

SUMMARY OF FIRE PROTECTION PROGRAMS FOR CALENDAR YEAR 2003



UNITED STATES DEPARTMENT OF ENERGY
OFFICE OF NUCLEAR AND FACILITY SAFETY
POLICY (EH-2.1)

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FOREWORD

This edition of the Annual Fire Protection Program Summary for the Department of Energy (DOE) 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 5a.(8) of DOE Order 231.1, "Environment, Safety and Health Reporting" and is considered the primary source for quantifying monetary loss from fire across the DOE Complex.

The report for calendar year (CY) 2003 was summarized from information sent to Headquarters by 37 out of 59 reporting elements, representing approximately 86 percent of DOE's ownership. For comparison purposes, field offices are arranged according to the CAIRS reporting format, with a total of 21 categories represented. Abbreviations are identified in the Glossary, as are the DOE site reporting elements and major definitions.

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. Additionally, a built-in reference to other DOE reporting activities (ORPS) is provided, allowing reporting elements and DOE managers the opportunity to easily review all fire protection events and activities under their responsibility. For example, the information contained in this publication was extracted from the Annual Summary application taken at the Headquarters level for CY 2003. To obtain a copy of the application please contact Jim Bisker in the Office of Nuclear and Facility Safety Policy (EH 2.2) at 301.903.6542 or jim.Bisker@hq.doe.gov.

GLOSSARY

Field Organization abbreviations:

AL	Albuquerque Operations
CAO	Carlsbad Area Office
CH	Chicago Operations
FETC	Federal Energy Technology Centers
GFO	Golden Field Office
HQ	Headquarters (DOE)
ID	Idaho Operations
NPR	Naval Petroleum Reserves
NV	Nevada Operations
OK	Oakland Operations (California)
OFO	Ohio Field Office
ORO	Oak Ridge Operations
ORP	Office of River Protection
PA	Power Administrations ¹
PNR	Pittsburgh Naval Reactors Office
RF	Rocky Flats Operations
RL	Richland Operations
SNR	Schenectady Naval Reactors Office
SPR	Strategic Petroleum Reserves ²
SRO	Savannah River Operations
YM	Yucca Mountain Site Characterization Project Office

Site abbreviations:

ALA	Ames Laboratory
ANLW	Argonne National Laboratory, West
ANLE	Argonne National Laboratory, East
AEMP	Ashtabula Environmental Management Project
BAPL	Bettis Atomic Power Laboratory
BNL	Brookhaven National Laboratory
ETTP	East Tennessee Technology Park
EML	Environmental Measurements Laboratory
FNAL	Fermi National Accelerator Laboratory
FEMP	Fernald Environmental Management Project
GJO	Grand Junction

1. Power Administration organizations are comprised of: the Alaska Power Administration (APA); the Bonneville Power Administration (BPA); Southeastern Power Administration (SEPA), Southwestern Power Administration (SWPA); and the Western Area Power Administration (WAPA).

² Strategic Petroleum Reserve Sites include: Bayou Choctaw, Big Hill, Bryan Mound and West Hackberry.

HAN	Hanford Site ³
INEEL	Idaho National Engineering & Environmental Laboratory
ITRI	Inhalation Toxicology Research Institute
KAPL	Knolls Atomic Power Laboratory
KCP	Kansas City Plant
KSO	Kesserling Site
LBL	Lawrence Berkeley National Laboratory
LLNL	Lawrence Livermore National Laboratories
LANL	Los Alamos National Laboratories
MEMP	Miamisburg Environmental Management Project
MGN	Morgantown Federal Energy Technology Center
NREL	National Renewable Energy Laboratory ⁴
NRF	Naval Reactor Facilities
NTS	Nevada Test Site ⁵
NBL	New Brunswick Laboratory
ORISE	Oak Ridge-Institute of Science & Education
ORNL	Oak Ridge National Laboratories
PAN	Pantex Site
PGDP	Paducah Gaseous Diffusion Plant ⁶
PNL	Pacific Northwest Laboratory
PGH	Pittsburgh Federal Energy Technology Center
POR	Portsmouth Gaseous Diffusion Plant ⁶
PPPL	Princeton Plasma Physics Laboratory
ROSS	Ross Aviation, Inc.
SLAC	Stanford Linear Accelerator Center
SNLA	Sandia National Laboratories, Albuquerque
SNLL	Sandia National Laboratories, Livermore
SRS	Savannah River Site
TJNL	Thomas Jefferson National Accelerator Facility
WIPP	Waste Isolation Pilot Plant
WSS	Weldon Spring Site
WVDP	West Valley Demonstration Project
WS	Windsor Site
Y-12	Y-12 Plant
YM	Yucca Mountain Project

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

³ Hanford Site includes the Pacific Northwest National Laboratory

⁴ National Renewable Energy Laboratory includes the Wind Site

⁵ Nevada Test 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.

⁶ 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.

DOE field organization (abr.)/Site(abr.)
Example: AL/LANL

DEFINITIONS

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

1. **Property Value:** The approximate replacement value of all DOE-owned buildings 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)
2. **Estimated Loss:** Monetary loss determination based on all estimated or actual costs to restore DOE property and equipment to preoccurrence 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 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 is 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)
3. **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)
5. **Loss Rate:** Unit of comparison in cents loss per \$100 of property value.

EXECUTIVE SUMMARY

DOE experienced no fatalities or major injuries from fire in CY 2003. There were however, 102 fire events reported during the period causing an estimated \$1,075,309 in property damage. These losses are approximately \$458,300 less than fire losses sustained in CY 2002, with 93 percent of losses attributed to 5 incidents. Loss comparisons between the DOE and private industry are performed by normalizing data against total property value. DOE property valuation decreased by about 28 percent (from 98.8 to 70.8 Billion dollars) in the CY 2003 primarily due to data source revisions¹. The CY 2003 fire loss rate is therefore approximately 0.15 cents for each \$100 in property value.

Recurring costs for fire protection exceeded 138 million dollars in CY 2003. On a ratio of cost to total property value, the DOE spent approximately 19.6 cents per \$100 in property value for recurring fire protection activities.

In CY 2003, three fires were controlled by automatic fire suppression systems. The success of these systems were, however, offset by the inadvertent actuation of 21 systems primarily due to employee or weather related causes (8 events each).

DOE PROPERTY LOSS EXPERIENCE

Property value estimates serve as a common denominator for comparing Annual Summary loss rates. In CY 2003 property values decreased by approximately 28 percent to a new total of approximately 70.8 Billion dollars. DOE elements reported 102 fire incidents² that accounted for a total year-end fire loss of \$1,075,309. These events are categorized as follows:

Fire/Smoke (Building) – 57 Events
Fire/Smoke (Brush) – 20 Events
Fire/Smoke (Vehicle) – 11 Events
Fire/Smoke (Other) – 14 Events

¹ DOE property valuation prior this Calendar Year was obtained from the Computerized Accident Incident Reporting System (CAIRS) maintained by EH to normalize fire and non-fire property loss events as required by DOE Order 231.1. Revisions in 2003 eliminated the CAIRS collection of property loss data, which also eliminated the CAIRS need to collect property valuation data as well. Therefore, CY 2003 property valuations were obtained from two sources: the Facilities Information Management System (FIMS), which contains facility and infrastructure replacement valuations; and, the Property Information Database System (PIDS), which contains replacement valuation data for building contents such as scientific equipment. Readers are therefore cautioned when analyzing normalized data prior to CY 03, including any multiple-year averaging statistic presented in this report as the normalized data reference sources are different. For example, comparison of the CY 02 and CY 03 valuations at the Operations level shows that the largest discrepancy (16.2 Billion) occurs at the Strategic Petroleum Reserves (SPR) which could be related to the absence of valuation for stored inventory at the SPR.

² By comparison, the Occurrence Reporting and Processing System (ORPS) logged 48 fire events in CY 2004. Also, page 13 of this report indicates that Fire Departments cataloged a total of 649 Fire events over the year, with a majority of events (547) determined by the sites to be insignificant for Headquarters reporting purposes.

Fire Protection Summary
For Calendar Year 2003

DOE's fire loss rate for CY 2003, as summarized from field organization reports, is approximately 0.16 cents loss per \$100 property value.

Table 1 characterizes Annual Summary loss histories since 1950 and includes both fire and non-fire loss rate categories. 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 and non-fire property loss since 1982

Figure 3 - fire loss rates since 1988

Figure 4 - the current year's fire event tally by Field Organizations

Figure 5 - the current year's fire loss (dollars) by Field Organizations

Figure 6 - the current year's fire loss rate by Field Organizations

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

Trending of fire loss data indicates that a small number of incidents constitute the majority of dollar losses reported to the DOE. For example, 5 fire incidents this year accounted for approximately 93 percent of the total dollar loss amount.

The largest fire loss for the year noted as follows:

1. RFO/RF – Glove box fire. Approx. \$82,208 of this amount relates to the loss of fire fighting equipment with the remaining \$400,000. spent on radiation contamination clean up.

Table 1
DOE Loss History From 1950 To Present

Year	Property Value (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)

Fire Protection Summary
For Calendar Year 2003

Year	Property Value (Millions of Dollars)	Fire Loss (Dollars)	Non-fire Loss (Dollars)	Loss Rates (cents per 100 Dollar Value)		
				Fire*	Non-Fire*	Total*
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)
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	1,541,174.00	920,673	0.16 (2.04)	0.09 (0.19)	0.25 (2.23)
03	70,812.80	1,075,309.00	No longer collected	0.15 (2.06)	NC NC	NC NC

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

Figure 1
DOE Property Valuation

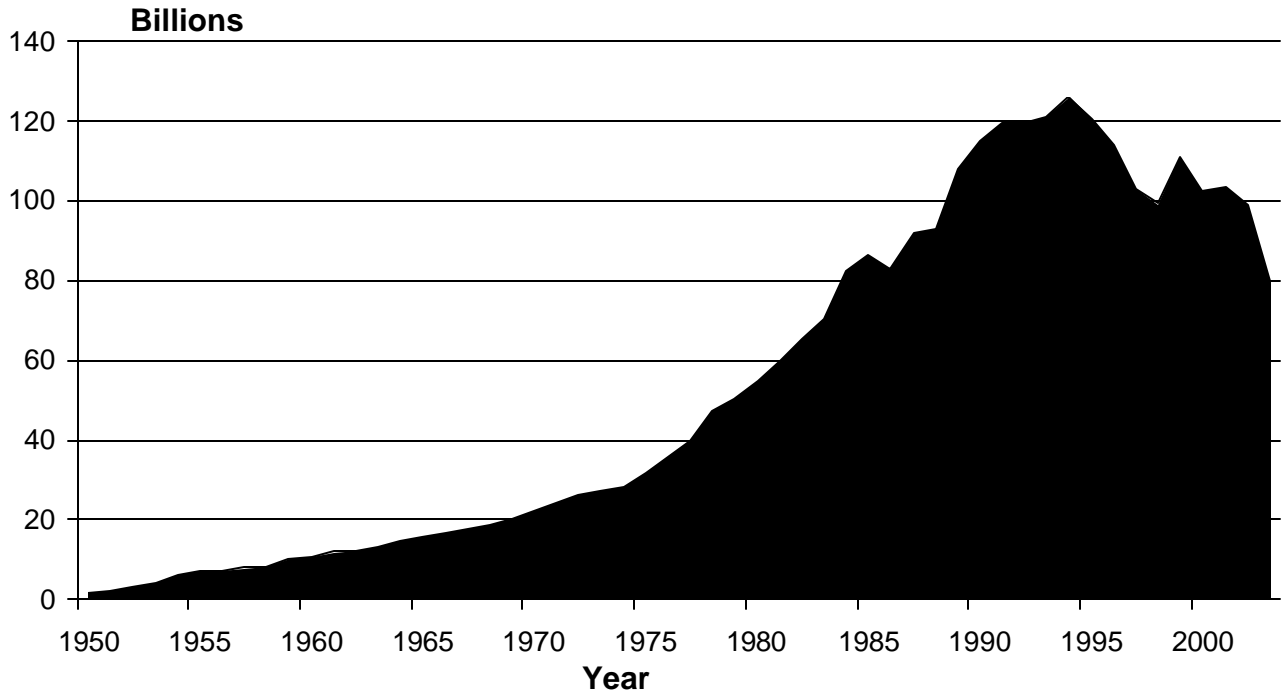


Figure 2
Property Loss

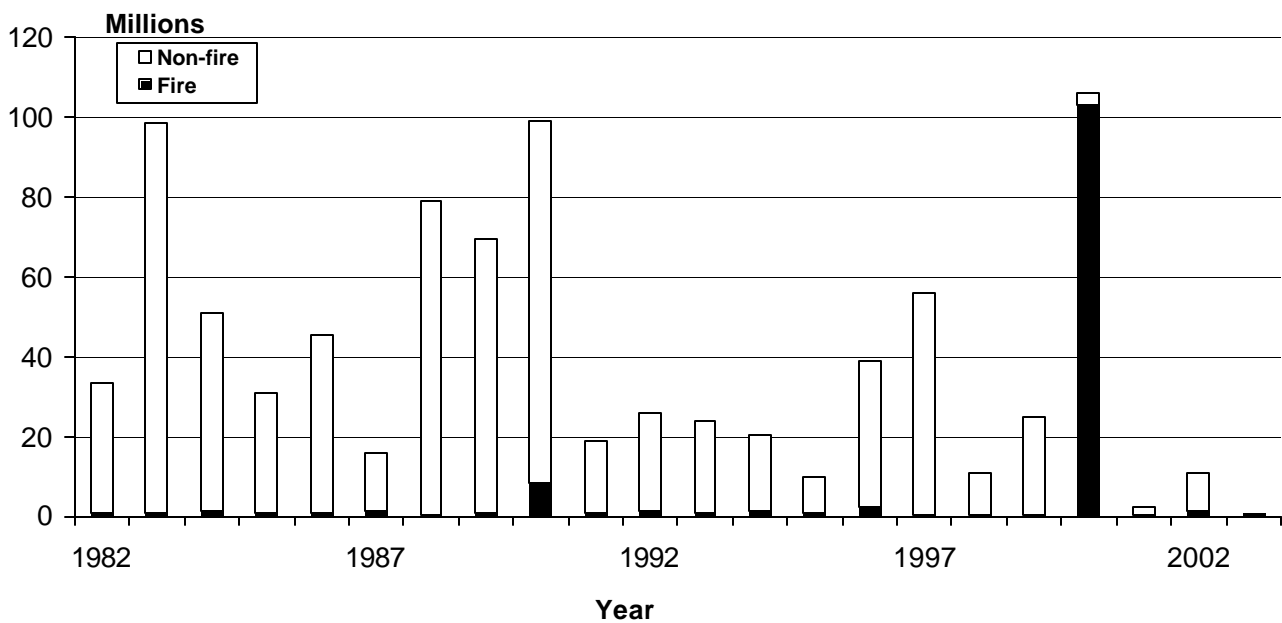


Figure 3
DOE Fire Loss Rate

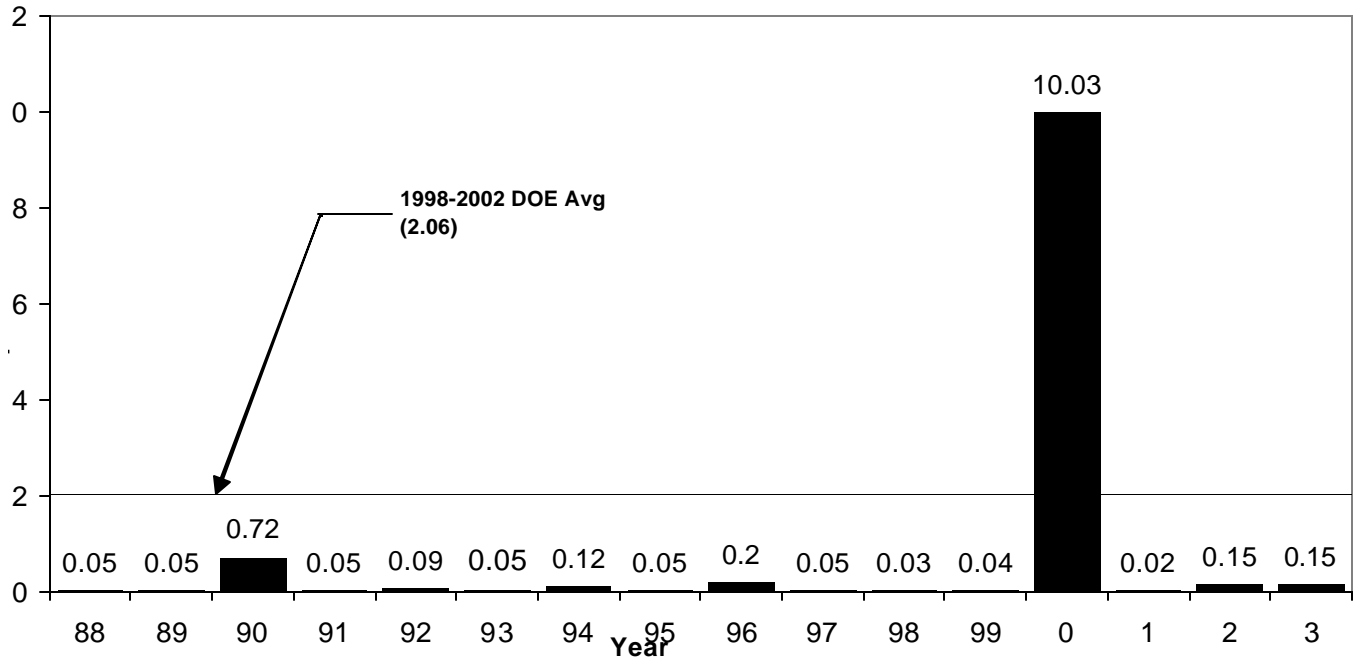


Figure 4
Fire Events by Field Organization

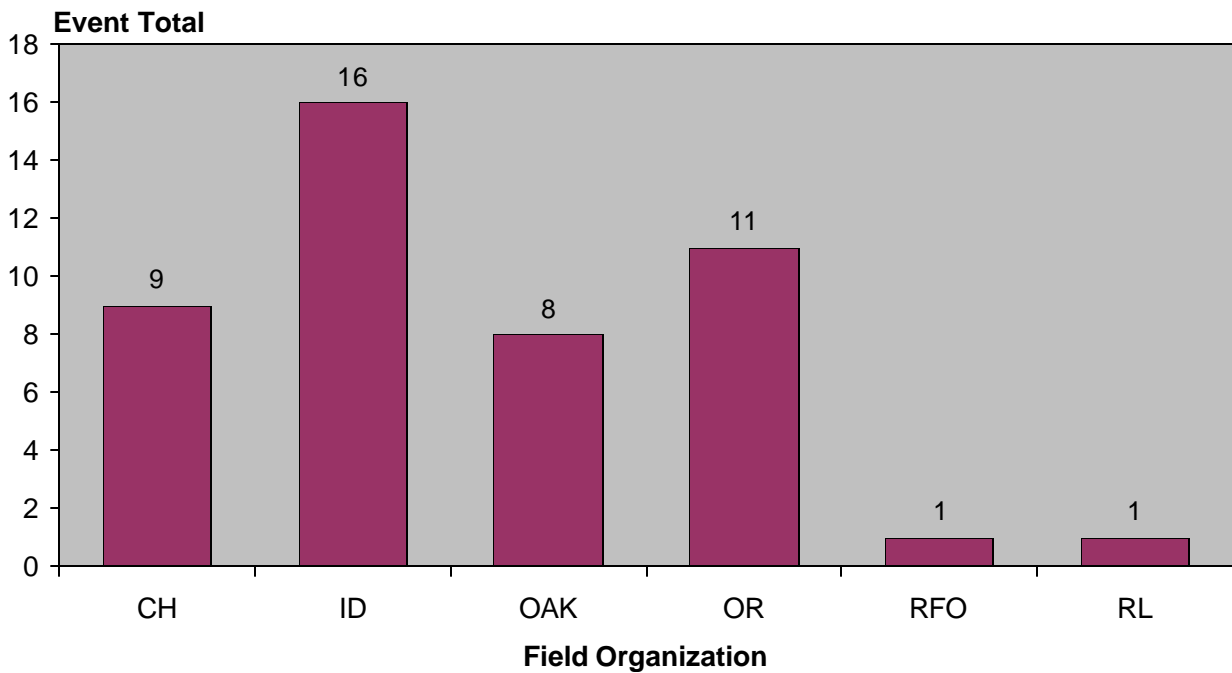


Figure 5
Fire Loss Amount by Field Organization

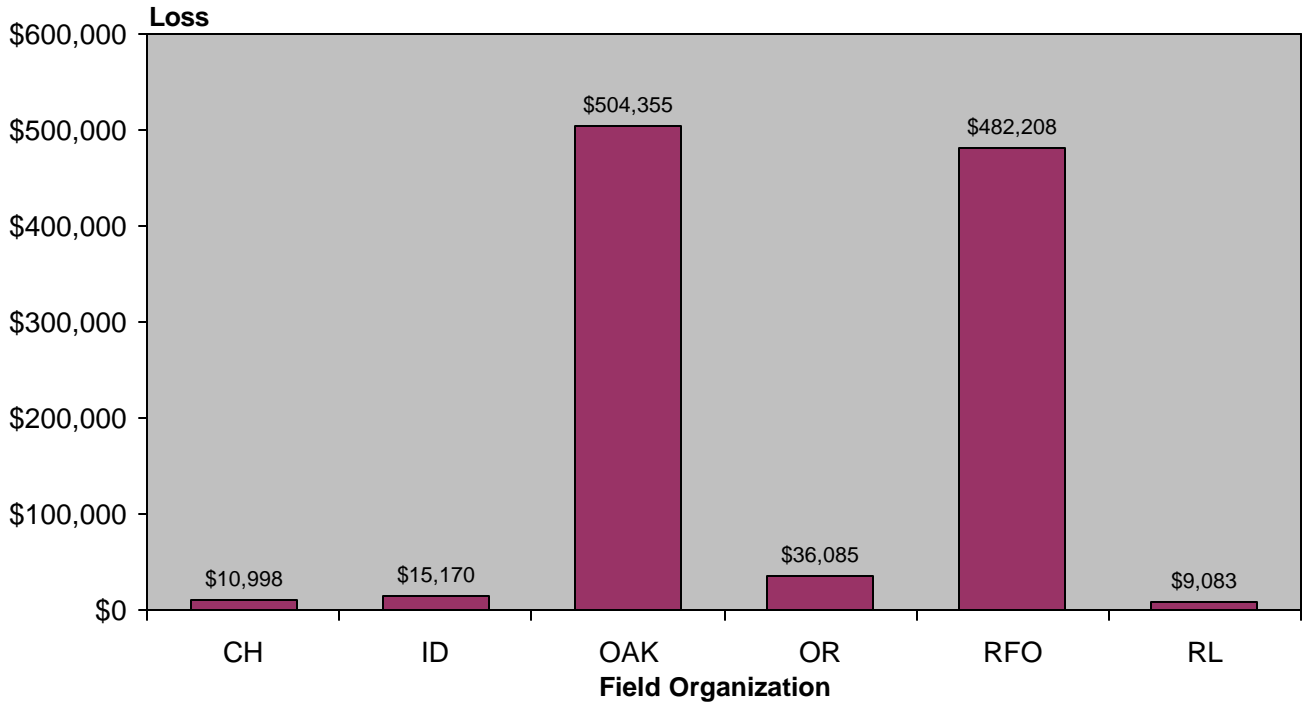
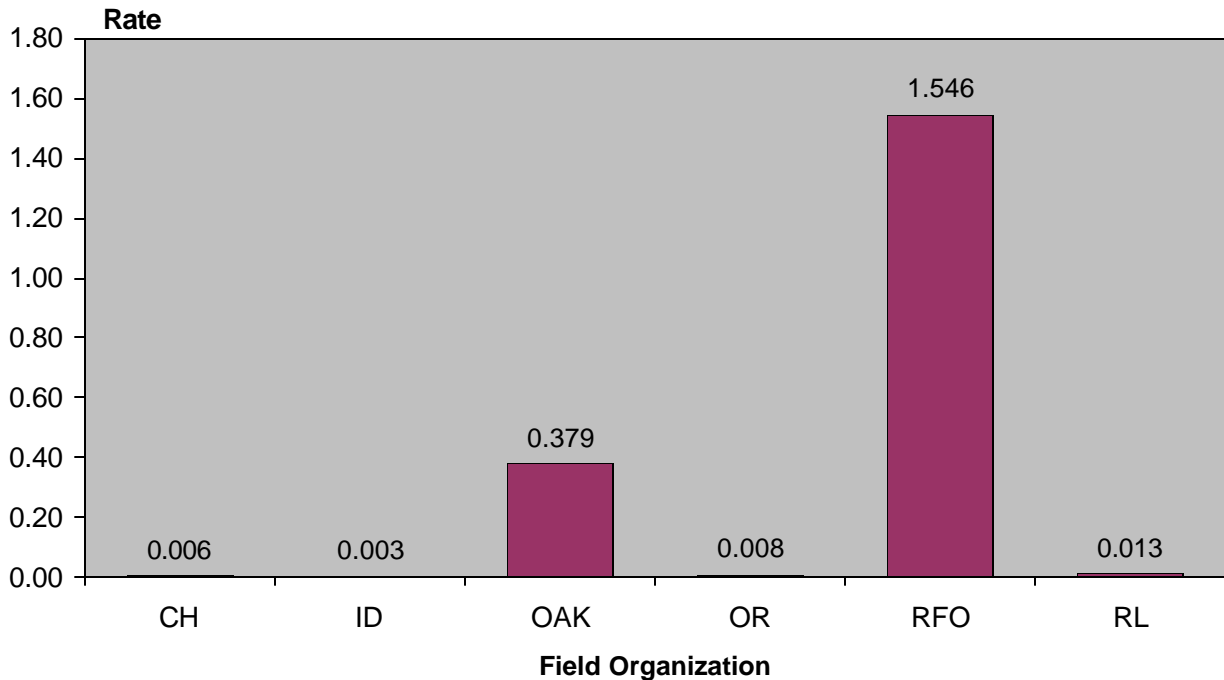


Figure 6
Fire Loss Rate by Field Organization



SUMMARY OF FIRE DAMAGE INCIDENTS

The following table provides a description major DOE fire losses over the year. See Tables 3 and 6 for fire events involving fixed automatic fire suppression systems:

Table 2: Summary of Fire Damage Incidents			
LOSS TYPE	LOCATION	DESCRIPTION	DOLLAR LOSS
Fire/Smoke (Building)	RFO/RF	Glove box fire. Approx. \$82,208 of this amount relates to the loss of fire fighting equipment with the remaining \$400,000. spent on radiation contamination clean up.	\$482,208.00
Fire/Smoke (Other)	OAK/LLNL	A wildfire in the Canberra region of Australia resulted in extensive damage of LLNL/DOE-owned equipment at the Research School of Astronomy and Astrophysics of the Australia National University (formerly Mount Stromlo). The preliminary estimated un-depreciated value of the damaged equipment was approximately \$400,000. A partial equipment list includes optical corrector cell, cryo cooling equipment, charge-coupled devices, and computers.	\$400,000.00
Fire/Smoke (Building)	OAK/SLAC	The NLCTA had a fire in the PFN Modulator with damage estimated to be 50,000.00.	\$50,000.00
Fire/Smoke (Building)	OR/Y-12	A container explosion and fire in a glove box was extinguished by applying coke to the burning material.	\$35,600.00
Fire/Smoke (Building)	OAK/SLAC	Room sustained major smoke damage and the sprinkler system did not operate. However, the smoke damage to electronic equipment and room contents was significant. One air conditioner was also destroyed by the small fire. The cause was identified as a short in an undersized extension cord.	\$30,000.00
Fire/Smoke (Building)	OAK/LLNL	The LLNL Fire Chief declared an Operational Emergency due to a fire in Building 298. A roofing subcontractor welding on the roof during re-roofing operations caused the fire. The LLNL Fire Department responded, categorized the situation, and called for assistance from the Livermore/Pleasanton Fire Department. The fire, which was contained to one wall, was suppressed in less than an hour using a single fire hose line. Damage to programmatic equipment within the building was minimal. Damage was estimated at \$24,305.	\$24,305.00
Fire/Smoke (Building)	SRO/SRS	At 12:19, the SRSFD was dispatched to a call-in notification from the 235-F facility advising a diesel load test was being conducted in 292-2F when the automatic transfer switch began to smoke. Power was de-energized while SRSFD personnel were enroute. Once on-scene, it was determined that an electrical short had occurred within the switch. The fire self-extinguished. There were no injuries and the dollar loss estimate is \$10,000.00.	\$10,000.00
Fire/Smoke (Building)	CH/BNL	A Pulse Firing Network capacitor developed an air bubble in the insulating oil between its dielectric plates. The resulting arcing and transfer of energy from the high voltage network ignited the capacitor's plastic case. Local alarming smoke detection internal to the cabinet alerted the control room operator, who hit the crash button for the power supply. A dry chemical fire extinguisher was to extinguish the smoldering remnants. The facility was back and running within two days. Property damage was \$10k. Corrective actions from the 1999 NSLS PFN (a \$100k fire) fire clearly reduced the loss.	\$10,000.00

Fire Protection Summary
For Calendar Year 2003

Table 2: Summary of Fire Damage Incidents			
LOSS TYPE	LOCATION	DESCRIPTION	DOLLAR LOSS
Fire/Smoke (Building)	RL/HAN	A small fire in a laboratory fume hood caused by a malfunctioning laboratory hotplate. Occurrence Report RL--PNNL-PNNLBOPER-2003-0004	\$9,083.00
Fire/Smoke (Brush)	ID/INEEL	The fire started off Site but eventually involved 552 acres of INEEL property. Property damage was required signage replacement. CAUSE:The BLM determined that the fire was human caused. A discarded fireworks observed within 2 feet of the roadside was established as the probable ignition factor.	\$5,000.00
Fire/Smoke (Building)	ID/INEEL	Generator, GEN-UTI-603, experienced an internal fault. The INEEL Fire Department was notified.	\$3,000.00
Fire/Smoke (Other)	ID/INEEL	Power pole	\$2,350.00
Fire/Smoke (Vehicle)	SRO/SRS	At 13:34, SRSFD personnel were dispatched to a government vehicle fire at 766-H. The fire fighters were out of Squad #3 in the facility. The vehicle had been parked for approximately 45 minutes when facility personnel noticed smoke and contacted dispatch. When the fire fighters in 766-H responded, they realized the vehicle involved was Squad #3. Initial assessment indicates a possible electrical short. One 10-lb. fire extinguisher and approximately 25 gallons of water were used to extinguisher the fire. There were no injuries and the dollar loss estimate is \$2,245.00.	\$2,245.00

WATER-BASED AUTOMATIC SUPPRESSION SYSTEM PERFORMANCE

A total of 19 incidents were reported where water-based suppression systems operated in CY 2003: 11 were wet-pipe systems, 6 dry-pipe and 2 deluge systems. No water-based activations were directly related to fire during the year. System activations were caused by the following events: employee related (5), design/material related (3), weather related (8), and unspecified/other related (3).

Water-based system activations of interest are listed in Table 3.

Table 3: Water Based System Actuations			
LOSS TYPE	LOCATION	DESCRIPTION	DOLLAR LOSS
Leaks, Spills, Releases	ID/INEEL	A sprinkler head failed in an office located in CPP-602. Water flowed for approximately 30 minutes before the system was isolated and the water shut off. Water flowed from the office into the hallways and into a small portion of a radiological buffer area. Underwriters Laboratories tested a 1% sample of the type of sprinkler head. None of the tested heads actuated pre-maturely. Mechanical failure. Labor was the main cost in repairing the system (water cleanup). Mechanical Failure	\$26,290.00
Leaks, Spills, Releases	SPR/SPR	A sprinkler system head (Grinnell model F950 - pendant 165° F) failed in a DOE-leased building causing minor water damage. Damage was limited to one computer monitor which was estimated at \$225.00. The monitor was replaced. Local fire	\$0.00

Table 3: Water Based System Actuations			
LOSS TYPE	LOCATION	DESCRIPTION	DOLLAR LOSS
		department was notified of a non fire and to return to station. The sprinkler system was placed back in service by building maintenance after sprinkler head was replaced. Occurrence report HQ-SPR-NO-2003-0002.	

There are a total of 243 incidents in DOE records where water based extinguishing systems operated in a fire. The satisfactory rate of performance is 99.2 percent, or 241 times out of 243 incidents. The two failures during a fire were attributed to; a closed cold weather valve in 1958 controlling a single sprinkler in a wood dust collector and, a deluge system failure due to a hung-up trip weight in a 1963 transformer explosion.

From the above history, DOE has experienced 115 fires that were either controlled or extinguished by the wet-pipe type of automatic suppression system. Table 4 below provides a summary on the number of sprinklers actuated to control or extinguish a fire against the number of occurrences where this event was reported. For example: 95 percent of these fires were controlled or extinguished with 4 or less sprinklers activating, 91 percent were controlled with 3 or less sprinklers activating, and so on.

The significance of this table is to highlight actual performance on systems that have been installed according to standard design practices (in this case the National Fire Protection Association (NFPA) Standard 13, Installation of Sprinkler Systems). By comparing the actual performance to design requirements, the designer or reviewer can get a sense of the conservativeness of the design requirement and adjust the design where necessary. Sprinkler system water containment, for example, could rely on actual performance rather than strict design practice, since no specific design criteria exist on the subject.

Table 4
**DOE Wet-Pipe Automatic Suppression Performance
1955 to 2003**

Number of Sprinklers Activated per Fire Event	Number of Events	Cumulative Total of Events	Percentage of Event	Cumulative Percentage of Events
1	81	81	70	70
2	19	100	17	87
3	5	105	4	91
4	4	109	3	95
5	2	111	2	97
6	1	112	1	97
7	2	114	2	99
8	0	114	0	99
9+	1	115	1	100

NON WATER-BASED FIRE SUPPRESSION SYSTEM PERFORMANCE

Concerns regarding the effect of chlorinated fluorocarbons (CFCs) and Halon on the ozone layer have led to their regulation under the 1991 Clean Air Act. The Environmental Protection Agency has subsequently published rules on this regulation 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 CY 2003, the DOE had 390 Halon 1301 systems in operation containing approximately 127,977 pounds of agent. Stored Halon 1301 inventory was reported at approximately 54,612 pounds³. Operational and stored inventory amounts for the Halon 1211 were reported at 90,871 and 7,867 pounds, respectively. Field organizations reported that 35 non-essential systems were removed from service in 2003, adding approximately 15,000 pounds to DOE's inventory.

Table 5 provides a breakdown of the five largest Halon utilizing field organizations, listing both Halon 1301 (fixed system extinguishing agent) and Halon 1211 (portable extinguishing agent). Agent Drawdown amount represents the Halon released to the environment over the calendar year. The bulk of Halon utilized within the Power Administrations⁴ is located at WAPA.

Table 5
Primary DOE Sites Utilizing Halon Suppression Systems

LOCATION	HALON 1301		AGENT DRAWDOWN	HALON 1211	
	ACTIVE (lbs.)	INVENTORY (lbs.)		ACTIVE (lbs.)	INVENTORY (lbs.)
SRO*	23,553	0	448	0	0
AL	26,769	28,294	0	46,254	2,658
CH	33,055	14,956	0	16,455	191
PA	10,828	2,331	0	2,155	0
SPR	6288	0	0	0	0
Total	100,493	45,581	448	64,864	2,849

* Designated as DOE's Halon bank.

³ Amount excludes banked inventory at the SRS – 50,007 pounds Halon 1301, 0 pounds Halon 1211. SRO reports that 21,880 pounds of Halon 1301 were shipped to the DLS in CY 2003 and that the Halon bank is no longer accepting Halon inventory from the sites.

⁴ In CY 1996, BPA ceased reporting any losses according to DOE O 231.1. Last known Halon amounts for the BPA were 14,495 lbs. in 6 systems and are not reflected in the current DOE totals.

Sites considering any Halon transfers outside the DOE are reminded that all excessed Halon should be transferred to the Department of Defense. Please contact your local Defense Logistics Agency for specific information relating to such transfers.

A total of 5 incidents were reported at DOE where Halon 1301 or other non-water based suppression systems operated in CY 2003. No sites reported any system failures during a fire. Additionally, approximately 448⁵ pounds of Halon 1301 were released to the environment. Non Water-based system activations of interest are listed in Table 6 below.

Table 6: Non Water Based System Actuations			
LOSS TYPE	LOCATION	DESCRIPTION	DOLLAR LOSS
Leaks, Spills, Releases	CH/W	Powder release, 135 Development	\$0.00
Leaks, Spills, Releases	SNR/KAPL	One event involved the inadvertent actuation of an underfloor (local application) Halon 1301 suppression system. In a Knolls Site Test area underfloor system cylinder discharged as the cylinder was being reconnected following weighing. There was no fire. The cylinder was being restored to service when the mechanical actuator experienced a mechanical misalignment and the Schroeder type valve caused the cylinder to be discharged. This system and one other of the same design were disarmed pending the results of an investigation into this failure. This Pyr-a-lon 1301 system is the only type Schroeder valve solenoid listed for service and has experienced similar failure in general industry. Both systems will be removed from service during the managed phase-out of halon suppression systems.	\$0.00
Fire/Smoke (Building)	SRO/SRS	At 10:16, SRSFD personnel were dispatched to an activated fire alarm from 221-HBL, 5th Level, Room 519, Glovebox #4. A pyrophoric reaction had occurred while an operator was working in the glovebox. The fire was extinguished by the operator when he manually released the Halon. The employee mistakenly discharged 129 lbs. on the south glovebox and then dumped the 129 lbs. for the north glovebox. A total of 258 lbs. of Halon were discharged. There was no damage to the glovebox enclosure. There were no injuries and no costs incurred.	\$0.00
Fire/Smoke (Building)	SRO/SRS	At 10:44, SRSFD personnel were dispatched to an alarm from 221-H, Hot Crane Halon, 4th Level, Section 15. Upon arrival, it was determined that 28 lbs. of Halon had been discharged and the cause could not be determined. After investigation by the facility it was determined that an electrical event occurred within the crane that generated sufficient smoke to activate the detector and discharge the Halon. There were no injuries and no costs incurred.	\$0.00
Fire/Smoke (Building)	SRO/SRS	At 10:14, SRSFD personnel were dispatched to an activated fire alarm from the Halon system in the E-Wing High Level Caves, Cell #1 of Building 773-A. A handy wipe had ignited from an unknown chemical source and a facility operator manually activated the Halon system, which discharged 162 lbs. of Halon into the cell. Upon arrival, fire fighters found the smoldering wipe but no further action was necessary. There were no injuries and no costs incurred.	\$0.00

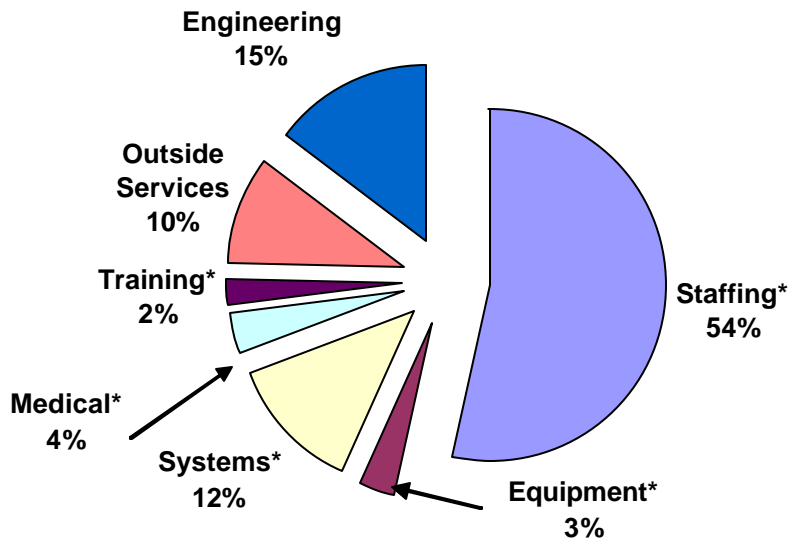
⁵ The above figure does not consider system leakage in a stable condition.

RECURRING FIRE PROTECTION PROGRAM COSTS

Yearly or recurring fire protection costs for CY 2003 reached \$138,908,389. for the DOE Complex. On a ratio of cost to CAIRS property value (recurring cost rate) , the DOE spent approximately 19.61 cents per \$100 property value for recurring fire protection activities.

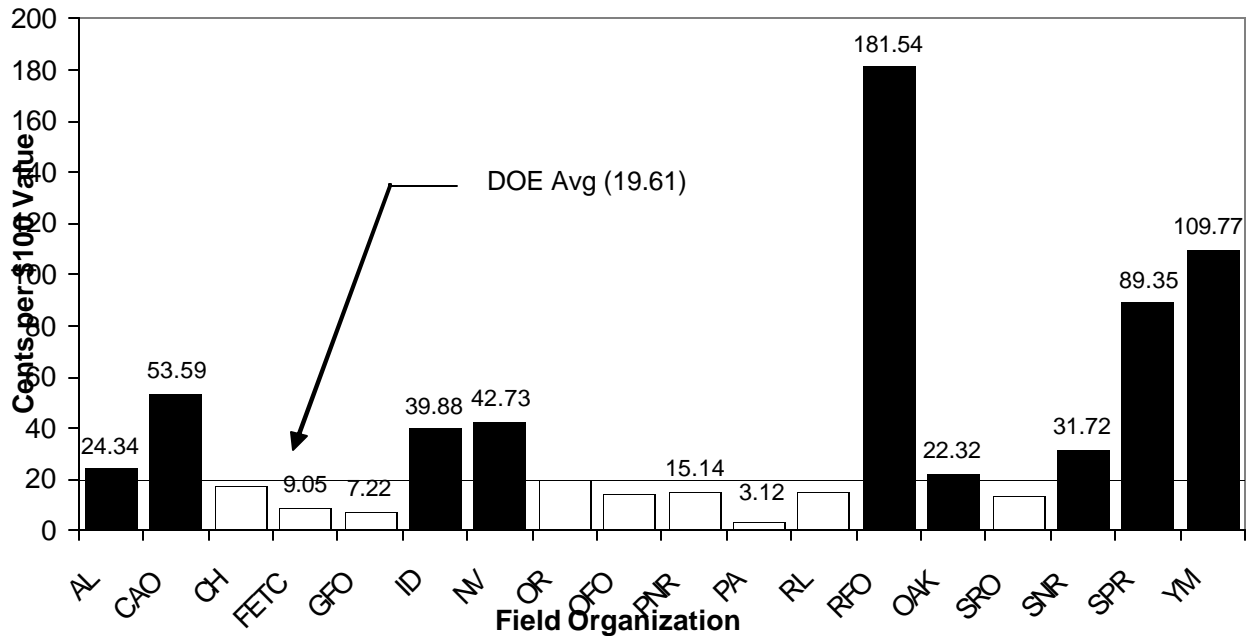
Figure 11 shows the CY 2003 recurring cost distribution by activity. Figure 12 lists the recurring cost rate by DOE field organizations. It should be noted that not all recurring cost activities were consistently reported, such as outside contracts and maintenance activities. Additionally, sites that did not report recurring costs this calendar year (primarily LANL, ETTP) had their costs carried forward from the past reporting period to maintain the validity of the statistic.

Figure 11
Recurring Fire Protection Cost Distribution



* Fire Department Activities

Figure 12
Cost Rate by Operations Office



FIRE DEPARTMENT ACTIVITIES

a. Number of Responses: The following is a summary of fire department responses for CY 2003. These numbers represent data sent in from approximately 19 of the 22 fire departments stationed at DOE sites.

1. Fire	649
2. Hazardous Materials	579
3. Other Emergency	2,819
4. Other Non-Emergency	8,426
5. Medical	1,943
Total	14,416

Comparing this data to the actual type of response is difficult since sites do not report incident responses in a consistent fashion. The Office of Environment, Safety and Health is examining the use of a standard reporting format which complies with the National Fire Protection Association's Guide 901, "Uniform Coding for Fire Protection" that could be linked to other DOE incident reporting programs for an accurate and cost effective approach to data collection in DOE. Other options, such as folding DOE's fire data collection into State or National programs such as the National Fire Incident Reporting System, are also being considered.

Fire Protection Summary
For Calendar Year 2003

b. Major Equipment Purchases:

Table 7: Major Equipment Purchases		
LOCATION	DESCRIPTION	AMOUNT
RL/HAN	Water tender	\$287,400.00
NV/NTS	Pumper	\$280,000.00
NV/NTS	Breathing Air Trailer	\$63,000.00
PNR/BAPL	Scba, and other ff eqpt.	\$26,131.00
RFO/RF	Helmets	\$13,304.00
RFO/RF	Turnout Gear	\$12,640.00
NV/NTS	Amakus Rescue Tool	\$12,000.00
OR/ORNL	Fire Hose	\$10,000.00
OR/ORNL	Thermal Imaging Camera	\$10,000.00

c. Notable Response Descriptions, such as mutual aid responses, that are not already included in this Report:

Table 8: Notable Responses		
LOCATION	DATE	DESCRIPTION
OR/ORNL	04/11/2003	Fire department personnel responded to a fire alarm at a government owned facility and discovered an active water flow condition. Upon investigation, it was discovered that pipefitters removed a piece of pipe without verifying that the sprinkler system was isolated and drained. Two laboratories and part of a hallway sustained water damage.
OR/Y-12	8/18/03	The Fire Department responded to a report of smoke in Building 9202. The source of the smoke was determined to be a duct as viewed by a thermal imager. The duct was opened to find a de-energized 480v buss electrical supply for a furnace on another floor. The cooling water for the buss had been turned off during maintenance allowing the buss to overheat.
OR/Y-12		Mutual aid response to Eastern Tennessee Technology Park (ETTP). The Y-12 fire department responded through the common response plan to support Hazmat operations at ETTP. There was a 55 gal. drum of unknown content experiencing a severe exothermic reaction in a facility operated by a private company.
OR/Y-12	1/27/03	The fire department responded to a methanol spill from a 55 gal. drum that was punctured by a forklift in building 9610-3. The area was secured and the drum was placed in an overpack container for later transfer.
NV/NTS	10/20/03	Vehicle Fire (Privately Owned) - Electrical
SPR/SPR	04/23/03	(Other Emergency) On-duty ERT responded to an on-site crude oil spill. Leak was isolated while ERT members initiated cleanup. (Occurrence Report HQ-SPR-WH-2003-0002)
SPR/SPR	05/28/03	(EMERGENCY) On-duty ERT responded to a small on-site crude oil spill. Leak was isolated while ERT members initiated cleanup. (Occurrence Report HQ-SPR-WH-2003-0003)
SPR/SPR	07/09/03	(Emergency) On-duty ERT responded to an on-site hazardous materials incident. A large

Table 8: Notable Responses		
LOCATION	DATE	DESCRIPTION
		bulk container of Ammonium Bisulfate over-pressurized with majority of product emitted from container. Area was isolated and cleaned up by site ERT. (Occurrence Report HQ-SPR-BH-2003-0004)
SPR/SPR	11/25/03	(Non-Emergency) On-duty ERT responded to an on-site tip over of contractor's crane. Precautionary boom was laid out by site ERT around the crane to prevent hydraulic fluid or diesel fuel from leaking into a local bayou. (Occurrence Report BC-1125-03-01)
SPR/SPR	2/27/03	(Medical) On-duty ERT responded to an on-site first aid call to local protection force officer. Subject was transported to hospital through ambulance for evaluation. (no occurrence report generated)
SPR/SPR	11/04/03	On-duty ERT responded to an on-site first aid call for a contractor back injury. Subject was transported to hospital through life flight helicopter after numbness was detected in legs. Injury resulted from exiting bulldozer during small fire which was immediately extinguished by sub-contractor personnel. (Occurrence Report HQ-SPR-BH-2003-0006)
AL/SNL	06/17/03, 2033 hours	SNLA Event #406-Fire, Off Site: The IC and SNL Security responded to a report of a fire south of the Eubank Gate. The fire was off site and Albuquerque Fire Department was on the scene. The fire did not present a hazard to SNL and the response was terminated.

CONCLUSIONS

DOE experienced no fatalities or major injuries from fire in CY 2003. The Annual Summary reporting process has recently been automated to streamline data collection and provide a more thorough review of DOE Reporting Element activities. It is now possible to view all Annual Summary Reporting Element responses since 1991 at the Site, Operations, Lead Program Secretarial Office and Headquarters levels, as well as reference other DOE reporting activities (CAIRS and ORPS) To obtain a copy of the Annual Summary Application please contact Jim Bisker in the Office of Nuclear and Facility Safety Policy (EH-53) at 301.903.6542 or jim.Bisker@hq.doe.gov.