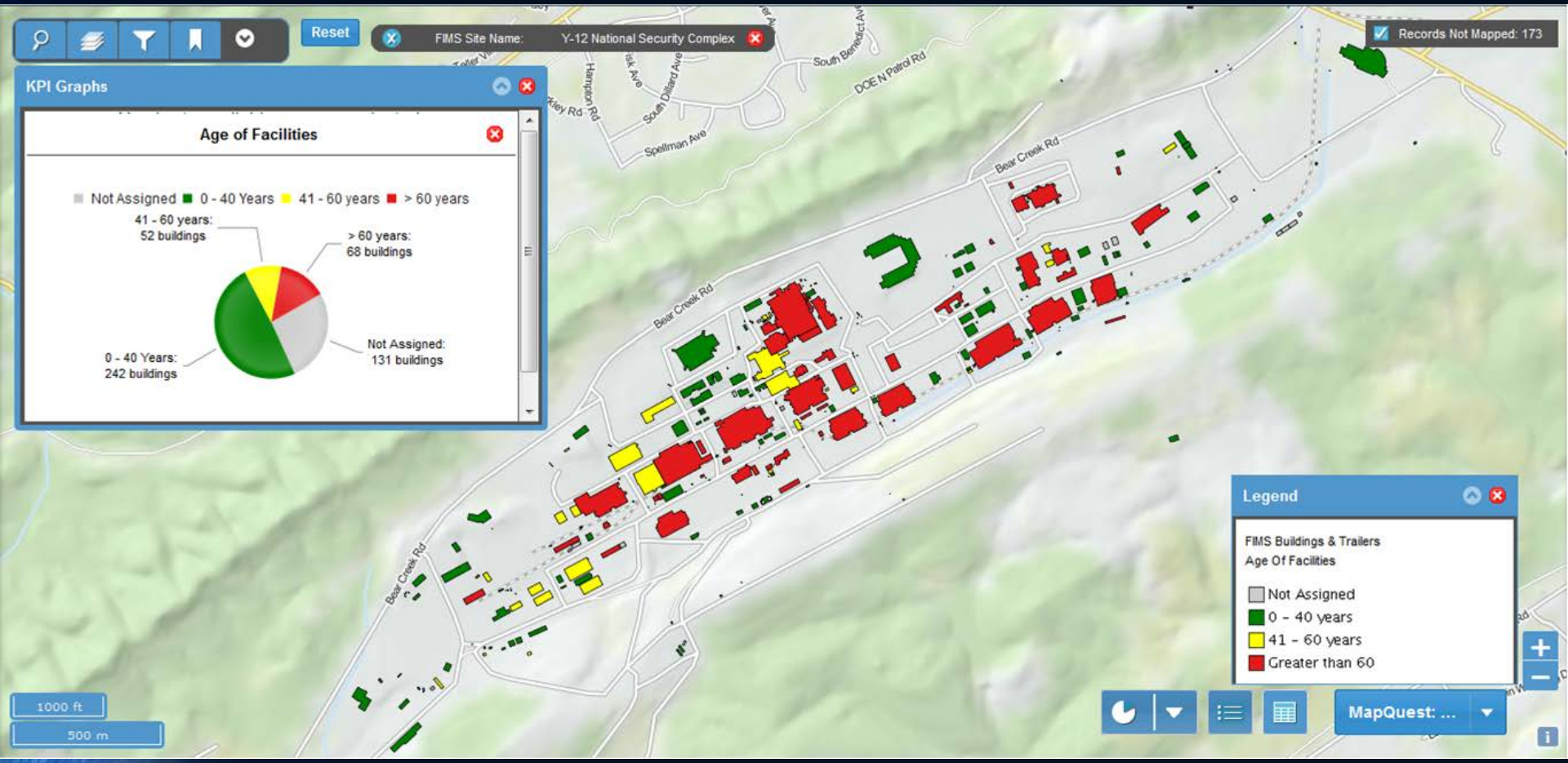
ENOUGH TO FILL ~15 WASHINGTON MONUMENTS

9.1 Trillion BTUs ANNUAL ENERGY CONSUMPTION

enough to power ~250,000 homes for one year

JULY 2015

Legacy Infrastructure



- More than 6,000 facilities located on 2,160 square miles in seven states
- Safely operating & modernizing this nuclear security enterprise with over $50 billion in real property assets

Challenges

NNSA infrastructure is too big, too old & too brittle

- Facilities & systems are well beyond end-of-life
- Block obsolescence limits maintenance & repair options
- Excess facilities pose unacceptable risks

Failures are increasing in frequency, severity & unpredictability

- Multiple Fire Suppression Breaks
- Multiple HVAC failures resulted in program delays
- Multiple roof leaks/failures
- Electrical Distribution Panel fire at Y-12

Outdated processes & tools

- 70 year old infrastructure management methodology
- Analytical methods & performance measures based on financial surrogates & do not capture relative importance or physical condition of facilities

Infrastructure risks become safety & program risks

Roof Failure

Electrical Panel Fire

Roof Leak

Fire Suppression Lead-in Line Corrosion

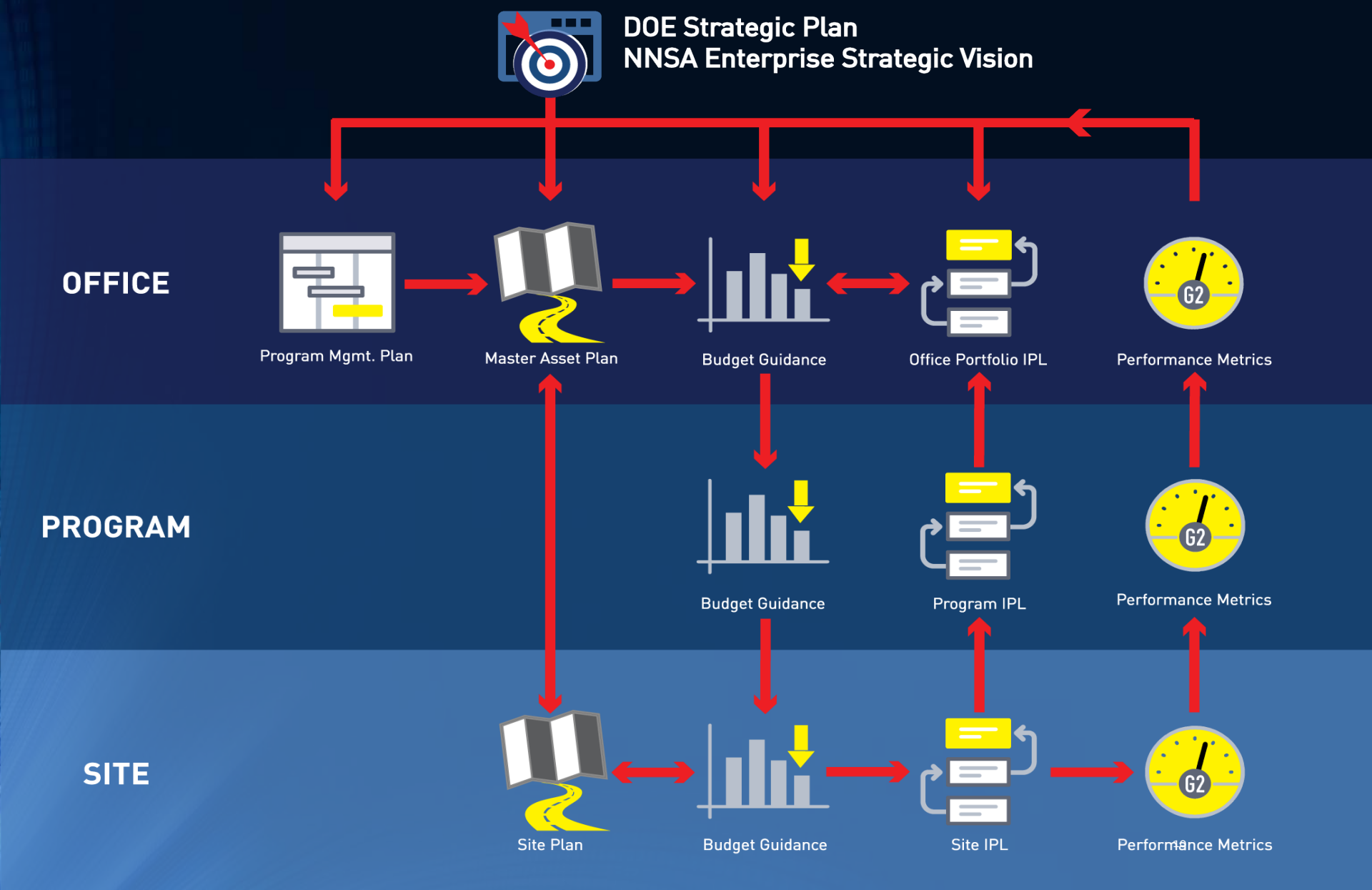
Tackling the Challenges

- **Garnering sustained, strategic infrastructure investments**
  - Prioritizing investments for recapitalization & disposition
  - Right-sizing NNSA capabilities & infrastructure
  - Enhancing transparency of excess facilities & general purpose infrastructure
- **Revolutionizing NNSA infrastructure management**
  - Advancing infrastructure investment decision making
  - Improving infrastructure management tools
  - Accelerating recapitalization activities
  - Repurposing, reusing, deactivating, or disposing of facilities
  - Increasing purchasing power
- **Applying Agile best practices to our Program Management Process**

Agile in Program Management

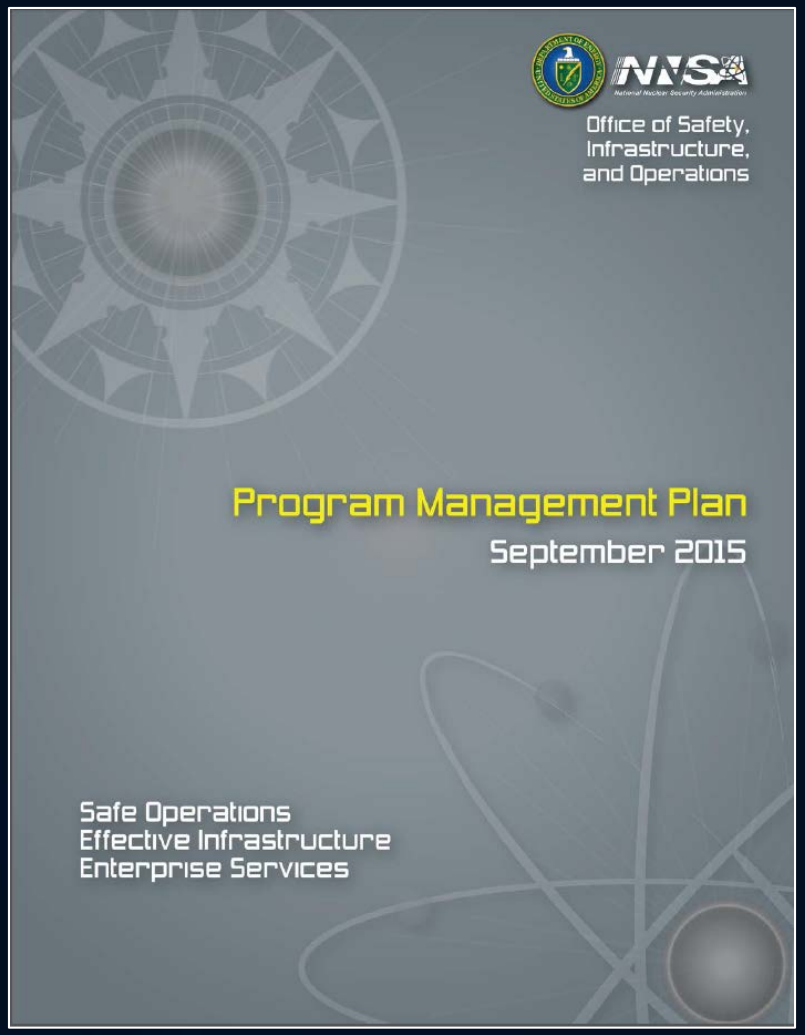
- Adopting Agile techniques enables NNSA to make the best use of Federal resources
- In the past year, NNSA has
  - Applied Agile techniques to deploy innovative, revolutionary processes & management tools to facilitate a data-driven process & enable risk-informed investment decisions
  - Adapted best practices of Agile to improve NNSA's management of its infrastructure portfolio at an enterprise level
  - Created a standardized, predictable, repeatable, & transparent process & developed a common vocabulary to improve communication between stakeholders

Infrastructure Management Process



Program Management Plan

- Defines program management requirements to enable program results
- Establishes & defines standardized Work Breakdown Structure
- Standardized planning process
- Programming & Budgeting
- Execution:
  - Describes process work flows
  - Establishes Monthly Performance Requirements

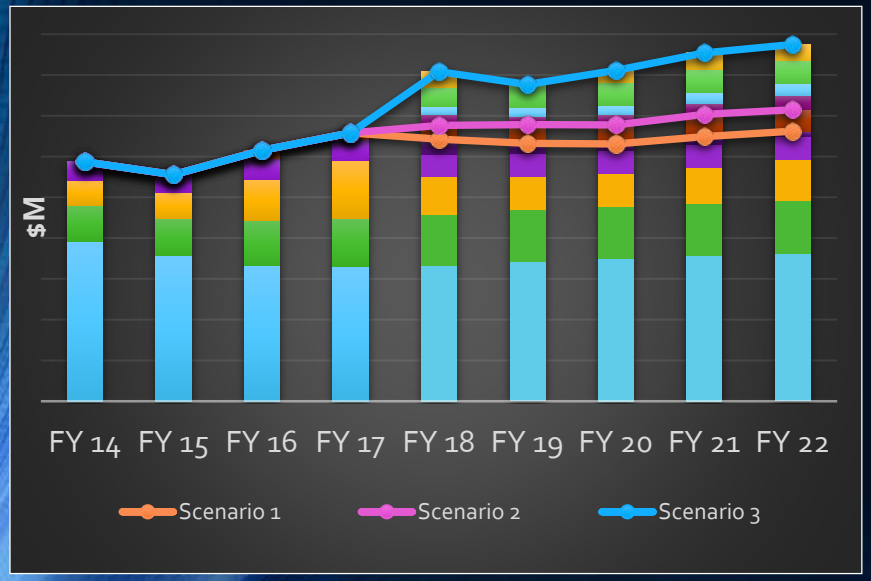


Planning

- Master Asset Plan (MAP): An integrated, long-term infrastructure strategic plan driven by programmatic requirements
- A 25-year & beyond vision
- Annual 2-3 day MAP Deep Dives by each site to fully understand program needs, infrastructure gaps & roadmap to addressing short-term gaps & achieving the long-term vision
- Partnering with sites & programs to develop effective solutions to complex challenges
- The MAP will drive annual programming & budgeting priorities & decisions

Programming & Budgeting

- A predictable, transparent & repeatable process to assign funding to projects
- A data-driven, risk-informed methodology to prioritize requirements (MDI, BUILDER, G2)
- Meaningful metrics to convey what can/cannot be achieved at different funding levels & associated risks

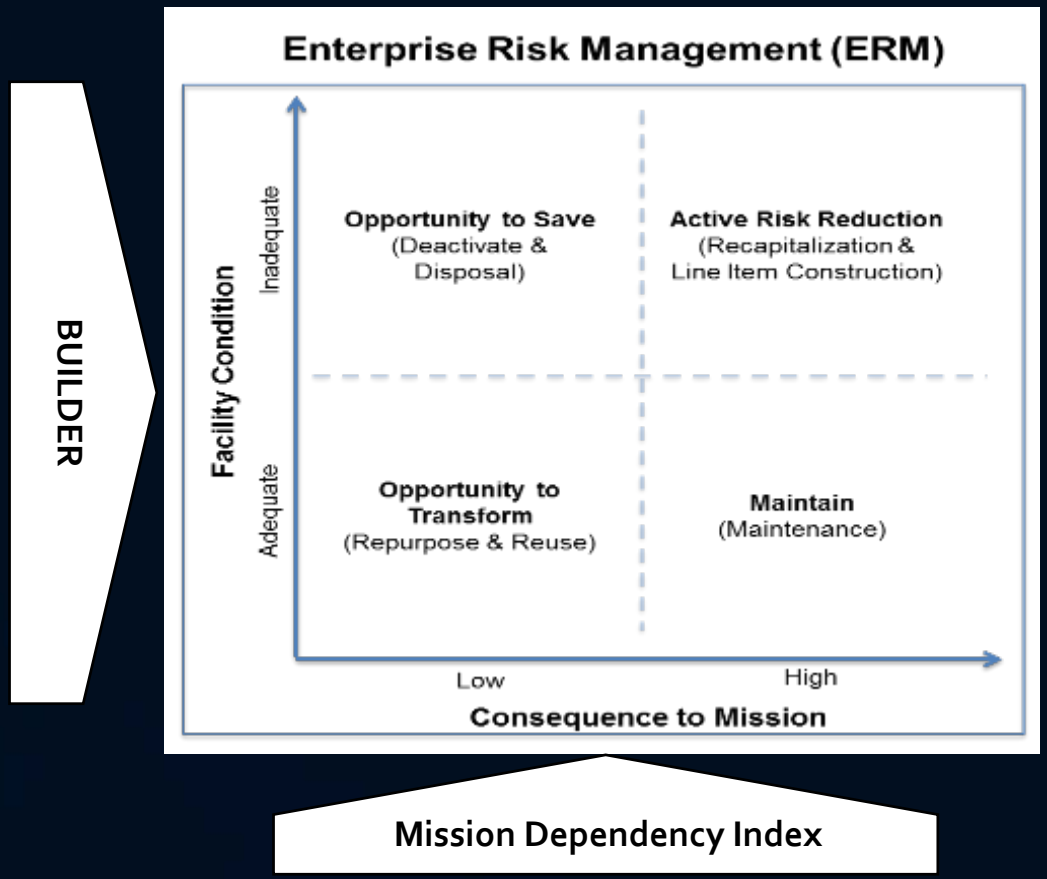


Prioritization Set: NA-50 IPL ▾ Funding Scenario: 2 - Max Working Target ▾

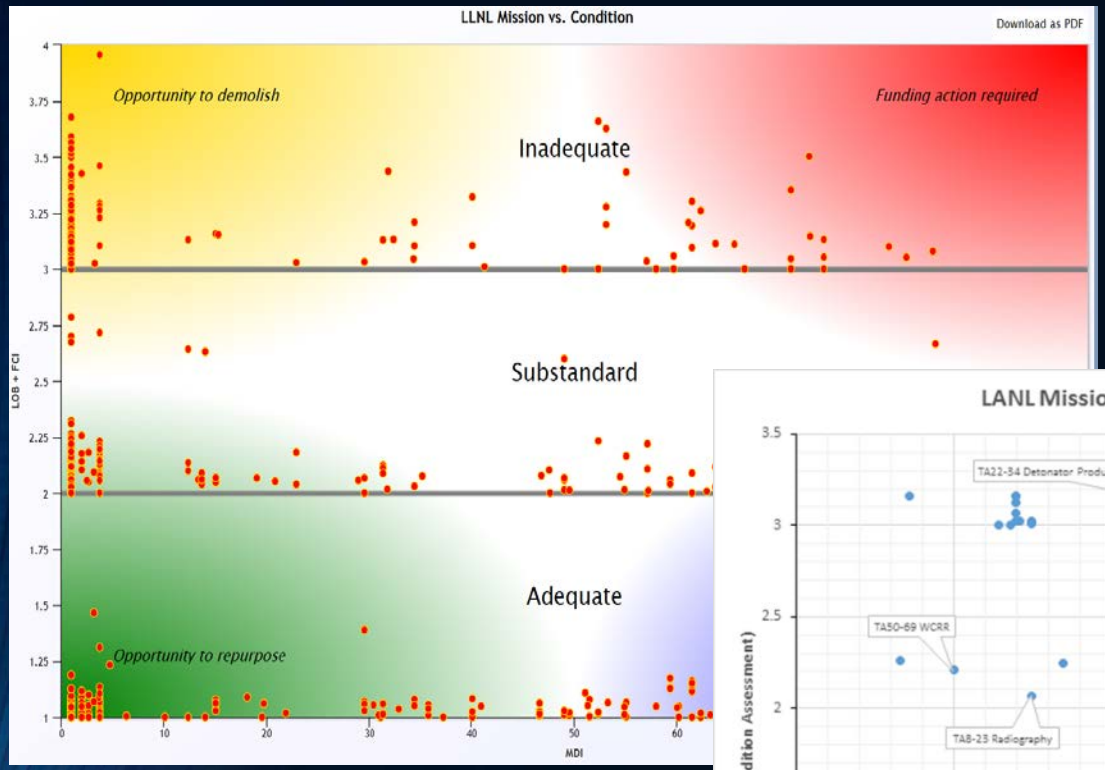
Pri. Rank	Site	Project	Est. Start	Est. Completion	Funded Year	2017	2018	2019	2020
1	PX	Flame Detection Installation, Building 12-84 Bays 18 & 20	2015	2017	2017	$1,500.00K			
2	Y-12	Utility and Power Pole Replacement-Phase 2	2017	2017	2017	$2,000.00K			
3	LANL	Non-Nuclear Classified Machine Shops Electrical Maintenance and Repair	2017	2018	2017	$400.00K			
4	LLNL	HED Physics Precision Target MicroMachining Consolidation	2017	2019	2017	$3,650.00K			
5	SRS	Replace Obsolete Oxygen Monitors (L2)	2017	2018	2017	$1,325.00K			
6	Y-12	Building 9204-2E Elevator #1 Replacement	2017	2017	2017	$3,000.00K			
7	LANL	Safety and Compliance Upgrades at TA-55	2017	2018	2017	$2,500.00K			
8	LLNL	Safety renovation of 4 high level laboratories in B151	2017	2017	2017	$3,750.00K			
9	PX	Flame/RAMS Fiber Network	2015	2017	2017	$13,700.00K			
10	PX	FS-10 Electrical Upgrade	2017	2018	2017	$800.00K			
11	LANL	Redundant Fire Detection In Tritium Process Areas	2017	2018	2017	$2,000.00K			
12	LANL	Ventilation Evaluation Based on TA-55 Active Confinement Ventilation Phase I	2017	2019	2017	$2,600.00K			
13	SNL	B827 (Primary Standards Laboratory) Refurbishments	2016	2017	2017	$6,500.00K			

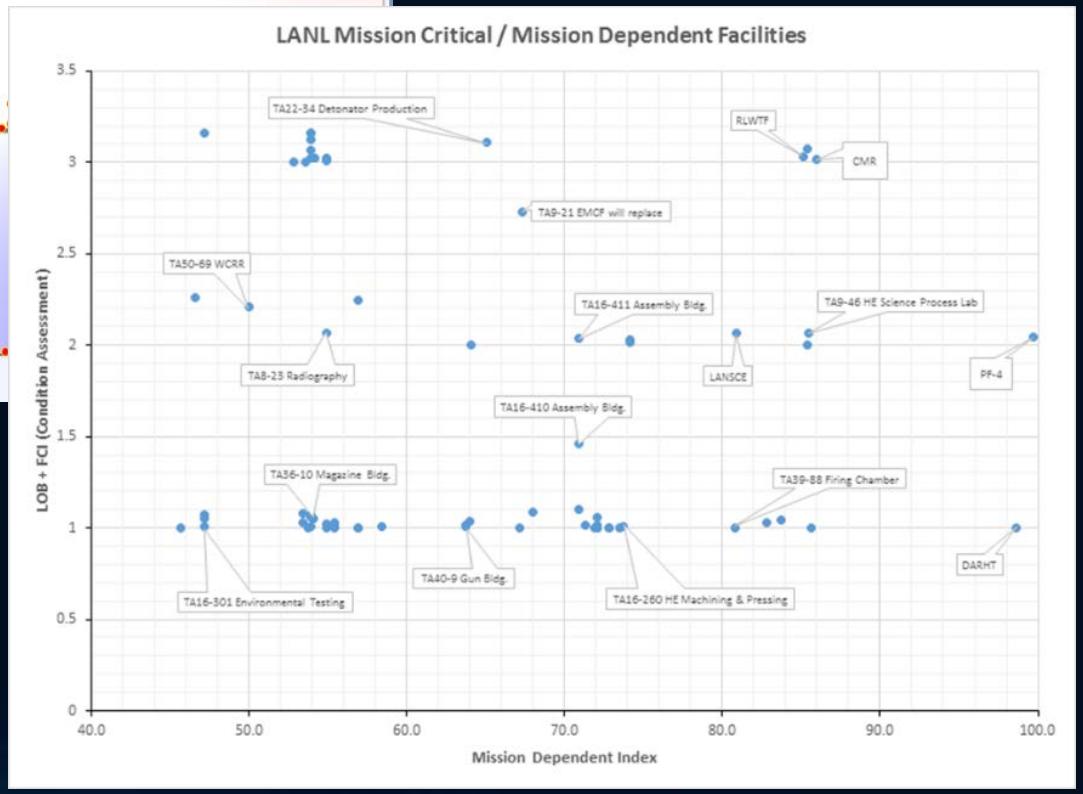
Infrastructure Tools

- New data-driven, risk-informed tools are needed
  - Enterprise Risk Management (ERM)
  - Mission Dependency Index (MDI)
  - BUILDER
  - Recapitalization Project Prioritization



Enterprise Risk Management (ERM)





Mission Dependency Index (MDI)

Asset Details

PLUTONIUM BLDG (55-0004) - PLUTONIUM BLDG

Asset — Review Complete: ☑

Property Name:	PLUTONIUM BLDG		
Site:	Los Alamos National Laboratory	**Location:**	Los Alamos National Laboratory
PSN:	85934	**Property ID:**	55-0004
Alt. Name:	PLUTONIUM BLDG	**RPV:**	$1,069,663,169
Mission Dep. Prog.:	DSW	**Gross Sq. Ft.:**	232,753.00
Property Type:	B	**Mission Essential:**	1
Mission Category:	Plutonium Manufacturing, Research, and Development	**Utilization:**	100%

Capabilities *(Reorder by dragging and dropping rows)*

+ Add Capability

# ▲	Capability	Difficulty of Replacement	Time Until Impact	Justification	
1	C2-Plutonium	Impossible	Dire	This facility is the only Category I nuclear facility in the United States and the only location for any plutonium manufacturing and R&D work required to support Defense Programs missions.	Edit Delete
2	C9-Special Nuclear Material Accountability, Storage, Protection, and Handling	Impossible	Dire	This facility is the only Category I nuclear facility in the United States. No other nuclear facilities within the NSE complex could store the material currently housed in this asset.	Edit Delete
3	C1.1-Design and Certification	Impossible	Dire	This asset is the only Category I nuclear facility in the United States. No other facility can do certification work at the required material quantities.	Edit Delete
4	C17-Work for Others	Impossible	Dire	This asset is the only Category I nuclear facility in the United States. No other nuclear facility can execute NASA missions with the required material.	Edit Delete
5	C14-Nonproliferation	Impossible	Grave	This asset is the only Category I nuclear facility in the United States. It is the only location where work supporting this capability can be executed.	Edit Delete

Dependent Assets

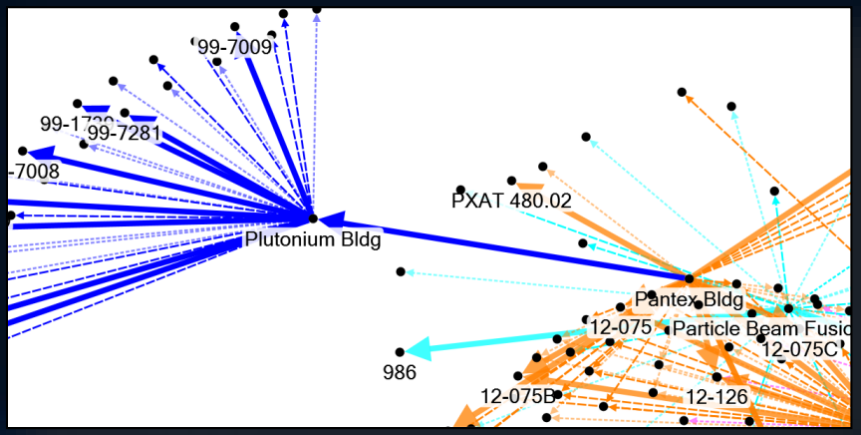
+ Add Dependent Asset

Asset (Site | Prop. ID | Asset Name)	Difficulty of Replacement	Time Until Impact	Justification	
LANL | 03-0029 | CMR LABORATORY	Impossible	Dire	55-0004 is the main location for sending materials to 03-0029 for analytical chemistry in support of plutonium manufacturing and R&D work.	Edit Delete
LANL | 55-0400 | RADIOLOGICAL LAB & OFFICE	Impossible	Dire	55-0004 is the main location for sending materials to 55-0400 for analytical chemistry in support of plutonium manufacturing and R&D work.	Edit Delete
LLNL | OS332WAA | BUILDING 332 WAA	Impossible	Dire	Facility 55-0004 is the only Category I nuclear facility in the United States and the only location for any plutonium manufacturing and R&D work required to support Defense Programs missions.	Edit Delete
Pantex | 12-116 | Pantex Building	Impossible	Dire	55-0004 is the only Category I nuclear facility in the United States and only location for any plutonium manufacturing work required to support Defense Programs missions.	Edit Delete

- Measures a facilities importance by pairing the impact of the loss of the asset with the difficulty of replacing the asset's functionality
- Formula adjusts the basic score to reflect how interconnected the asset is with other assets

$$MDI = \beta_1 \left(\gamma_1 \left(\frac{\sum_{i=1}^{n=5} \alpha_i C_i}{\sum_{i=1}^{n=5} \alpha_i} \right) + \gamma_2 \frac{\sum_{i=1}^{N} S_i}{N} + \gamma_3 \ln(N+1) \right) - \beta_2$$

- Enables new, groundbreaking ways for NNSA to visualize the interconnection of facilities

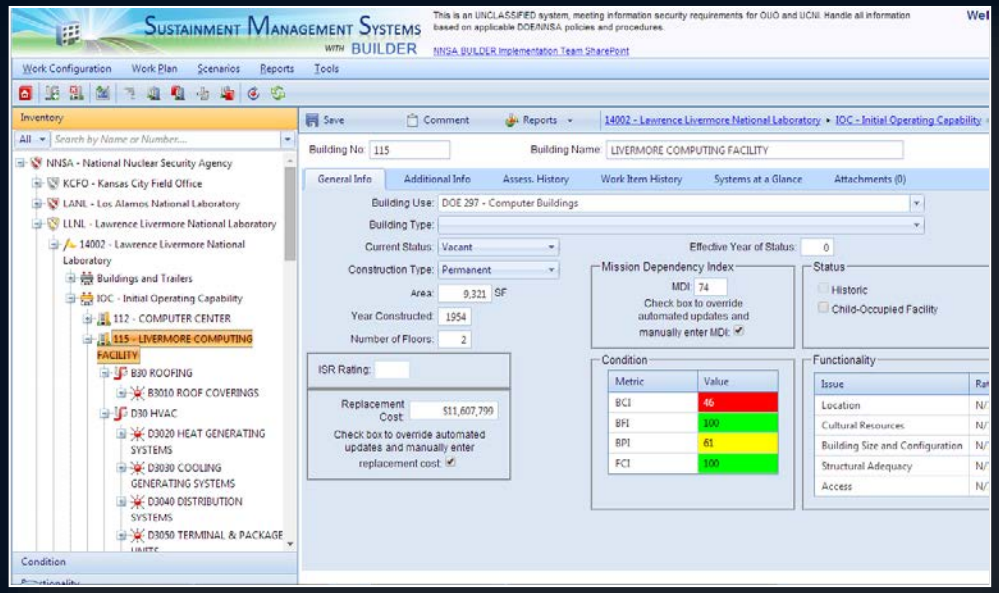


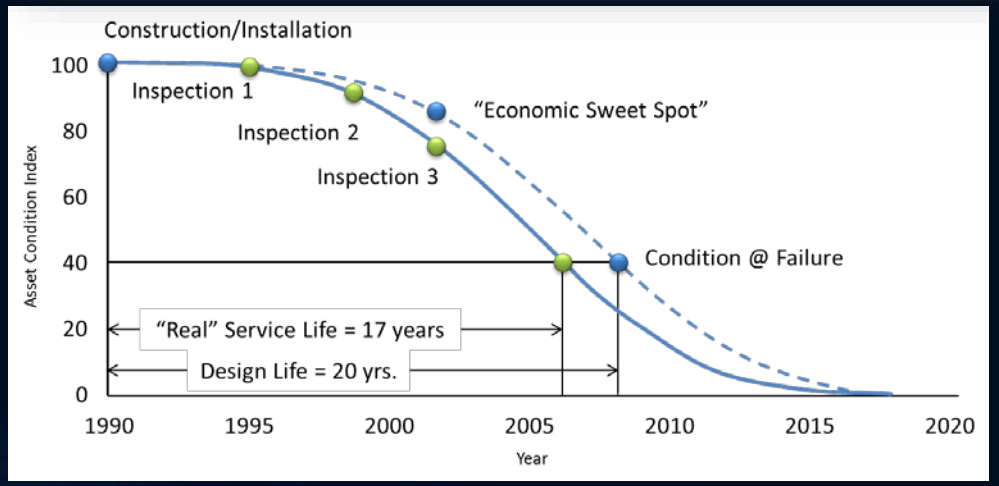
Node Analysis Example

BUILDER

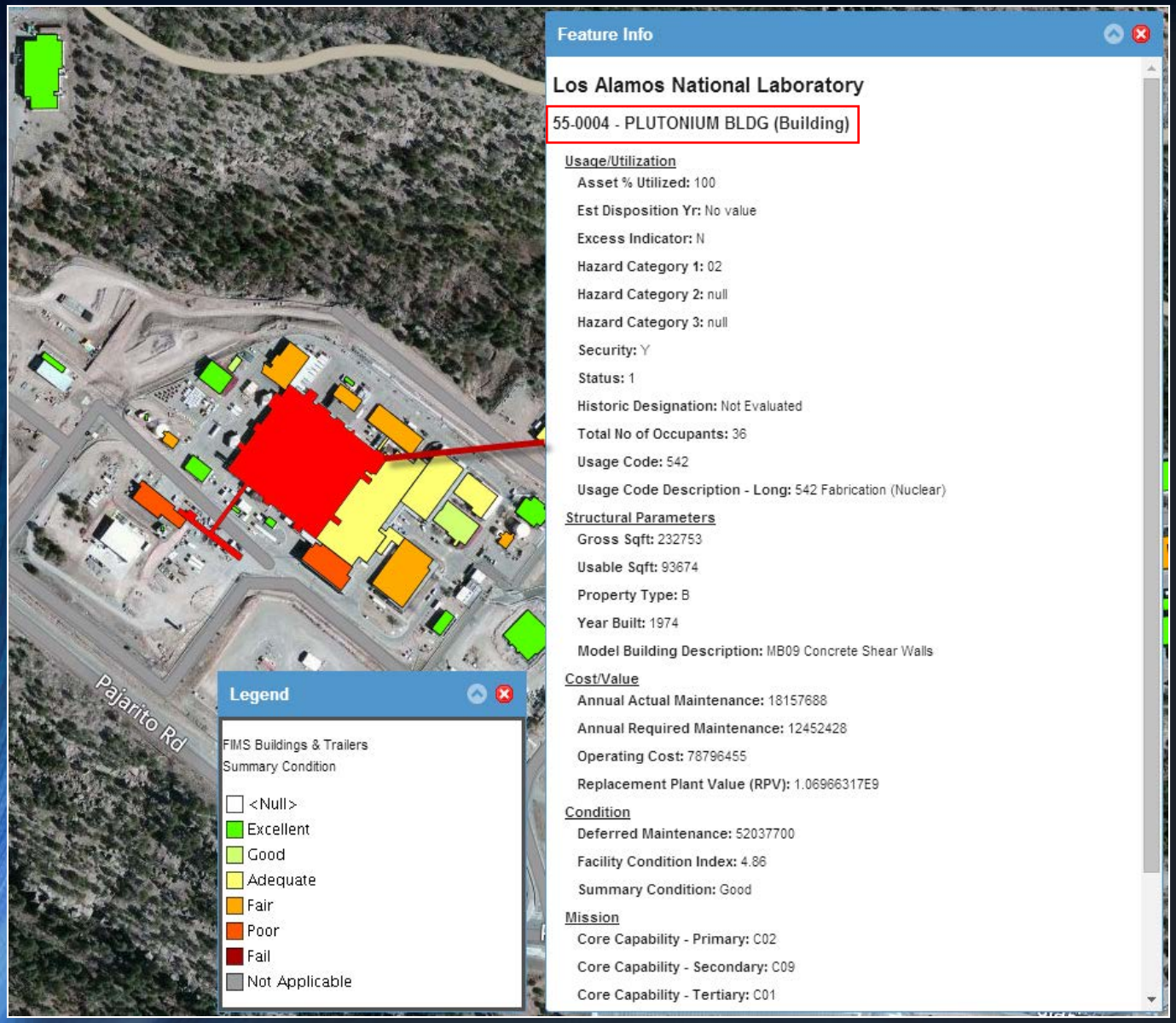
- The U.S. Army Corps of Engineer's Knowledge Based Condition Assessment software, BUILDER, which provides facility condition assessments for NNSA assets

- BUILDER Compares inspection data against known failure curves to predict system wear & identify the optimal time to make critical investments





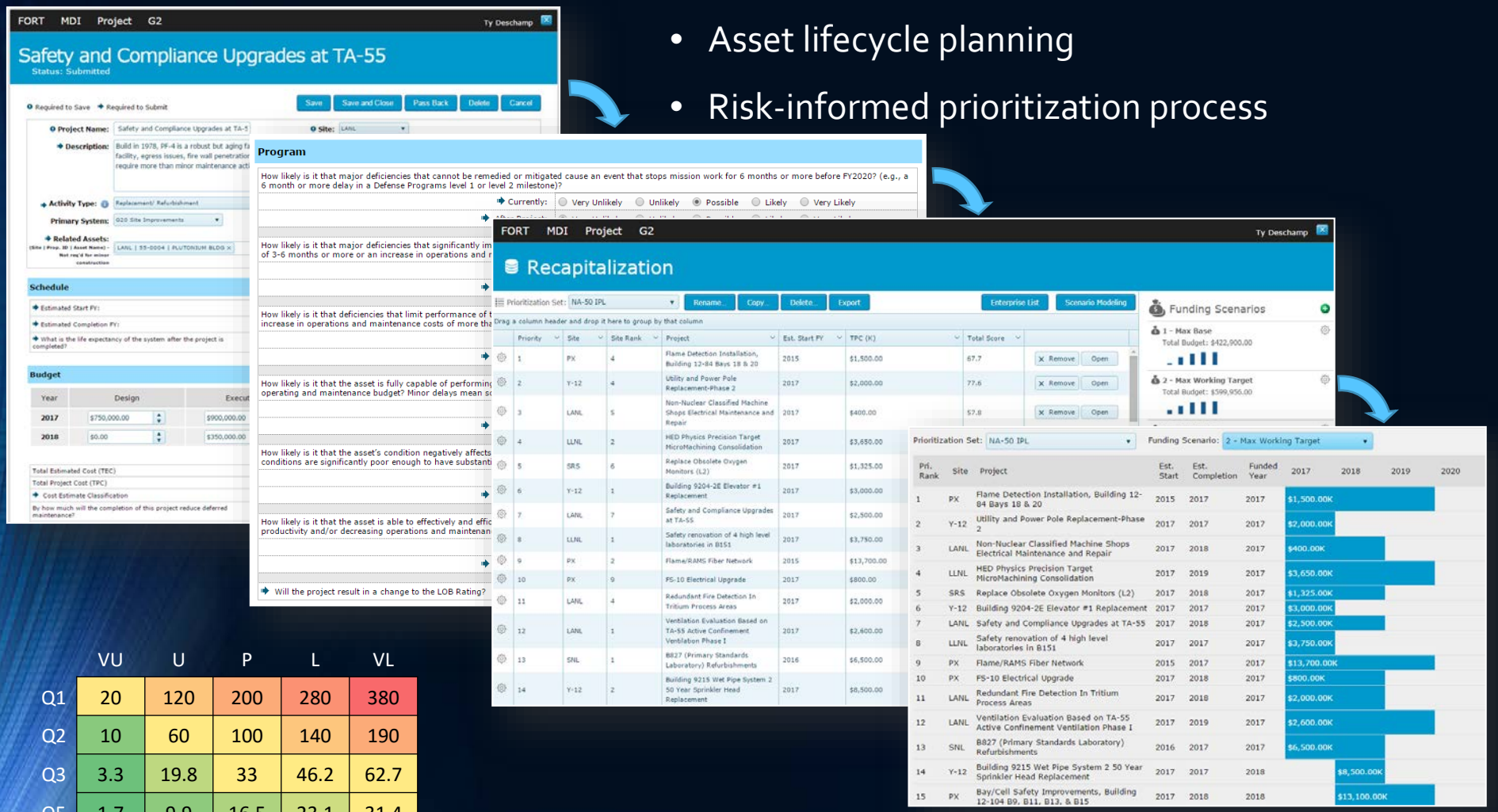
Infrastructure Data



- Integrating infrastructure data from previously disparate sources
- Allows NNSA to communicate infrastructure data to stakeholders in new and more meaningful ways

Infrastructure Planning

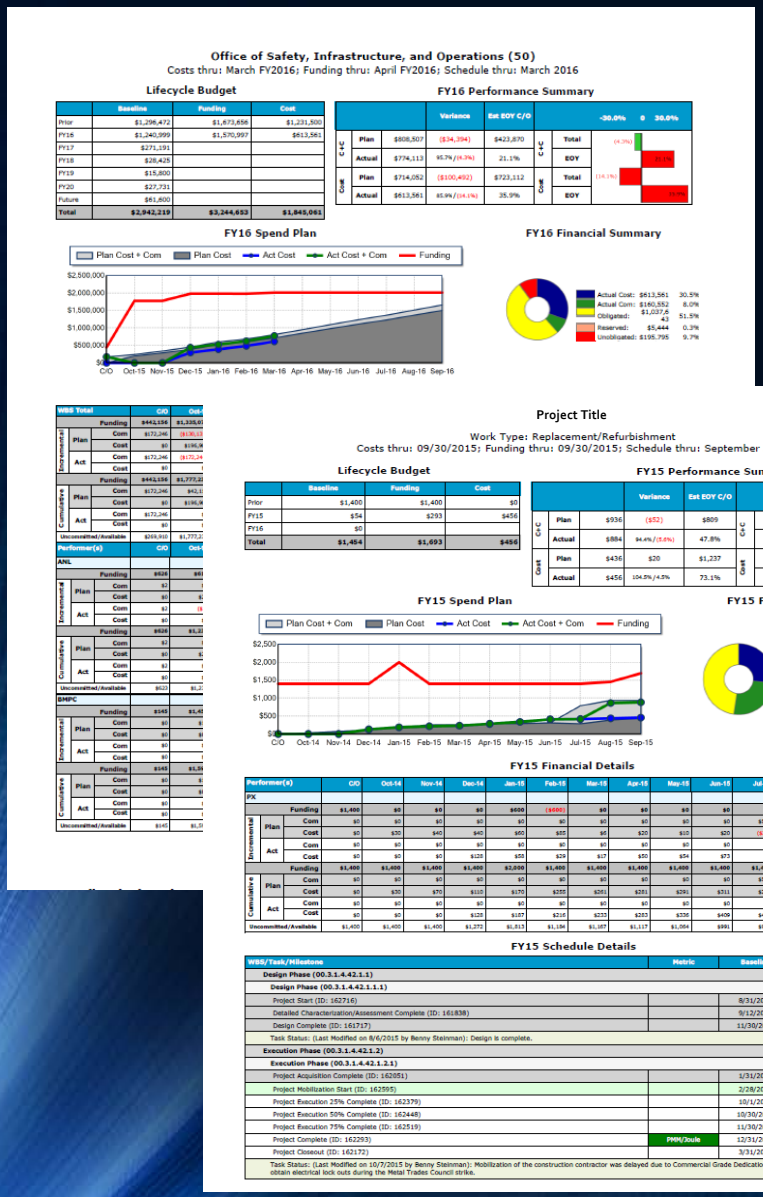
- Asset lifecycle planning
- Risk-informed prioritization process



	VU	U	P	L	VL
Q1	20	120	200	280	380
Q2	10	60	100	140	190
Q3	3.3	19.8	33	46.2	62.7
Q5	1.7	9.9	16.5	23.1	31.4
Q4	20.9	15.4	11	6.6	1.1
Q6	62.7	46.2	33	19.8	3.3

$$Program = \alpha_1 \ln\left[\left(1 + \frac{MDI}{100}\right)\left(\frac{Program\ RR}{TEC}\right)\right] - \alpha_2$$

Scope/Metric Reports



Office of Safety, Infrastructure, and Operations (50)
Costs thru: March FY2016; Funding thru: April FY2016; Schedule thru: March 2016

Lifecycle Budget

	Baseline	Funding	Cost
Prior	$1,296,472	$1,673,858	$1,231,500
FY16	$1,240,999	$1,570,997	$613,561
FY17	$271,191		
FY18	$28,425		
FY19	$15,800		
FY20	$27,731		
Future	$61,600		
Total	$2,942,219	$3,244,653	$1,845,061

FY16 Performance Summary

			Variance	Est EOY C/O
C+C	Plan	$808,507	($34,394)	$423,870
	Actual	$774,113	95.7% / (4.3%)	21.1%
Cost	Plan	$714,052	($100,492)	$723,112
	Actual	$613,561	85.9% / (14.1%)	35.9%

C+C: Total (4.3%), EOY 21.1%; Cost: Total (14.1%), EOY 35.9%; -30.0% 0 30.0%

FY16 Spend Plan

FY16 Financial Summary

Project Title

Work Type: Replacement/Refurbishment
Costs thru: 09/30/2015; Funding thru: 09/30/2015; Schedule thru: September 2015

Lifecycle Budget

	Baseline	Funding	Cost
Prior	$1,400	$1,400	$0
FY15	$54	$293	$456
FY16	$0		
Total	$1,454	$1,693	$456

FY15 Performance Summary

			Variance	Est EOY C/O
C+C	Plan	$936	($52)	$809
	Actual	$884	94.4% / (5.6%)	47.8%
Cost	Plan	$436	$20	$1,237
	Actual	$456	104.5% / 4.5%	73.1%

C+C: Total (5.6%), EOY 47.8%; Cost: Total 4.5%, EOY 73.1%; -30.0% 0 30.0%

FY15 Spend Plan

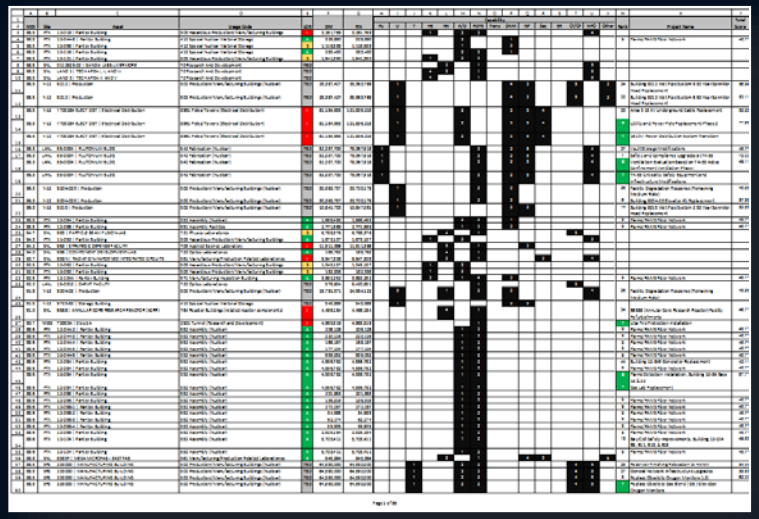
FY15 Financial Summary

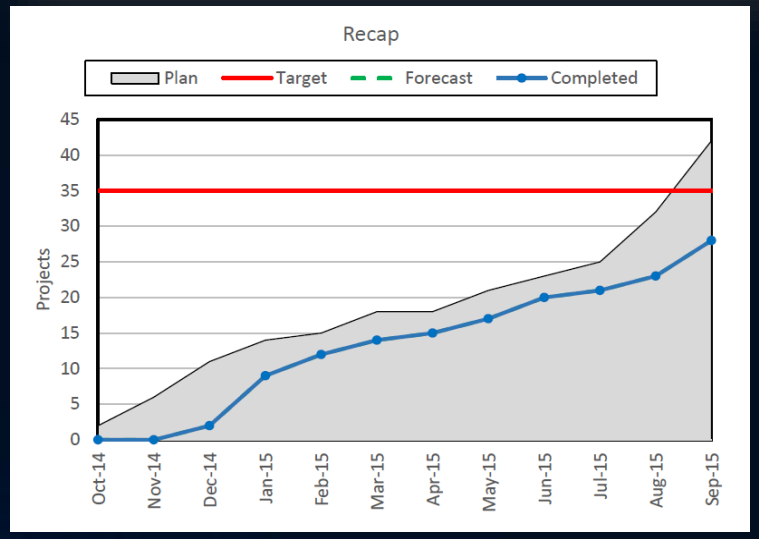
FY15 Financial Details

Performer(s)			C/O	Oct-14	Nov-14	Dec-14	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	Jul-15	Aug-15	Sep-15	Total
PX																
Incremental	Plan	Funding	$1,400	$0	$0	$0	$600	($600)	$0	$0	$0	$0	$0	$54	$239	$1,693
		Com	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$500	$50	($50)	$500
		Cost	$0	$70	$40	$40	$60	$60	$0	$20	$10	$20	($25)	$100	$50	$426
	Act	Com	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$428	$0	$428
		Cost	$0	$0	$0	$0	$126	$55	$29	$17	$50	$54	$73	$5	$21	$20	$456
Cumulative	Plan	Funding	$1,400	$1,400	$1,400	$1,400	$2,000	$1,400	$1,400	$1,400	$1,400	$1,400	$1,400	$1,454	$1,693	$1,693
		Com	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$500	$550	$500	$500
		Cost	$0	$30	$70	$110	$170	$255	$261	$281	$291	$311	$286	$386	$436	$436
	Act	Com	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$428	$428	$428
		Cost	$0	$0	$0	$126	$167	$216	$233	$263	$536	$409	$415	$436	$456	$456
Uncommitted/Available			$1,400	$1,400	$1,400	$1,273	$1,813	$1,184	$1,167	$1,117	$1,066	$991	$985	$596	$809	$809

FY15 Schedule Details

WBS/Task/Milestone	Metric	Baseline	Forecast	Slipped
Design Phase (00.3.1.4.42.1.1)				
Design Phase (00.3.1.4.42.1.1.1)			Lead Performer: PX	
Project Start (ID: 162716)		8/31/2014	8/31/2014 A	0
Detailed Characterization/Assessment Complete (ID: 161838)		9/12/2014	9/12/2014 A	0
Design Complete (ID: 161717)		11/30/2014	7/1/2015 A	-152
Task Status: (Last Modified on 8/6/2015 by Benny Steinman): Design is complete.				
Execution Phase (00.3.1.4.42.1.2)				
Execution Phase (00.3.1.4.42.1.2.1)			Lead Performer: PX	
Project Acquisition Complete (ID: 162051)		1/31/2015	7/29/2015 A	-127
Project Mobilization Start (ID: 162595)		2/28/2015	9/28/2015 A	-150
Project Execution 25% Complete (ID: 162379)		10/1/2015	10/30/2015	-21
Project Execution 50% Complete (ID: 162448)		10/30/2015	11/30/2015	-21
Project Execution 75% Complete (ID: 162519)		11/30/2015	12/31/2015	-23
Project Complete (ID: 162293)	PMM/Joule	12/31/2015	1/15/2016	-11
Project Closeout (ID: 162172)		3/31/2016	3/31/2016	0
Task Status: (Last Modified on 10/7/2015 by Benny Steinman): Mobilization of the construction contractor was delayed due to Commercial Grade Dedication/Quality plan approval and inability to obtain electrical lock outs during the Metal Trades Council strike.				





G2 Program Management System

- The "National Nuclear Security Administration (NNSA) Program Management Information System, Generation 2" is a custom-developed system to integrate & highlight data at the Enterprise/Program level
- Manages over $2B annually
- Currently ~900 users, tracks ~19,000 actions per month
- Electronic change control, business rules & automatic notifications
- Encrypted access control, internal permissions & failover/backup/recovery
- Enterprise Risk Management questions & formulas for prioritizing projects
- Agile development with new features released every 8 weeks
- Project Management Institute (PMI) Award
- Association for Enterprise Information's (AFEI) Excellence in Enterprise Information Award

Program Management Improvement Team (PMIT)

- **Purpose**
  - Enhance program, portfolio & project performance by sharing best practices for planning, executing & controlling scope, schedule, costs, risks & opportunities
- **Process**
  - PMIT comprised of private industry experts
  - Share leading-edge practices between sites & from industry
  - Recognition for best practices
  - No-fault, non-attribution, safe forum for discussion; no rating of performance
  - Quarterly meetings for 2-3 days

Final Thoughts

- Agile techniques can be applied outside of IT development – find what works for you
- Failure is always a possibility – you have to learn to walk the walk & take risks
- Passion drives success –work on something you care about & surround yourself with similarly motivated team members
- Don't let Perfect be the enemy of Good – something is better than nothing