Annual Infrastructure Executive Committee Report to the Laboratory Operations Board

27 March 2018

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1 Purpose

The Department of Energy (DOE) is responsible for a vast portfolio of world-leading scientific infrastructure and production assets and the general purpose infrastructure that enables the use and operation of those assets. With origins in the Manhattan Project, this portfolio has developed over the past 75 years, and now accounts for the fourth largest inventory of real property in the Federal Government by square footage. The DOE complex includes seventeen DOE National Laboratories, National Nuclear Security Administration plants, and Environmental Management cleanup sites that provide the foundation for the Department's ability to conduct its mission. The land, facilities, and other assets that comprise the infrastructure represent some of America's premier assets for science, technology, innovation, and security.

While the Department has made significant investments in its world class experimental facilities to accommodate evolving science and technology mission needs, infrastructure continues to age and commands greater attention. DOE facilities currently have an average age of 37 years and the systems that support these facilities (water, sewage, electrical, paved areas, etc.) have an average age of 40 years. General purpose infrastructure - such as office space, general laboratory space, storage space, and utilities - enables the Department's mission and forms the backbone of the DOE enterprise. Modern, reliable infrastructure is critical to support DOE in successfully and efficiently executing its missions both now and in the future.

KEY INFRASTRUCTURE STATISTICS

9,575 buildings totaling 107.2 million square feet

Average facility age: 37 years

Average support structure age: 40 years (utilities, roads, bridges, etc.)

2.1 million acres

$131.3 billion Total Replacement Plant Value

$2.1 billion in annual operating and maintenance costs

$5.9 billion in deferred maintenance (operational facilities)

Source: FY 2017 Facility Information Management System snapshot for the EE, EM, FE, NE, NNSA, and SC Program Offices

In 2013, the DOE formed the National Laboratory Operations Board (LOB) to provide an enterprise-wide forum for engaging DOE Laboratories and Program Secretarial Offices (PSOs) in a joint effort to identify opportunities to improve effectiveness and efficiency in the National Laboratory System. In 2014, the LOB established an integrated plan to conduct site-wide infrastructure assessments across all 17 National Laboratories as well as NNSA plants and environmental management activities, for the first time using common standards and definitions. These assessments provided an unprecedented, uniform condition analysis of facilities and infrastructure systems across the complex. Based on this data, the Department faces a systemic challenge of degrading

infrastructure with levels of deferred maintenance that continue to rise. This finding provided the basis for over $100 million requested and appropriated in FY 2016 for general purpose infrastructure investments. To build on the success of that effort, the Infrastructure Executive Committee (IEC) was established as a subgroup of the LOB to monitor the status of infrastructure investments and the Department's evolving infrastructure condition. The committee is comprised of line managers and facilities experts from across the DOE complex.

In FY 2016, the IEC was charged with providing annual updates to the LOB on the state of infrastructure. This report represents the latest annual update and is intended to present the Department with mature and accurate data to help inform infrastructure investment decisions. The scope of this report covers the six DOE PSO's that manage laboratory assets including the Office of Energy Efficiency and Renewable Energy (EE), Environmental Management (EM), Fossil Energy (FE), Nuclear Energy (NE), the National Nuclear Security Administration (NNSA), and the Office of Science (SC). Note that this report also refers to the PSO's as Program Offices or Programs.

In the development of this report, the committee has coordinated efforts with the LOB, integrated with the Excess Contaminated Facilities Working Group (ECFWG), and partnered with the Office of Management to ensure consistent data reporting across multiple platforms. This is the third annual infrastructure update, prepared by the IEC, and presented to the LOB.

2 Background

When the Department established the LOB in 2013, DOE Laboratories and PSOs were engaged in a joint effort to identify opportunities to improve effectiveness and efficiency in the National Laboratory System. One of the transformational opportunities identified by the LOB was the need to focus on revitalizing infrastructure across the DOE enterprise to support current and future mission activities. Beginning in the fall of 2013 and under leadership of the LOB, the Department began focusing significant attention on improving its stewardship of infrastructure – specifically for assets such as utilities, general office buildings, and general laboratory spaces that are used on a broad basis to enable the mission of an entire plant, site, and laboratory. These efforts were developed and executed by DOE headquarters, site office, laboratory, and plant employees, in a complex-wide partnership. Notable outcomes include:

- In 2014, the Department developed a new data element for the Facility Information Management System (FIMS). This data element, called "Overall Asset Condition", combined traditional physical condition assessment results with functional assessments to identify assets' overall ability to support the mission.
- Clear and consistent guidance for conducting overall condition assessments was developed through the LOB infrastructure process and issued across the Department; approximately 99% of DOE's infrastructure assets have now been evaluated using this methodology.

- The Department established the IEC as a subgroup of the LOB. The IEC is charged with preparing this report for the LOB on an annual basis. The IEC includes senior leadership from across the Department and is co-chaired by various programs on a one-year rotating basis. The Office of Management serves at the permanent co-chair while the second co-chair position rotates among NE, NNSA, and SC. The NNSA holds the second co-chair position during FY 2018.
- The NNSA and SC led efforts to develop consistent reporting among DOE sites in accounting for repair needs and deferred maintenance – two measures that are important indicators of investment needs.
- NNSA has expanded its Asset Management Program, which uses supply chain management economies-of-scale to provide a more centralized and efficient procurement approach to replacing aging infrastructure systems that are common throughout the enterprise, such as roofs and HVAC systems.
- EM is pursuing coordination, analysis and concurrence of EM site submissions for infrastructure reporting, such as, the Integrated Facilities Infrastructure Crosscut Budget and five-year plans.
- Within individual program offices, infrastructure planning is now included as an integral component of the annual planning and evaluation process. This has enhanced integration of infrastructure and mission planning and raised the visibility of infrastructure and its mission impact. For example, building from the SC planning model, NNSA is deploying its Master Asset Plan, which is a strategic, enterprise-wide, risk-informed, long-range view (25+ years) of NNSA infrastructure that will be updated on an annual basis.

3 Current State of Infrastructure

This annual report is structured around the seven questions identified in the Performance Measurement section of the DOE Real Property Asset Management Order 430.1C. Addressing these questions will help identify trends in the state of DOE infrastructure and, going forward, the progress made in revitalizing that infrastructure.

1 Is the percentage of adequate facilities and other structures increasing?
2 Is deferred maintenance decreasing?
3 Is the square footage of underutilized space decreasing?
4 Are excess space/buildings being eliminated?
5 Are the costs of carrying excess facilities declining?
6 Did the Department make the investments in infrastructure that it committed to make?
7 Are fewer core capabilities at risk due to infrastructure deficiencies?

The first annual report in 2016 established metrics to address the questions above consistently across the DOE enterprise. The focus of this third annual report is to update those metrics, analyze the quality of those metrics, and examine any trends that are beginning to form.

3.1 Is the percentage of adequate facilities and other structures increasing?

In 2014, the LOB developed and issued consistent guidance for assessing the adequacy of assets in terms of both physical condition as well as functionality via the "Overall Asset Condition" FIMS data element. Figure [1] shows the percentage of Departmental assets that have undergone these LOB-directed condition assessments from FY 2013 to FY 2017. The percentages in Figure [1] include Buildings, Trailers, and Other Structures and Facilities (OSFs) and are evaluated based on the total Replacement Plant Value (RPV) of these assets.

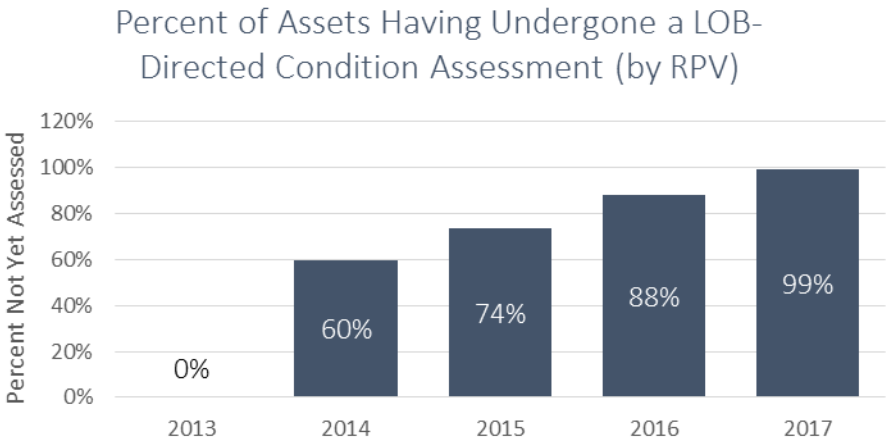

Figure 1 - Percentage of Assets Assessed for Condition

The asset condition categories developed through the LOB assessment process are defined as:

> Adequate: Fully capable of performing its current mission with only minor deficiencies that can be corrected within normal operating budgets.
>
> Substandard: Deficiencies limit performance of the mission and refurbishment is required to return the asset to adequate condition.
>
> Inadequate: Major deficiencies that significantly impair performance of the mission; major refurbishment is required.

Figure [2] shows the asset condition of DOE facilities at the end of FY 2017, with just about half of DOE-owned buildings and trailers rated as adequate to meet the mission. Figure [3] shows the condition of the Department's core OSFs. OSFs are supporting infrastructure assets not classifiable

as buildings or trailers, such as utility systems, paved areas, towers, tanks, etc. The majority of OSF assets were rated at the end of FY 2017 as adequate to meet the mission. Figure [4] provides more detailed information regarding the current condition of several key OSF system types. Note that Figures 2 through 4 show percentages by assets' RPV.

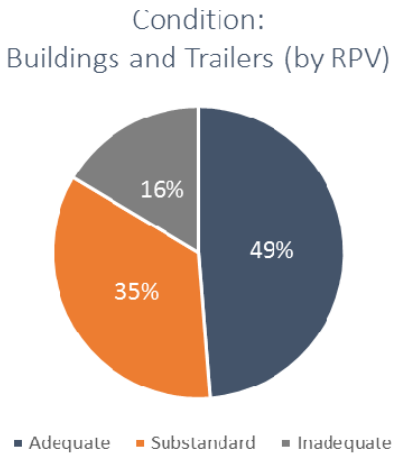

Figure 2 – Condition: Buildings and Trailers

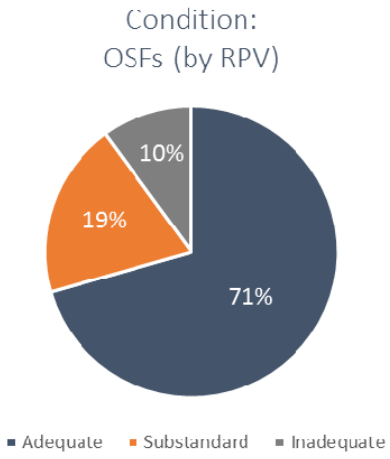

Figure 3 – Condition: OSFs

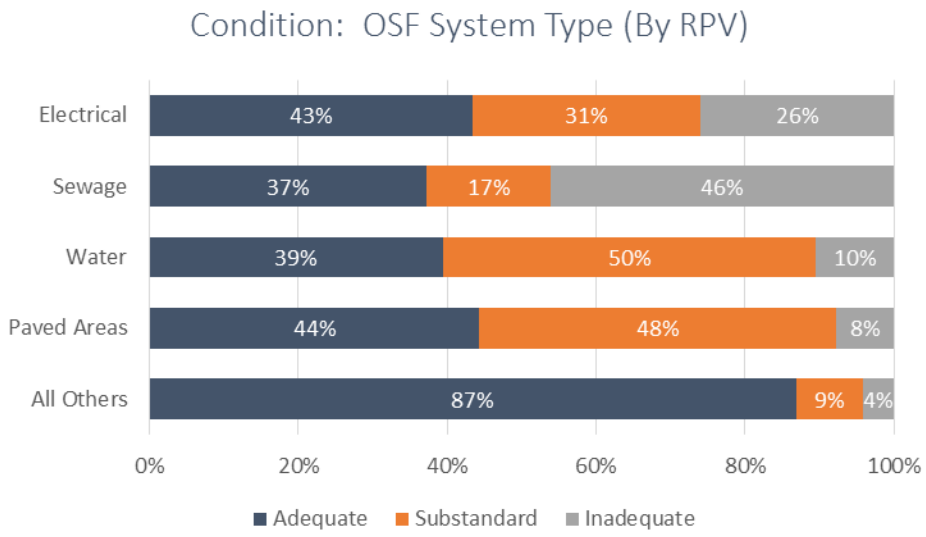

Figure 4 – Condition: OSF System Types

Next Steps

The Department is focused on improving the condition of its assets to meet mission needs and address potential risks to safety, security, and programmatic objectives.

In the near term, the DOE is focused on ensuring all of its facilities have undergone LOB-directed functional condition assessments to establish a solid baseline against which to measure future progress in improving asset condition. Recent DOE Financial Reports identified eight management priorities that represent the most important strategic management issues facing the Department. Infrastructure is among these eight priorities. To help promote progress and improvements in these priority areas, the Department has developed a set of Management Priority Goals. The Infrastructure goal is as follows:

In FY 2017, decrease the percent of unassessed DOE Buildings, OSFs and Trailers by 5% below the FY 2016 baseline. In FY 2018, decrease the percent by 5% below the FY 2017 amount. The DOE continues to meet these goals and has now performed condition assessments for about 99% of its assets.

As Figure [1] indicates, about 1% of the Department's infrastructure covered in this report has yet to undergo an initial LOB-directed condition assessment. This number has steadily improved each year since implementing this initiative in 2014. Since the number of assessed facilities continued to significantly change each year, the Department had not yet established a stable baseline from which to measure future progress in improving asset condition. However, now that nearly all assets have been assessed (all but 1% as of FY 2017), the IEC plans to set FY 2017 as a stable baseline from which to measure future progress. Beginning with next year's report, the IEC will include year to year trending changes in the portfolio's condition rating (i.e. adequate, substandard, and inadequate).

3.2 Is deferred maintenance decreasing?

When necessary maintenance on a facility or utility system is scheduled or should be performed, and is postponed, it is referred to as deferred maintenance. Trends in deferred maintenance could indicate aging infrastructure and associated challenges, such as those relating to reliability, mission readiness, and health and safety. Figure [5] shows the deferred maintenance trend for the Department since FY 2013. Deferred maintenance for active, DOE-owned assets has increased by about 25% from $4.7 billion in FY 2013 to $5.9 billion in FY 2017.

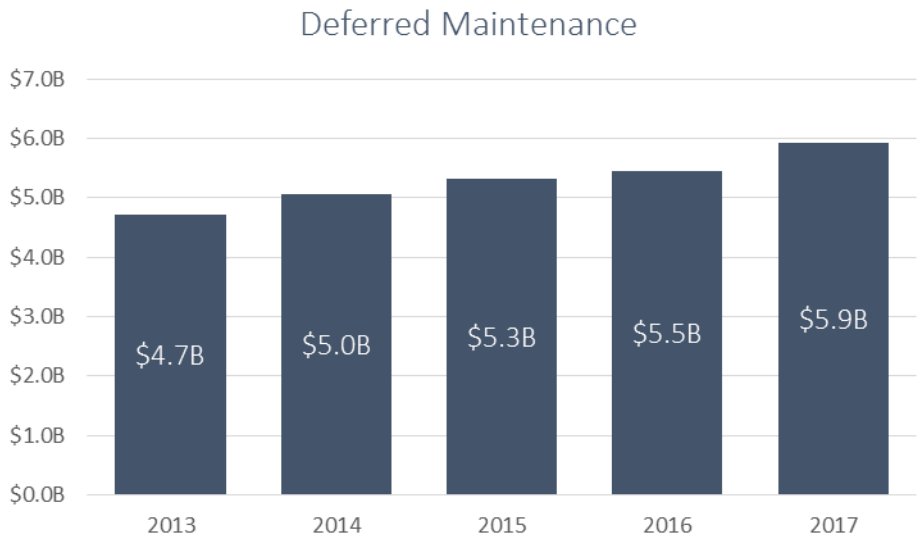

Figure 5 – Deferred Maintenance

Beginning in 2014, the DOE Office of the Chief Financial Officer (CFO), in coordination with the LOB and IEC infrastructure initiative, established deferred maintenance budget guidance targeted at the FY 2016 budget year and beyond. The guidance required DOE programs to fund their infrastructure and maintenance budgets at levels sufficient to halt the growth of the deferred maintenance backlog. However, Figure [5] indicates that the Department's deferred maintenance backlog continues to grow.

Next Steps

Moving forward, the IEC will continue to track annual trends in deferred maintenance. Since the deferred maintenance backlog continues to grow, the IEC will also consider coordinating with the CFO to determine opportunities for increasing emphasis on infrastructure budget planning focused on reducing deferred maintenance.

3.3 Is the square footage of underutilized space decreasing?

The Department is committed to maximizing the use of its space and assets. Identifying underutilized assets provides opportunities to identify ways to more fully utilize space or disposition assets and eliminate the need for resources to maintain those assets.

In addition to redefining asset condition, the LOB infrastructure assessment effort in 2014 also redefined metrics associated with space type and space utilization. These space types include Office space, Storage space, and Other space. Other space includes wet lab and dry lab space, power-intensive space (e.g. data centers, accelerators), and ventilation intensive space (e.g.

positive or negative pressure cleanrooms). Table [A] provides a breakdown of how space utilization is defined for different space types.

Utilization Rating	Office	Storage	Other
Over-utilized	> 95%	> 80%	> 85%
Fully Utilized	75% - 95%	50% - 80%	60% - 85%
Under-utilized	< 75%	10% - <50%	30% - <60%
Not Utilized		< 10%	< 30%

Table A – Utilization Definitions by Space Type

The Department continues to make progress on identifying space-type utilization across all of its assets. Since the number of assets undergoing space-type utilization assessments increases each year, the IEC is unable to evaluate year-to-year trends on a dataset that continues to significantly change. Figure [6] shows the breakdown of space utilization across all three space types at the end of FY 2017.

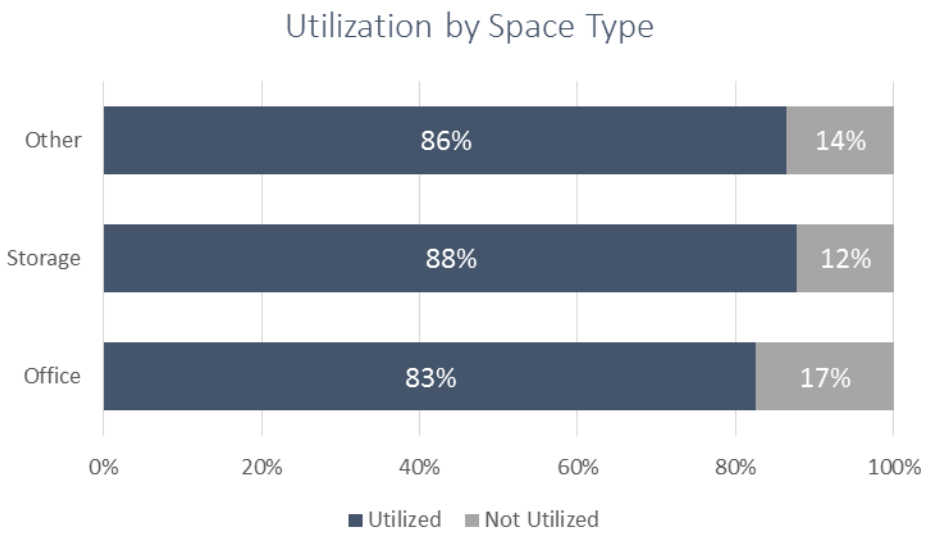

Figure 6 – Utilization by Space Type

At the end of FY 2017, Departmental Office space is currently categorized as fully-utilized, with room to grow, while Storage and Other space are over-utilized.

Next Steps

Moving forward, the IEC will continue to track the number of real property assets assessed for space-type utilization and the percentage of assets utilized and non-utilized for all three space

types. Currently, the DOE has assessed about 82% of its active buildings and trailers (by gross square feet) to determine how much usable space they have in terms of the various space types. Once 95% of assets have been assessed for space-type utilization, and the data accurately represents the utilization of Department space, the IEC will begin tracking annual trends for space utilization. This data will be available for DOE to target investments to maximize the use of space, including reusing or repurposing infrastructure where possible to meet current mission needs.

3.4 Are excess space/buildings being eliminated?

In addition to its active infrastructure portfolio, DOE leads the largest nuclear cleanup effort in the world. DOE's objective is to remediate the environmental legacy of more than seven decades of government-sponsored nuclear energy research and nuclear weapons research, development, and production. The disposition of excess facilities is an important part of this cleanup mission. Since EM was established in 1989, DOE's other PSOs have transferred thousands of excess facilities to EM for deactivation and decommissioning (D&D). EM has made substantial progress in D&D of these legacy excess facilities, having completed almost 3,000 facilities over the past 25 years.

Excess facilities, especially those that are process contaminated, are a drain on DOE's infrastructure resources, and can pose a risk to safety, security, and programmatic objectives. The Department faces a significant challenge with the number of aging excess facilities throughout the enterprise and the limited resources to deactivate, decontaminate, decommission, and demolish those facilities in the near term. Disposition of process contaminated facilities is the responsibility of EM. However, until EM is able to accept such facilities, stewardship (management, surveillance, and maintenance) responsibilities are retained with the owning PSO. In addition, each PSO is responsible for D&D of all excess facilities in its portfolio that are not process contaminated.

DOE's disposition priorities are to stabilize higher-risk facilities, characterize their hazards and conditions, remove hazardous materials, place them in the lowest risk condition possible, and ultimately eliminate the risk by demolishing the facility and disposing of the resulting waste. However, because of competing regulatory and other compliance obligations and performance challenges in some areas, EM is unable to D&D all of the excess facilities already transferred from other programs at this time.

In 2015, the LOB established an Excess Contaminated Facilities Working Group (ECFWG) to explore issues and develop options for disposition of DOE's excess facilities. The working group collected enterprise-wide data to develop a qualitative assessment of potential risks and to obtain updated rough order of magnitude (ROM) cost estimates to deactivate, decontaminate, decommission, and demolish excess facilities. The ECFWG used this data to define the scope of the challenge and to suggest risk-informed approaches for addressing DOE's contaminated excess facilities in their "Plan for Deactivation and Decommissioning of Nonoperational Defense Nuclear Facilities" report to

Congress in December 2016. The DOE will issue this report every two years, in response to a requirement of the 2016 National Defense Authorization Act, as DOE continues to address the challenges of managing excess contaminated facilities.

The IEC has integrated efforts with the ECFWG to assess whether excess facilities are being eliminated and to ensure the accuracy of reporting data across multiple platforms. At the end of FY 2017, DOE had 1,795 excess facilities listed in the FIMS database. Figure [7] reflects excess facilities across the Department, broken out by the number of facilities that each PSO is currently responsible for.

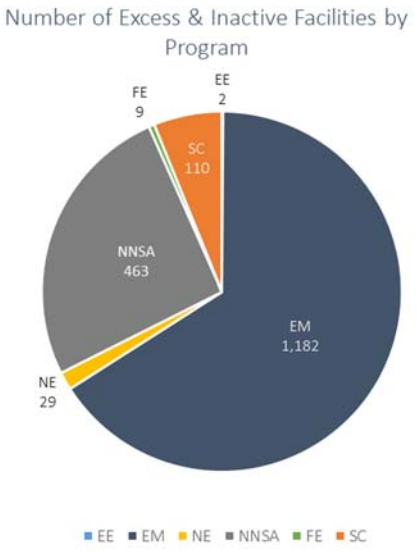

Figure 7 – FY 2017 Number of Excess & Inactive Facilities by Program

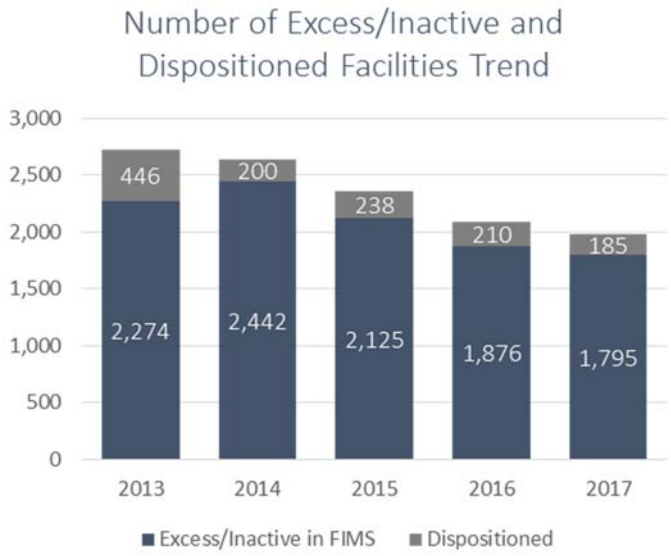

Figure 8 – Excess and Inactive Facilities Trend

Figure [8] shows the trend of excess and inactive facilities within the Department including the number of facilities dispositioned during the last five fiscal years. In total, DOE dispositioned 1,279 real property assets from FY 2013 to FY 2017 through methods such as demolition, sale, transfer, or lease cancellation.

Last year's report also indicated that hundreds of assets at the Paducah and Portsmouth sites were transferred to EM for disposal. Since then, EM consolidated many assets in the FIMS database (e.g., combined individually listed assets like monitoring wells and roads into groups). As a result, EM administratively eliminated many of those assets from the database and now uses a more streamlined approach to track them. In addition, EM is maintaining many additional transferred assets as active since they are still supporting mission work (i.e., D&D and environmental remediation) at those assets. As a result, Figure [8] above reflects the latest FIMS snapshot without separately calling-out those assets as last year's report did. EM continues to assess the excess Paducah and Portsmouth assets and will update FIMS as needed and appropriate.

Next Steps

The IEC will continue to integrate efforts with the ECFWG to accurately report excess assets across multiple DOE documents. This data will be available to inform DOE in the process of improving enterprise-wide assessment, planning, and prioritization of excess facilities in order to address the potential risks these excess facilities pose to DOE's mission, workers, the public, and the environment.

3.5 Are the carrying costs of excess facilities declining?

The information gathered as part of the ECFWG efforts included ROM costs for D&D; cost ranges for maintenance, surveillance, repairs, and operations (MSRO); and an assessment of potential risks to public health and the environment, worker safety, and mission.

As a general matter, for higher risk excess facilities, MSRO costs can run into the millions of dollars per year to keep the facilities safe and stable. These costs are terminated when a facility is demolished. In addition to incurring ongoing MSRO costs, delaying D&D may:

- Expose individuals and the environment to increasing levels of risk;
- Escalate disposition costs (e.g., D&D of the K-25 building at Oak Ridge cost substantially more due to degradation that took place over a number of years prior to D&D); and
- Impede ongoing mission work (such as excess facilities located near ongoing mission work) as well as plans and space to accommodate new missions.

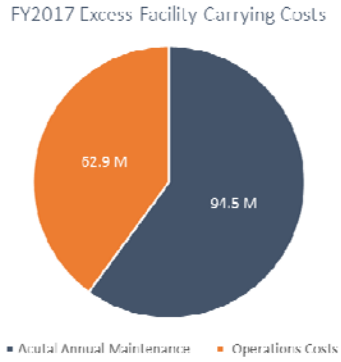

Figure 9 – FY 2017 Carrying Costs for Excess Facilities

For the purpose of this report, MSRO costs for excess facilities are best captured as carrying costs, which are organized into two categories: Annual Actual Maintenance (AAM) and Operations (OPS). AAM includes preventive maintenance and repairs. Sites identify AAM costs on an asset by asset level, providing a good indication of true carrying costs for excess facilities. OPS costs however, are generally tracked at the Site level (not asset level). OPS costs include electricity, water, sewer, gas, cooling, heating, pest control, snow removal, trash removal, janitorial services, and grounds maintenance. Sites typically allocate those costs across all assets based on factors such as asset size and/or operating hours. Since OPS costs are not specifically tracked at the asset level, they may not provide a completely accurate picture of such costs for excess assets alone.

Therefore, it may be beneficial to consider the OPS costs reported here as an upward limit. Actual OPS carrying costs may be somewhat lower. Figure [9] exhibits the breakdown of FY 2017 Carrying Costs for excess facilities.

Next Steps

The IEC will continue to integrate efforts with the ECFWG and determine when this dataset has reached a level of maturity such that it can be analyzed for year-over-year trends. The annual trend data will then be available to inform DOE in the process of improving enterprise-wide assessment, planning, and prioritization of excess facilities in order to address the potential risks these excess facilities pose to DOE's mission, workers, the public, and the environment.

3.6 Did the Department make the investments it committed to make?

The March 2015 DOE Asset Management Plan (AMP) addresses the level of investment needed to keep the Department's real property inventory in good working order through regularly scheduled maintenance and anticipated repairs. The AMP sets an annual investment target in the range of 2% to 4% of the RPV of the Department's owned and active real property assets. This goal is based on the recommendations of the National Research Council as set forth in its publication entitled "Committing to the Cost of Ownership: Maintenance and Repair of Public Buildings".

Figure [10] below shows the five year trend of the DOE's Maintenance Investment Index (MII) which equals: total AAM ÷ RPV x 100. This figure shows the Department is implementing its infrastructure sustainment activities at approximately 1.25% of RPV per year. This is well below the recommended minimum of 2% and is a contributing factor in the DOE's Deferred Maintenance backlog.

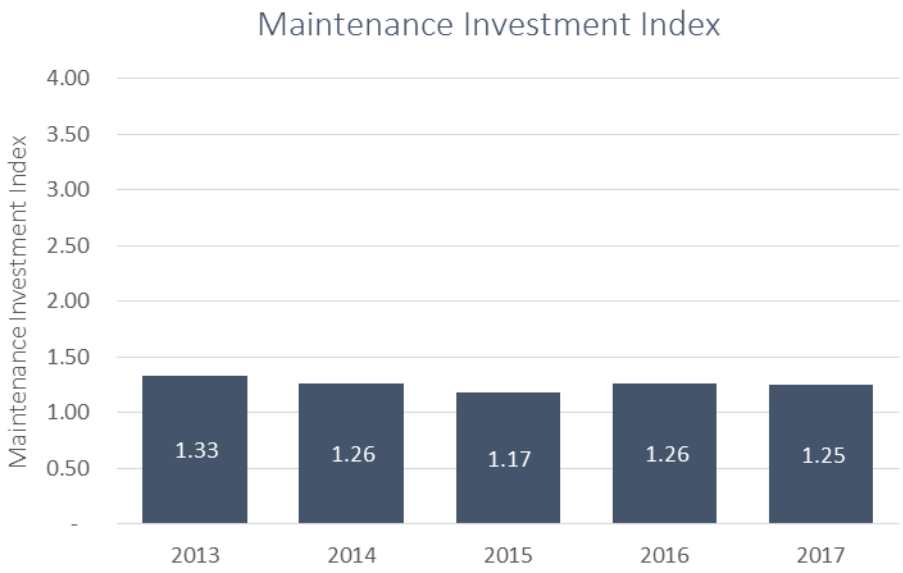

Figure 10 – Maintenance Investment Index

For additional insight into the Department's infrastructure investments, the IEC tracks what investments the DOE has made to maintain and improve that infrastructure. Over the past five years (from FY 2013 – FY 2017), the DOE has invested more than $14 billion in infrastructure, either directly by the Department or indirectly through laboratory overhead. Investments in this area have steadily increased, rising more than 75% over this five year period (Figure [11]). The increase in infrastructure funding from FY 2016 to FY 2017 was primarily from additional funding for NNSA Recapitalization, General Plant Projects (GPPs), Maintenance and Repair (M&R) projects, and full funding ($200M) for disposition of the Kansas City Bannister Federal Complex.

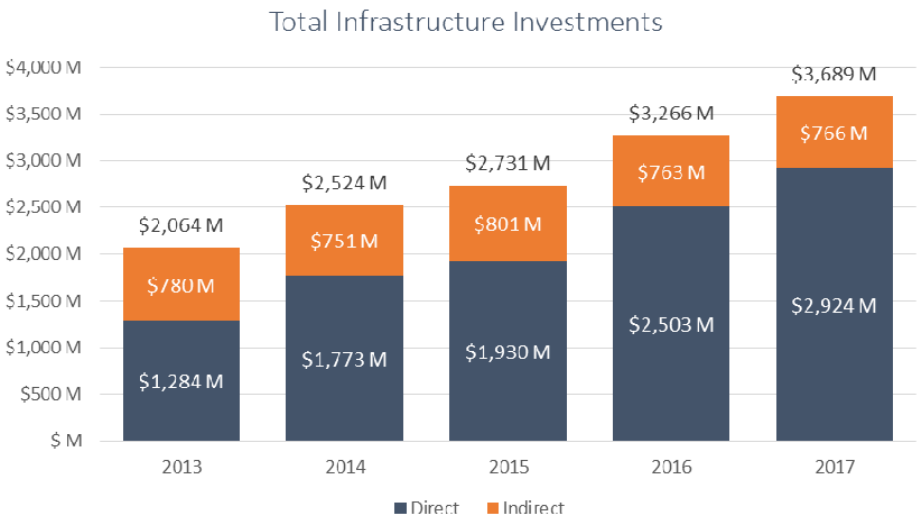

Figure 11 – Total Infrastructure Investments

Managing DOE infrastructure is a partnership between the federal line programs that steward a laboratory or site (e.g., NNSA, EM, NE, and SC) and the individual plants, sites, and laboratories. Figure [11] demonstrates this partnership, showing that infrastructure investments are a mix of direct-funded and indirect-funded activities, averaging about 70% direct and 30% indirect when aggregated over the past five years.

Indirect-Funded Investments

Indirect Funded Investments are made through Laboratory overhead and include the following:

- Institutional General Plant Projects (IGPPs), which are capital improvements of less than $10M* that are of general benefit across the site;
- Excess Facilities Disposition Projects that are funded by site overhead; and
- M&R funded by site overhead.

Figure [11] above shows that indirect investments have remained relatively steady over the past five years. These investment levels, are largely managed by the individual sites, and vary from program to program.

Direct-Funded Investments

Direct-funded infrastructure investments include:

- Line item projects, which are capital improvements greater than $10M*;
- GPPs, which are capital improvements less than $10M*;
- Excess Facilities Disposition Projects; and
- M&R activities.

Figure [11] above shows that direct investments in infrastructure have steadily increased in recent years. This is, in large part, a result of LOB efforts to identify and prioritize investments in critical infrastructure projects, following the condition assessments initiated in FY 2014. Overall, Congress has appropriated 98% of the direct-funded infrastructure investments the DOE requested since FY 2013 as seen in Figure [12] below.

* The $10M threshold in effect during the scope of this report's FY 2017 timeframe is now $20M for FY 2018 and after.

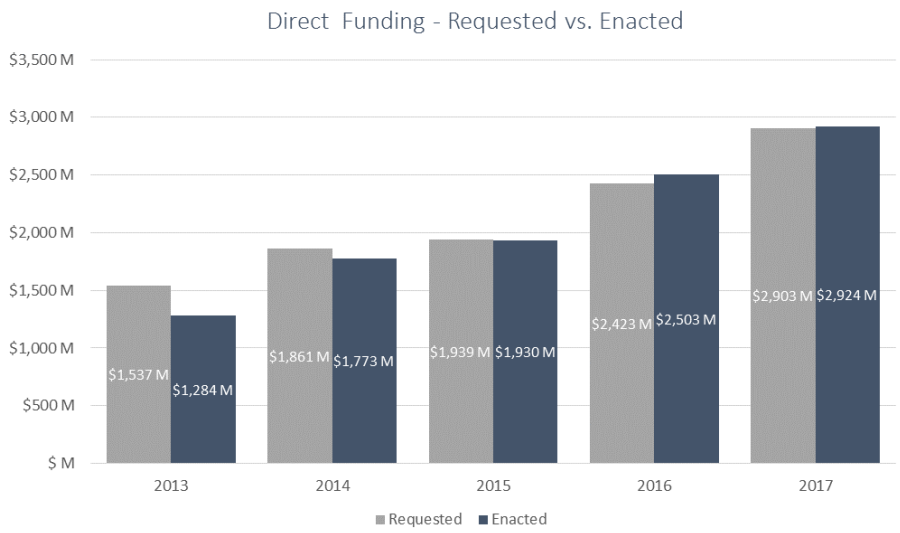

Figure 12 – Requested vs. Enacted Direct Funding

Recent Infrastructure Projects

Table [B] on the following page highlights a few examples of the work supported by recent appropriations to target critical infrastructure projects.

Next Steps

The NNSA has initiated a multi-year infrastructure modernization initiative aimed at reducing the backlog of deferred maintenance and repair needs. An element of this initiative includes a focus on making adequate maintenance investments to help ensure long-term sustainment. The IEC will continue to track investments the Department has committed to make and will pay close attention to NNSA's initiative for insights into any aspects that may have Department-wide applicability.

Funding ($M)	Work Scope	Funding Activity Type	Status
$9.4	Replace failing Heating, Ventilation, and Air Conditioning (HVAC) systems at several facilities across Lawrence Livermore National Laboratory	GPP	Complete
$11.0	Upgrade ventilation and confinement at a nuclear facility at Los Alamos National Laboratory	Other Recapitalization Activities	In Progress FY 2019 completion
$7.9	Replace critical mission equipment at the Kansas City National Security Campus	Other Recapitalization Activities	In Progress FY 2018 completion
$7.5	Upgrade fire protection and other core infrastructure systems at the Nevada Nuclear Security Site	GPP	Complete
$7.3	Replace failed dehumidification systems at Y12 National Security Complex	GPP	Complete
$7.2	Upgrade the Savannah River National Laboratory firewater system, and replace hot cell windows and associated electrical control systems	M&R	In Progress FY 2019 completion
$18.9	Replace North Loop transmission system at Hanford	M&R	In Progress FY 2022 completion
$20.0	Replace Hanford Water Treatment Facility and tank system	GPP	In Progress FY 2021 completion
$3.6	Upgrade high voltage electrical cable and associated substation equipment at Argonne National Laboratory (ANL)	GPP	Complete
$8	Upgrade the refrigeration unit supporting operation of an accelerator at Thomas Jefferson National Accelerator Facility	GPP	In Progress FY 2020 completion
$95	Construct a building with specialty low-vibration labs to support research in materials science at ANL	Line Item	In Progress FY 2021 completion
$90	Construct a building to collocate research supporting world class capabilities at Lawrence Berkeley National Laboratory	Line Item	In Progress FY 2021 completion
$85	Construct a building to collocate staff to enable a world-leading program and attract a new generation of users at Fermi National Accelerator Laboratory	Line Item	In Progress FY 2024 completion
$23.1	Upgrade utilities at Idaho National Laboratory, including power distribution infrastructure and control systems	GPP and M&R	In Progress FY 2018 completion
$3.1	Laboratory Renovation of Building-94, 3rd Floor, National Energy Technology Laboratory in Pittsburgh	GPP	In Progress FY 2019 completion
$1.6	Primary Power Distribution Switchgear Upgrade Replace A House and TS-A Switch Gear at National Energy Technology Laboratory in Morgantown	GPP	In Progress FY 2018 completion

Table B – Examples of Recent and On-going Infrastructure Projects

3.7 Are fewer core capabilities at risk due to infrastructure deficiencies?

Each of the DOE's Program Offices has specific and unique capabilities that directly support and enable the Program to meet its mission requirements. Examples of these capabilities include weapons assembly (NNSA), nuclear fuels and materials research (NE), securing and storing nuclear material (EM), accelerator science (SC), etc. The Department currently identifies 79 separate core capabilities and maintains a list of them in the FIMS database. This list can fluctuate from year to year as the Program Offices gain or lose mission requirements. Each real property asset in the FIMS database is associated with at least one (and up to five) core capabilities.

The DOE considers a core capability to be potentially at risk if 25% or more of the total RPV associated with that capability is assessed as inadequate (see Section 3.1 for an overview of the DOE's condition assessments). Table [C] shows that 17 of the Department's 79 core capabilities were potentially at risk in FY 2017 due to inadequate infrastructure.

Core Capability	% of Core Capabilities' Total RPV Assessed as Inadequate
EE06 - National Bioenergy Center Research	100%
EE07 - Materials and Chemical Science Technology	100%
EE08 - Mechanical and Thermal Engineering	100%
EE10 - Fundamentals Science & Technology	100%
EM05 - Decontaminate and Decommission Facilities and Infrastructure	74%
C13 - Federal Management and Oversight	72%
C15 - Security	46%
C03 - Uranium	45%
EM06 - Remediate Soil and Groundwater	44%
C09 - Nuclear Material Accountability, Storage, Protection, and Handling	43%
C02 - Plutonium	40%
C14 - Nonproliferation	37%
C07 - Weapons Assembly/Disassembly	36%
SC09 - Climate Change Sciences and Atmospheric Science	35%
SC06 - Biological Systems Science	28%
C06 - Non-nuclear	27%
C01.1 - Design and Certification	26%

Table C – Core Capabilities Potentially at Risk Due to Infrastructure Deficiencies

Note that the information above is based on FY 2017 FIMS data which is well-populated for the primary core capabilities but may still lack full information regarding lesser capabilities for many assets. In addition, the data cycle for populating overall asset condition into FIMS occurs over a

five-year period (i.e. sites must conduct condition assessments across all assets once every five years).

Next Steps

Because of the data limitations described above, the IEC believes that Programs should view the Core Capability data simply as a starting point for conducting deeper analyses to help verify the current status of core capabilities and to help identify any priorities for addressing those potentially at-risk. For example, reviewing individual assets under each potentially at-risk core capability may show that just a small number of high-dollar RPV assets are driving the risk classification across the entire capability. Such information can then help Programs and Sites determine whether to accept such risks or to focus improvements on reducing those risks.

Finally, increases in overall Departmental infrastructure investments since FY 2014 (see section 3.6) have allowed for additional improvement projects which are currently at various stages of planning, design, and construction. As these projects wrap-up over the next few years, they are expected to help improve asset condition and reduce the number of core capabilities potentially at risk.

4 Path Forward

To sustain ongoing infrastructure improvements, the IEC plans to accomplish the following actions in FY 2018:

- Submit the third Annual Infrastructure Executive Committee Report to the LOB.
- Share new tools, best practices, and lessons learned on infrastructure program and risk management.
- Continue to evaluate year-over-year trends in deferred maintenance with the goal of highlighting the Department's progress on halting the growth of maintenance backlog which, at this time, continues to rise.
- Track the percentage of real property assets that have been assessed for space utilization until 95% of assets have been assessed. Once this threshold percentage is reached, track year-over-year trends to determine if the percentage of underutilized and not utilized space is decreasing.
- Continue to integrate efforts with the ECFWG to assess whether excess space/buildings are being eliminated; assess whether the costs of carrying excess facilities are declining; and establish uniform measures and data validation in this area.

APPENDIX

Data Source for Figures Presented in this Report

Unless otherwise noted, data source is FIMS Historical Report for FY 2017
Note all BLUE text in this Appendix represents the names of FIMS data elements

Summary Table - DOE Owned Infrastructure

Number of Buildings
- Fiscal Year
- Ownership = DOE Owned (O)
- Program Office = EE, EM, FE, NE, NNSA, SC
- Property Type = Building, Trailer

Square Feet
- Size
- Fiscal Year
- Ownership = DOE Owned (O)
- Program Office = EE, EM, FE, NE, NNSA, SC
- Property Type = Building, Trailer

Average Facility Age
- Average Age = Sum of all Asset Ages / # of Assets
- Asset Age = FY – Year Built
  - (if Year Built is blank, use Year Acquired)
  - (if Year Acquired is blank then exclude the asset)
- Fiscal Year (calculated per above)
- Ownership = DOE Owned (O)
- Program Office = EE, EM, FE, NE, NNSA, SC

Average Support Structure Age
- Asset Age (calculated per above)
- Fiscal Year
- Ownership = DOE Owned (O)
- Program Office = EE, EM, FE, NE, NNSA, SC
- Property Type = OSF

Acreage
- Size
- Fiscal Year
- Ownership = DOE Owned (O), Withdrawn Land (W)
- Program Office = EE, EM, FE, NE, NNSA, SC
- Property Type = Land

Replacement Plant Value
- RPV
- Fiscal Year
- Ownership = DOE Owned (O)
- Program Office = EE, EM, FE, NE, NNSA, SC

Operating and Maintenance Costs
- Annual O&M Costs = Actual Annual Maintenance + Op Costs Total
- Fiscal Year
- Ownership = DOE Owned (O)
- Program Office = EE, EM, FE, NE, NNSA, SC

Deferred Maintenance
- Deferred Maintenance
- Fiscal Year
- Ownership = DOE Owned (O)
- Program Office = EE, EM, FE, NE, NNSA, SC
- Status = Operating, Outgranted, Standby

Figure [1] – Percentage of Assets Not Yet Assessed for Condition

% of Assets not yet Assessed (by RPV) = RPV of Assets Not Yet Assessed ÷ Total RPV of All Assets

RPV Not Yet Assessed
- RPV
- Fiscal Year
- Ownership = DOE Owned (O)
- Program Office = EE, EM, FE, NE, NNSA, SC
- Excess Indicator = N, (Blank)
- Property Type = Building, Trailer, OSF
- Overall Asset Condition = (Blank)

Total RPV
- RPV
- Fiscal Year
- Ownership = DOE Owned (O)
- Program Office = EE, EM, FE, NE, NNSA, SC
- Excess Indicator = N, (Blank)
- Property Type = Building, Trailer, OSF

Figure [2] – Condition of Buildings and Trailers (by RPV)

% Adequate (by RPV) = RPV Assessed as Adequate ÷ Total RPV Assessed
% Substandard (by RPV) = RPV Assessed as Substandard ÷ Total RPV Assessed
% Inadequate (by RPV) = RPV Assessed as Inadequate ÷ Total RPV Assessed

Total RPV Assessed
- RPV
- Fiscal Year
- Ownership = DOE Owned (O)
- Program Office = EE, EM, FE, NE, NNSA, SC
- Property Type = Building, Trailer
- Excess Indicator = N, (Blank)
- Overall Asset Condition = Adequate, Substandard, Inadequate

RPV Assessed as Adequate, Substandard, Inadequate
- RPV
- Fiscal Year
- Ownership = DOE Owned (O)
- Program Office = EE, EM, FE, NE, NNSA, SC
- Property Type = Building, Trailer
- Excess Indicator = N, (Blank)
- % Adequate: Overall Asset Condition = Adequate
- % Substandard: Overall Asset Condition = Substandard
- % Inadequate: Overall Asset Condition = Inadequate

Figure [3] – Condition of OSFs (by RPV)

% Adequate (by RPV) = RPV Assessed as Adequate ÷ Total RPV Assessed
% Substandard (by RPV) = RPV Assessed as Substandard ÷ Total RPV Assessed
% Inadequate (by RPV) = RPV Assessed as Inadequate ÷ Total RPV Assessed

Total RPV Assessed
- RPV
- Fiscal Year
- Ownership = DOE Owned (O)
- Program Office = EE, EM, FE, NE, NNSA, SC
- Property Type = OSF
- Excess Indicator = N, (Blank)
- Overall Asset Condition = Adequate, Substandard, Inadequate

RPV of Adequate, Substandard, Inadequate
- RPV
- Fiscal Year
- Ownership = DOE Owned (O)
- Program Office = EE, EM, FE, NE, NNSA, SC
- Property Type = OSF
- Excess Indicator = N, (Blank)
- % Adequate: Overall Asset Condition = Adequate
- % Substandard: Overall Asset Condition = Substandard
- % Inadequate: Overall Asset Condition = Inadequate

Figure [4] – Condition of OSF System Types (by RPV)

% Adequate (by RPV) = RPV Assessed as Adequate ÷ Total RPV Assessed
% Substandard (by RPV) = RPV Assessed as Substandard ÷ Total RPV Assessed
% Inadequate (by RPV) = RPV Assessed as Inadequate ÷ Total RPV Assessed

And, filter each of the below by the following OSF Property Type:
For Electrical: Asset Type = 615 Elect Generation, Transmission, Distribution
For Sewage: Asset Type = 640 Sewage Systems
For Water: Asset Type = 650 Water Supply, Pumping, Treatment, Distribution
For Paved Areas: Asset Type = 470 Roads, Walks, and Paved Areas

Total RPV Assessed
- RPV
- Fiscal Year
- Ownership = DOE Owned (O)
- Program Office = EE, EM, FE, NE, NNSA, SC
- Property Type = OSF
- Excess Indicator = N, (Blank)
- Overall Asset Condition = Adequate, Substandard, Inadequate

RPV of Adequate, Substandard, Inadequate
- RPV
- Fiscal Year
- Ownership = DOE Owned (O)
- Program Office = EE, EM, FE, NE, NNSA, SC
- Property Type = OSF
- Excess Indicator = N, (Blank)
- % Adequate: Overall Asset Condition = Adequate
- % Substandard: Overall Asset Condition = Substandard
- % Inadequate: Overall Asset Condition = Inadequate

Figure [5] – Deferred Maintenance

Total Deferred Maintenance
- Deferred Maintenance
- Fiscal Year
- Ownership = DOE Owned (O)
- Program Office = EE, EM, FE, NE, NNSA, SC
- Status = Operating, Outgranted, Standby
- Property Type = Building, Trailer, OSF

Figure [6] – Utilization by Space Type

Office Utilization = Office Utilized SqFt ÷ Office Usable SqFt
Storage Utilization = Storage Utilized SqFt ÷ Storage Usable SqFt
Other Utilization = (Total Utilized SqFt – Office Utilized SqFt – Storage Utilized SqFt) ÷ (Total Usable SqFt – Office Usable SqFt – Storage Usable SqFt)

Office Utilized Sqft
- Util-Office Utilized SF
- Fiscal Year
- Ownership = DOE Owned (O)
- Program Office = EE, EM, FE, NE, NNSA, SC
- Excess Indicator = N, (Blank)

Office Usable Sqft
- Util-Office Usable SF
- Fiscal Year
- Ownership = DOE Owned (O)
- Program Office = EE, EM, FE, NE, NNSA, SC
- Excess Indicator = N, (Blank)

Storage Utilized Sqft
- Util-Storage Utilized SF
- Fiscal Year
- Ownership = DOE Owned (O)
- Program Office = EE, EM, FE, NE, NNSA, SC
- Excess Indicator = N, (Blank)

Storage Usable Sqft
- Util-Storage Usable SF
- Fiscal Year
- Ownership = DOE Owned (O)
- Program Office = EE, EM, FE, NE, NNSA, SC
- Excess Indicator = N, (Blank)

Other Utilized Sqft
- Util-Total Utilized SF
- Util-Office Utilized SF
- Util-Storage Utilized SF
- Fiscal Year
- Ownership = DOE Owned (O)
- Program Office = EE, EM, FE, NE, NNSA, SC
- Excess Indicator = N, (Blank)

Other Usable Sqft
- Util-Total Usable SF
- Util-Office Usable SF
- Util-Storage Usable SF
- Fiscal Year
- Ownership = DOE Owned (O)
- Program Office = EE, EM, FE, NE, NNSA, SC
- Excess Indicator = N, (Blank)

Note: "Other" Usable & Utilized Sqft = Total minus Storage minus Office

Figure [7] – Number of Excess and Inactive Facilities by Program

Total Number of Excess Assets = Number of Excess + Number of Inactive (but not excess)

In years past, many sites would list assets as inactive but would not yet establish them as officially excess. As a result, for FY 2016 and earlier, to identify excess assets one must include all Excess Indicator = "Y" assets as well as all INACTIVE assets where Excess Indicator = "N" or (Blank). Inactive assets are those with a Status of: In-Situ Closed, In-Situ Closed LTM, Shutdown, Undergoing Stabilization/Deactivation, Undergoing Decommissioning, or Undergoing Disposition.

New FIMS data standards now require that any inactive asset also be established as excess. As a result, for FY 2017 onward, including just those assets with Excess Indicator = "Y" is sufficient to identify all excess assets.

Number of Excess Assets
- Fiscal Year
- Ownership = DOE Owned (O)
- Program Office = EE, EM, FE, NE, NNSA, SC
- Excess Indicator = Y
- Property Type = Building, Trailer, OSF
- Status does not equal: Active Land, Inactive Land

Number of Inactive Assets (but not excess)
- Fiscal Year
- Ownership = DOE Owned (O)
- Program Office = EE, EM, FE, NE, NNSA, SC
- Excess Indicator = N, (Blank)
- Property Type = Building, Trailer, OSF
- Status = In-Situ Closed
  In-Situ Closed LTM
  Shutdown
  Undergoing Stabilization/Deactivation
  Undergoing Decommissioning
  Undergoing Disposition

Figure [8] – Number of Excess/Inactive Facilities and Disposal Trend by Fiscal Year

To determine the number of excess assets, use the same methodology as Figure 7 above but show the totals for the past 5 fiscal years instead of just the most recently completed fiscal year.

Number of Excess Assets
- Fiscal Year
- Ownership = DOE Owned (O)
- Program Office = EE, EM, FE, NE, NNSA, SC
- Excess Indicator = Y
- Status does not equal: Active Land, Inactive Land
- Property Type = Building, Trailer, OSF

Number of Inactive Assets (but not excess)
- Fiscal Year
- Ownership = DOE Owned (O)
- Program Office = EE, EM, FE, NE, NNSA, SC
- Excess Indicator = N, (Blank)
- Property Type = Building, Trailer, OSF
- Status = In-Situ Closed, In-Situ Closed LTM, Shutdown, Undergoing Stabilization/Deactivation, Undergoing Decommissioning, Undergoing Disposition

To determine the number of asset dispositions each FY, use the FIMS ARCHIVE database as follows: Note: Be sure to include those archived in the FISCAL YEAR rather than the CALENDAR YEAR (i.e. make sure to sum the data by Disposition Dates between 1 October and 30 September of the relevant Fiscal Year rather than the January – December calendar year dates.

Total Assets Disposed of Each Year
- Disposition Date (arrange by Fiscal Year as described above)
- Disposition Method = all except "Admin Correction/no Disposal"
- Program Office = EE, EM, FE, NE, NNSA, SC
- Property Type = Building, Trailer, OSF

Figure [9] – Carrying Costs for Excess Facilities

As described with Figure [7] above, beginning with FY 2017, FIMS requires all assets with an inactive status code to also be listed as excess. Therefore, this figure only needs to take into account assets with an Excess Indicator = "Y".

For Excess Assets
- Actual Annual Maintenance
- Op Costs-Total
- Ownership = DOE Owned (O)
- Program Office = EE, EM, FE, NE, NNSA, SC
- Excess Indicator = Y
- Property Type = Building, Trailer, OSF

For Portsmouth & Paducah Sites:
- Actual Annual Maintenance
- Op Costs-Total
- Ownership = DOE Owned (O)
- Program Office = EM
- Excess Indicator = N, (Blank)
- Property Type = Building, Trailer, OSF
- Status = Operating, Outgranted, Standby, (Blank)
- Site Name = Paducah Gaseous
- Site Name = Portsmouth Gaseous

Figures [10] – Maintenance Investment Index

For Actual Annual Maintenance
- Actual Annual Maintenance
- Ownership = DOE Owned (O)
- Status = Operating, Standby, Outgranted, Blank
- Program Office = EE, EM, FE, NE, NNSA, SC
- Property Type = Building, Trailer, OSF

For RPV:
- RPV
- Ownership = DOE Owned (O)
- Status = Operating, Standby, Outgranted, Blank
- Program Office = EE, EM, FE, NE, NNSA, SC
- Property Type = Building, Trailer, OSF

Figures [11] and [12] and Table [B]

Data Source: Prior year enacted appropriates and Integrated Facilities and Infrastructure Crosscut submissions for Congressional Requests – data provided by programs.

Table [A]

As defined in the FIMS User Dictionary

Table [C] - Core Capabilities Potentially at Risk Due to Infrastructure Deficiencies

% inadequate for each Core Capability (CC) = RPV of Assets assessed as Inadequate (within each CC) ÷ Total RPV of Assessed Assets (within each CC)

Notional Example (just shows 2 CC's for each asset, but consider all 5 CC's when calculating)

Asset	RPV	Overall Asset Condition	Core Capability #1	Core Capability #2
A	$1,000,000	Adequate	Security	Experiments
B	$500,000	Inadequate	Testing	Security
C	$750,000	Blank (i.e. not assessed)	Security	Blank

Total Inadequate RPV associated with CC "Security" = $500,000 (asset B)
Total Assessed RPV associated with CC "Security" = $1,000,000 + $500,000 = $1,500,000 (assets A&B)
So the % of Inadequate RPV for Core Capability "Security" = $500,000 ÷ $1,500,000 = 33%

For RPV of Assessed Assets
- RPV
- Core Capability 1
- Core Capability 2
- Core Capability 3
- Core Capability 4
- Core Capability 5
- Fiscal Year
- Ownership = DOE Owned (O)
- Program Office = EE, EM, FE, NE, NNSA, SC
- Excess Indicator = N, (Blank)
- Overall Asset Condition = Adequate, Substandard, Inadequate

For RPV of Assets Assessed as Inadequate:
- RPV
- Core Capability 1
- Core Capability 2
- Core Capability 3
- Core Capability 4
- Core Capability 5
- Fiscal Year
- Ownership = DOE Owned (O)
- Program Office = EE, EM, FE, NE, NNSA, SC
- Excess Indicator = N, (Blank)
- Overall Asset Condition = Inadequate