

# Annual Fire Protection Program Summary for Calendar Year 2010



UNITED STATES DEPARTMENT OF ENERGY

Summary Provided by:

Office of Environmental Protection, Sustainability Support  
and Corporate Safety Analysis

Office of Health, Safety and Security

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## Foreword

The Department of Energy (DOE) *Annual Fire Protection Program Summary for Calendar Year 2010* continues the series started in 1972.

Since May 1950, an Annual Fire Protection Program Summary (Annual Summary) has been submitted by DOE's fire protection community under the requirements of DOE's predecessor agencies: the Atomic Energy Commission (AEC) and the Energy Research Development Administration (ERDA). This report is currently required by section 4b (2) of DOE Order 231.1B, *Environment, Safety and Health Reporting* and is considered the primary source for quantifying monetary loss from fire across the DOE Complex.

In 1999, the Annual Summary reporting process was automated to streamline data collection and provide a more comprehensive look at reporting element activities. It is now possible to view all responses since 1991 at the Site, Operations, Lead Program Secretarial Office and Headquarters levels. In 2007, a new Fire Protection Reporting System was designed by the Office of Corporate Safety Analysis and implemented across the DOE Complex. This new process allows sites to submit their information on a real-time basis versus the submittal of an annual summary as was provided in the past. The data set being reported was reviewed in 2010 -2011 as part of the Departments' Directive Reform initiative in the update of DOE Order 231.1B, *Environment, Safety and Health Reporting*. Subject Matter Experts from across the Department agreed to maintain the existing data reporting guidance.

The report for calendar year (CY) 2010 was summarized from information sent to Headquarters by 24 reporting elements, representing approximately 84 percent of DOE's facility and equipment valuation (most of the significant DOE facilities have reported into this database, with the exception of the Power Marketing Administrations and Headquarters offices). Abbreviations are identified in the Glossary, as are the DOE site reporting elements and major definitions.

The information contained in this publication was extracted from the Fire Protection Reporting System for CY 2010. Although the requirement is for sites to submit this data to the Office of Health, Safety and Security (HSS) by April 30 of each year, this report was generated based on data reported into the Fire Protection Reporting System as of June 21, 2011 to allow ample time for a high percentage of sites to submit data.

The Fire Protection Reporting System can be found at:  
<http://www.hss.doe.gov/sesa/corporatesafety/fpdb.html>

HSS plans on continuing to work with the DOE Fire Safety Committee to examine the data submission systems and content of the annual report to improve its benefit to both Headquarters and Field Elements, as needed.

## Glossary

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### Headquarters Organizational Elements:

NNSA	National Nuclear Security Administration
SC	Science
FE	Fossil Energy
NE	Nuclear Energy
EM	Environmental Management
PMA	Power Marketing Administrations <sup>1</sup>
EE	Energy Efficiency & Renewable Energy
RW	Civilian Radioactive Waste Management
LM	Legacy Management
HSS	Health, Safety & Security

### Field/Area/Site Organizational Elements:

CAO	Carlsbad Area Office
CH	Chicago Operations Office
GFO	Golden Field 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 <sup>2</sup>
YSO	Y-12 Site Office

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<sup>1</sup> Power Administration organizations are comprised of the Bonneville Power Administration (BPA); Southeastern Power Administration (SEPA); Southwestern Power Administration (SWPA); and the Western Area Power Administration (WAPA).

<sup>2</sup> Strategic Petroleum Reserve Office sites include: Bayou Choctaw, Big Hill, Bryan Mound and West Hackberry.

*Annual Fire Protection Program Summary for Calendar Year CY2010*

**Site abbreviations:**

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
HAN	Hanford Site <sup>3</sup>
INL	Idaho National Laboratory
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
MEMP	Miamisburg Environmental Management Project
NETL	National Energy Technology Laboratory
NREL	National Renewable Energy Laboratory <sup>4</sup>
NRF	Naval Reactors Facilities
NTS	Nevada National Security Site <sup>5</sup>
ORISE	Oak Ridge Institute for Science and Education
ORNL	Oak Ridge National Laboratory
TWPC	TRU Waste Processing Center
PX	Pantex Plant
PGDP	Paducah Gaseous Diffusion Plant <sup>6</sup>
PORTS	Portsmouth Gaseous Diffusion Plant <sup>6</sup>
PPPL	Princeton Plasma Physics Laboratory
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

The reference below is used throughout the report to identify various DOE elements:

DOE field organization (abr.)/Site (abr.)

*Example: LASO/LANL*

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<sup>3</sup> Hanford Site includes the Pacific Northwest National Laboratory and Office of River Protection facilities (Tank Farms, etc).

<sup>4</sup> National Renewable Energy Laboratory includes the Wind Site.

<sup>5</sup> Nevada National Security Site Includes: Amador Valley Operations, Las Vegas Operations, Nevada-Los Alamos Operations, Nevada-Special Technology Laboratory, Washington Aerial Measurements Operation, and Nevada-EG&G Wolburn NV.

<sup>6</sup> On July 1, 1993, a lease agreement took effect between the DOE and the United States Enrichment Corporation (USEC) essentially transferring all ownership responsibilities to USEC.

## Definitions

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The following terms are defined in the text of archived DOE Manual M 231.1-1, *Environment, Safety, and Health Reporting Manual*. Major definitions not included in this manual have been extracted from the archived DOE Order 5484.1 to clarify key concepts. Section references to these documents are given at the end of the 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)

Total valuation is 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 (\$5k to \$25k and greater than \$25k).

**Estimated Loss:** Monetary loss determination based on all estimated or actual costs to restore DOE facility and equipment to pre-occurrence conditions irrespective of whether this is in-fact 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 damage and loss consequences resulting from the occurrence. Categorization of occurrences shall be by fire loss and non-fire loss events. (APPENDIX C, DOE M 231.1)

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

**Loss Rate:** Unit of comparison in cents loss per \$100 of valuation (facilities and equipment).

## **Executive Summary**

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DOE experienced no fire-related fatalities or serious injuries during CY2010. There were 51 fire loss events (nine fewer than CY2009) reported during the period which caused an estimated \$1,608,762 in property damage. Although these reported fire losses are double the fire losses in CY2009, two INL range fires accounted for **91%** (\$1,465,000) of the total CY2010 losses. Losses from non-fire related events (leaks, spills or inadvertent releases) cost the Department \$312,033 in CY2010, which is a **50% decrease** from non-fire losses in CY2009. There were three separate events in which a worker received minor injuries.

Loss comparisons among DOE sites are performed by normalizing data against total facility and property value (or valuation). Total DOE valuation increased during CY2010 approximately 14 percent (from \$75.6 to \$86.6 Billion). For CY 2010 those sites reporting into the database represented a total valuation of \$74.4 Billion, (86% of the total DOE Complex). The overall CY2010 fire loss rate for those sites was approximately 0.22 cents for each \$100 in total site valuation. Excluding the two INL range fires drops the loss rate to approximately 0.02 cents.

Recurring costs for fire protection reached \$170 million in CY2010 which is approximately 12% more than was spent in CY2009. On a ratio of cost to total valuation, the DOE spent approximately 23 cents per \$100 in valuation for recurring fire protection activities for those sites reporting into the Fire Protection Program database (almost the same as was reported in CY2009).

In CY2010, three fires were extinguished in areas that were controlled by automatic fire suppression systems. Departmental facilities experienced inadvertent actuations of 15 wet-pipe systems and one dry-pipe failure due to corrosion.

## DOE Property Loss Experience

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Property and facility value estimates serve as a common denominator for comparing annual summary fire loss rates. In CY2010, total DOE valuation increased by approximately 14 percent to a total of approximately \$86.6 billion. For those sites reporting into the DOE Fire Protection Program database, the valuations totaled \$74.4 billion. DOE elements reported 51 fire loss events which accounted for a total year-end fire loss of \$1,608,762. Although this represents nine fewer events than the previous year, the fire loss total for CY2010 was significantly inflated by two INL range fires that accounted for 91% of the CY2010 fire losses.

In addition to these fire-related losses, losses for non-fire related events fell 50% during CY2010 to \$312,033. These events included system leaks, spills and other inadvertent releases/discharges. Of that loss total, two inadvertent sprinkler discharges accounted for 73% of total non-fire losses for the year: (1) water damage to LBNL computer equipment resulted in a \$177,000 loss, (2) water damage at ANL resulted in \$50,000 of property and cleanup costs. Weather-related damage (freezing) accounted for the majority of the other non-fire losses.

These property loss events were categorized as follows:

Fire related:	Fire/Smoke (Building)	26 Events	\$34,260
	Fire/Smoke (Brush)	7 Events	\$1,479,700
	Fire/Smoke (Vehicle)	5 Events	\$80,907
	Fire/Smoke (Other)	13 Events	<u>\$13,895</u>
			\$1,608,762
Non-Fire <sup>1</sup> related:	Leaks, Spills, Releases	15 Events	\$312,033

DOE's fire loss rate for CY2010, as reported into the Fire Protection Reporting System, was approximately 0.22 cents loss per \$100 valuation. That loss rate falls to 0.02 cents per \$100 valuation if the two INL range fires are excluded.

**Table 1:** Characterizes Annual Summary loss histories since 1950 and includes both fire and non-fire loss rate categories up to 2003 when the non-fire reporting total was discontinued. Numbers shown in parentheses represent a 5-year running average, where applicable.

The accompanying figures are described as follows:

**Figure 1:** Graphical representation of the Department's property valuation since 1950

**Figure 2:** Fire property loss since 1983

**Figure 3:** Fire loss rates since 1989

**Figure 4:** Number of fire events reported at the 4 sites posting greater than \$10,000 in total losses

**Figure 5:** The current year's fire loss (dollars) by those sites with greater than \$10,000 in total losses

**Figure 6:** The current year's fire loss rate by those sites with greater than \$10,000 in total losses

**Figure 7:** Distribution of recurring Fire Protection Costs by activity

**Figure 8:** The costs of fire protection costs in cents per \$100 of valuation by site

Organizations not shown in Figures 4 through 6 reported either insignificant or zero losses for the year.

1. Small subset of non-fire losses (leaks, spills, releases) attributable to automatic water-based suppression systems only.



Trending of fire loss data continues to indicate that a small number of incidents constitute the majority of dollar losses reported to the DOE. For example, there were seven fire and inadvertent actuation incidents this year with loss figures exceeding \$10,000 per event. These seven incidents accounted for approximately 94 per cent of the total dollar loss amount for the entire complex. For example, an inadvertent sprinkler discharge resulted in water damage to LBNL computing equipment valued at \$177,000 while two INL range fires cost \$1.5 million.

A summary of the three most costly fire and inadvertent actuation events follows:

**LBNL:** Excessive heat generated by computer servers increased the room temperature to the point where the room's water sprinklers activated causing significant water damage to the computer equipment. The excessive heat occurred when the facility air conditioning systems failed. Activation of the sprinklers likely prevented complete loss of the multi-million dollar facility/computing equipment. The total loss was estimated at \$177,000.

**INL:** Two range fires resulted in losses estimated at \$1,465,000. The Jefferson fire in July was the largest in INL history and the largest in the U.S. during CY2010. It destroyed 109,000 acres while causing an estimated fire loss of \$1,119,000. The Middle Butte fire in August destroyed 14,000 acres and resulted in an estimated fire loss of \$346,000.

### **Personnel Injuries**

There were three separate events in which a worker received minor injuries. An NTS worker suffered minor (first degree) burns to the back of both hands when a propane leak resulted in a kitchen fire at the new fire station in Mercury, NV, an ANL worker suffered minor bruises after being startled and falling from a ladder when a sprinkler activated while the worker was soldering a nearby pipe, and an INL firefighter received a minor back strain while fighting a range fire. All three workers were treated and released.

**Table 1**

**DOE Loss History from 1950 to Present**

Year	Valuation (Millions of Dollars)	Fire Loss (Dollars)	Non-Fire Loss (Dollars)	Loss Rates (Cents per 100 Dollar Value)		
				Fire*	Non-Fire*	Total*
50	1,800.00	486,389	10,050	2.70 -	0.06 -	2.76 -
51	2,177.10	38,318	317,797	0.18 -	1.46 -	1.64 -
52	3,055.10	449,107	356,600	1.47 -	1.17 -	2.64 -
53	4,081.00	148,142	427,430	0.36 -	1.05 -	1.41 -
54	6,095.90	185,438	190,436	0.30 -	0.31 -	0.62 -
55	6,954.20	125,685	330,103	0.18 (1.00)	0.47 (0.81)	0.66 (1.81)
56	7,364.10	2,206,478	940,945	3.00 (0.50)	1.28 (0.89)	4.27 (1.39)
57	7,973.20	590,663	885,936	0.74 (1.06)	1.11 (0.86)	1.85 (1.92)
58	8,102.50	275,560	476,265	0.34 (0.92)	0.59 (0.84)	0.93 (1.76)
59	10,301.80	199,841	998,060	0.19 (0.91)	0.97 (0.75)	1.16 (1.67)
60	10,708.60	636,228	764,823	0.59 (0.89)	0.71 (0.88)	1.31 (1.77)
61	11,929.90	325,489	5,530,566	0.27 (0.97)	4.64 (0.93)	4.91 (1.91)
62	12,108.80	3,020,023	293,341	2.49 (0.43)	0.24 (1.60)	2.74 (2.03)
63	13,288.90	599,056	776,998	0.45 (0.78)	0.58 (1.43)	1.04 (2.21)
64	14,582.80	480,519	870,516	0.33 (0.80)	0.60 (1.43)	0.93 (2.23)
65	15,679.30	1,743,448	2,106,621	1.11 (0.83)	1.34 (1.35)	2.46 (2.18)
66	16,669.00	158,220	698,753	0.09 (0.93)	0.42 (1.48)	0.51 (2.41)
67	17,450.90	359,584	2,423,350	0.21 (0.90)	1.39 (0.64)	1.59 (1.53)
68	18,611.90	155,986	713,097	0.08 (0.44)	0.38 (0.87)	0.47 (1.31)
69	20,068.30	27,144,809	909,525	13.53 (0.37)	0.45 (0.83)	13.98 (1.19)
70	22,004.30	89,456	1,611,336	0.04 (3.00)	0.73 (0.80)	0.77 (3.80)
71	24,155.80	78,483	1,857,566	0.03 (2.79)	0.77 (0.68)	0.80 (3.47)
72	26,383.50	222,590	698,061	0.08 (2.78)	0.26 (0.75)	0.35 (3.52)
73	27,166.70	117,447	2,258,241	0.04 (2.75)	0.83 (0.52)	0.87 (3.27)
74	28,255.50	249,111	930,766	0.09 (2.75)	0.33 (0.61)	0.42 (3.36)
75	31,658.30	766,868	4,485,481	0.24 (0.06)	1.42 (0.59)	1.66 (0.64)
76	35,512.70	251,849	2,040,727	0.07 (0.10)	0.57 (0.72)	0.65 (0.82)
77	39,856.10	1,084,823	2,529,161	0.27 (0.11)	0.63 (0.68)	0.91 (0.79)
78	47,027.10	12,976,036	4,501,943	2.76 (0.14)	0.96 (0.76)	3.72 (0.90)
79	50,340.80	654,716	1,886,307	0.13 (0.69)	0.37 (0.78)	0.50 (1.47)
80	54,654.70	1,385,686	7,160,249	0.25 (0.69)	1.31 (0.79)	1.56 (1.49)
81	59,988.80	2,042,633	2,600,855	0.34 (0.70)	0.43 (0.77)	0.77 (1.47)
82	65,360.40	948,691	3,252,277	0.15 (0.75)	0.50 (0.74)	0.64 (1.49)
83	70,484.40	731,234	9,765,828	0.10 (0.73)	1.39 (0.71)	1.49 (1.44)
84	82,166.90	1,549,807	4,917,513	0.19 (0.19)	0.60 (0.80)	0.79 (0.99)
85	86,321.84	1,145,975	2,983,322	0.13 (0.21)	0.35 (0.85)	0.48 (1.05)
86	82,787.52	805,030	4,490,262	0.10 (0.18)	0.54 (0.65)	0.64 (0.83)
87	91,927.20	1,570,736	1,440,093	0.17 (0.13)	0.16 (0.67)	0.33 (0.81)
88	92,998.00	466,120	7,837,000	0.05 (0.14)	0.84 (0.61)	0.89 (0.74)
89	107,948.00	615,551	6,890,000	0.06 (0.13)	0.64 (0.50)	0.70 (0.63)
90	115,076.00	8,392,746	9,078,000	0.73 (0.10)	0.79 (0.51)	1.52 (0.61)
91	118,868.68	608,740	1,820,065	0.05 (0.22)	0.15 (0.59)	0.20 (0.81)
92	118,267.06	1,166,858	2,486,696	0.10 (0.21)	0.21 (0.52)	0.31 (0.73)
93	119,826.25	679,939	2,338,595	0.06 (0.20)	0.19 (0.53)	0.25 (0.73)
94	124,350.29	1,533,717	1,869,933	0.12 (0.20)	0.15 (0.40)	0.27 (0.60)
95	120,321.68	720,720	911,746	0.06 (0.21)	0.08 (0.30)	0.14 (0.51)
96	113,471.00	2,372,482	3,653,350	0.21 (0.08)	0.32 (0.16)	0.53 (0.24)
97	102,947.24	544,924	5,567,963	0.05 (0.11)	0.54 (0.19)	0.59 (0.30)
98	99,127.79	316,475	1,062,313	0.03 (0.10)	0.11 (0.26)	0.14 (0.36)
99	110,858.47	443,049	2,467,991	0.04 (0.10)	0.22 (0.24)	0.26 (0.34)

\* Numbers shown in parentheses represent the previous 5-year running average.

\* All dollar information is in actual dollars and is not indexed to inflation.

*Annual Fire Protection Program Summary for Calendar Year CY2010*

Year	Valuation (Millions of Dollars)	Fire Loss (Dollars)	Non-Fire Loss (Dollars)	Loss Rates (Cents per 100 Dollar Value)		
				Fire*	Non-Fire*	Total*
00	102,514.01	102,861,283	312,839	10.03 (0.08)	0.03 (0.25)	10.06 (0.33)
01	103,215.56	287,263	218,323	0.03 (2.07)	0.02 (0.25)	0.05 (2.32)
02	98,779.44	1,541,174	920,673	0.16 (2.04)	0.09 (0.19)	0.25 (2.23)
03	70,812.80	1,075,309	NC	0.15 (2.06)	NC NC	NC NC
04	72,601.95	622,613	NC	0.09 (2.08)	NC NC	NC NC
05	74,951.25	2,537,565	NC	0.34 (2.09)	NC NC	NC NC
06	64,547.05	997,805	NC	0.15 (0.15)	NC NC	NC NC
07	67,382.01	1,674,515	NC	0.25 (0.18)	NC NC	NC NC
08	60,576.55	573,161	NC	0.10 (0.20)	NC NC	NC NC
09	63,569.89	623,299	NC	0.10 (0.19)	NC NC	NC NC
10	74,417.99	1,608,762	NC	0.22 (0.19)	NC NC	NC NC

\* Numbers shown in parentheses represent the previous 5-year running average.

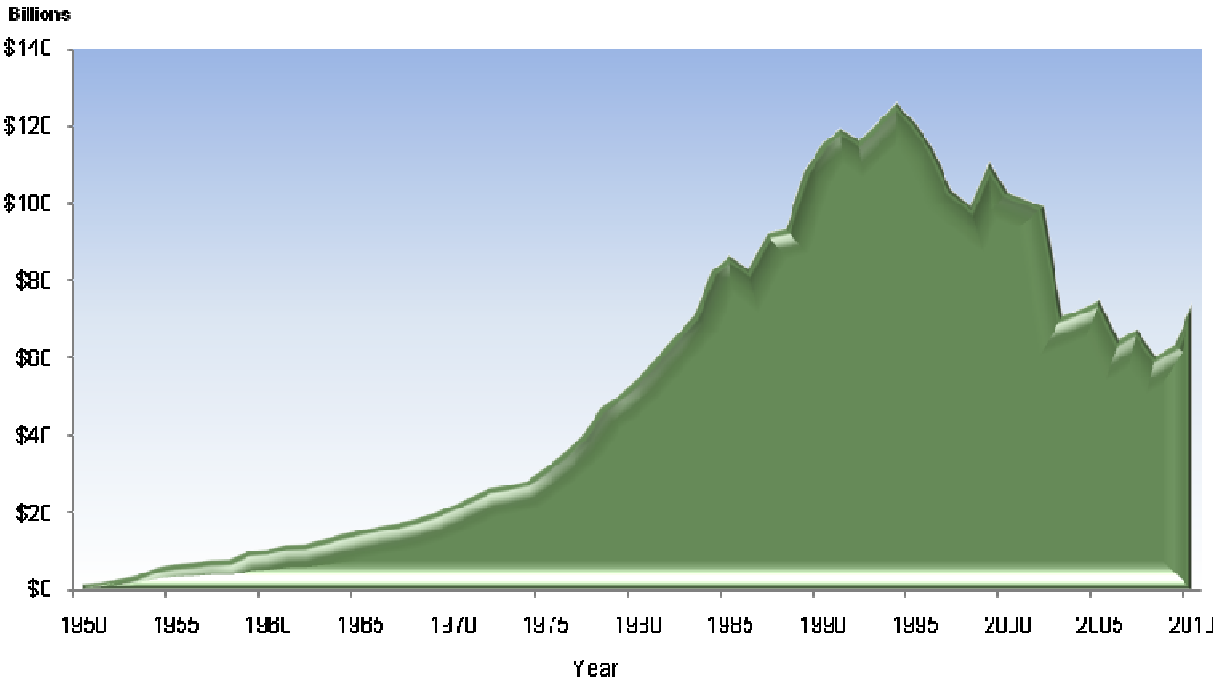
\* All dollar information is in actual dollars and is not indexed to inflation.

NC – The data is no longer collected

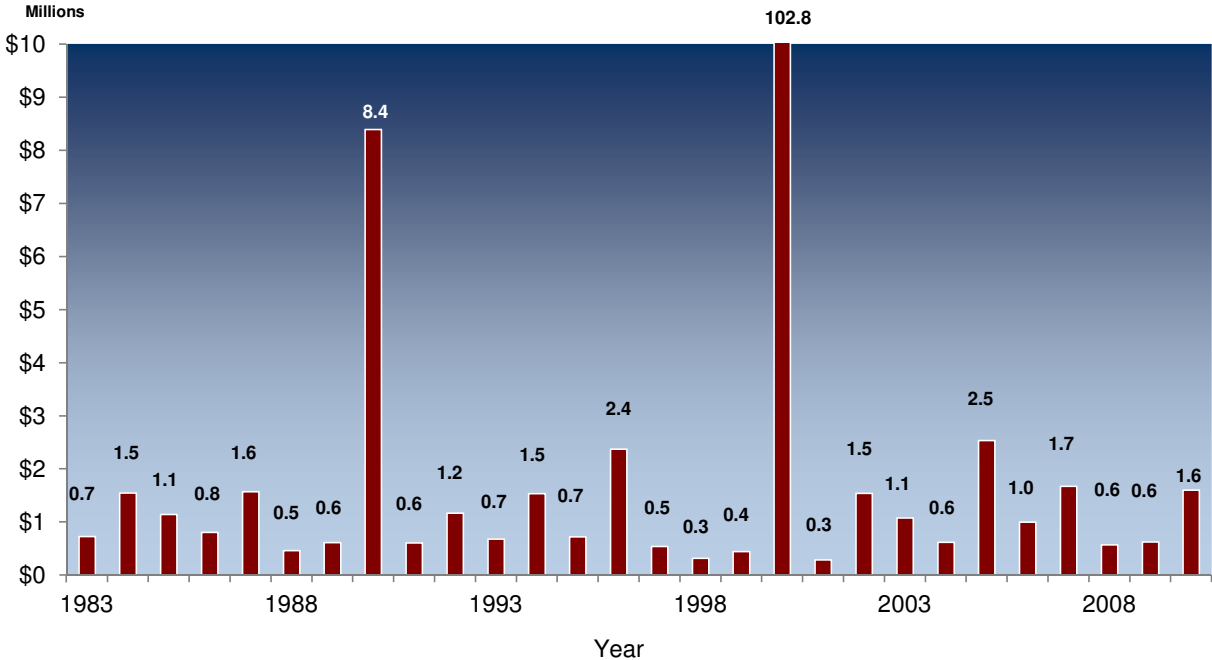
The CY00 fire loss increase was primarily due to the Cerro Grande fire at LANL.

The CY2010 fire loss increase was due to two range fires at INL that accounted for 91% (\$1,465,000) of the total CY2010 losses.

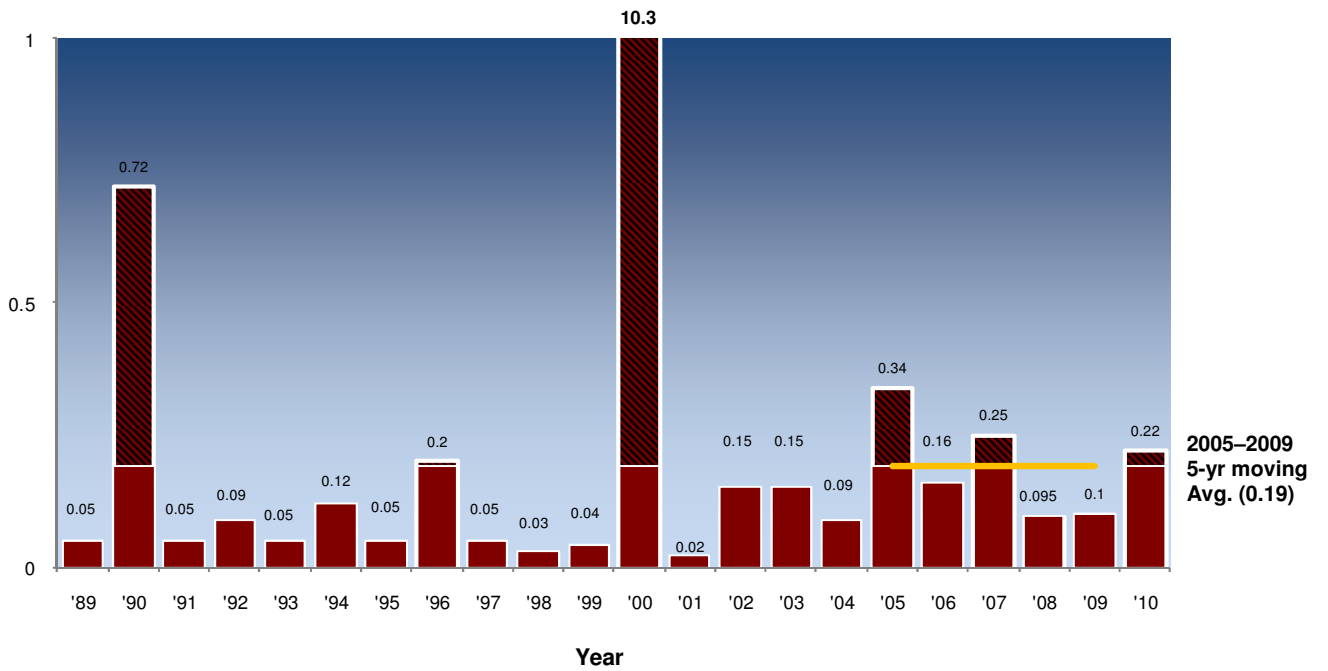
**Figure 1**  
**DOE Valuation** (actual dollars not indexed to inflation)



**Figure 2**  
**Property and Facility Losses Due to Fires**

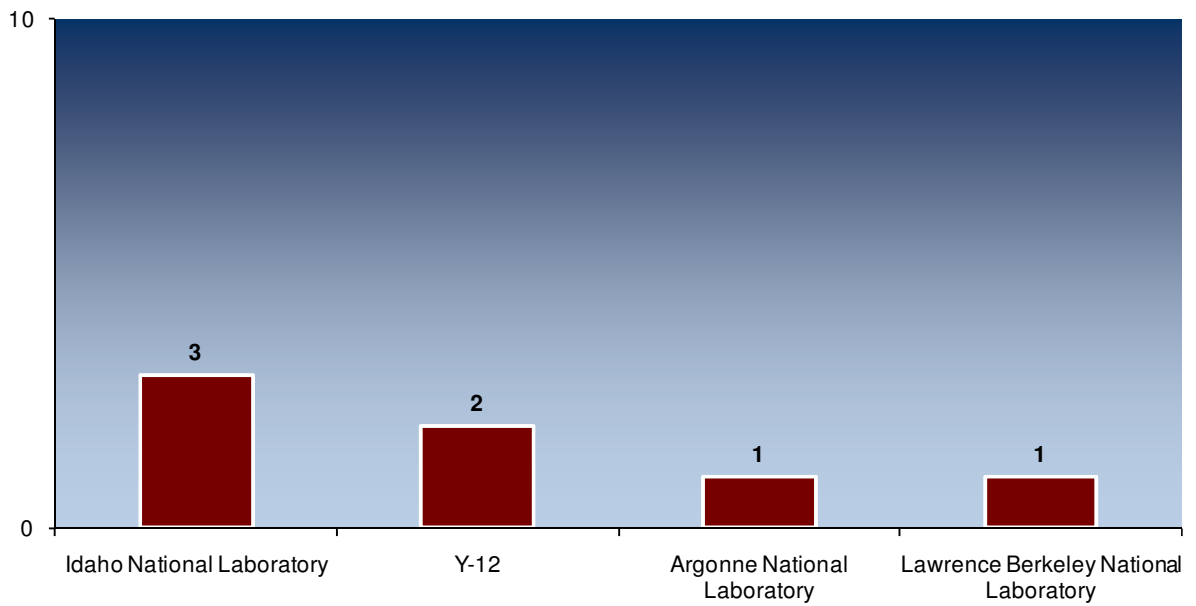


**Figure 3**  
**DOE Fire Loss Rate**  
 (Rate in cents per \$100 of valuation)



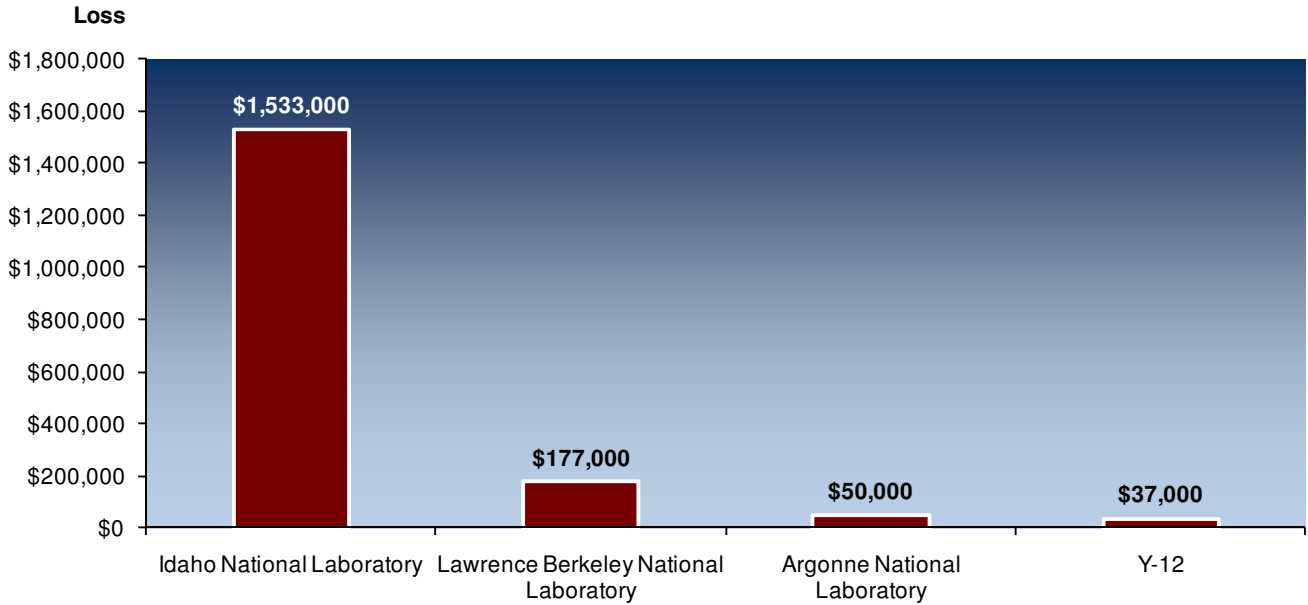
**Figure 4**  
**Fire Events**

(Number of fire events reported at the 4 sites (INL, ANL, LBNL and Y-12) posting greater than \$10,000 in total losses in CY2010)



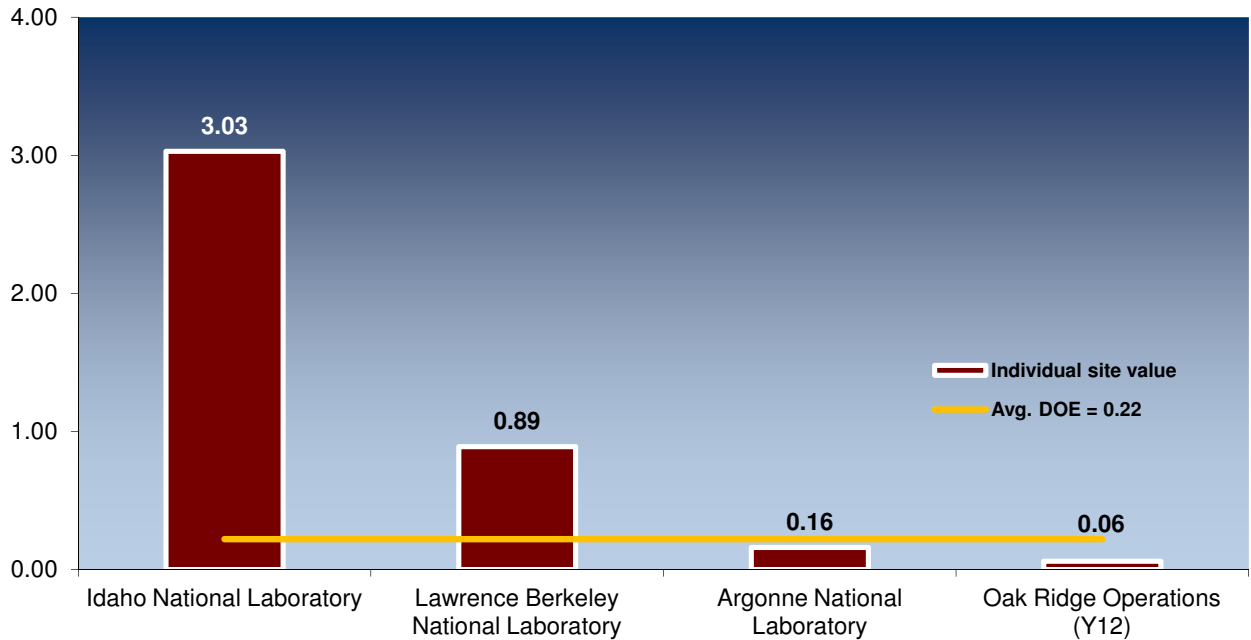
**Figure 5**  
**Fire Loss Amount**

(Total losses in CY2010 for those sites posting greater than a \$10,000 loss per event)



**Figure 6**  
**Fire Loss Rate**

(Rate in cents per \$100 of valuation during CY2010 for those sites posting greater than a \$10,000 loss per event)



## Summary of Major Fire Damage Incidents

The following table provides a description of individual major (dollar loss greater than \$10,000 per event) DOE fire losses during CY2010. While four different sites posted seven major “fire events” resulting in losses greater than \$10,000 per event, only three loss events were directly attributable to a fire. See Table 3 for significant non-fire events involving fixed automatic fire suppression systems.

**Table 2**  
**Summary of Three Major Fire Loss Events**

Loss Type	Location	Description	Dollar Loss
Fire/Smoke (Brush)	INL Jefferson Fire	A range fire initiated along Jefferson Blvd on July 13, 2010. The fire danger was HIGH at the time and wind gusts exceeding 50 MPH resulted in the fire expanding quickly and eventually destroying 109,000 acres during a three day interval. The fire was the largest in INL history and the largest in the U.S during CY2010. There was substantial interruption to MFC facilities, loss of many power line structures and superficial damage to the TREAT facility. One INL firefighter suffered a minor back strain while fighting the fire.	\$1,119,000
Fire/Smoke (Brush)	INL Middle Butte	A range fire initiated near Middle Butte on August 27, 2010. The fire quickly developed into a large wind-driven blaze that eventually destroyed 14,000 acres. There were no personnel injuries.	\$346,000
Fire/Smoke (Vehicle)	INL	A vehicle (telehandler) at the Radioactive Waste Management Complex lost power during routine operations and the operator observed smoke coming from its engine compartment. Firefighters responding to the scene with equipment and hoses observed flames coming from the engine compartment and subsequently extinguished the fire.	\$68,000

## Automatic Water-Based Suppression System Performance

There were 15 inadvertent actuations of wet-pipe suppression systems: nine were due to weather-related events (freezing), one was due to personnel error while performing nearby soldering, two were caused by pneumatic air leaks initiating actuation, one was due to pipe corrosion, one was caused by steam initiating actuation and one actuation was due to unknown causes. There was one dry-pipe failure due to corrosion.

The four significant (exceeding \$10,000 per incident) events are noted below in Table 3.

**Table 3**  
**Summary of Four Water-Based Fire System Inadvertent Actuations**

Loss Type	Location	Description	Dollar Loss
Leaks/Spills/Releases Water-Based Suppression System Actuations	LBNL	Excessive heat generated by computer server equipment raised the room temperature above the overhead water sprinkler actuation threshold, activating water flow and dousing the energized computer server equipment. There were no reported personnel injuries, but the water damage and cleanup costs were significant.	\$177,000
Leaks/Spills/Releases Water-Based Suppression System Actuations	ANL	A worker in Building 223 was standing on a ladder and using an acetylene torch to solder an overhead pipe located within nine inches of a sprinkler head. The torch activated water flow from the sprinkler startling the worker who fell from the ladder and received minor fall injuries (bruises). Cleanup costs and water damage repair to the building were significant.	\$50,000
Leaks/Spills/Releases Water-Based Suppression System Actuations	Y-12	A weather-related (freezing) event resulted in unexpected water flow that caused significant cleanup costs in Building 9201-5 after a fire suppression sprinkler branch line pipe froze and ruptured. There were no reported personnel injuries.	\$25,000
Leaks/Spills/Releases Water-Based Suppression System Actuations	Y-12	A design/material-related event resulted in unexpected water flow that caused significant cleanup costs in Building 9215 after a dry pipe fire suppression system began leaking water due to corrosion. There were no reported personnel injuries.	\$12,000



## Non-Water Based Fire Suppression System Performance

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Concerns regarding the effect of chlorofluorocarbons, including Halon, on the ozone layer have led to their regulation under the 1991 Clean Air Act. The Environmental Protection Agency has subsequently published implementing regulations to include prohibiting new Halon production, establishing container labeling requirements, imposing Federal procurement restrictions, imposing significant Halon taxes, issuing requirements for the approval of alternative agents, and listing essential areas where Halon protection is considered acceptable.

DOE's current policy 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 CY2010, DOE maintained 167 active Halon-1301 systems in operation containing approximately 53,614 pounds of Halon. Stored Halon-1301 inventory was reported at approximately 73,312 pounds<sup>1</sup>, a 104% increase over CY2009. The number of active Halon-1301 systems is down 22% from the 214 systems active in CY2009 while inventory is up 104% from CY2009 levels of 35,857 pounds of agent (more accurate reporting demonstrates more systems in use than previously reported).

Operational and stored inventory amounts for Halon-1211 (for hand held extinguishers) were reported at 14,944 and 38,396 pounds respectively. This represents an increase of 158 % in the amount of operational Halon-1211 in storage while the amount in use doubled.

Additionally, approximately 399 pounds<sup>2</sup> of Halon-1301 were reported to be released to the environment in non-fire related events (SRS reported 27 pounds released via recycling activities and 125 pounds from incidental discharges while INL lost 247 pounds through leakage or actuation).

A total of three incidents involving automatic actuation of Halon-1301 or other non-water based suppression systems occurred in CY2010. The first event was actually a compilation of four recurring CO<sub>2</sub> discharges attributed to equipment failures in Building 8300 at ORNL in contrast to the 20 recurring events at the facility last year. There were two automatic actuations of non-water based suppression systems due to fire: (1) a Halon system at BNL automatically activated due to an electrical fire in Building 911, (2) a CO<sub>2</sub> system at SNL automatically activated due to an electrical fire in Building 858N. Both fires were quickly extinguished by the automatic suppression systems and there were no personnel injuries.

The two fire events and the recurring CO<sub>2</sub> event are listed in Table 4 on the following page.

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<sup>1</sup> SRS continues to maintain a legacy Halon repository for the DOE complex, which includes clean Halon 1301 in bulk storage tanks and cylinders of various sizes and weights. There is no Halon 1211. SRS reports that the Halon bank is no longer accepting Halon inventory from the sites.

<sup>2</sup> The above figure does not consider system leakage in a stable condition.

**Table 4**  
**Automatic Non-Water Based System Actuations**

Loss Type	Location	Description	Dollar Loss
Fire/Smoke (Other)	BNL Building 911	Electrical fire in electromagnetic relays activated the fire alarm and Halon systems. The Halon extinguished the fire. There were no personnel injuries.	\$200
Leaks/Spills/Releases	ORNL Bldg 8300	4 events, classified as <b>non-fire</b> events, occurred when capacitors inside of a modulator failed resulting in a release of energy. Typical responses to the failures included de-energizing the equipment and manually activating a CO <sup>2</sup> system for cooling and equipment salvage. In most cases, there was no fire and no fire was observed during the fire department response. One hundred pounds of CO <sup>2</sup> agent was locally released on the modulator upon receipt of an automatic alarm indicating capacitor failure occurring remotely at the control room. This was one of several recurring events involving different modulators. The costs related to each individual event were \$5,000. There were no personnel injuries.	\$20,000
Fire/Smoke (Other)	Sandia National Laboratories Bldg 858N	Electrical fire in a work bench control unit activated the fire alarm and CO <sup>2</sup> systems. The CO <sup>2</sup> extinguished the fire. There were no personnel injuries.	\$0

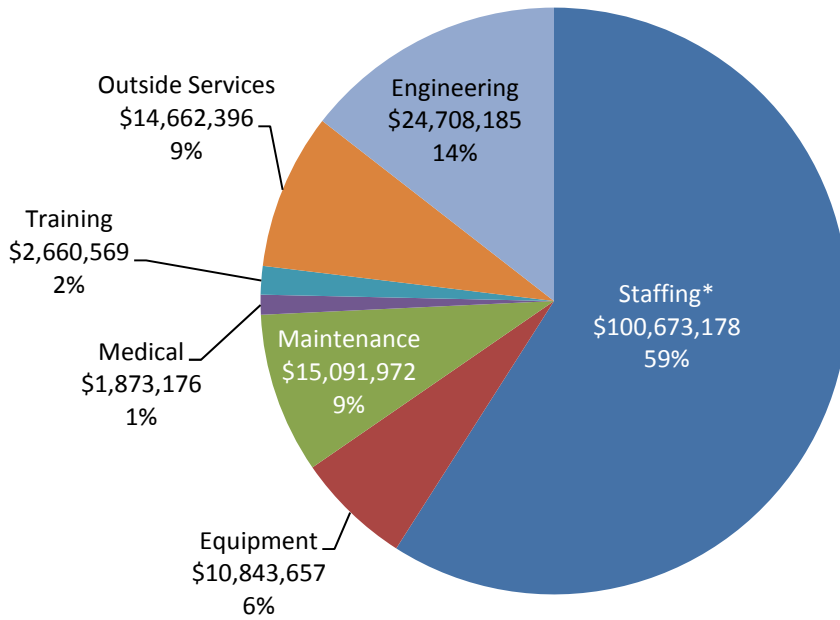
## Recurring Fire Protection Program Costs

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Yearly or recurring fire protection costs for CY2010 reached \$170,513,133 for those sites reporting into the Fire Protection Program database. On a ratio of cost to replacement property value (recurring cost rate), the DOE spent approximately 23 cents per \$100 valuation for recurring fire protection activities at those sites.

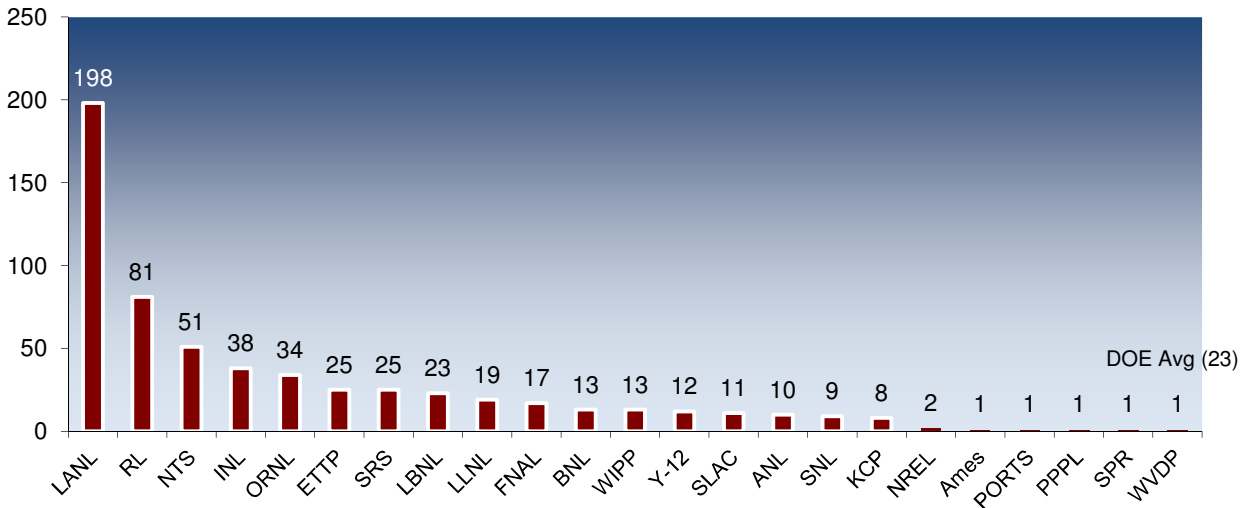
Figure 7 shows the CY2010 recurring cost distribution by activity. Figure 8 lists the recurring cost rate by DOE sites. It should be noted that not all recurring cost activities were consistently reported, such as outside contracts and maintenance activities.

**Figure 7**  
**Recurring Fire Protection Cost Distribution**



\* Fire Department Activities

**Figure 8**  
**Recurring Fire Protection Program Cost Rate by Site**  
(Rate in cents per \$100 of valuation)



## Fire Department Activities

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### Number of Responses:

The following is a summary of fire department responses for CY2010.

1. Fire	538
2. Hazardous Materials	247
3. Other Emergency	1,869
4. Other Non-Emergency	2,790
5. Medical	2,573
<b>Total</b>	<b>8,017</b>

Comparing this 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.

## **Conclusions**

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DOE experienced no fatalities or significant injuries due to fire in CY2010. Total DOE valuation increased during CY2010 approximately 14 percent (from \$75.6 to \$86.6 Billion). For CY 2010 those sites reporting into the database represented a total valuation of \$74.4 Billion, (86% of the total DOE Complex). The overall CY2010 fire loss rate for those sites was approximately 0.22 cents for each \$100 in total site valuation. Excluding the two INL range fires drops the loss rate to approximately 0.02 cents.

Recurring costs for fire protection reached \$170 million in CY2010 which is approximately 12% more than was spent in CY2009. On a ratio of cost to total valuation, the DOE spent approximately 23 cents per \$100 in valuation for recurring fire protection activities for those sites reporting into the Fire Protection Program database (almost the same as was reported in CY2009). It is possible to view archived DOE annual fire protection program summary reports at the following internet address: <http://www.hss.doe.gov/sesa/corporatesafety/fpdb.html>