Annual Fire Protection Program Summary
for Calendar Year 2016

UNITED STATES DEPARTMENT OF ENERGY

Summary Provided by:

Office of Environmental Protection and ES&H Reporting

Office of ES&H Reporting and Analysis

October 2017

E Office of Environment, Health, Safety and Security

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Foreword

This report, required by Department of Energy (DOE) Order 231.1B, *Environment, Safety and Health Reporting*, is the primary source for quantifying fire and fire-related monetary losses of properties, facilities, and equipment across the DOE Complex.

The report for calendar year (CY) 2016 was summarized from information sent to Headquarters by 27 reporting elements, representing approximately 99 percent of DOE's facility and equipment valuation (most of the significant DOE facilities report into this database, except for the Power Marketing Administrations and Headquarters offices). Abbreviations are identified in the Glossary, as are the DOE site reporting elements and major definitions.

The fire protection data for CY2016 were extracted from the DOE Fire Protection Reporting System, with the following organizations reporting into the database:

Ames Laboratory
Argonne National Laboratory
Brookhaven National Laboratory
East Tennessee Technology Park
Fermi National Accelerator Laboratory
Idaho National Laboratory
Kansas City Plant
Lawrence Berkeley National Laboratory
Lawrence Livermore National Laboratory
Los Alamos National Laboratory
National Renewable Energy Laboratory
Nevada National Security Site
Oak Ridge National Laboratory
Office of River Protection
Pacific Northwest National Laboratory
Paducah Gaseous Diffusion Plant
Pantex Plant
Portsmouth Gaseous Diffusion Plant
Princeton Plasma Physics Laboratory
Richland Operations Office
Sandia National Laboratory
Savannah River Site
Stanford Linear Accelerator Laboratory
Strategic Petroleum Reserves
Waste Isolation Pilot Plant
West Valley Demonstration Project
Y-12 Plant

Organizations are required to report by April 30th of each year; however, the Office of Environment, Health, Safety and Security (AU) accepts data through the end of May.

The Fire Protection Reporting System is located at:
http://energy.gov/ehss/policy-guidance-reports/databases/fire-protection-database. [Password required]

AU continues to work with the DOE Fire Safety Committee to improve the data submission system and the content of the annual report to improve its utility.

Glossary

Headquarters Organizational Elements

AU	Environment, Health, Safety and Security
EE	Energy Efficiency & Renewable Energy
EM	Environmental Management
FE	Fossil Energy
LM	Legacy Management
NE	Nuclear Energy
NNSA	National Nuclear Security Administration
PMA	Power Marketing Administrations
SC	Science

Field/Area/Site Organizational Elements

CAO	Carlsbad Area Office
CH	Chicago Operations Office
GFO	Golden Field Office
GJO	Grand Junction Office
DOE-ID	Idaho Operations Office
KCSO	Kansas City Site Office
LSO	Livermore Site Office
LASO	Los Alamos Site Office
NETL	National Energy Technology Laboratory
NPR	Naval Petroleum Reserves
NSO	Nevada Site Office
ORO	Oak Ridge Operations Office
ORP	Office of River Protection
PXSO	Pantex Site Office
RL	Richland Operations Office
SSO	Sandia Site Office
SRO	Savannah River Operations Office
SPR	Strategic Petroleum Reserve Office
YSO	Y-12 Site Office

Site Abbreviations and Acronyms

ALA	Ames Laboratory
ANL	Argonne National Laboratory
AEMP	Ashtabula Environmental Management Project
BAPL	Bettis Atomic Power Laboratory
BNL	Brookhaven National Laboratory
ETTP	East Tennessee Technology Park
FNAL	Fermi National Accelerator Laboratory
FEMP	Fernald Environmental Management Project
INL	Idaho National Laboratory
ID-EM	Idaho Cleanup Project
KAPL	Knolls Atomic Power Laboratory
KCP	Kansas City Plant
KSO	Kesselring Site Operations
KAFB	Kirtland Air Force Base
LBNL	Lawrence Berkeley National Laboratory
LLNL	Lawrence Livermore National Laboratory
LANL	Los Alamos National Laboratory
MOAB	Moab Uranium Mill Tailings Remedial Action (UMTRA) Project
NBL	New Brunswick Laboratory
NETL	National Energy Technology Laboratory
NREL	National Renewable Energy Laboratory
NRF	Naval Reactors Facilities
NNSS	Nevada National Security Site
ORISE	Oak Ridge Institute for Science and Education
ORNL	Oak Ridge National Laboratory
ORP	Office of River Protection
TWPC	TRU Waste Processing Center
PAD	Paducah Gaseous Diffusion Plant
PTX	Pantex Plant
PGDP	Paducah Gaseous Diffusion Plant
PNNL	Pacific Northwest National Laboratory
PORTS	Portsmouth Gaseous Diffusion Plant
PPPL	Princeton Plasma Physics Laboratory
RL	Richland Operations Office
SLAC	SLAC National Accelerator Laboratory
SNL-NM	Sandia National Laboratories, New Mexico
SNL-CA	Sandia National Laboratories, California
SRS	Savannah River Site
TJNAF	Thomas Jefferson National Accelerator Facility
WIPP	Waste Isolation Pilot Plant
WVDP	West Valley Demonstration Project
Y-12	Y-12 Plant
YMP	Yucca Mountain Project

Definitions

The following terms are from the archived DOE Manual (M) 231.1-1, *Environment, Safety, and Health Reporting Manual*. Other definitions come from the archived DOE Order (O) 5484.1, *Environmental Protection, Safety and Health Protection Information Reporting Requirements*, to clarify key concepts. Section references to these documents are given at the end of each definition.

Property Value/Valuation: The approximate replacement value of all DOE-owned buildings/facilities and equipment. Included are the cost of all DOE-owned supplies and average inventory of all source and special nuclear materials. Excluded are the cost of land, land improvements (such as sidewalks or roads), and below ground facilities not susceptible to damage by fire or explosion (such as major water mains and ponds). (APPENDIX C, DOE M 231.1-1)

Total Valuation: Obtained by combining information from the Facility Information Management System (FIMS) and the Property Information Database System (PIDS). FIMS is the Department's official repository of real property data, whereas PIDS provides the means for reporting DOE and contractor held property for sensitive items and equipment ($5– $25K and greater than $25K).

Estimated Loss: Monetary loss determination is based on all estimated or actual costs to restore DOE facility and equipment to pre-occurrence conditions irrespective of whether or not such restoration is performed. The estimate includes: (1) any necessary nuclear decontamination; (2) restoration in areas that received water or smoke damage; (3) any loss reductions for salvage value; and (4) any lost revenue experienced as a result of the accident. The estimate excludes: (1) down time; and (2) any outside agency payments. Losses sustained on private property are not reportable, even if DOE is liable for the damage and loss consequences resulting from the occurrence. (APPENDIX C, DOE M 231.1-1)

Fire Loss: All damage or loss sustained as a direct consequence of (and following the outbreak of) a fire shall be classified as a fire loss. Exception: the burnout of electric motors and other electrical equipment through overheating from electrical causes shall be considered a fire loss only if a self-sustained combustion exists after power is shut off. (APPENDIX C, DOE M 231.1-1)

Fire Loss Rate: Unit of comparison in *cents* loss per $100 of valuation (facilities and equipment) as a consequence of fire events.

Fire Protection Loss: All damage or loss sustained as a consequence of fire events, or non-fire events involving fire protection systems; including leaks, spills, and inadvertent releases.

Non-Fire Loss: All damage sustained as a consequence of non-fire events involving fire protection systems; including leaks, spills, and inadvertent releases.

Notes:

- GJO, KAPL, MOAB, NBL and TJNAF may have property valuations in FIMS and/or PIDS, but do not report into the Fire Protection Database and are not included in the overall DOE fire protection calculations.

Executive Summary

In 2016, DOE sites reported no fire-related fatalities and two injuries (page 4). At the Office of River Protection, a worker jumped out of a front-end loader when a fire was discovered beneath the cab, resulting in two fractures in the right leg. At the West Hackberry SPR site, a worker was grinding to rebuild mainline valves, when a fire flashed and then self-extinguished, resulting in minor flash burns requiring first aid.

There were 87 fire protection events reported into the Fire Protection Reporting System in 2016 (page 5). Of these, 50 resulted in monetary losses. Thirty-nine of the loss events (down 13% from 2015) were directly attributable to fire or smoke, resulting losses of $679,619, a decrease of 27% from 2015. Eleven events (down 61%) were non-fire events (leaks, spills, and inadvertent releases), with losses of $118,819, an 84% decrease from 2015. The total costs associated with the 87 fire protection loss events was $798,438, which is a 52% decrease from 2015's $1.6 million. There were no fire protection events reported in 2016 that resulted in losses exceeding $100,000.

It is worth noting that while nearly half of all sites reporting into the Fire Protection Database reported some fire protection losses in 2016, some of the larger sites did not report any losses at all. DOE might benefit from a closer look at these larger sites with no reported losses, as their fire protection systems, strategies, and procedures may offer an opportunity to reveal and share best practices with other sites.

There were an additional 36 events reported in 2016 with no associated reported costs. These events are typically small incidents that are resolved quickly by local staff and are not included in the counts presented in this report, except as part of the number of water-based and non-water-based system actuations.

Loss comparisons among DOE sites are performed by normalizing data against total facility and property valuation as reported in the FIMS and PIDS databases. Total DOE valuation for sites reporting into the Fire Protection Database increased 10% in CY2016 to approximately $141.1 billion (page 9). The overall CY2016 fire loss rate for reporting sites was approximately 0.05 *cents* for each $100 in total site valuation, an 29% decrease from the 2015 rate (page 10). This reflects the absence of major fire events reported during the year.

Recurring costs for fire protection were $311,927,586 in CY2016, which is a 48% increase over 2015 (page 13). As a ratio of cost to total valuation, in CY2016 DOE spent approximately 22 cents per $100 of valuation for recurring fire protection activities at the sites reporting into the Fire Protection Program database, compared with 16 cents in 2015, an increase of 38%.

Notable Occurrences Reported in ORPS

There were 92 fire or fire protection-related occurrences reported into the DOE Occurrence Reporting and Processing System (ORPS) in CY2016 (a 12% increase from CY2015. Of these, 2 were rated as Significance Category 2 (Moderate Impact) occurrences, 2 were rated as Recurring Events, and 3 were deemed Operational Emergencies. None were rated as Significance Category 1 (Major Impact). The remaining 85 occurrences were rated as Significance Category 3 (Minor Impact) or 4 (Some Impact). Below are summaries of the Significance Category 2, Recurring Event, and Operational Emergency occurrences.

Table 1
Summaries of Notable Fire Protection Events Reported into ORPS in 2016

Site	Description
Significance Category 2 Events	
WIPP	On May 12, 2016, during a review of the work packages used for the fire water suppression system obstruction testing performed in March 2016, a Fire Protection Engineer (FPE) determined that the obstruction testing at Room 108 and the Contact Handled (CH) Bay risers had failed and the flow path to fire suppression sprinklers was obstructed. The FSM further determined that a Technical Safety Requirement (TSR) violation had occurred on March 22, 2016, when a work package to replace alarm check valve/trim, perform obstruction testing on the fire water suppression system (sprinklers) and perform hydrostatic testing in the CH Bay was completed. Another TSR violation occurred on March 23, 2016, when a work package to replace alarm check valve/trim, perform obstruction testing on the fire water suppression system (sprinklers) and perform hydrostatic testing in Room 108 was completed. During the May 12 review of those work packages, the FPE noted several steps in each work package that were identified as not meeting the obstruction test acceptance criteria. There must be an unobstructed flow path from the tank to the sprinklers to be considered operable. The FSM determined that a TSR violation occurred when an LCO was not entered and required LCO actions were not taken after the obstruction testing failed in March.
ID-EM	A 15-year-old propane heater ignited as a result of an accumulation of propane gas due to a misfire, possibly caused by a misaligned burner assembly. The propane supply isolation valve was frozen, and the Fire Department had to use alternate measures to stop the propane flow.
Recurring Events	
PTX	During an annual preventive maintenance, the fire damper was unable to be tested due to restricted access ports. An extent of condition review identified that the maintenance procedures did not include the correct number of dampers that were required to be inspected. Therefore, all dampers in the subject facility had not been consistently maintained as required.

Site	Description
Legacy Management	Two events reported. At Weldon Spring a tow-behind mowing deck that was mowing fire management burn breaks ejected a stick 80 feet, and it contacted a passenger vehicle window. At Rocky Flats, smoke was detected from a generator near a particle board trailer wall. The hot embers were extinguished. For both events, subcontractors did not follow the manufacturers' recommendations.
Operating Emergencies	
ANL	The Fire Department responded to a fire alarm and found light smoke coming from roof ventilator housings and a small fire of ground debris adjacent to a power substation nearby the building. The source of the smoke within the building was located at the rear interior of the structure and found to be a faulted 480-volt, 3 phase system that formerly supplied power to experimental equipment. When located, there was no active burning as the fire had self-extinguished.
LLNL	An offsite fire occurred at a private company located west of Site 300 after work hours. The offsite fire potentially involved hazardous materials and smoke was observed to be blowing towards Site 300. As a precaution, an Operational Emergency was declared and shelter-in-place instructions were initiated for the limited number of individuals still onsite.
PGDP	A large grass fire impacted an area on Department of Energy property licensed to the Western Kentucky Wildlife Management Area. The Plant Shift Superintendent (PSS) received a request for mutual aid from the local Fire Department to fight the fire. The PSS approved the request, declared an Operational Emergency (OE) and notified the DOE-Headquarters Watch Office. As a precautionary measure, the C-746-U Landfill was evacuated. The fire was controlled and the OE was terminated.

Fire Protection Losses Personnel Injuries

There were two fire-related personnel injuries reported by DOE during CY2016.

Hanford ORP	On June 23, 2016, a subcontract worker jumped out of a front-end loader when they discovered flames coming from beneath the cab. The worker landed clear of the loader and contacted 911 for emergency services. The worker and a dump truck operator tried to extinguish the flames with fire extinguishers from the dump truck, but were unsuccessful. Hanford Emergency Services arrived and extinguished the flames. The worker was taken to the project medical facility for first aid treatment and x-rays which indicated evidence of two fractures in the right lower leg.
SPR West Hackberry	On December 7, 2016, at the West Hackberry (WH) Strategic Petroleum Reserve site, a subcontractor was working on a project to rebuild the mainline valves on the WH-Sun 42" Crude Oil Pipeline. Prior to work, a gas test was performed inside of the open line at the valve being repaired. When grinding commenced, a fire flashed within a few seconds and then self-extinguished. Even though the vapors were depleted by the flash and no additional flammable material was present to continue combustion, a dry chemical fire extinguisher was discharged into the valve area as a precaution to prevent re-ignition. All work at the job site was ceased and a Stand Down for Safety was held. At the end of the work shift, the employee who performed the grinding was taken to a medical facility to be examined for potential flash burns to exposed skin. First aid was administered and the employee was given a full release and returned to work with no restrictions.

There were 87 fire protection events reported into the Fire Protection Reporting System in 2016; a decrease of 36% from 2015. Of these, 51 resulted in monetary losses; of which 40 were fire loss events (directly attributable to fire or smoke) and 11 were non-fire loss events (leaks, spills, and inadvertent releases). The total cost associated with the 51 events was $799,438 million, which is a 52% decrease from 2015's approximately $1.7 million.

The 40 fire loss events in CY2016, (down 13% from 2015), resulted in an estimated $679,619 in fire losses, which is a 27% decrease from 2015. The 11 reported non-fire losses (leaks, spills or inadvertent releases) in CY2016 represent a 61% decrease from 2015; and resulted in $118,819 in losses, an 84% decrease from 2015. This large decrease is attributable to two notable 2015 events at INL involving broken firewater pipes that resulted in $633,000 in losses.

There were an additional 36 events with no reported costs. These events are typically small incidents that are resolved quickly by local staff, or events where all associated costs are absorbed by the Fire Department. They are not included in the counts presented in this report, except as part of the number of water-based and non-water-based system actuations.

Table 2

DOE Fire Protection Loss Events

Loss Category	Fire Loss Type	Number of Events*	Property Loss Amount
	Fire/Smoke – Brush	3 Events	$6,500
Fire Loss Events	Fire/Smoke – Vehicle	4 Events	$66,500
	Fire/Smoke – Other	5 Events	$312,100
	Fire/Smoke – Building	27 Events	$294,519
	Total Fire Loss Events:	**39 Events**	**$679,619**
Non-Fire Loss Events	Leaks, Spills, Releases	11 Events	$118,819
	Total Fire Protection Loss Events:	**50 Events**	**$798,438**

* Fire events recorded in the database with no associated costs are not counted in the number of events.

It is worth noting that while nearly half of all sites reporting into the Fire Protection Database reported some fire protection losses in 2016, some of the larger sites did not report any losses at all. DOE might benefit from a closer look at these larger sites with no reported losses, as their fire protection systems, strategies, and procedures may offer an opportunity to reveal and share best practices with other sites.

DOE's total fire protection loss rate for CY2015, as reported into the Fire Protection Reporting System, was approximately 0.06 cents loss per $100 valuation. For fire events only, the loss rate was 0.05 cents per $100.

Major Fire Protection Loss Events

Trending of fire loss data indicates that a small proportion of incidents constitute the majority of dollar losses reported by DOE sites. Fifteen (38%) of the 40 fire protection loss events in CY2016 resulted in losses of $10,000 or more per event. These 15 incidents represented $715,105, or 89% of the total 2016 fire losses for the entire DOE Complex.

Table 3 provides descriptions of the five costliest ($40,000 or greater) fire losses, which contributed 64% of the total DOE fire protection losses for the year.

Table 3

Summaries of Fire Events with Losses of $40,000 or Greater

Loss Type	Location	Description	Dollar Loss
Fire/Smoke (Other)	FNAL	The MI-60 Exterior oil-cooled Transformer next to Anode Room failed.	$280,000
Fire/Smoke (Building)	LANL	Unattended Rostok Max V2 3-D printer fire in office, resulting in sprinkler system activation and FD response.	$76,500
Fire/Smoke (Building)	SNL	During a routine post-shot process on the Z Machine, the system reported an "unbalanced trip" due to a Marx failure. The failure resulted in the upward release of energy and heat, reaching the ceiling of the high bay, which, resulted in contact with and activation of two sprinklers. Loss estimates include down time to clean oil tank of water contamination.	$74,376
Fire/Smoke (Vehicle)	NNSS	An armored vehicle caught on fire. Verification was made that personnel were accounted for and that there were no hazards in the vehicle. F&R crews achieved complete fire extinguishment of the engine compartment.	$43,000
Leaks, Spills, Releases	LBNL	The Aqueous Film Forming Foam (AFFF) deluge system activated during a major rainstorm, due to water entering into the fire alarm system conduits. The water caused the system to mimic an alarm event, causing the release. Approximately 100 gallons of AFFF water were released, of which approximately 50 gallons were carried downhill and into a nearby storm drain.	$40,000

Figure 1

Significant Fire Loss Events by Site

Nine DOE sites reported 15 fire loss events resulting in losses of $10,000 or greater.

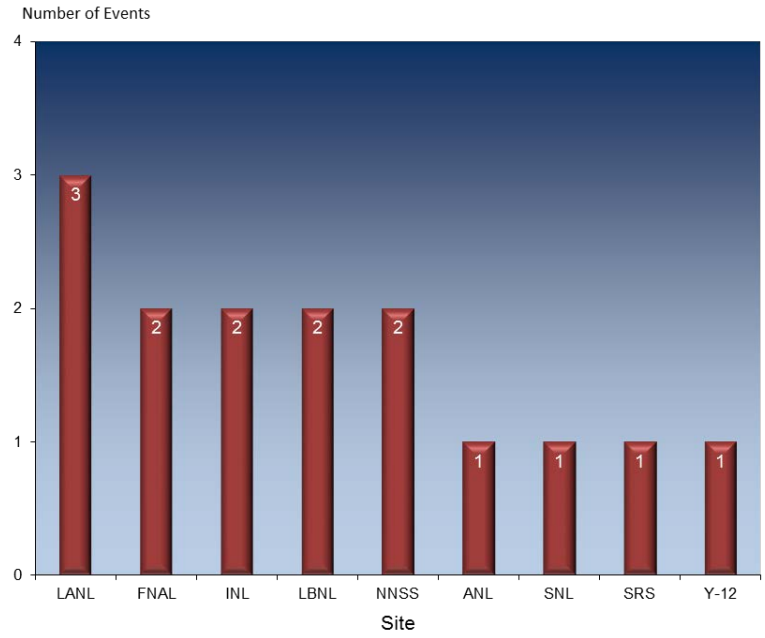


Figure 2

Significant Fire Loss Amounts by Site

Total losses from the nine sites with fire events resulting in losses of $10,000 or greater.

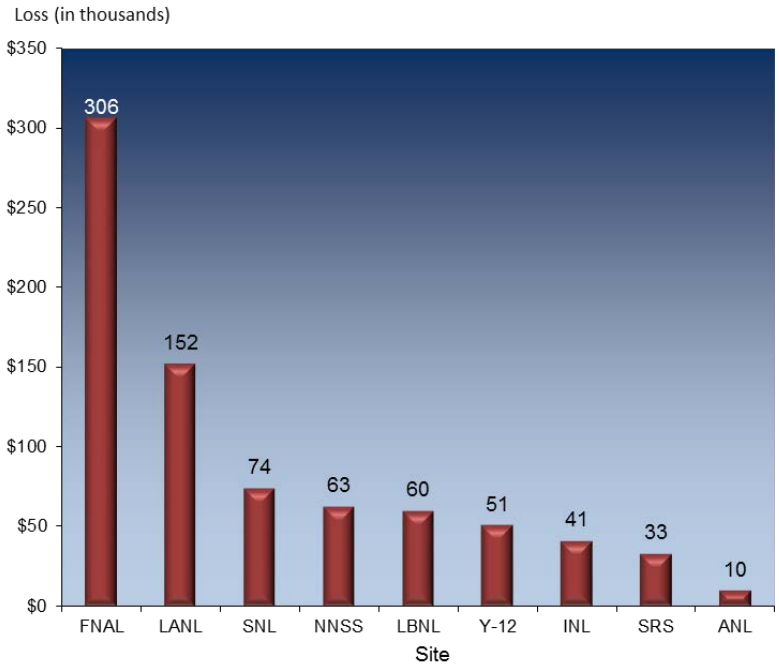
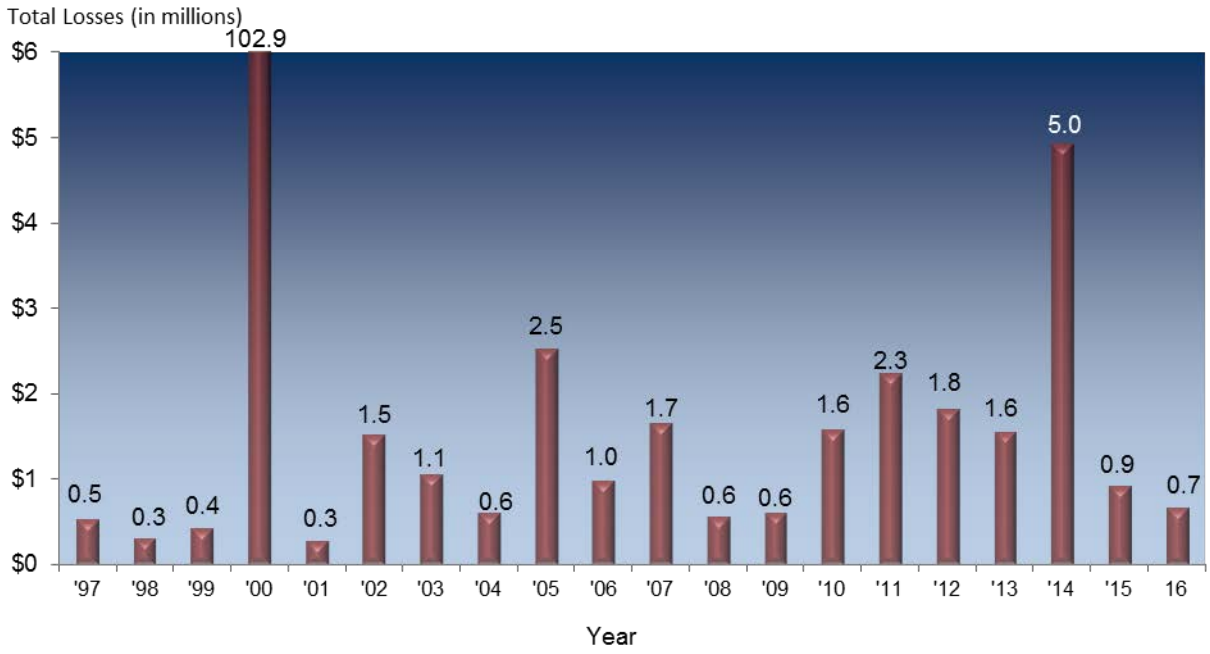


Figure 3

DOE Property and Facility Fire Loss Amounts since 1996 *



Note: CY2000 figure includes the $100 million LANL range fire loss and the CY2014 total includes the $2.4 million WIPP vehicle fire event.

* In the *Annual Fire Protection Summary* reports from 2011-2014, Fire Protection Loss figures included both fire losses and non-fire losses, such as fire-protection system leaks, spills and unintentional releases. From 2015 forward, fire losses and non-fire losses are separated, as they were in reports prior to 2011, with fire losses including only losses resulting from actual fire events. Non-fire loss events are detailed in the Water-Based Fire Suppression System Actuations and Non-Water-Based Fire Suppression System Actuations sections of this report.

Fire Loss Rates

Facility and property valuation estimates serve as a common denominator for comparing annual fire loss rates, which include actual fire events and fire suppression system actuations. In CY2016, the total DOE valuation for sites reporting into the Fire Protection Database increased approximately 10% from 2015 to roughly $141.4 billion.

DOE's calculated 2016 Fire Protection Loss Rate for sites reported into FIMS, PIDS, and the Fire Protection Reporting System, was approximately 0.05 *cents* per $100 of total valuation, a 29% decrease from the 2015 rate.

Figure 4

DOE Total Valuation since 1966

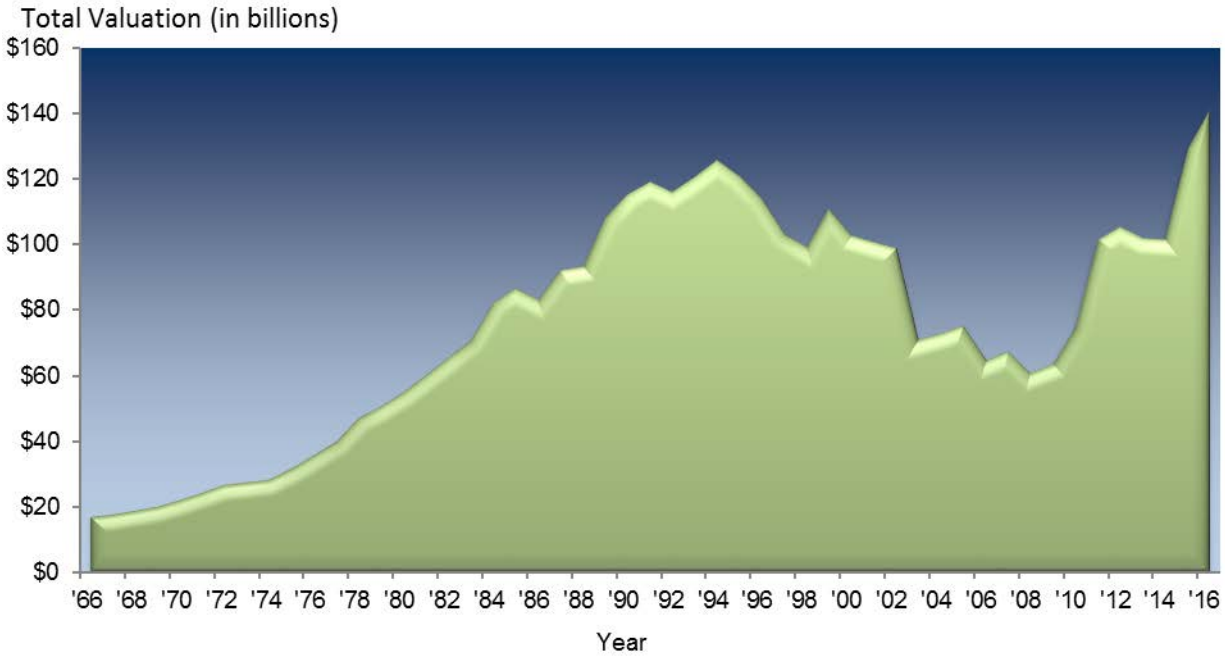
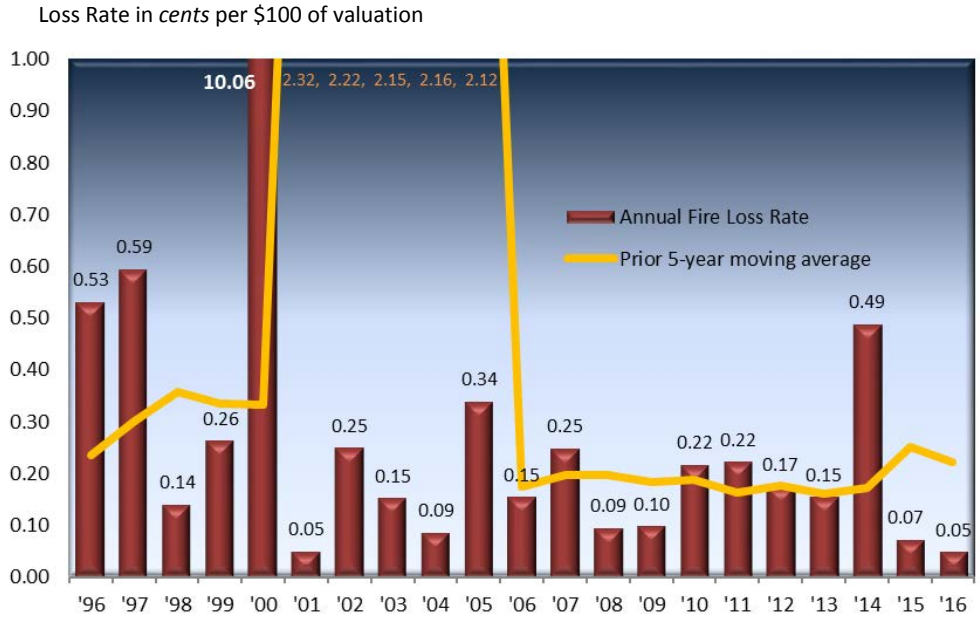


Figure 5

DOE Fire Loss Rates since 1996 *



* Please see the Note on page 8 of this report.

Figure 6

Fire Loss Rates by Site

Fire loss rates for the nine DOE sites with *total* fire protection losses of $10,000 or greater.

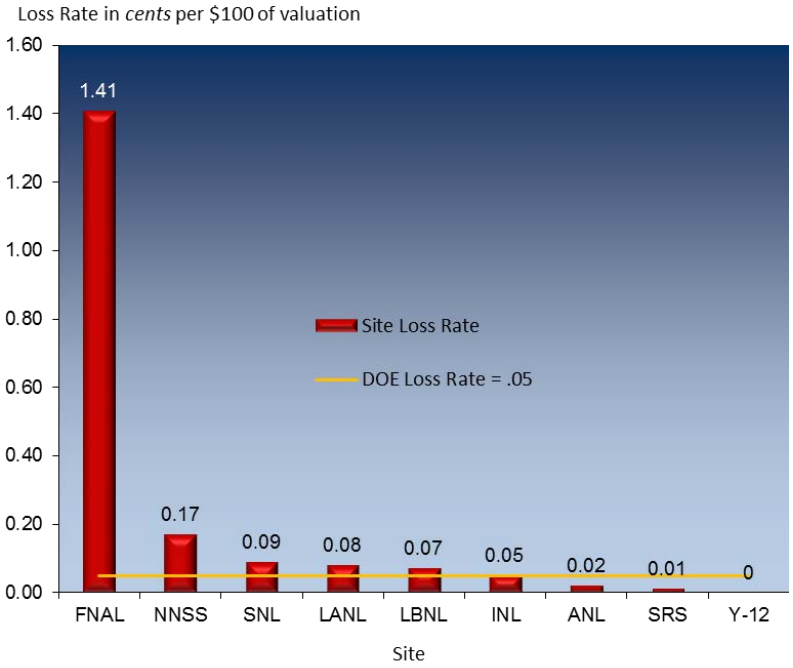


Table 4
DOE Fire Loss History from 1950 to the Present *

Year	Valuation (Millions of Dollars)	Fire Loss (Dollars)	Fire Loss Rate (Cents per $100 Valuation)	Previous 5-Year Average (Cents per $100 Valuation)
1950	1,800.00	496,439	2.76	–
1951	2,177.10	356,115	1.64	–
1952	3,055.10	805,707	2.64	–
1953	4,081.00	575,572	1.41	–
1954	6,095.90	375,874	0.62	–
1955	6,954.20	455,788	0.66	1.81
1956	7,364.10	3,147,423	4.27	1.39
1957	7,973.20	1,476,599	1.85	1.92
1958	8,102.50	751,825	0.93	1.76
1959	10,301.80	1,197,901	1.16	1.67
1960	10,708.60	1,401,051	1.31	1.77
1961	11,929.90	5,856,055	4.91	1.91
1962	12,108.80	3,313,364	2.74	2.03
1963	13,288.90	1,376,054	1.04	2.21
1964	14,582.80	1,351,035	0.93	2.23
1965	15,679.30	3,850,069	2.46	2.18
1966	16,669.00	856,973	0.51	2.41
1967	17,450.90	2,782,934	1.59	1.53
1968	18,611.90	869,083	0.47	1.31
1969	20,068.30	28,054,334	13.98	1.19
1970	22,004.30	1,700,792	0.77	3.80
1971	24,155.80	1,936,049	0.80	3.47
1972	26,383.50	920,651	0.35	3.52
1973	27,166.70	2,375,688	0.87	3.27
1974	28,255.50	1,179,877	0.42	3.36
1975	31,658.30	5,252,349	1.66	0.64
1976	35,512.70	2,292,576	0.65	0.82
1977	39,856.10	3,613,984	0.91	0.79
1978	47,027.10	17,477,979	3.72	0.90
1979	50,340.80	2,541,023	0.50	1.47
1980	54,654.70	8,545,935	1.56	1.49
1981	59,988.80	4,643,488	0.77	1.47
1982	65,360.40	4,200,968	0.64	1.49
1983	70,484.40	10,497,062	1.49	1.44
1984	82,166.90	6,467,320	0.79	0.99
1985	86,321.84	4,129,297	0.48	1.05
1986	82,787.52	5,295,292	0.64	0.83
1987	91,927.20	3,010,829	0.33	0.81
1988	92,998.00	8,303,120	0.89	0.74
1989	107,948.00	7,505,551	0.70	0.63
1990	115,076.00	17,470,746	1.52	0.61
1991	118,868.68	2,428,805	0.20	0.81

Year	Valuation (Millions of Dollars)	Fire Loss (Dollars)	Fire Loss Rate (Cents per $100 Valuation)	Previous 5-Year Average (Cents per $100 Valuation)
1992	118,267.06	3,653,554	0.31	0.73
1993	119,826.25	3,018,534	0.25	0.72
1994	124,350.29	3,403,650	0.27	0.60
1995	120,321.68	1,632,466	0.14	0.51
1996	113,471.00	6,025,832	0.53	0.23
1997	102,947.24	6,112,887	0.59	0.30
1998	99,127.79	1,378,788	0.14	0.36
1999	110,858.47	2,911,040	0.26	0.33
2000	102,514.01	103,174,122	10.06	0.33
2001	103,215.56	505,586	0.05	2.32
2002	98,779.44	2,461,847	0.25	2.22
2003	70,812.80	1,075,309	0.15	2.15
2004	72,601.95	622,613	0.09	2.16
2005	74,951.25	2,537,565	0.34	2.12
2006	64,547.05	997,805	0.15	0.17
2007	67,382.01	1,674,515	0.25	0.20
2008	60,576.55	573,161	0.09	0.20
2009	63,569.89	623,299	0.10	0.18
2010	74,417.99	1,608,762	0.22	0.19
2011*	101,351.17	2,250,744	0.22	0.16
2012*	105,238.57	1,840,121	0.17	0.18
2013*	101,940.69	1,572,342	0.15	0.16
2014*	101,437.21	4,953,200	0.49	0.17
2015	129,041.10	929,879	0.07	0.25
2016	141,366.10	680,619	0.05	0.22

* As noted on page 8 of this report, in the *Annual Fire Protection Summary* reports from 2011-2014, Fire Loss figures (column 3 in Table 4 above) included both fire and non-fire losses such as fire-protection system leaks, spills and releases. The calculated Fire Loss Rate and Previous 5-Year Average (columns 4 and 5) also reflected those values. From 2015 forward, the figures reflect only actual fire losses.

Recurring Fire Protection Program Costs

Yearly recurring fire protection costs for CY2016 were $311,927,586 for those sites reporting into the Fire Protection Program database, a 48% increase over 2015. As a ratio of cost to replacement property value (recurring cost rate), in 2016 DOE spent approximately 22 cents per $100 valuation for recurring fire protection activities at those sites, compared with 16 cents in 2015, an increase of 38%. Figure 7 shows the CY2016 recurring cost distribution by activity type.

Figure 7

Recurring DOE Fire Protection Program Costs by Activity

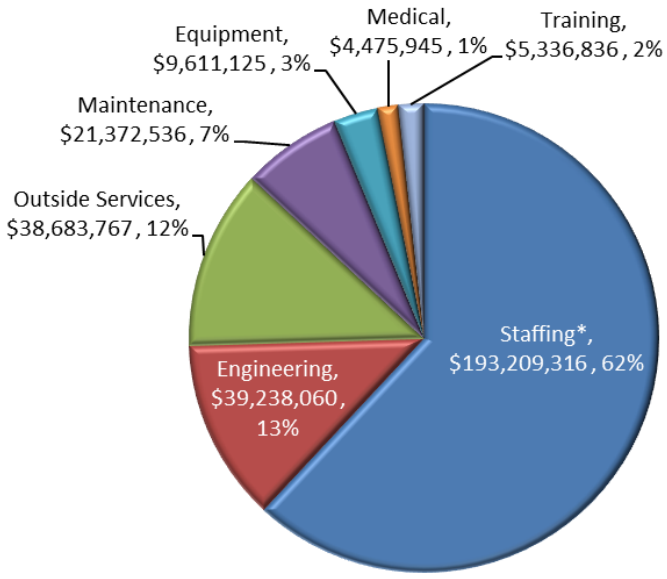
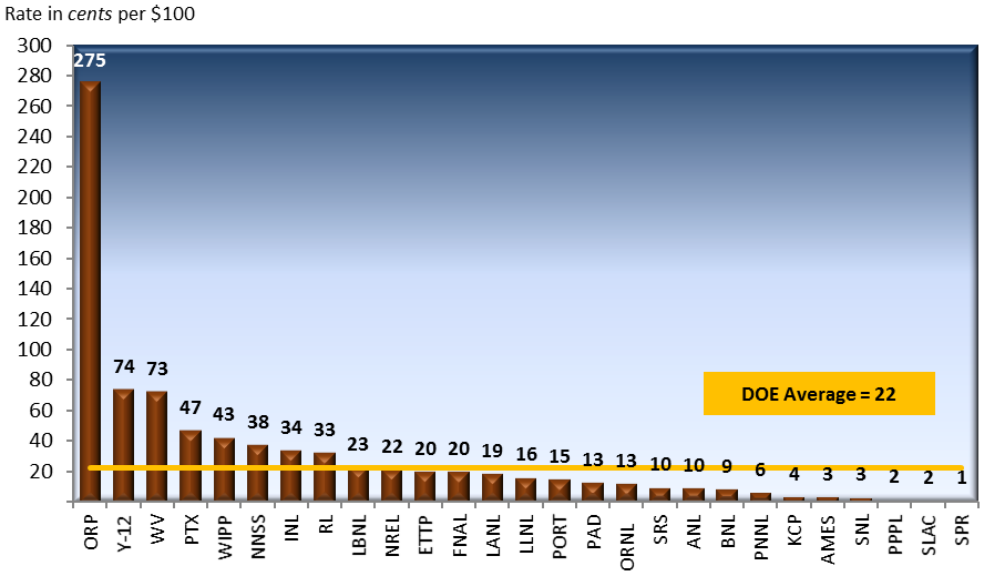


Figure 8 displays the recurring cost rates in *cents* per $100 of valuation at DOE sites. It should be noted that not all recurring cost activities are consistently reported, such as outside contracts and maintenance activities. For comparison, the DOE-wide figure of 22 cents per $100 is displayed as a line.

Figure 8

Recurring Fire Protection Program Cost Rates by Site



Water-Based Fire Suppression System Actuations

In CY2016, DOE facilities reported inadvertent actuations of 19 wet-pipe suppression systems resulting in $190,695 in losses. (Eight of the 18 events had no costs associated with them.) Of the 18 events, 3 were attributed to weather-related events (freezing), 5 to design/material issues, 2 to electrical issues, 2 to procedure issues, and 7 were attributed to other or unspecified problems.

The four costliest events ($10,000 or greater), representing 87% of the water-based suppression system reports, are noted below.

Table 5

Water-Based Fire Suppression System Actuations with Losses of $10,000 or Greater

Loss Type	Location	Description	Dollar Loss
Fire/Smoke (Building)	SNL	During a routine post-shot process, the system reported an "unbalanced trip" due to a Marx failure. The failure resulted in the upward release of energy and heat to the ceiling of the high bay, which resulted in the activation of two sprinklers. Loss estimates include down time to clean the oil tank of water contamination.	$74,376
Leaks, Spills, Releases	LBNL	The Aqueous Film Forming Foam (AFFF) deluge system activated during a major rainstorm, due to water entering into the fire alarm system conduits. The water caused spikes in the system, which mimicked an alarm event, causing the release. Approximately 100 gallons of AFFF water were released, of which approximately 50 gallons were carried downhill and into a nearby storm drain.	$40,000
Leaks/Spills/Releases	Y-12	A sprinkler head inside RAD-contaminated ductwork discharged, causing flooding in both levels of the building.	$27,046
Leaks, Spills, Releases	LANL	Inadvertent sprinkler head actuation, causing water damage to stored computing equipment, post-event water clean-up, and recovery actions.	$25,000

Non-Water-Based Fire Suppression System Actuations

Chlorofluorocarbons, including Halon, are regulated under the 1991 Clean Air Act because of their detrimental impact on the ozone layer. The Environmental Protection Agency has published implementation regulations to prohibit Halon production, establish container labeling requirements, impose Federal procurement restrictions and Halon taxes, issue requirements for the approval of alternative agents, and list essential areas where Halon protection is considered acceptable.

DOE policy, as stated in the May 5, 1993 Memorandum, DOE F 132S.8, *Managed Phase Out of Halon Fixed Fire Suppression Systems*, does not allow the installation of any new Halon systems. Field organizations have been requested to aggressively pursue alternative fire suppression agents to replace existing systems and to effectively manage expanding Halon inventories. The long-term goal is the gradual replacement of all Halon systems.

In CY2016, DOE sites reported 136 active Halon systems in operation, containing approximately 46,646 pounds of Halon. The number of reported active Halon systems increased by 147% from 2015, while Halon inventory amounts increased by 46%.

There were 3 inadvertent actuations of a non-water-based suppression system reported in CY2016 as described below.

Table 6

Non-Water-Based Fire Suppression System Actuations

Loss Type	Location	Description	Dollar Loss
Leaks/Spills/Releases	LANL	An FM-200 automatic fire extinguishing system protecting inadvertently discharged when an employee jarred of the manual release station.	$2,500
Fire/Smoke (Other)	ORNL	One hundred pounds of CO2 were released as a result of an electrical event involving a modulator. The modulator overheated and activated a smoke detector.	$2,500
Fire/Smoke (Other)	ORNL	One hundred pounds of CO2 were released as a result of an electrical event involving a modulator. The modulator overheated and activated a smoke detector.	$2,500

Fire Department Responses

In CY2016, DOE reported 6,082 Fire Department responses, a 2.5% decrease from 2015. The distribution of Fire Department response types is displayed below.

Table 7

Fire Department Responses

Call Category	2016 Responses
Fire Calls	433
HazMat Calls	264
Other Emergency Calls	1,623
Non-Emergency Calls	2,136
Medical Calls	1,626
TOTAL Fire Department Responses	**6,082**

Comparing these data to the actual type of response is difficult since sites do not report incident responses in a consistent fashion. The Fire Protection Committee continues to examine the use of a standard reporting format which complies with the National Fire Protection Association's Guide 901, *Uniform Coding for Fire Protection*, which could be linked to other DOE incident reporting programs.

Summary provided by:

Office of ES&H Reporting and Analysis