



DOE PERFORMANCE INDICATORS

ENVIRONMENT, SAFETY & HEALTH

Period Ending
June 1999



DOE Office of Environment, Safety and Health
DOE Office of Operating Experience Analysis
<http://tis.eh.doe.gov/oeaf/>

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Accidents/Events that have already happened

Accidents/Events are injuries, fatalities, releases, uptakes, etc.

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Introduction

As we were preparing this report for print, DOE sadly experienced a fatality on November 13, 1999. In this unfortunate incident, a DOE Transportation Safeguards Division contractor employee was found unconscious inside a rental vehicle and, a short time later, died while CPR was being administered. Although the vehicle was found upright, it appeared to be a rollover accident (Notification report ALO-GOAL-TSS-1999-0010). CAIRS reports that more than 7,000 vehicle accidents have occurred in DOE in the past 19 years, and that 15 accidents have resulted in fatalities. Though the fatality rate for vehicle accidents is low, they do constitute 18 percent of the total fatalities (84 from 1981 to 1999) in DOE. The loss of this employee warrants a reminder to all personnel of the need to remain vigilant while driving vehicles on and off the job.

Trends

In reviewing overall trends this quarter, the following general observations can be made: six of the indicators demonstrated favorable trends, two demonstrated unfavorable trends, and remaining 14 indicators demonstrated no significant trends. This quarter had the fewest number of PI's with unfavorable trends compared with previous quarters.

Indicators showing favorable trends are as follows:

- **Total Recordable Case Rate** - The DOE-wide TRC rate continued (six quarters) to remain below the DOE average of 3.7. Lost workday cases decreased by 30 percent from 98Q4 values. (PI-1)
- **Cost Index** - The DOE-wide occupational safety and health cost index continued (seven quarters) to decrease from a five-year average of 23.0. Although revisions in lost work time and late reporting will increase the cost index for the more recent quarters, the downward trend is expected to continue. (PI-2)
- **Electrical Safety** – For this quarter, the number of electrical safety events decreased by 38 percent from last quarter's value (highest number since tracking of these events began in 94Q4.) The number of significance level 3 events also decreased greatly over last quarter (15 to 1). (PI-3)
- **Environmental Releases** - The data for 99Q1 continues the previously favorable trend that has existed for the past 14 quarters and is the lowest number of reportable releases to the environment recorded since we began tracking these events. (PI-6)
- **Radiation Dose to the Public** – Though the estimated collective dose to the public increased by 11% over 1997, it continues to remain well below the DOE average of 75 person-rem (1990 – 1997). (PI-9)
- **Waste Generation** – DOE exceeded its commitment for waste reduction in Fiscal Year 1998. Waste generated from routine operations continues to decrease from past years (65 percent since 1993). (PI-22)

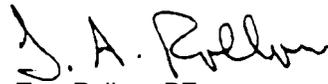
Several indicators show either a potential degradation in performance or the need for a focused effort to reverse the trend:

- **Near Misses and Safety Concerns** – This indicator is exhibiting a seven-quarter adverse trend that started in 97Q4 despite a decrease from last quarter. In fact, for the past 6 years, there has been little improvement in this indicator. (PI-12)
- **Industrial Operations Safety** – We continue to observe an increase in industrial operations safety events above the DOE average for the past five quarters. The events this quarter were primarily associated with activities involving hoisting/

rigging. (PI-4)

The remaining performance indicators did not show any improvement or adverse trends; however, managers may wish to review them as a proactive safety management practice.

EH is re-engineering its analysis activities. Effective with this report, we will be transitioning the *DOE Performance Indicators* report from a quarterly to, at a minimum, a semi-annual publication. For further information, contact the Performance Indicator Team Leader, Sam Rosenbloom (contact information below) or stay in touch through our web site at <http://tis.eh.doe.gov/oeaf>.



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Future Reports

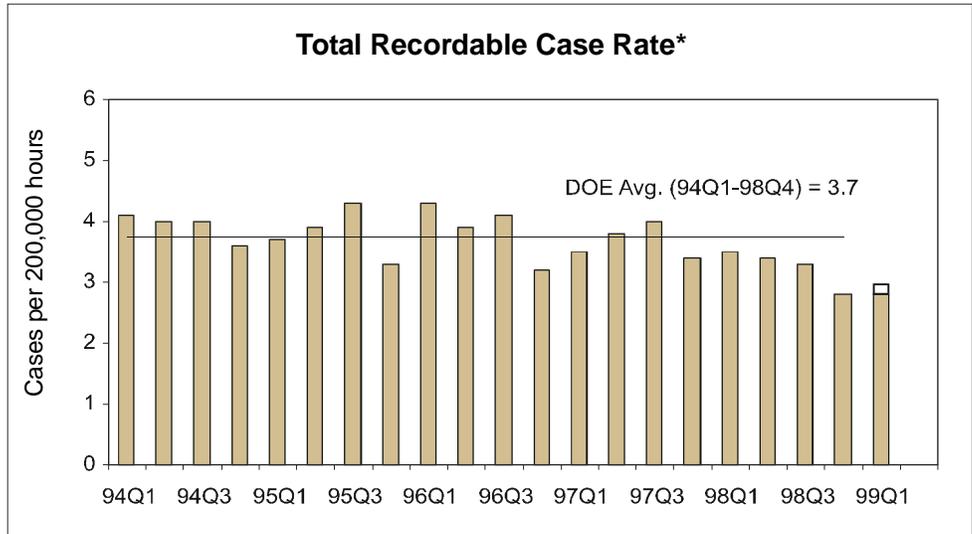
Contact for Additional Information

Indicator

1. Total Recordable Case Rate

Definition

Work-related death, injury or illness, which resulted in loss of consciousness, restriction of work or motion, transfer to another job, or required medical treatment beyond first aid.



Source: DOE Data—Computerized Accident/Incident Reporting System.

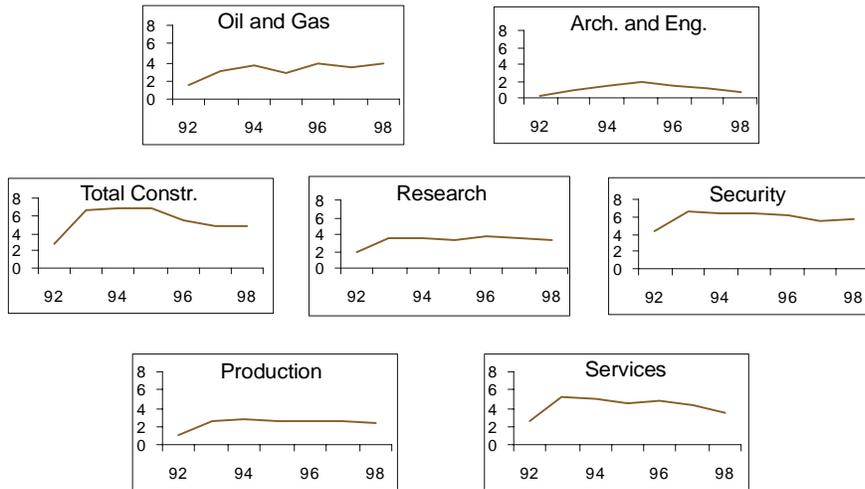
Note: Extended portion at the top of 99Q1 depicts the estimated increase due to late reporting.

Key Observations

- The 99Q1 TRC rate (cases per 200,000 hours worked), even with the estimated increase, is expected to be almost equal to the TRC rate recorded in 98Q4, which was the lowest rate ever recorded.
- In 99Q1, the estimated 973 total reportable cases will represent a 9% decrease in the number of cases reported when compared to the first quarter of 1998. For the same period of time, there was little change in the number of work hours.
- For this quarter, about 41% of the total recordable cases were lost workday cases, which is approximately 30 percent lower than the first quarter in 1998.

* Total Recordable Case rate is analyzed for the preceding quarter due to the lag time of the occurrence and the final reporting.

Distribution by Operation Type (Annual Trends)



Additional Analysis

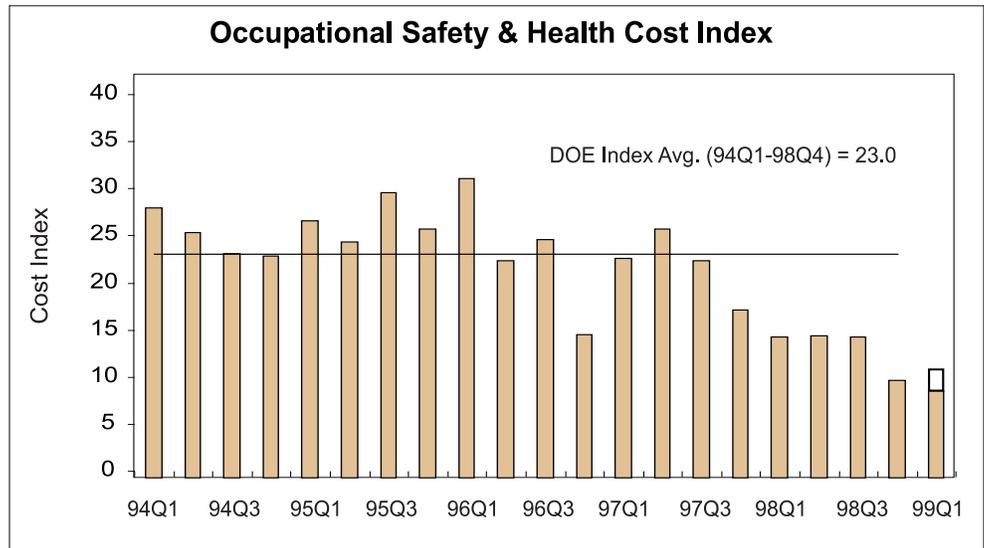
- While the above charts depict annual fluctuations only, the TRC rates for 99Q1 ranged from 3.8 for employees performing work activities in oil and gas organizations, to zero for employees working in architectural and engineering operations. This is the third quarter in a row that architectural and engineering operations have recorded a TRC rate of zero.
- With the exception of Oil and Gas operations, all other operations categories experienced a decrease in TRC Rate over the same quarter in 1997.
- Three operations have recorded decreasing TRC rates over the past three quarters: construction, research, and security.

Indicator

2. Occupational Safety and Health Cost Index

Definition

Represents the approximate amount of dollars lost (indirect and direct) per 100 hours worked for all injuries/illnesses using the formula specified in Appendix C, Glossary. The coefficients used in the Cost Index formula are weighing factors derived from a study of the direct and indirect dollar costs of injuries. The index is not commonly used in private industry. DOE sites use this index to measure their progress in improving worker safety and health.



Source: Computerized Accident/Incident Reporting System.

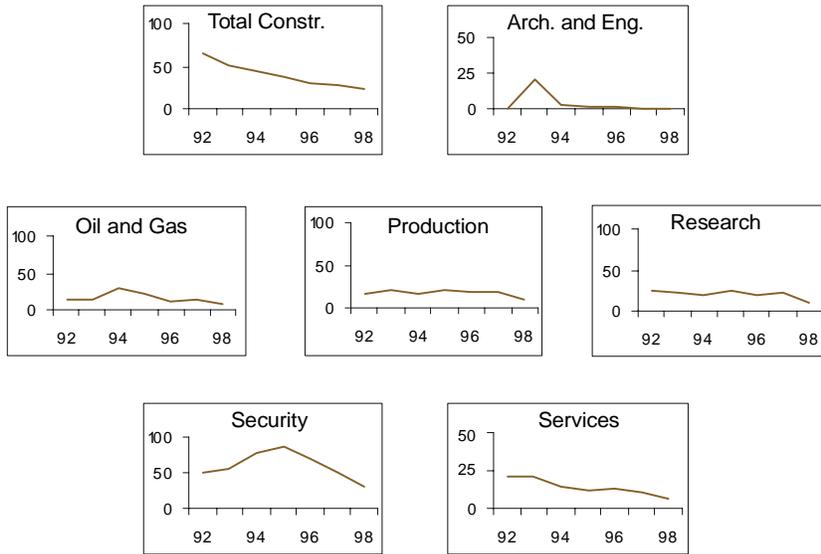
Note: Extended portion at the top of 99Q1 depicts the estimated increase due to revisions in lost worktime and late reporting.

Key Observations

- The estimated 99Q1 Cost Index for DOE contractors is 11.49. When compared to the actual 98Q1 Cost Index, the estimated 99Q1 index represents a decrease of 23 percent.

* The Cost Index is analyzed for the preceding quarter due to the lag time of the occurrence and the final reporting.

Cost Index Distribution by Operation Type (Annual Trends)



Additional Analysis

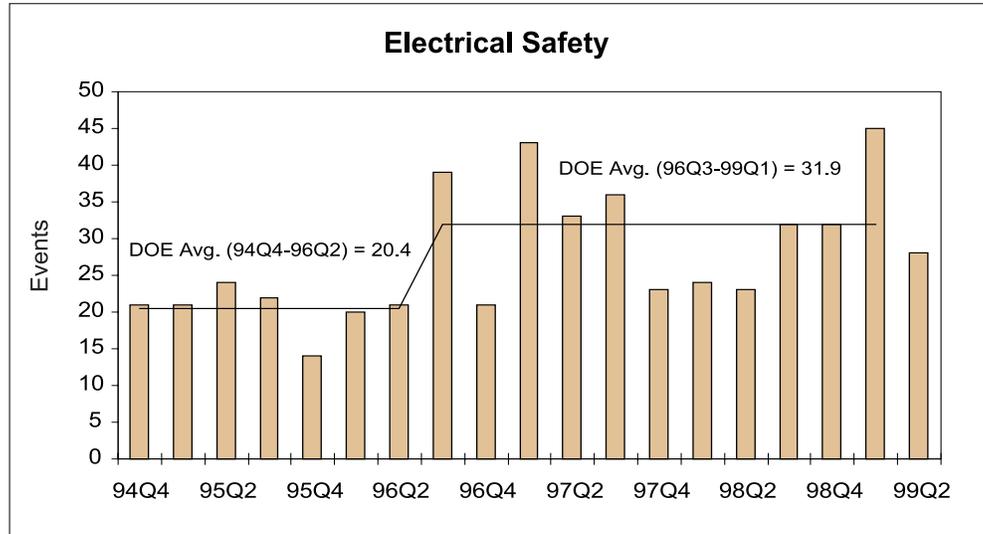
- While the above charts depict annual fluctuations only, this quarter experienced a decrease in Cost Index for all operations over the previous quarter (98Q4), with the exception of construction. Cost Index ranged from 27.19 for construction to zero for architectural and engineering. This is the third consecutive quarter that architectural and engineering has recorded a zero Cost Index.
- Four operations have recorded a decrease over the last three consecutive quarters: oil and gas, production, research, and security.

Indicator

3. Electrical Safety

Definition

The number of events involving worker contact or the potential for contact with electrically energized equipment. These events are reportable under DOE Order 232.1A, *Occurrence Reporting and Processing of Operations Information*.



Source: Review of Occurrence Reports by Department Analysts.

Key Observations

- The number of electrical safety events dropped 38% from 45 events in 99Q1 to 28 events in 99Q2.
- Twenty-six of the 28 events were Significance Level 4¹ (the lowest significant rating) with one Level 2 and one Level 3.
- Nineteen of the 28 electrical safety events (68%) were categorized as near misses with the potential for more serious consequences.

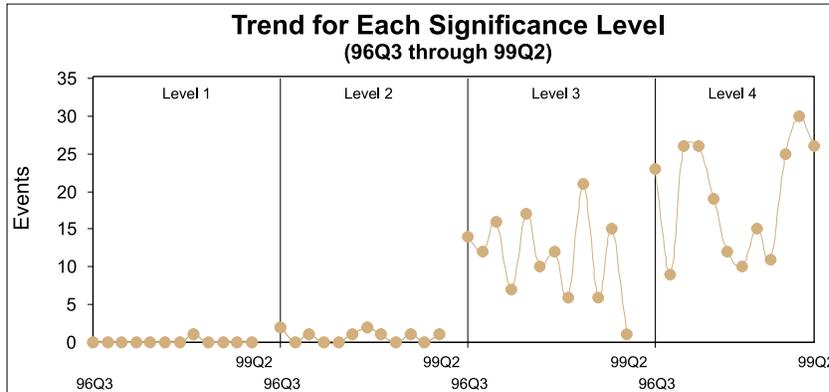
Additional Analysis

- Nineteen of the 28 events (68%) in 99Q2 involved personnel violating procedures and/or inattention to detail. In one instance, a mechanical technician turned off a switch to a fan, but left the plug connected to the wall outlet resulting in a minor electrical shock.
- Four events involved personnel working outside of the defined scope of work.

¹Level 1 Significance (Electrical safety) – fatality or permanent disability
 Level 2 Significance (Electrical safety) – injury requiring off-site hospitalization
 Level 3 Significance (Electrical safety) – onsite medical aid, possible minor injuries
 Level 4 Significance (Electrical safety) – no medical aid required, no injuries

Significance of Events

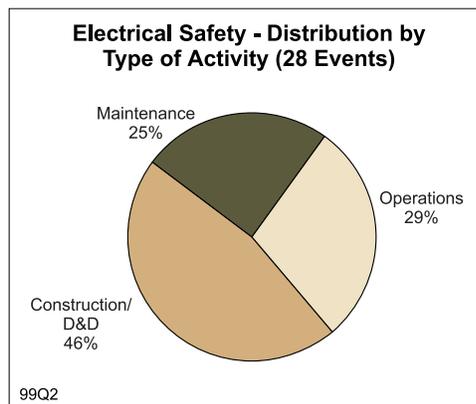
- Significance of electrical safety events is ranked in accordance with Table 1, *EH-33 Performance Indicator Significance Criteria*, which is included in Appendix B-3 of this report. A discussion of significance of electrical safety events in this report started in 98Q1. The following graph illustrates the trend for each significance level from 96Q3 to the current quarter.
- The number of electrical events decreased by 38% this quarter. There was a significant decrease in Level 3 events from 15 in 99Q1 to 1 in 99Q2 which is its lowest value since significance has been analyzed in this report.



- There was one Significance Level 2 event. A subcontract employee at the Big Hill Site came into contact with a 480-volt power distribution center panel while looking for and/or tagging a cable. The subcontract employee was airlifted to an area hospital with burn injuries.

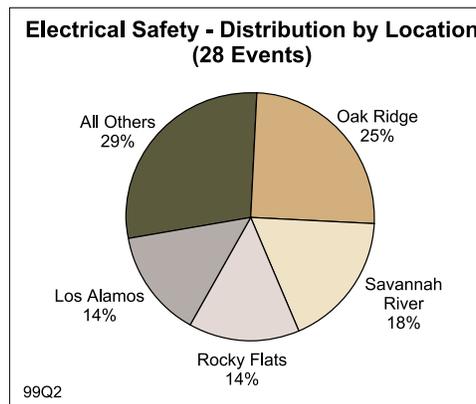
Distribution by Activity

- The leading activity contributor for 99Q2 was Construction/D&D, accounting for 46% of electrical safety events.

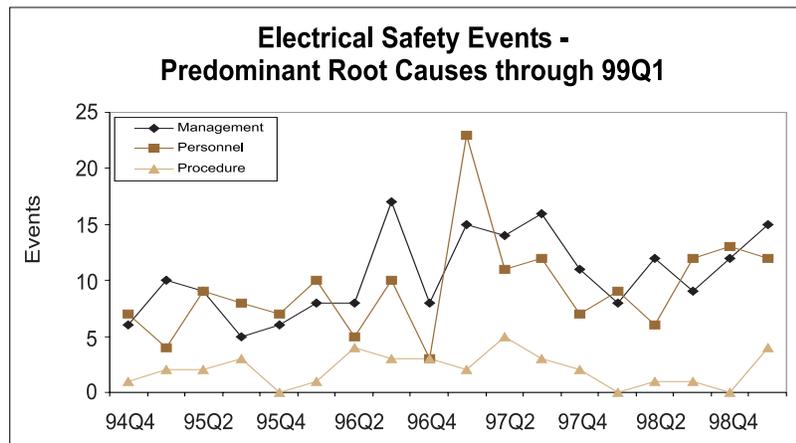


Distribution by Location

- Oak Ridge reported seven electrical safety events, which is a 75% increase over the previous quarter. It is also the highest of any DOE site this quarter. All seven events were Significance Level 4.
- Savannah River reported five electrical safety events, which is a decrease over the last two quarters and is the next highest DOE site. Los Alamos and Rocky Flats each reported four electrical safety events, and no other site reported more than two.
- Big Hill site reported the only Significance Level 2 electrical safety event, while Lawrence Livermore National Lab had the only Significance Level 3 event.



Distribution by Root Cause*



- Sixty percent of 99Q1 events were caused by either management problem or personnel error.
- Fifty percent of 99Q1 events caused by personnel error were attributed to "Inattention to Detail." The remaining 50% were equally divided between "Procedure Not Used or Used Incorrectly" and "Communication Problem."

*Root cause analysis is displayed for the preceding quarter due to time lag between notification of occurrence and issuance of the final report.

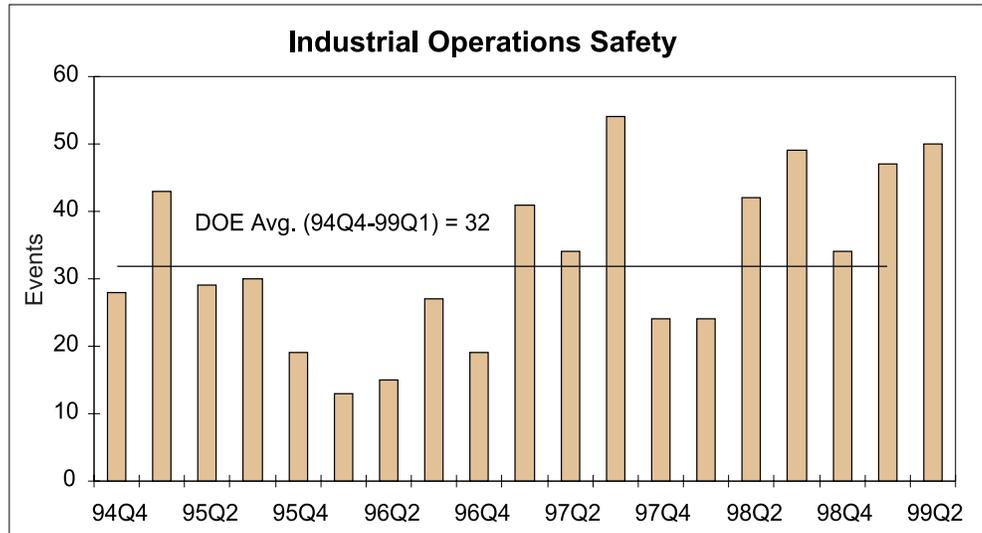
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Indicator

4. Industrial Operations Safety

Definition

Number of operations-related events involving construction equipment, forklift operations, machining operations, hoisting, rigging, or excavation reportable under DOE Order 232.1A, *Occurrence Reporting and Processing of Operations Information*.



Source: Review of Occurrence Reports by Department Analysts.

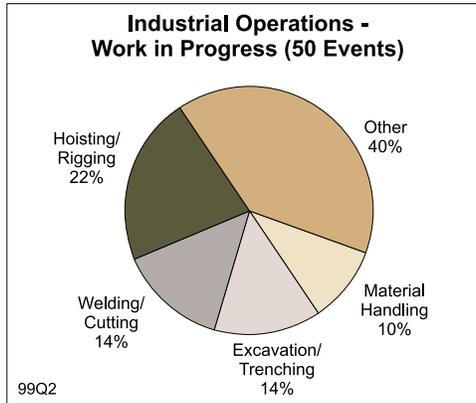
Key Observations

- The second largest number of industrial operations safety events recorded occurred in this quarter (50).
- Sixty-eight percent of all industrial operations events this quarter were categorized as near misses. Two events involved injuries: a minor injury to a worker's shoulder when struck by a section of pipe, and second degree burns to a worker's forearm when ethanol vapor ignited during a welding operation.
- For this quarter, 26 percent of the industrial operations safety events were the result of utility incursions. From 98Q1 to 99Q2, the average percentage of industrial operations safety events that involved utility incursions is 32 percent.

Additional Analysis

Work In Progress

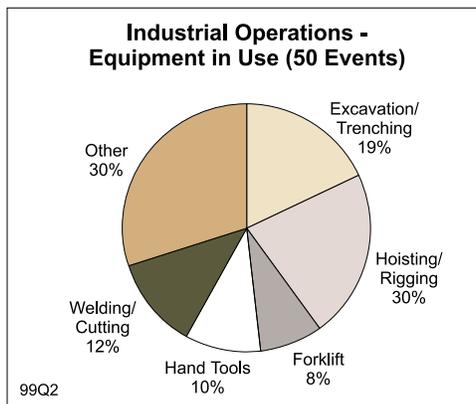
This analysis addresses the type of work activity being performed at the time an event occurred.



Equipment In Use

This analysis only addresses equipment (forklifts, backhoes, cranes, hand tools, etc.) that were reported as being in use at the time an event occurred.

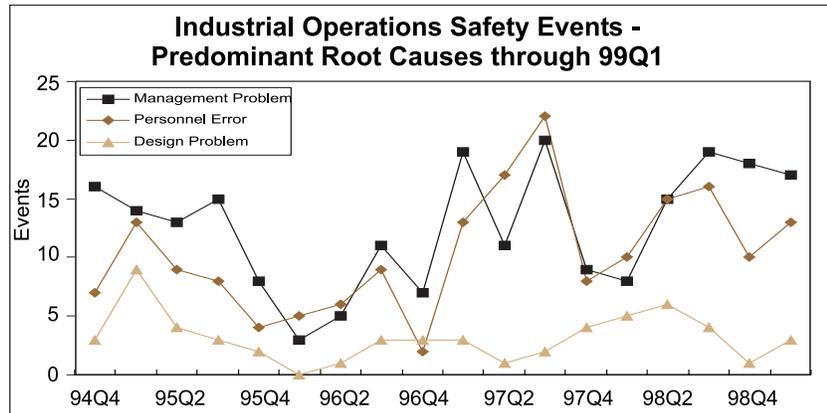
- The “Other” category was comprised of several different pieces of equipment ranging from machinery, abrasive blasting equipment, a laser, dump truck, and a cherry picker.



Utility Incursion Data

- In 99Q2, there were 13 utility incursions: 7 underground, 2 structural penetrations, and 4 overhead incursions.
- This quarter, 9 of the 13 utility incursions involved electrical utilities; the remaining incursions involved the rupture of a pressurized natural gas line and damage to both a contaminated waste water line and an overhead solvent storage tank transfer line.
- For “Work in Progress” at the time the utility incursion occurred, five events involved excavation/ trenching and three involved drilling/cutting operations. The remaining incursion events were comprised of material handling, truck, and jackhammer operations.

Distribution by Root Cause*



- Of the 47 industrial operations safety events recorded for 99Q1, 42 had root causes established.
- Approximately seventy percent of the root causes for 99Q1 were comprised of management problems and personnel error.
 - For management problems, five events were recorded for the categories of Work Organization/Planning Deficiency and four each for Policy Not Adequately Defined, Disseminated, or Enforced and Other Management Problem.
 - For the Personnel Error category, root causes were equally divided between Inattention to Detail (6) and Procedure Not Used or Used Incorrectly (6).

* Root cause analysis is displayed for the preceding quarter due to time lag between notification of occurrence and issuance of the final report.

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Indicator

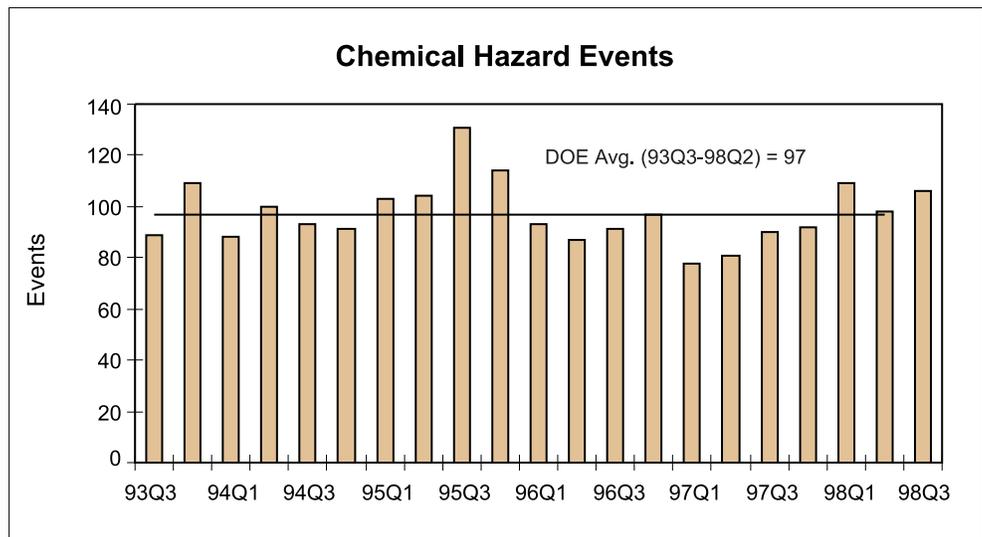
5. Chemical Hazard Events

Definition

Number of events reportable under DOE Order 232.1A, *Occurrence Reporting and Processing of Operations Information*, that are gathered by a word search for specific chemical names. The selected events are reviewed and screened for conditions meeting one of the following categories:

- Class 1 - An injury or exposure requiring hospital treatment or confirmed, severe environmental effect.
- Class 2 - Minor injury (first aid) or exposure, or minor environmental damage.
- Class 3 - Potential precursors to the occurrences in Class 1 or 2.
- Class 4 - Minor occurrences such as leaks, spills, or releases that are significant by the frequency, but not by the consequences.

No change to this section since last report.



Source: Office of Field Support, EH-53, *Chemical Safety Concerns: A Quarterly Review of ORPS* (draft, posted on the Web at <http://www.dne.bnl.gov/etd/csc/>)

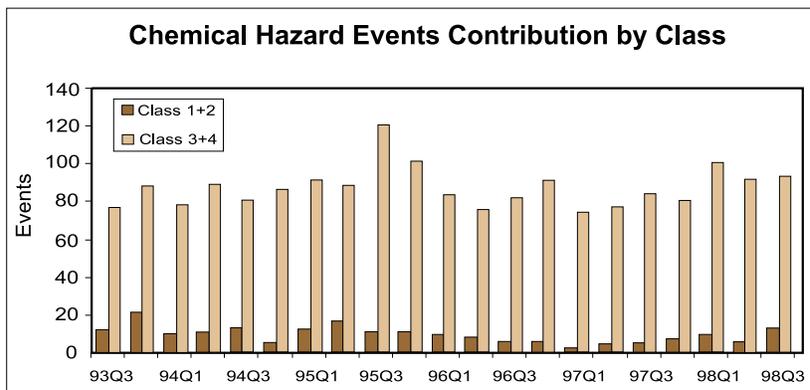
Key Observations

- In 98Q3 there was an 8% increase in the number of chemical hazard events (106) over 98Q2. This is the third consecutive quarter in which the number of events have exceeded the five year average of 97. Since 97Q1, there has been an overall increasing trend in the number of chemical hazard events.
- Class 1 and 2 events show an increasing trend over the last six quarters. There were 13 Class 1 and 2 events for 98Q3, the third highest total since 93Q4; 12 of the 13 events were Class 2.
- In 98Q3, one Class 1 event involved a fatality and three serious injuries. This accident occurred at the Idaho National Engineering and Environmental Laboratory when fire retardant carbon dioxide (CO₂) was accidentally released during routine maintenance operations.

Characterization of Chemical Hazard Events

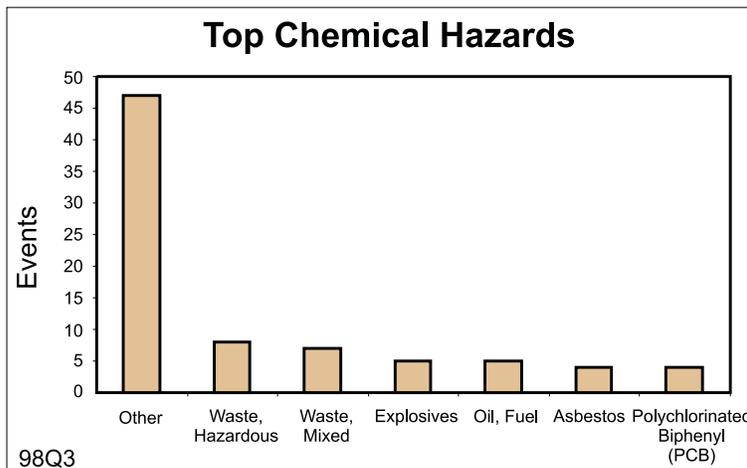
- There were 12 Class 2 events this quarter, up from 6 in 98Q2. Some of the more noteworthy events are:
 - Three Class 2 events involved overpressurized storage containers. In two cases, lids blew off of the containers as they were being opened to perform sampling for waste characterization.
 - One Class 2 event resulted in three workers suffering varying degrees of burn when acetone vapor ignited during a cleaning operation.
 - At Hanford, a Class 2 event involved the inadvertent discharge of a Halon system during maintenance functional test activities. While the event was similar to the one at INEEL that resulted in one fatality and several injuries, this event resulted in five personnel being successfully evacuated.

Additional Analysis



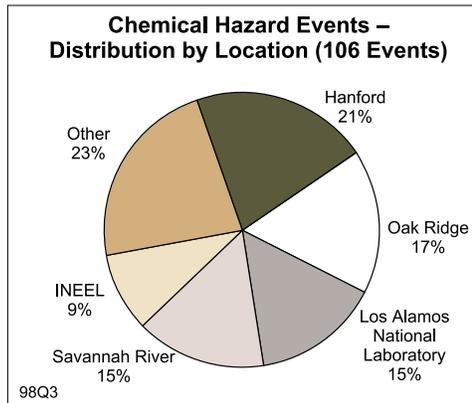
Distribution by Chemicals Involved

- In 98Q3, there was not one category of chemical events or individual chemicals that dominated the distribution.



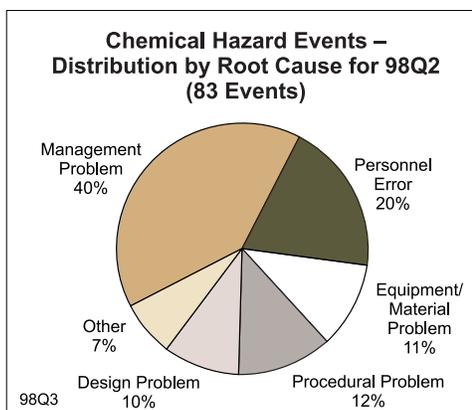
Distribution by Location

- Of the 22 events reported at Richland, one was a class 2 event with the rest class 3 events. The class 2 event involved an inadvertent discharge of a Halon system during a maintenance functional test.
- The 18 events at Oak Ridge involved a variety of hazards including, uranium, hydrogen fluoride, Halon, and PCBs among others.



Distribution by Root Cause*

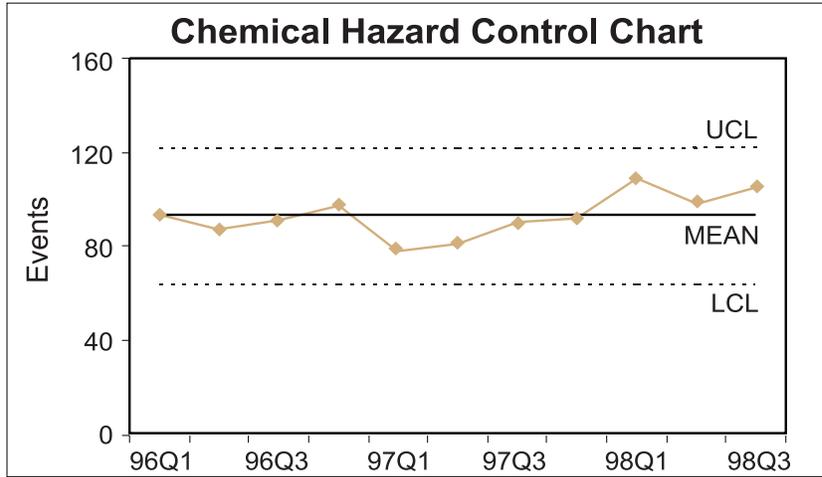
- Of the 98 chemical hazard related events reported in 98Q2, 83 had root causes assigned. Of these, the top 2 categories were Management Problems (33 events) and Personnel Error (16 events). Procedure and Material/Equipment problems accounted for 10 and 9 events respectively.
 - Of the management problems cited, Inadequate Administrative Control was cited the most (13), with Work Organization/Planning Deficiency, and Policy Not Adequately Defined, Disseminated, or Enforced with 6 each.
 - In the Personnel Error category, the most frequently cited was Procedure Not Used or Used Incorrectly; Inattention to Detail was second.
 - Of the Equipment/Material Problems cited, Defective or Failed Part was the most often cited.



*Root cause analysis is displayed for the preceding quarter due to time lag between notification of occurrence and issuance of the final report.

Statistical Process Control (SPC) Analysis

- The processes in place to prevent chemical hazard events remains within statistical process control.

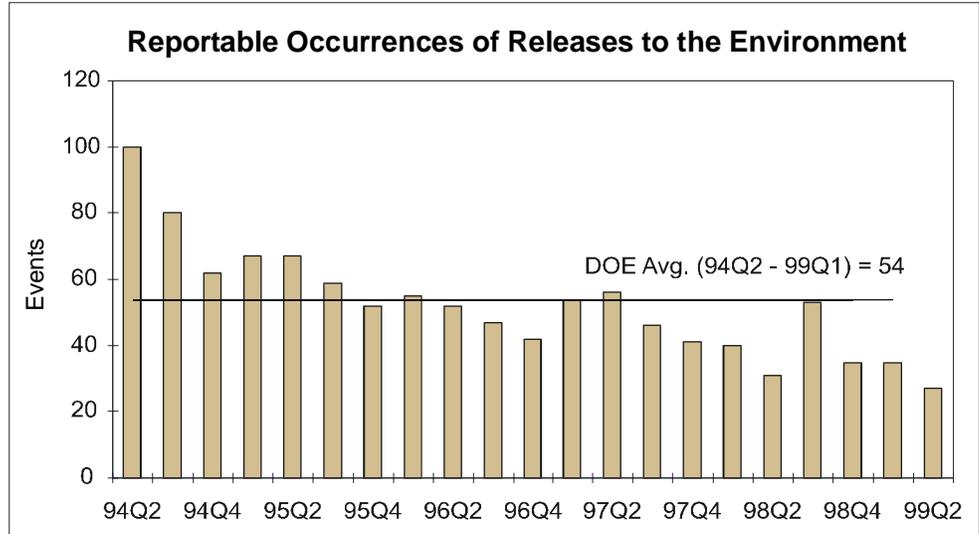


Indicator

6. Reportable Occurrences of Releases to the Environment

Definition

Releases of radionuclides, hazardous substances, or regulated pollutants that are reportable to federal, state, or local agencies.



Source: Review of Occurrence Reports by Department Analysts.

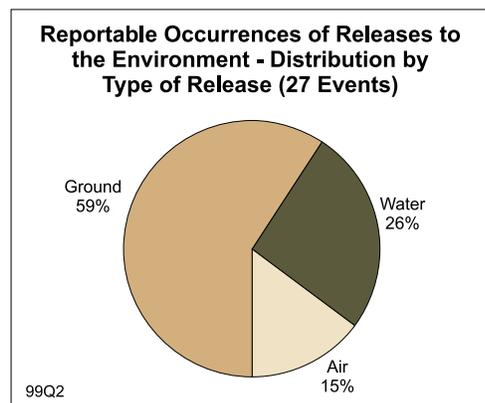
Key Observations

- 99Q2 saw a decrease in the number of reported release events of nearly 25% compared to 99Q1. The 27 release events in 99Q2 is the lowest number reported since 93Q1. This notable decrease is primarily due to a drop in the number of releases to local streams at Los Alamos and the number of petroleum releases at the Yucca Mountain Site.
- The low number of release events in 99Q2 continues a downward trend in the number of events over the past 3 years. This trend is substantiated by 8 consecutive quarters (97Q3 to 99Q2) below the DOE average. The average for the past 20 quarters (94Q2 – 99Q1) is 54 events; while, the average of the last 7 quarters (97Q3 – 99Q1) is 39 events.

Additional Analysis

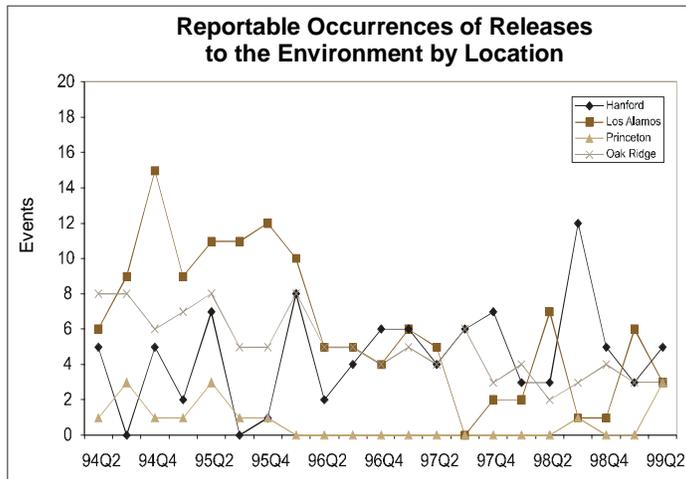
Distribution by Type of Release

- Of the 16 ground releases, petroleum products were the largest contributors (7). These releases included fuel oil, hydraulic oil and transformer oil. Other releases to the ground included polychlorinated biphenyls (PCBs), sewage, and radioactive material.



- Of the 7 releases to local waters, 3 involved excessive total suspended solids (NPDES permit violations) at various sewer outfalls. Two events involved excessive storm sewer overflows. Examples of other types of releases included petroleum contamination of the ground water and excess sediment releases.
- Only 4 airborne release events were reported in 99Q2. Two of the releases involved natural gas.

Distribution by Location

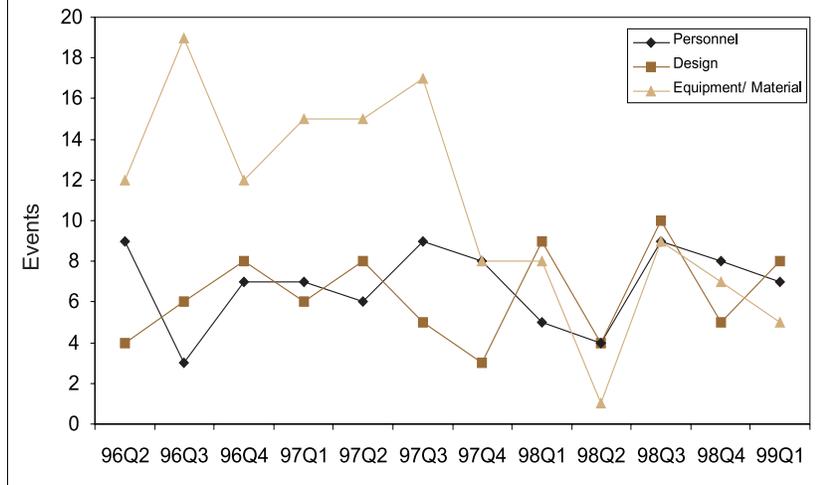


- Hanford had the most reported release events in 99Q2 with 5. This is consistent with last quarter's 4 events as well as the average number of events reported at this site over the past 20 quarters (4.5). Of these 5 events, all were releases to the ground, 3 of petroleum, one of potentially contaminated water/effluent and one of hexone.
- Los Alamos, Princeton and Oak Ridge each reported 3 events in 99Q2. Of these, both Los Alamos and Oak Ridge were well below their 20-quarter averages of 6.4 and 5.2 events respectively. Only Princeton saw a notable increase in the number of events up from its 20-quarter average of less than 1 event. The releases at Princeton were natural gas to the air and freon and petroleum to the ground.
- Other contributors with more than one release included Sandia National Laboratory, the Nevada Test Site and the Stanford Linear Accelerator site, each with 2 releases reported.

Distribution by Root Cause*

- Of the 35 events reported in 99Q1, 28 had root causes established. Consistent with the past several quarters, two of the three predominant root cause categories were personnel and design. The majority of design related events were attributed to inadequate or defective design.
- Inattention to detail was the most commonly attributed personnel related root cause. This is consistent with the previous 8 quarters.

Reportable Occurrences of Releases to the Environment - Predominant Root Causes through 99Q1

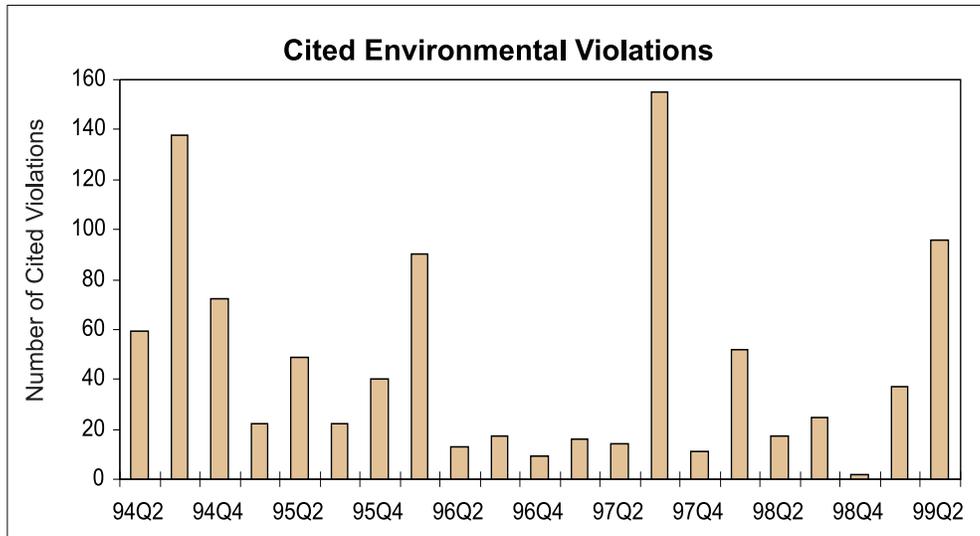


*Root cause analysis is displayed for the preceding quarter due to time lag between notification of occurrence and issuance of the final report.

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Indicator 7. Cited Environmental Violations

Definition Number of environmental violations cited in enforcement actions, e.g., Notices of Violations (NOVs), by regulators at DOE facilities. (An NOV may cite one or multiple violations).



Source: EH-41 Compliance Database.

Key Observations

- Four Notices of Violation were received in 99Q2, citing 96 violations.
- A single NOV at Idaho cited 86 violations of the Resource Conservation and Recovery Act (RCRA), and assessed a fine of \$839,550.
- The number of violations (and of NOVs) per quarter continues to be highly variable.

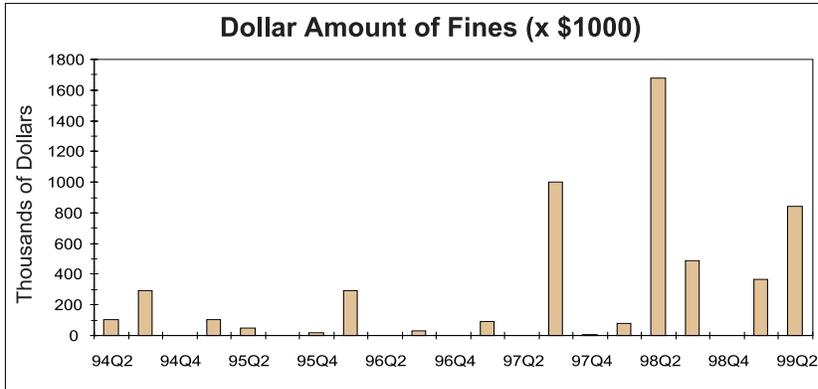
Additional Analysis

Violations by Statute

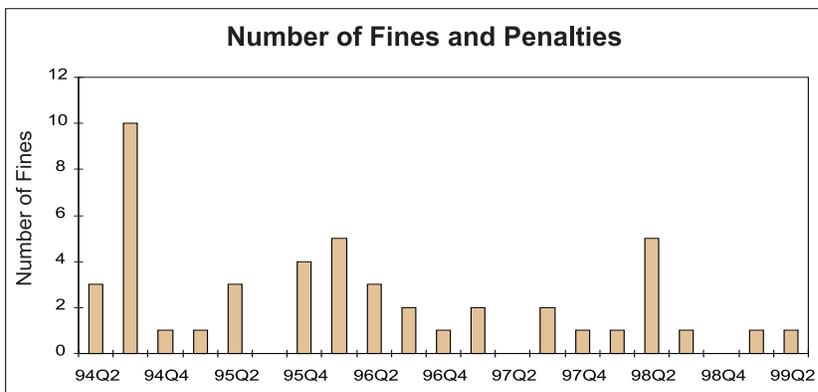
- All four NOVs this quarter (citing a total of 96 violations) were issued under RCRA.

Fines

- A fine of \$839,550 was assessed at Idaho in the second quarter for 86 RCRA violations.



- The state of New York issued an NOV to Brookhaven on March 29, 1999 citing 6 RCRA violations, and assessing a fine of \$11,750. This NOV was subsequently withdrawn by the state to correct errors, and is not included in the above figures. A revised NOV is expected to be issued, citing three violations, and a fine of \$2,250; it will be included in a subsequent report.



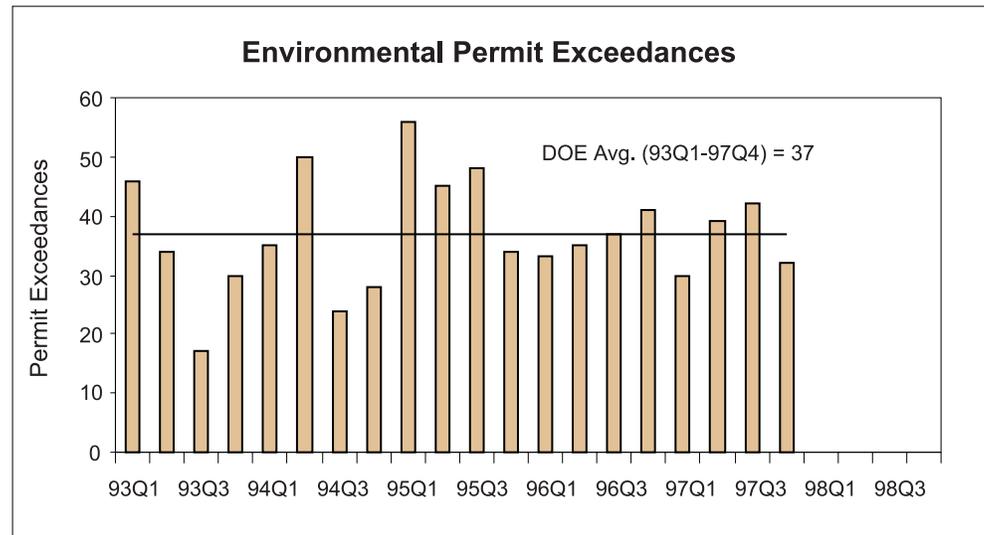
Indicator

8. Environmental Permit Exceedances

Definition

Exceedance of release levels specified in air and water permits during the quarter.

No change to this section since last report.



Source: Annual Site Environmental Reports, additional site data.

Key Observations

- The number of DOE permit exceedances continues essentially unchanged in 1997.
- The overall numbers mask some large increases and decreases at individual sites.

Additional Analysis

- Nearly all exceedances continue to occur under National and State (water) Pollution Discharge Elimination System Permits.
- The number of permit exceedances increased significantly at Pantex and Hanford in 1996 and 1997. There were major decreases at Los Alamos, Argonne-East, and Portsmouth, and decreases at Strategic Petroleum Reserve and Savannah River.

Locations of Major Changes in Permit Exceedances		
	1996	1997
Increases		
Pantex	17	34
Lawrence Livermore Nat'l Laborat.	0	8
Decreases		
Los Alamos	13	6
Princeton Plasma-Physics Laborat.	5	0
Strategic Petroleum Reserve	9	4
Savannah River	12	6

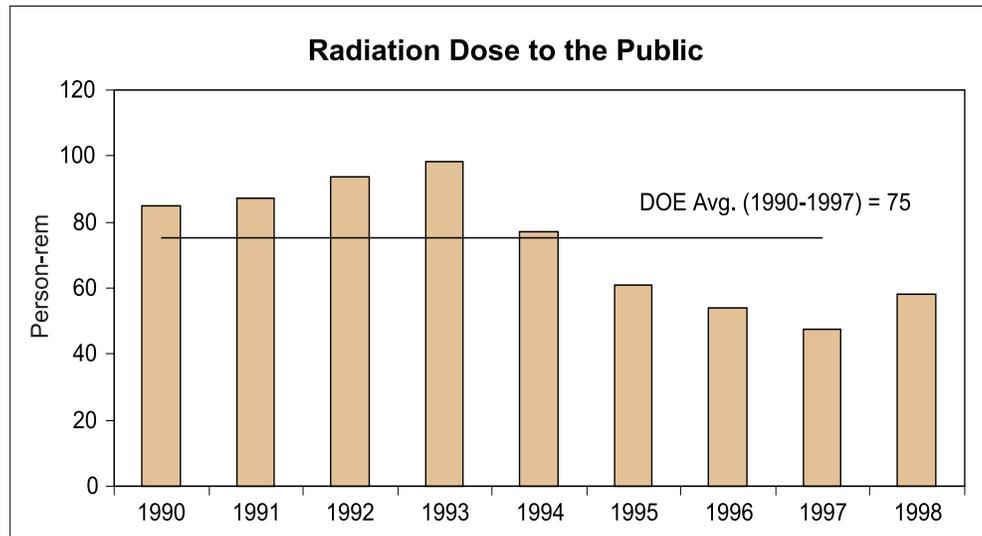
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Indicator

9. Radiation Dose to the Public

Definition

Total collective radiation dose (person-rem) to the public within 50 miles of DOE facilities due to radionuclide airborne releases. ("Collective radiation dose" is the sum of the effective dose equivalent to all off-site people within a 50-mile radius of a DOE facility over a calendar year.)



Source: Annual reports to EPA; EH-41 data tabulation.

Key Observations

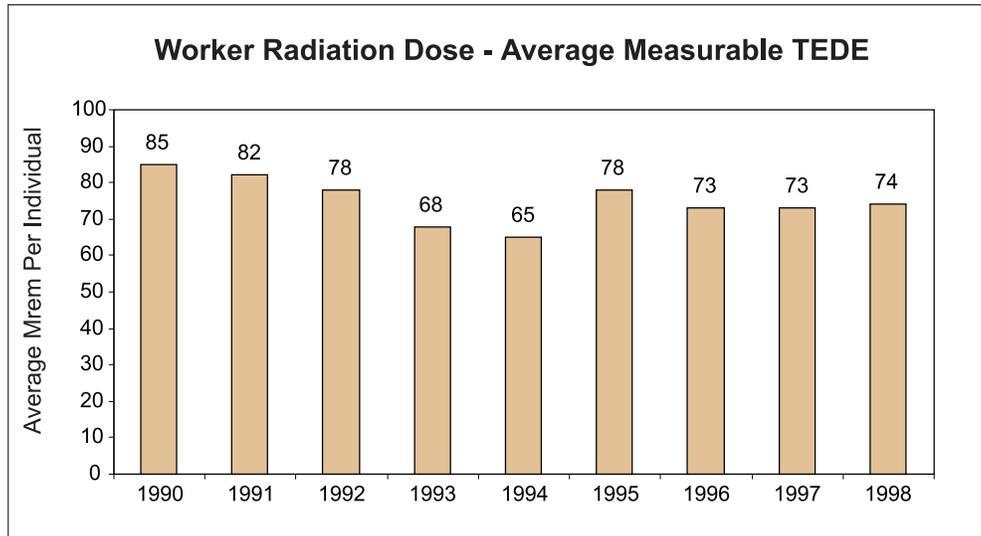
- Total collective radiation dose to the public from DOE sources was very low compared to the public dose from natural background radiation. The total collective radiation dose to the public around DOE sites from air releases was one ten-thousandth of the dose received by the same population from natural background radiation.
- The estimated collective dose in 1998 was 21% (or 11 person-rem) higher than in 1997. It is approximately 60% of 1993's level.
- The estimated increase from 1997 to 1998 resulted principally from increases at the following locations:
 - a 7.4 person-rem increase at the Lawrence Livermore National Laboratory's 300 Site,
 - a 6.2 person-rem increase at Rocky Flats,
 - a 4.1 person rem increase at Brookhaven,
 - and minor increases at other sites.
- Decreases occurred at Fernald (8.7 person-rem) and at Princeton Plasma Physics Lab (3.6 person-rem.) These changes are consistent with the historic variability of site data from year to year.

- More than three-quarters of the estimated collective dose came from five sites: Oak Ridge, Lawrence Livermore—Site 300, Savannah River, Brookhaven National Laboratory, and Rocky Flats.
- Site-specific changes included:
 - Rocky Flats. The factor of 24 increase from 1997, from 0.27 to 6.5 person-rem, resulted from the draining of the Building 788 clarifier tank during the 1998 calendar year. (However, the level was smaller than in 1996 when higher values were reported due in large part to excavation at the T-3 and T-4 trenches.)
 - Lawrence Livermore National Laboratory—300 Site. The factor of 3 increase, from 3.6 to 11 person-rem, resulted from tests conducted during 1998 with explosives containing higher explosive power than in 1997. The higher-powered explosives disperse radionuclides at higher altitudes and therefore impact a larger population around the site.
 - Brookhaven National Lab. The factor of 2 increase, from 3.5 to 7.6 person-rem, did not result from increased emissions, but resulted instead from the use of a different meteorological data set as input into the CAP88-PC modeling. For 1998, “actual” wind and stability class data were used in the calculation. In prior years, the “10-year average” of actual meteorological data was used.
 - Fernald. The factor of 10 decrease, from 9.7 to 0.97 person-rem, does not represent a real decrease in emissions (rather, the previous emissions were overestimated). The decrease resulted from the use of ambient monitoring in 1998 to assess the dose to the public instead of modeling the dose. The 1997 dose was modeled with CAP88-PC which can be excessively conservative depending on the parameters used.

Additional Analysis

Indicator | **10. Worker Radiation Dose**

Definition | Average measurable dose to DOE workers, calculated by dividing the collective total effective dose equivalent (TEDE) by the number of individuals with measurable dose. TEDE is determined by combining both internal and external contributions to an individual's occupational exposure. The number of individuals receiving measurable dose is used as an indicator of the exposed work force size.



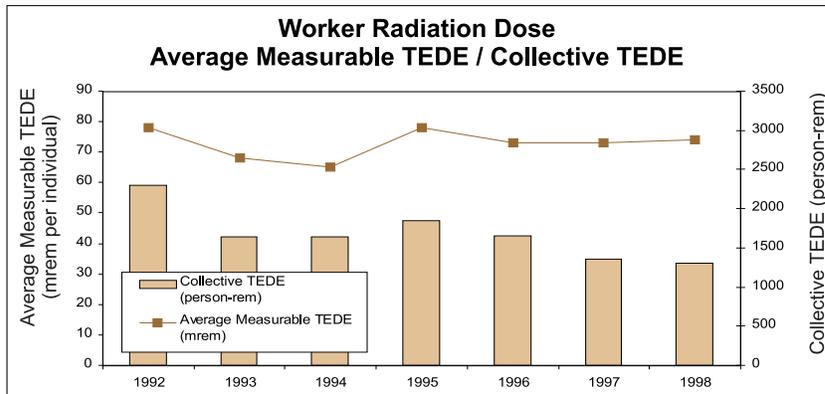
Source: U.S. Department of Energy, DOE/EH-52 and DOE Occupational Radiation Exposure Report.

Key Observations

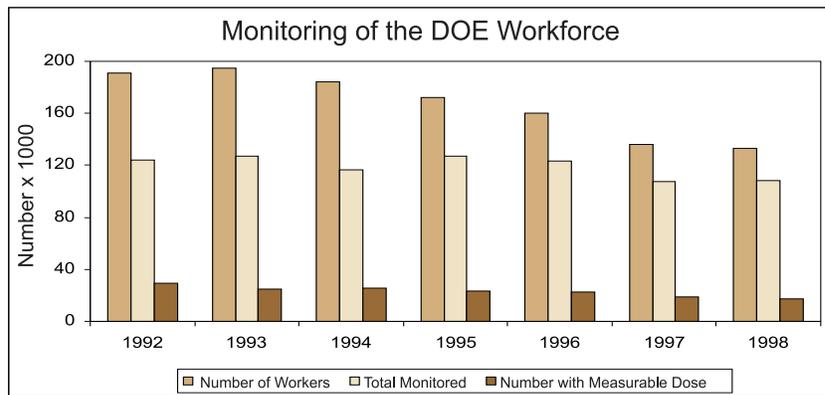
- The average measurable TEDE increased slightly in 1998 (0.001 rem, or 0.010 mSieverts) and the number of individuals receiving measurable external dose dropped by 6%. It should also be noted that there were no exposures over the DOE five-rem TEDE limit.
- The collective TEDE at DOE decreased by 4% from 1997 to 1998. Sixty-three percent (63%) of the DOE sites reported decreases in the collective TEDE from the 1997 values. Four of the seven highest dose sites reported decreases in the collective TEDE, and one site had an increase of less than one percent.
- Eighty four percent (84%) of the collective TEDE for the DOE Complex was accrued at seven DOE sites in 1998.
- The number of workers (533) with measurable internal dose increased by 23% from 1997 to 1998 and the TEDE increased 27%.

- Information concerning exposure received by individuals associated with DOE activities is in DOE/EH-0575, *Occupational Radiation Exposure Report 1998* (on line at <http://rems.eh.doe.gov/annual.htm>).

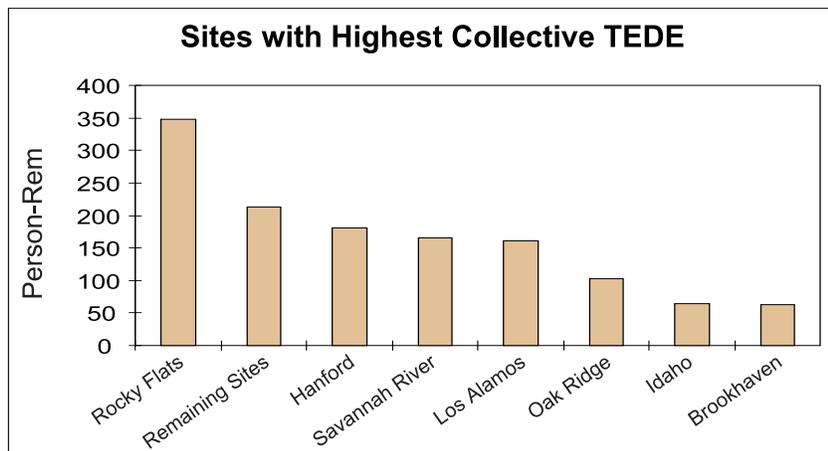
Additional Analysis



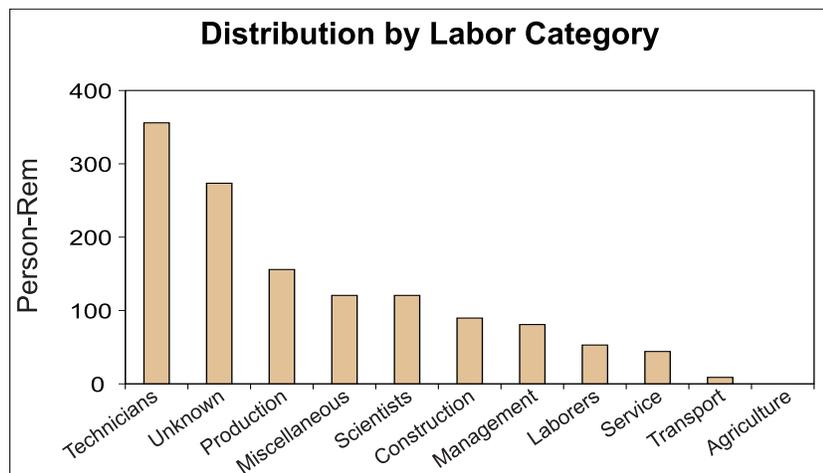
- Although the highest average measurable dose is due to radon exposures from mill tailings, the highest collective dose is due to uranium exposures, primarily at Oak Ridge.



- While the total number of individuals monitored for radiation has decreased by nearly 7% from 1994 to 1998, the percentage of the DOE workforce monitored for radiation exposure increased by 18% during this same time period. However, the majority of the monitored individuals (82%) did not receive any measurable radiation dose.
- An average of 18% of monitored individuals (slightly less than 14% of the DOE workforce) received a measurable dose during the past five years.



- The seven sites with the highest collective TEDE were (in descending order of collective dose) Rocky Flats, Hanford, Savannah River, Los Alamos, Oak Ridge, Idaho, and Brookhaven.
- Weapons fabrication and testing facilities accounted for the highest collective dose. Rocky Flats and Hanford accounted for the majority of this dose. These sites were primarily involved in nuclear materials stabilization and waste management.
- Compared with 1997 data, Idaho and Hanford experienced the largest percentage decrease (44% and 23% respectively) in collective TEDE of the seven sites, while Oak Ridge and Rocky Flats realized increases of 32% and 8%, respectively.

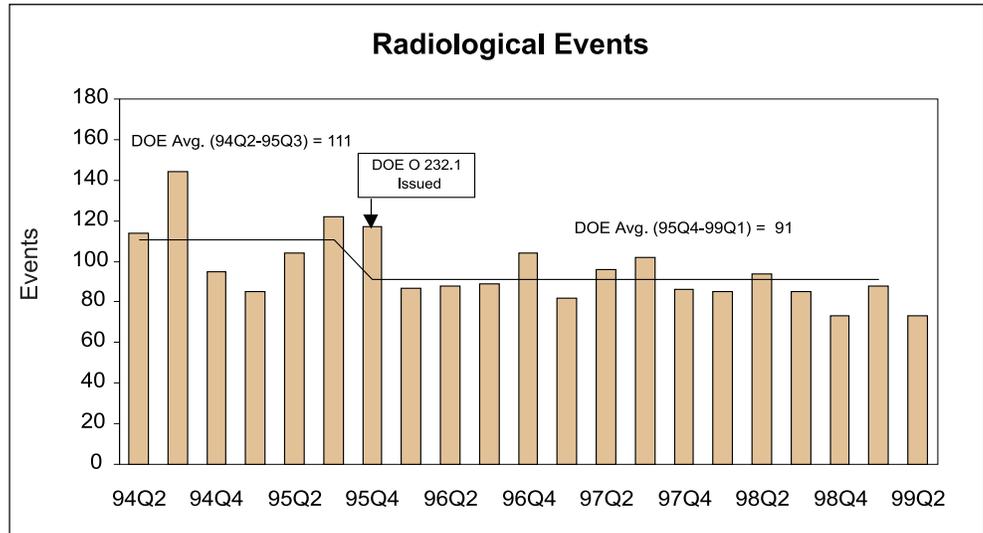


- For the past four years, technicians have received the highest collective dose of any specified labor category.
- Of the technicians, 40% of the dose was received by radiation protection technicians and 22% by science technicians.

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Indicator 11. Radiological Events

Definition Number of reportable radiological events as defined in DOE Order 232.1A, *Occurrence Reporting and Processing of Operations Information*. These events are made up of both personnel contaminations and radiation exposures that are reported as personnel radiation protection events.



Source: Review of Occurrence Reports by Department Analysts.

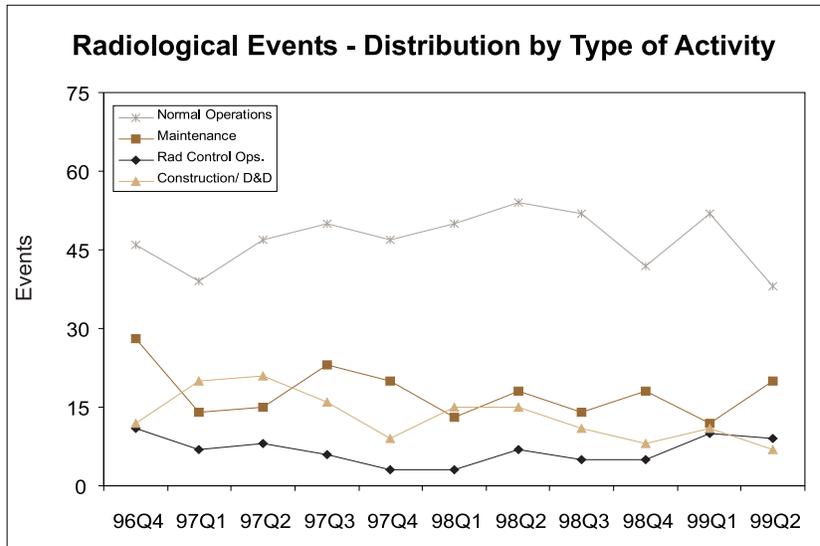
Key Observations

- The number of radiological contamination events reported per quarter since 96Q1 demonstrated no statistically significant change in Departmental performance.
- There were 73 radiological contamination/exposure events reported in 99Q2, in which 81 personnel were contaminated or exposed.
- Of the 73 radiological contamination events reported in 99Q2, nine (12%) involved radiological control personnel which is the highest number of contamination events in this worker category since Activity Types were first analyzed in 96Q4.

Additional Analysis

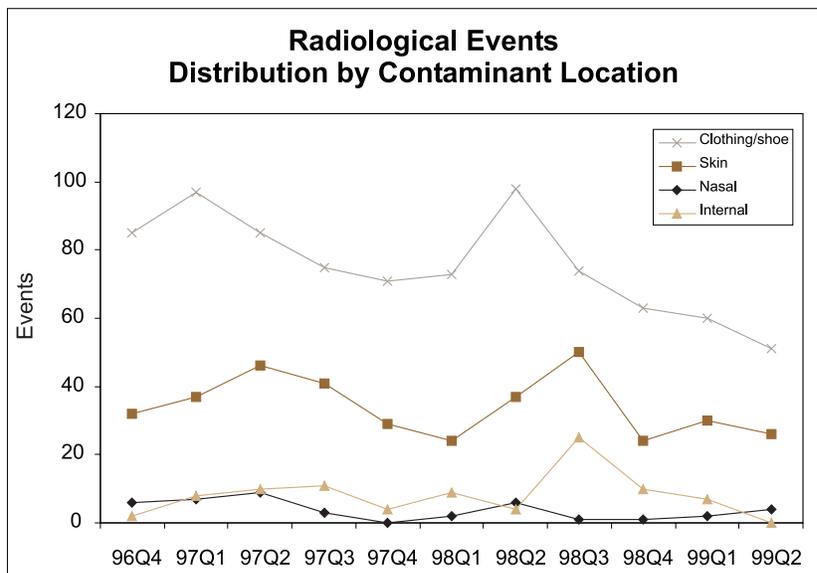
Distribution by Type of Activity

- The number of contamination events involving radiological control personnel nearly doubled when compared to the previous quarter and is the highest number since the inception of analyzing activity types.



Distribution by Radiological Contaminant Location

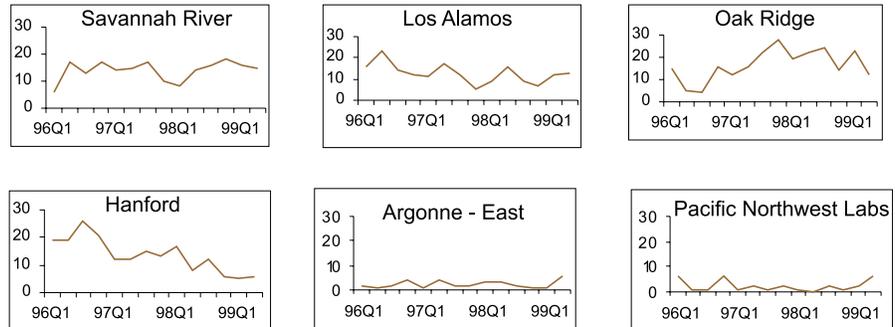
- The number of clothing/shoe contamination events in 99Q2 (51) was the fewest reported in any quarter since 96Q4. This represents a 35% decrease when compared the previous 10-quarter average of 78 clothing/shoe contamination events. A similar 25% drop was experienced in the number of reported skin contamination events.
- Of the reports which mentioned the contaminant involved in the event, the predominant isotopes were Cobalt 60 (9 events) and Cesium 137 (9 events). Both are beta/gamma emitters and are normally prominent contaminants in each quarter.
- There were no reported confirmed internal contamination events in 99Q2. This is a significant decrease compared to the 7 events reported in 99Q1. This also compares favorably to the average of 9 events reported over the previous 10 quarters.



Note: One personnel contamination may involve more than one location on the body.

Distribution by Site

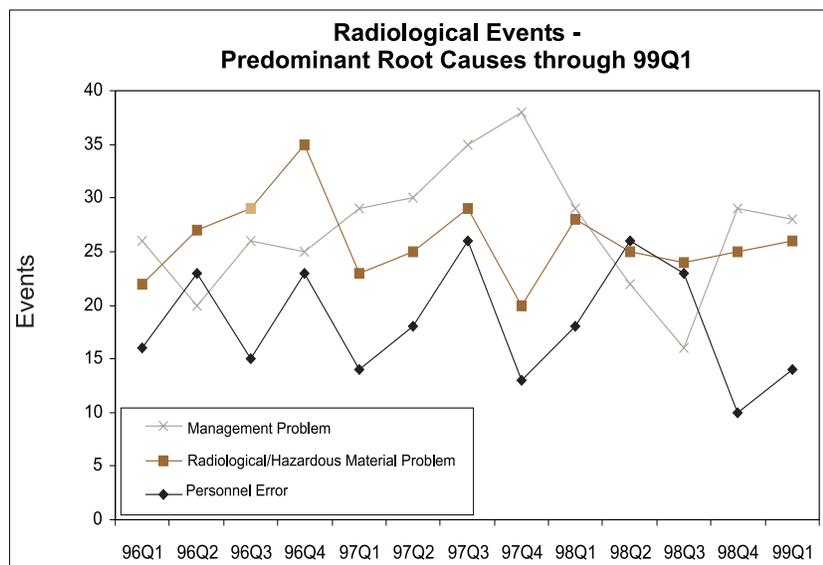
- The Hanford site, in the past a leader in the number of radiological contamination events, reported only six events in 99Q2 compared to an average of 14 events since 96Q1.



- Of the six major contributors in 99Q2, only Argonne-East and Pacific Northwest Labs were significantly different than their respective averages since 96Q1. In the case of these sites, the numbers of events were each 6, while their average numbers of events were 2.

Distribution by Root Cause*

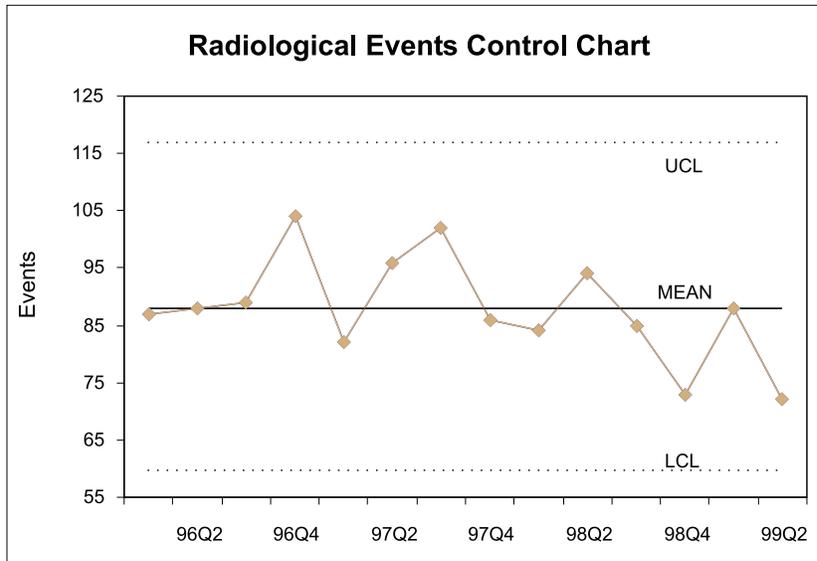
- Of the 88 radiological contamination events reported in 99Q1, 79 had a root cause analysis at the time of this report.



* Root cause analysis is displayed for the preceding quarter due to time lag between notification of occurrence and issuance of the final report.

Statistical Process Control (SPC) Analysis

- The radiological event data remains within control limits based on statistical process control.

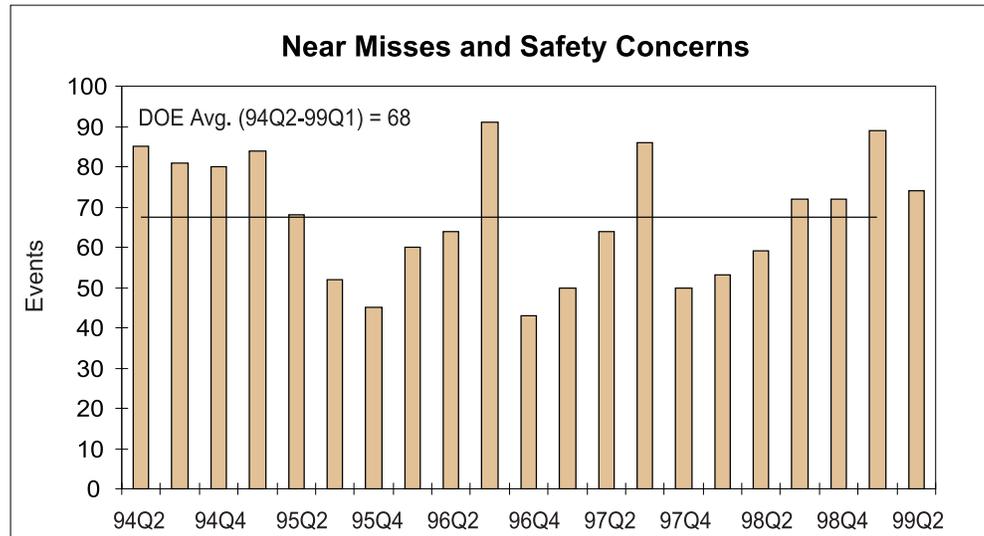


Indicator

12. Near Misses and Safety Concerns

Definition

A near miss is an operational event where barriers to an accident have been compromised such that no barriers or only one barrier remain (e.g., lack of fall protection, electric shock without injury, unauthorized confined space entry). A safety concern includes the unauthorized use of hazardous products or processes, or if work is shut down as a result of an OSHA violation. Near misses and safety concerns are reportable under DOE Order 232.1A, *Occurrence Reporting and Processing of Operations Information*.



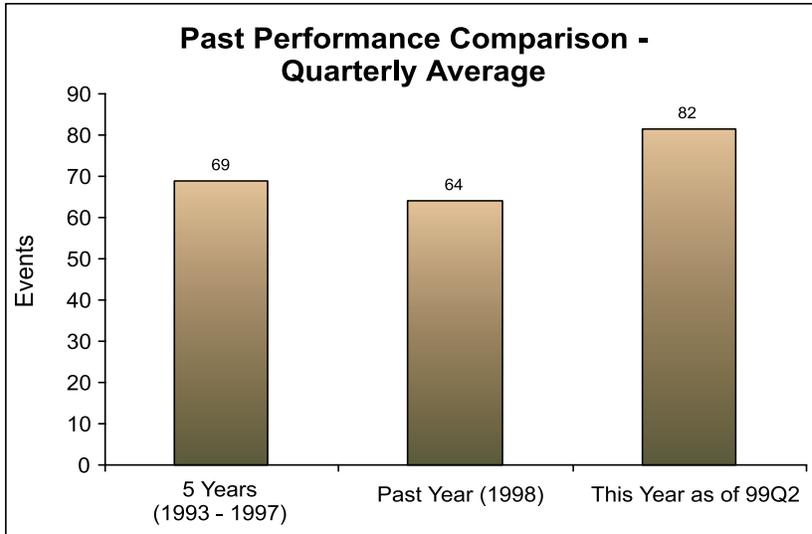
Source: Review of Occurrence Reports by Department Analysts.

Key Observations

- For the past seven quarters, the number of near miss and safety concern events have been increasing, although there was a decrease in 99Q2.
- Six injuries occurred from these 74 events, with the severity ranging from bruises to abrasions and lacerations. Two of the six injuries resulted from electrical-related activities, resulting in singeing of an arm and face and an electrical shock.

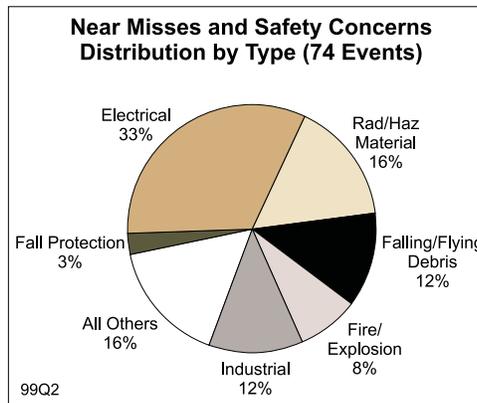
- For the past six years, DOE has shown little improvement in reducing the number of near miss and safety concern events; the annual totals and quarterly averages have been fairly constant. As noted in previous quarterly reports, electrical-related near miss and safety concerns continue to dominate this category (approximately 30-40 percent).

Additional Analysis



Distribution by Type of Hazard

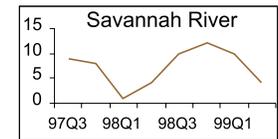
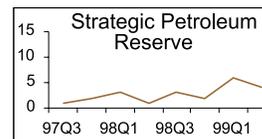
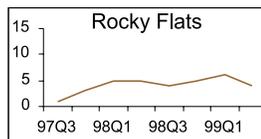
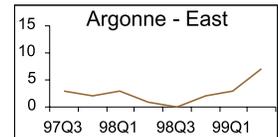
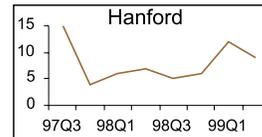
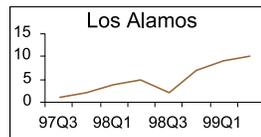
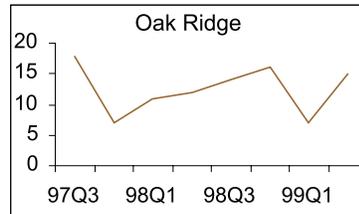
- Seventeen of the 24 electrical-related near miss and safety concern events occurred because personnel did not follow work-safe practices or follow procedures during planning or performance of electrical work activities.
- Twenty-one of the 74 events involved subcontractors (33 workers); the remainder involved Managing and Operating contractor workers (87 personnel), three researchers and a scientific staff member.



- Within one week, a subcontractor at the Oak Ridge National Laboratory reported two near miss events involving failure of hoisting cabling and/or connectors used on material hoists. While neither event resulted in injury, there was loss of materials and equipment.
- Only 2 events involved decontamination and decommissioning activities, neither resulting in injury to workers.

Distribution by Location

- In 99Q2, Hanford, Rocky Flats, Strategic Petroleum Reserve, and Savannah River exhibited decreasing numbers of near misses and safety concerns.
- Argonne National Laboratory-East experienced its highest number of events since 93Q1. Three of the seven events involved researchers and/or scientists. In one instance, a scientist attempted to perform a series of electrical tests on a heating/cooling unit without use of a Hot Work Permit or Lockout/Tagout process.

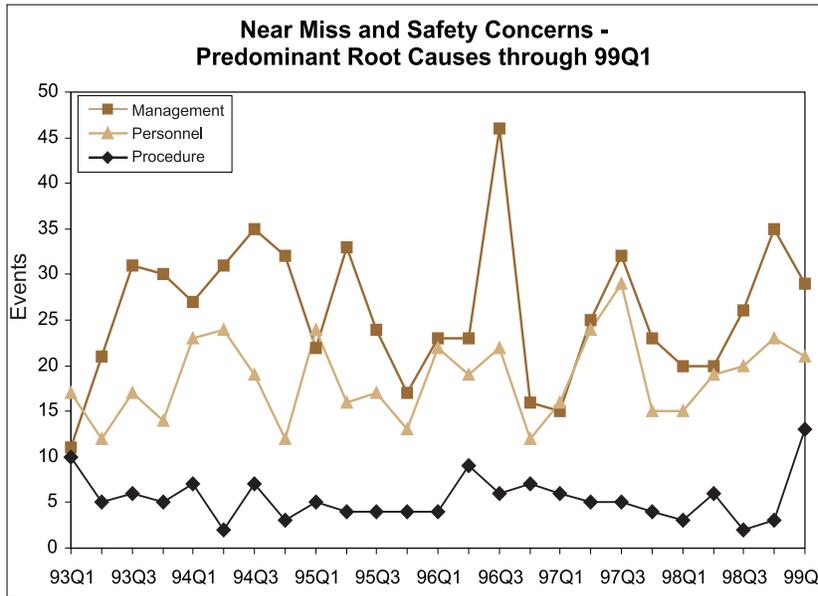


Distribution by Root Cause*

- For the past year, Management Problems and Personnel Errors continue to be the predominant causal factors for most near miss and safety concern events.
- The majority of management problems were fairly evenly distributed between work organization/planning deficiency (6) and other unspecified management problems (5).
- The predominant personnel errors involved workers failing to use procedures or use them properly (5), inattention to detail (4), and other unspecified human errors (3).

* Root cause analysis is displayed for the preceding quarter due to time lag between notification of occurrence and issuance of the final report.

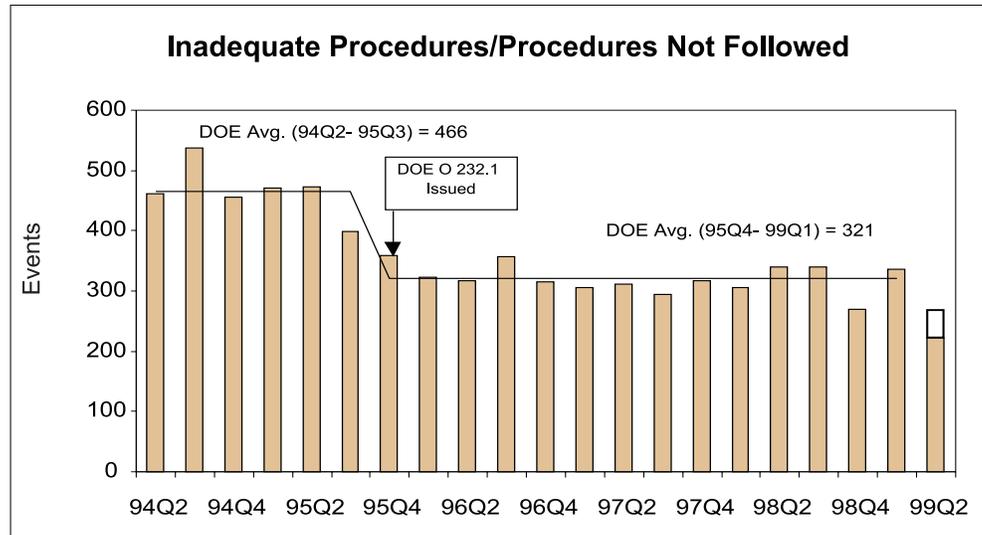
- The procedure root cause category experienced the highest reported value (total of 13) since 93Q1. Over 80% of procedural problems (11 of 13) were attributed to defective or inadequate procedures. Examples include procedures not addressing venting of containers (i.e, drums) prior to opening them at Portsmouth and not defining the process for dismantling compressed gas cylinders at Albany Research Center.



Indicator
Definition

13. Inadequate Procedures/Procedures Not Followed

Number of reportable events as defined in DOE Order 232.1A, *Occurrence Reporting and Processing of Operations Information*, either categorized as procedure violations or problems, or reportable as being caused by a procedure violation or problem.



Source: Review of Occurrence Reports by Department Analysts.
NOTE: Extended portion at the top of 99Q2 depicts the estimated increase due to revisions and finalization of root causes of occurrences.

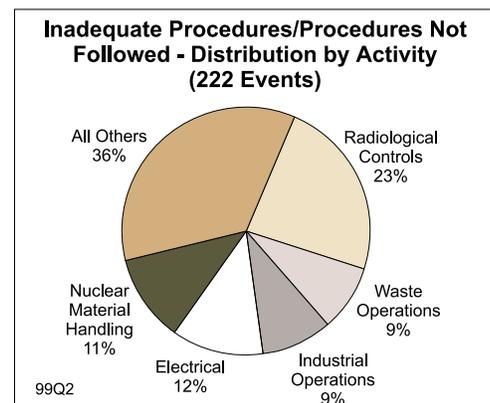
Key Observations

- The number of procedural-related events fell in 99Q2 (222 actual events expected to rise to 267 as more reports are finalized). This decrease is notable because it is similar to 98Q4 values when the Department experienced the lowest number of these events (270) to date.
- This reduction is primarily due to the decrease in the number of events at Idaho (44%); Rocky Flats (36%); and Los Alamos (32%). The majority of other DOE sites also realized a lower number of events relating to the use of procedures.

Additional Analysis

Distribution by Activity

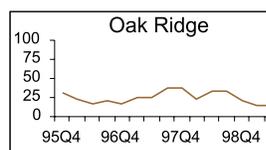
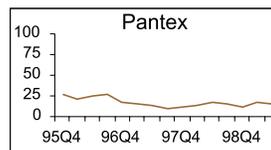
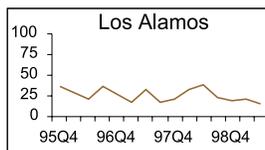
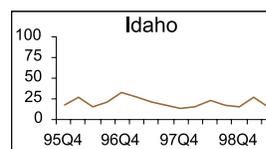
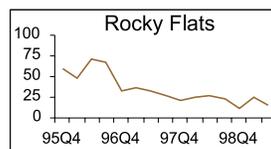
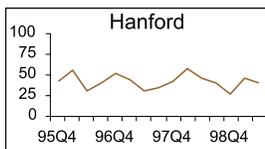
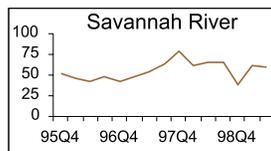
- The majority of event categories realized a reduction when compared to the previous quarter, 99Q1. This is one of the few quarters with such wide spread overall reduction since these categories have been tracked.



- Consistent with the last three years, radiological controls related events continue to be the leading type of procedural-related events reported across the Department (52 events expected to rise to 63 by the end of the quarter). Of these events, work controls/contamination (17), surveys/monitoring (12), and tools and equipment usage (9) were the three most common activities involved.
- Electrical-related events were the second most common category of reported procedural-related events in 99Q2 (27 events, expected to rise to 33). The majority of electrical-related events were associated with failure to follow lockout/tagout program requirements.
- Nuclear material handling had 25 events reported in 99Q2, which is expected to rise to 30. Reported events included those violating administrative criticality limits, noncompliance with nuclear material processing procedures, and violation of two person "line of sight" requirements.
- The only procedural-related event categories experiencing increases in 99Q2 over 99Q1 were use of weapons/explosives (12 in 99Q2 versus 11 in 99Q1) and fire protection (11 in 99Q2 versus 8 in 99Q1).

Distribution by Location

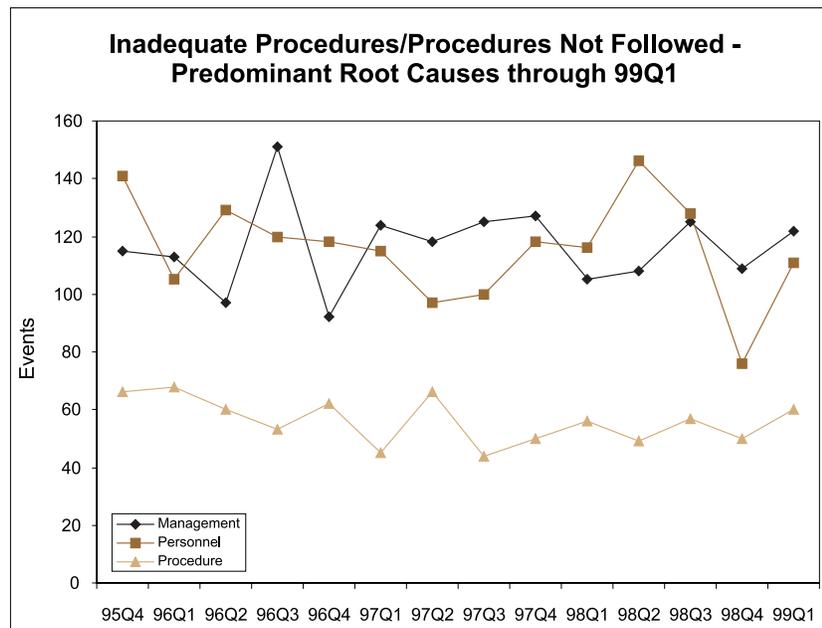
- Those sites identified in the charts below have consistently contributed more procedural-related events than any other sites across the Department.



- Savannah River reported the most events, with a total of 60. Of this total, the largest number of events occurred at these facilities: H-Canyon (8), F-Tank Farm (7), H-Tank Farm (5), and F-Canyon (4).
- Of the 41 events at Hanford, the two largest contributing facilities were the Plutonium Finishing Plant (8 events) and the Spent Nuclear Fuel facility (7 events).
- Eighty-three percent of the reporting sites, including those delineated in the charts above, reported fewer events when compared to 99Q1.

Distribution by Root Cause*

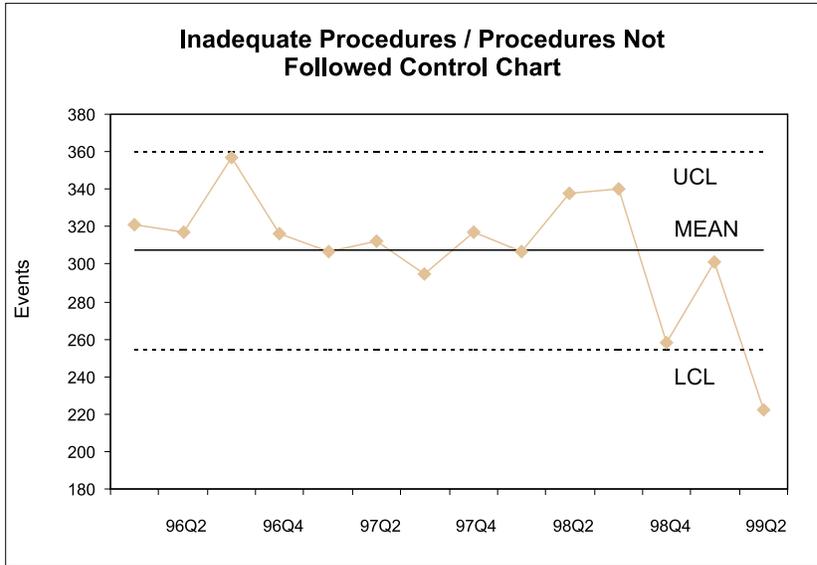
- Of the 336 events reported in 99Q1, 325 had root causes established at the time that this analysis was performed. Consistent with previous quarters, the three most common root cause categories were management, personnel, and procedures.
- Of those 122 events whose root cause was attributed to management deficiencies, the three leading causal factors were:
 - inadequate administrative control (40);
 - policy not adequately defined, disseminated, or enforced (33); and
 - work organization/planning deficiencies (26).
- Personnel root cause accounted for 111 of the events, with the majority of these attributed to procedure not used or used incorrectly (50) and inattention to detail (42).
- The root cause for 60 of the events was identified as procedural, with the majority (50) attributed to defective or inadequate procedure.



* Root cause analysis is displayed for the preceding quarter due to time lag between notification of occurrence and issuance of the final report.

Statistical Process Control (SPC) Analysis

- As noted earlier in this report, it is anticipated that the overall total of procedural events will rise to approximately 267 by the end of the next quarter. This will place the 99Q2 results within the current range of upper and lower control limits.

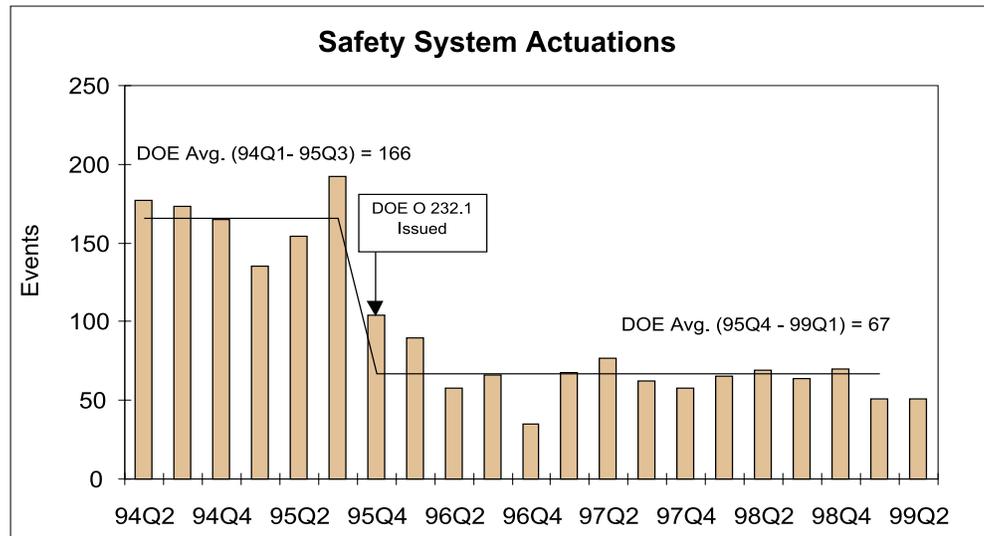


Indicator

14. Safety System Actuations

Definition

Number of operations-related events determined to be safety system actuations reportable under DOE Order 232.1A, *Occurrence Reporting and Processing of Operations Information*. This includes real actuations of any safety-class equipment or alarm, unplanned electrical outages, unplanned outages of service systems, serious disruptions of facility activity related to weather phenomena, facility evacuations, or losses of process ventilation. These events have the potential to impact the safety and health of workers in the vicinity.



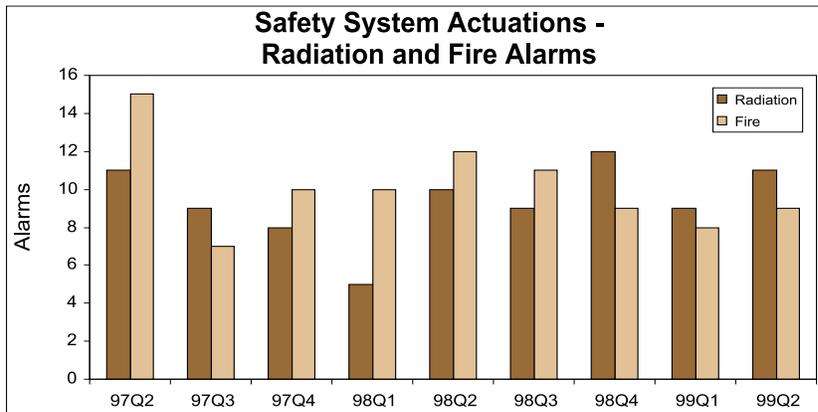
Source: Review of Occurrence Reports by Department Analysts.

Key Observations

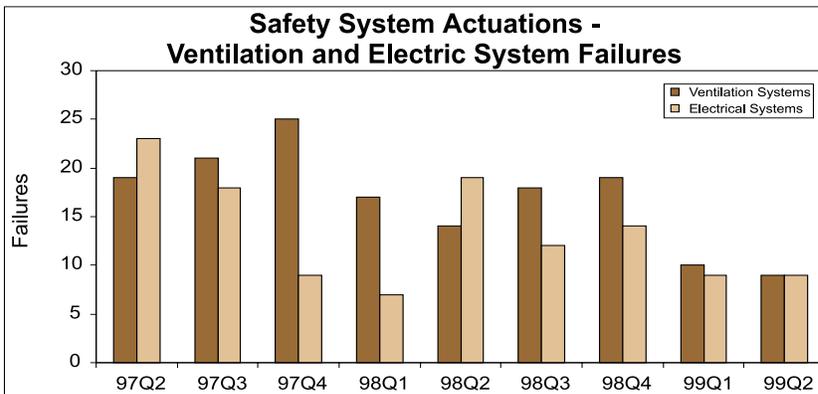
- The number of safety system actuation events remained consistent across the Department with respect to alarm types and system failures in 99Q2.
- The number of events in 99Q2 also remained within control limits based on statistical process control.

Distribution by Type of Alarm

The following chart represents non-spurious radiation and fire alarms, reported over the time period 97Q2 – 99Q2.



- Other non-spurious alarms reported in 99Q2 included various alarms involved with leak detection and monitoring of radioactive waste operations as well as a nitrous oxide (NOX) alarm related to vitrification operations at West Valley.
- System failures also constituted a portion of the safety system actuations reported in 99Q2. The two primary contributors were process ventilation failures and electrical system failures (9 each).

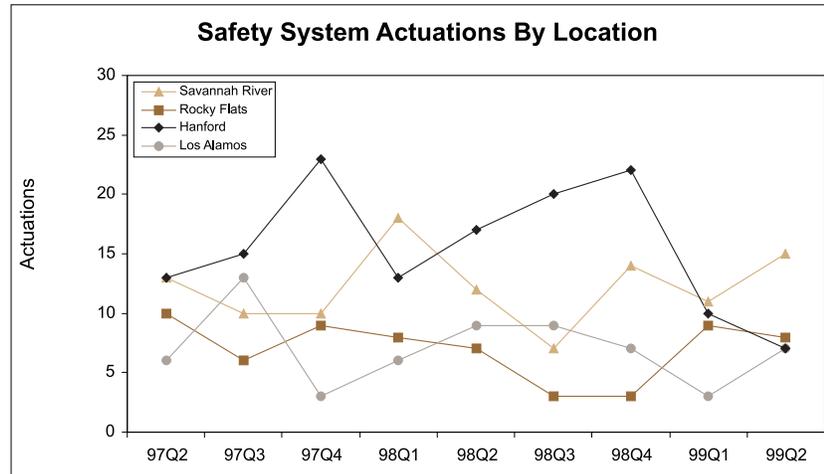


- As previously noted, the number of ventilation and electrical system failures in 99Q2 were consistent with those reported in 99Q1.
- The drop in electrical failures is unexpected in 99Q2. Typically the highest numbers of electrical system failures occur in the second and third quarters of each calendar year due to increased thunderstorm activity with resultant lightning-induced power failures.

Additional Analysis

Distribution by Location

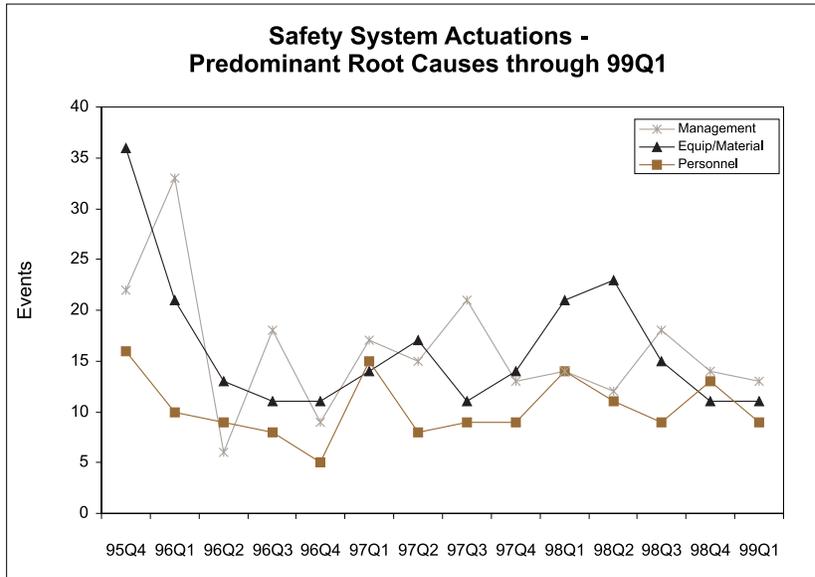
The following chart represents the breakdown of safety system actuations by those sites providing the majority of reported events.



- For most of the major contributing sites, the number of events in 99Q2 was consistent with the average number of events reported since 97Q2. The only significant difference was experienced at Hanford, whose 7 events in 99Q2 was significantly lower than the 8 quarter average of 17 events.
- The drop in the number of events reported at Hanford in 99Q1 and 99Q2 was due to a decrease in failures of ventilation systems that serve a confinement function. In 98Q4, there were 15 such events reported at Hanford, while in 99Q1 and 99Q2 that number dropped to only 4 and 3 events, respectively.
- The number of events reported at Idaho dropped from 5 events in 99Q1 to none reported in 99Q2. Those events reported in 99Q1 involved electrical outages (2), radiation and fire alarms (1 each) and a protective reactor shutdown.

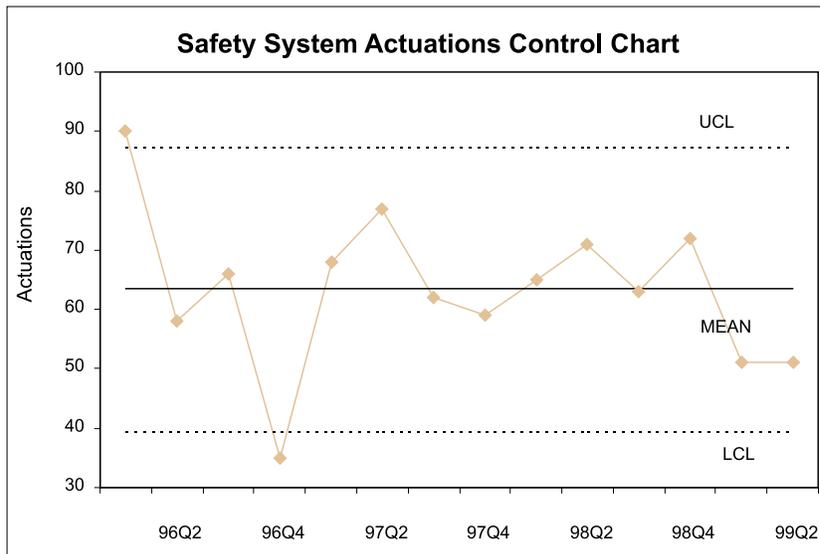
Distribution by Root Cause*

The predominant root causes remain somewhat evenly distributed between management, equipment/material, and personnel problems.



Statistical Process Control (SPC) Analysis

- The data for safety system actuation events remains within control limits based on statistical process control.



* Root cause analysis is displayed for the preceding quarter due to time lag between notification of occurrence and issuance of the final report.

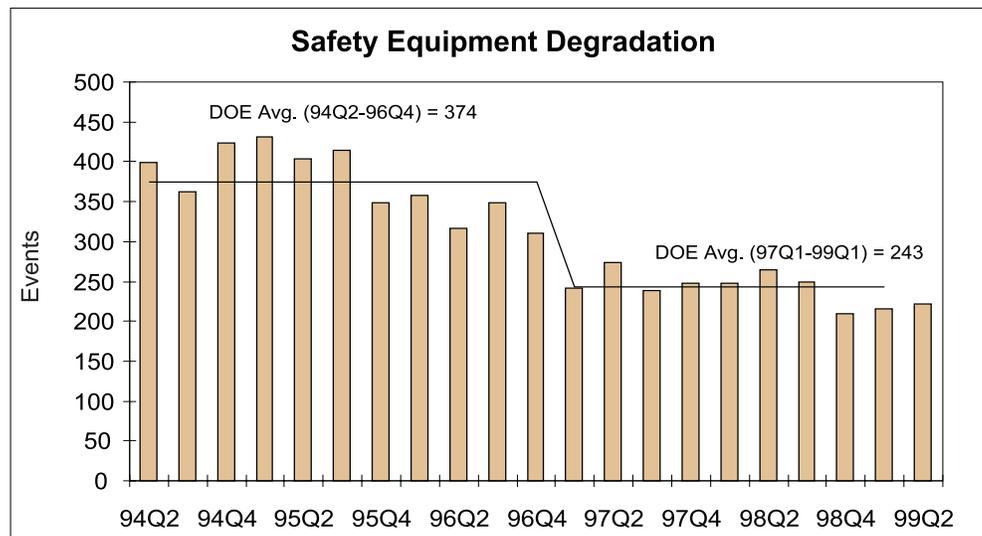
Indicator

15. Safety Equipment Degradation

Definition

Number of reportable events categorized as “vital system/component degradation” as defined in DOE Order 232.1A, *Occurrence Reporting and Processing of Operations Information*.

Safety equipment degradation includes: (1) any unplanned occurrence that results in the safety status or the authorization basis of a facility or process being seriously degraded; or (2) a deficiency such that a structure, system, or component (SSC) vital to safety or program performance does not conform to stated criteria and cannot perform its intended function; or (3) unsatisfactory surveillances/inspections and appraisal findings of any safety SSC.



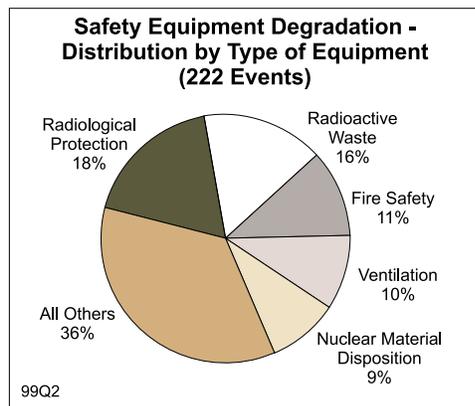
Source: Review of Occurrence Reports by Department Analysts.

Key Observations

- In 99Q2, the number of reported safety equipment degradation events (222) continued to rise slightly (3%) when compared to the previous quarter. However, this number remains below the average number of events recorded since the rebaselining that occurred in 97Q1.
- The continuing lower number of events reported since 98Q4 appears to be due to the low number of reported radiological protection related equipment, ventilation equipment and glovebox degradation events when compared to these types of events reported since 97Q1.

Distribution by Type of Equipment

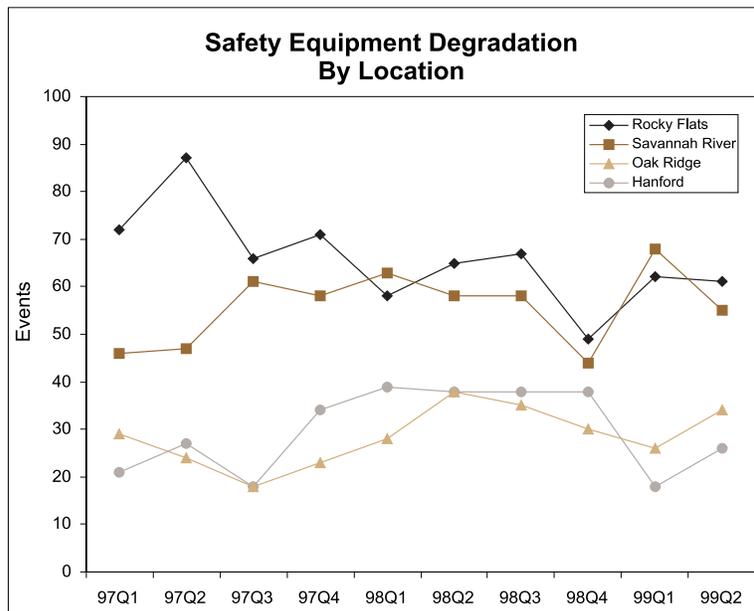
- Radiological protection related equipment represents the single largest type of degraded safety equipment (41 events) in 99Q2. This has consistently been the case since 96Q4. Of these 41 events, continuous air monitors replaced criticality/nuclear incident monitors as the equipment most often degraded (17 events).
- Radioactive waste storage, processing, and handling equipment returned to second place in 99Q2 with 35 events. This is consistent with the 34 events reported in 99Q1. Similar to both 98Q4 and 99Q1, the most frequent type of radioactive waste related degradations were failures of instrumentation/monitoring equipment (16 events).
- Fire safety equipment dropped behind radioactive waste equipment in 99Q2 with 25 events, down from 37 events in 99Q1. Most of these events were related to safety status degradation as a result of maintenance/surveillance activities. Other major contributors were failures in alarm/reporting equipment and sprinkler piping and heads.



Additional Analysis

Distribution by Location

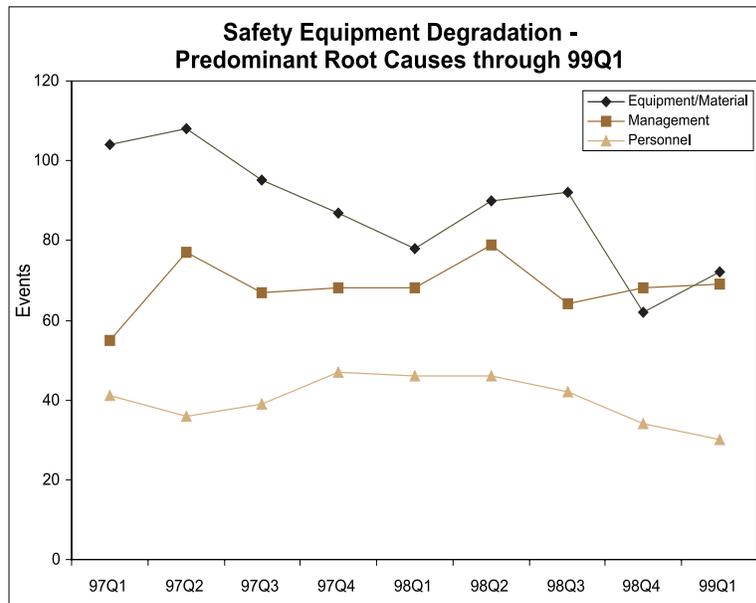
- Rocky Flats (61 events) and Savannah River (55 events) have been the top contributors for the past 10 quarters. Oak Ridge was also a significant contributor with 34 events.



- The number of events at Savannah River dropped by nearly 20% compared to 99Q1 but was consistent with the average number of events since 97Q1 (55 events.) The facilities at Savannah River experiencing the largest number of safety equipment degradation events were H-Tank with 11 events and H-Canyon with 8 events. The majority of these failures were related to radioactive waste treatment and radiation monitoring equipment.
- The number of events at Rocky Flats remained consistent compared to 99Q1 and remains slightly below the average since 97Q1 (66 events.) At this site, facilities primarily responsible for plutonium processing and handling accounted for nearly 70% of the events.

Distribution by Root Cause*

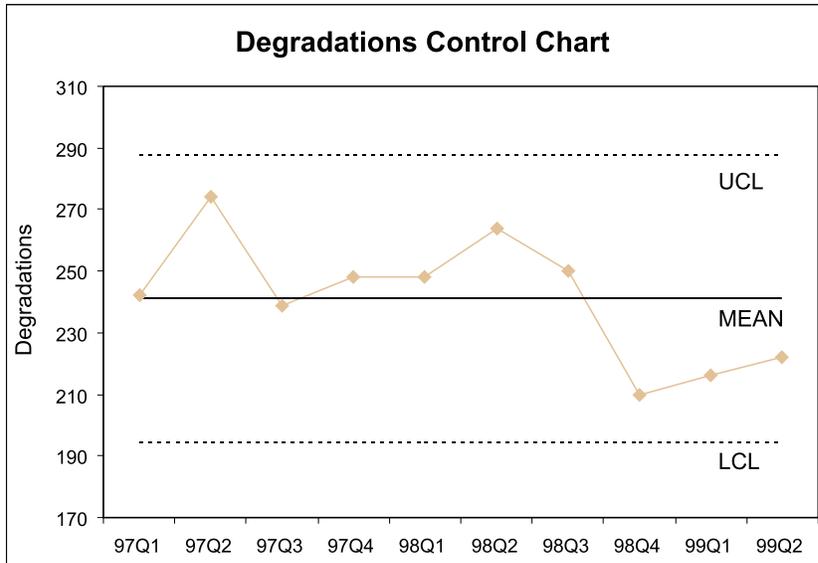
- Of the 216 events reported in 99Q1, 204 (94%) had root causes established at the time of this report. Consistent with previous quarters, the three most common root cause categories identified were equipment/material, management, and personnel.
- The root cause for 72 of the degradation events was identified as equipment/material problems. Consistent with 98Q4, the most significant sub-categories were defective or failed parts (53 events) and end of life failures (14 events.)
- The root cause for 69 of the safety equipment degradation events was identified as management problems. Inadequate administrative controls (28 events) and work organization/planning deficiencies (12 events) were the most frequently cited specific management related root causes in 99Q1.



*Root cause analysis is displayed for the preceding quarter due to time lag between notification of occurrence and issuance of the final report.

Statistical Process Control (SPC) Analysis

- The data for safety equipment degradation events remains within control limits based on statistical process control.



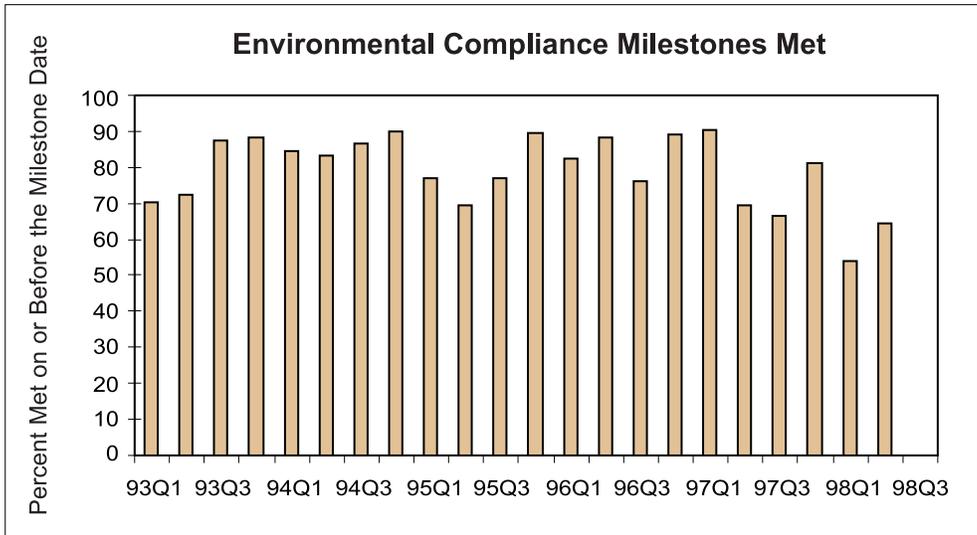
Indicator

16. Environmental Compliance Milestones Met

Definition

Enforceable requirements in environmental agreements met on or before the milestone date (percent).

No change to this section since last report.



Source: Office of Environmental Management; Progress Tracking System Data.

Key Observations

- An average of the most recent 5 quarters indicates DOE is missing an increasing number of enforceable compliance deadlines when compared to past performance. To date in fiscal year 1998, DOE has met only two-thirds of its enforceable milestones.

Additional Analysis

- In 98Q1 and 98Q2, DOE met only 54% and 64% of its enforceable milestones; significantly worse performance than most previous quarters.
- These data do not capture all enforceable milestones. They reflect only those milestones under the purview of the Office of Environmental Management. EM's Progress Tracking System is believed to capture 85-90 percent of all DOE enforceable environmental milestones.

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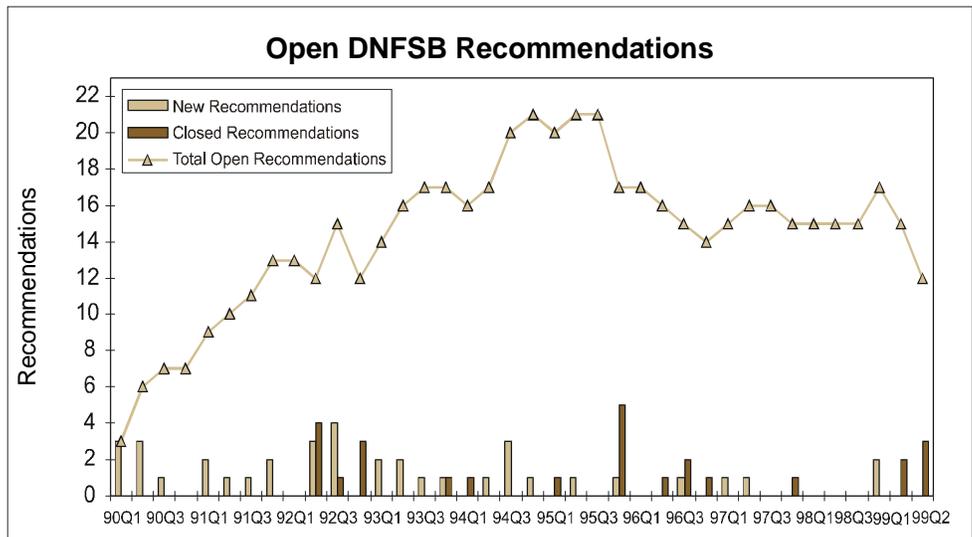
Indicator

17. Open DNFSB Recommendations

Definition

Cumulative number of open Defense Nuclear Facilities Safety Board (DNFSB) recommendations. DNFSB recommendations only apply to DOE defense nuclear facilities and, therefore, are representative only of DOE defense facilities.

Each DNFSB recommendation accepted by DOE leads to an implementation plan containing a set of commitments which, when fully implemented, will resolve the safety issues and lead to closure of the recommendation. A commitment is any documented obligation by the Secretary, or designee, that describes products to be delivered on a specified schedule. Commitments resulting from DNFSB recommendations are tracked by the Office of the Departmental Representative to the DNFSB (S-3.1) as completed (fulfilled), not yet due, and overdue.



Source: Safety Issues Management System (SIMS)

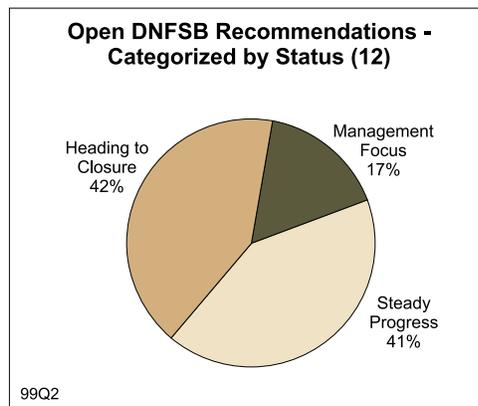
Key Observations

- In 99Q2, three DNFSB recommendations were closed; 93-6, *Maintaining Access to Nuclear Weapons Expertise*; 94-3, *Rocky Flats Seismic and Systems Safety*; and 94-5, *Rules, Orders and Other Requirements*.
- The number of open Recommendations (12) is at its lowest point since the second quarter of 1992. The number of open implementation plan commitments (139) is at its lowest level since 1991. Three reasons for these lows are:
 1. Board recommendation process evolved to develop more broad-based recommendations.
 2. Increased use of letters and other communication modes to identify safety issues.
 3. More prompt and effective Department response to identified safety concerns.

- As of July 1999, the Office of the Departmental Representative tracked 12 DNFSB recommendations that represented 439 DOE commitments. Of these commitments, 300 (68%) were completed, 101 (23%) were open and not yet due, and 38 (9%) were open and overdue. A total of 39 commitments were completed over the past quarter.
- The Department approved one new implementation plan; Board recommendation 98-2, *Integrated Safety Management at Pantex*.
- The DNFSB sent a new recommendation (99-1, *Safe Storage of Pits*) to the Secretary on August 11th concerning the safe storage of nuclear weapons pits at the Pantex Plant. The Office of Defense Programs has been assigned the lead to evaluate the recommendation and prepare the response for the Secretary. The recommendation contains four sub-recommendations to further the safety of these pits.

Characterization of Recommendation Status

This chart shows an evaluation by the Office of the Departmental Representative on the number of open DNFSB recommendations categorized by recommendation status. A status of "Heading to Closure" includes the existence of a clearly defined path to closure, and the expectation that the remaining commitments/actions can be completed within the next year. "Steady Progress" implies the existence of an acceptable implementation plan with most commitments/deliverables generally being completed on schedule. Recommendations classified as "Management Focus" involve difficulties with (or lack of) an implementation plan or a large number (8) of overdue commitments.



- During this quarter only two recommendations were on the Management Focus list; 93-3, *Improving Technical Capability*, and 94-2, *Low Level Waste*.

Additional Analysis

Distribution of Tracked Commitments

- The table below provides an overview of the status of commitments to DNFSB recommendations. The Offices of Environmental Management (EM) and Management and Administration (MA) continue to have the majority of overdue commitments (80% of 38 overdue commitments).

Office	DNFSB Recommendations	Commitments	Complete		Not Yet Due		Overdue		Open	
			Count	%	Count	%	Count	%	Count	%
EM	6	252	173	69%	57	23%	22	9%	79	31%
DP	2	85	43	51%	35	41%	7	8%	42	49%
MA	1	75	66	88%	1	1%	8	11%	9	12%
OS/SMIT	2	20	11	55%	8	40%	1	5%	9	45%
NE	1	7	7	100%	0	0%	0	0%	0	0%
Total	12	439	300	68%	101	23%	38	9%	139	32%

NOTE: % is percentage of total commitments for that office.

- The downward trend for both open and total commitments is due to closure of 5 recommendations in 1999 and re-baselining of the implementation plan for Recommendation 94-1.
- The total number of overdue commitments decreased significantly (25) since 99Q1. Approximately 80% (30) of the overdue commitments are overdue by 3 or more months.
- The final commitment for Recommendation 97-1, Safe Storage of U-233, was completed in July 1999.
- As of July 1999, two Recommendations were awaiting closure by the DNFSB; 95-1, *Cylinders Containing Depleted Uranium*, and 92-4, *Hanford Multi-Function Waste Tank Facility*.

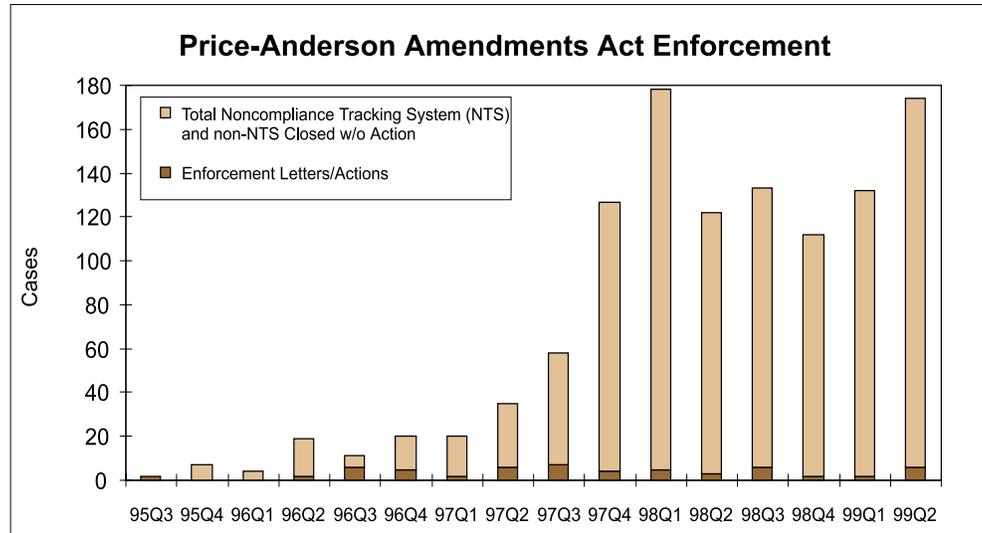
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Indicator

18. Price-Anderson Amendments Act Enforcement

Definition

Total number of cases the Price-Anderson Amendments Act^a (PAAA) Enforcement Office reviews per quarter.



Source: Office of Enforcement and Investigation Database.

Key Observations

- During 99Q2, the PAAA Office of Enforcement and Investigation reviewed 191 reports (53 new NTS reports and 138 non-NTS reports), of which 168 reports were closed without action. This Office also issued three Preliminary Notices of Violation (PNOV^b), and three Enforcement Letters.

Additional Analysis

Enforcement Actions

- On April 15, 1999, a PNOV with a Civil Penalty of \$27,500 was issued to Brookhaven Science Associates for a number of incidents that revealed deficiencies in radiological protection and work process controls at Brookhaven National Laboratory.
- On May 21, 1999, a PNOV was issued to Sandia Corporation for two recurring and programmatic concerns, which included repetitive, long-term problems with the control of radioactive material and with the documentation, use and implementation of technical work documents, specifically radiological work permits at Sandia National Laboratory.

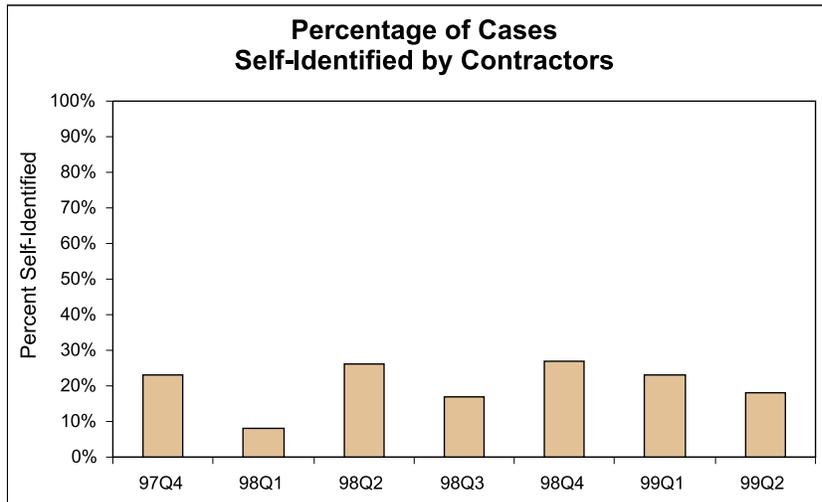
^a10CFR Parts 830.120, 835, 820.11. Severity Levels are defined in Appendix A, Section VI, as amended, to 10CFR Part 820.

^bDOE weighs several issues when deciding to issue a PNOV with a civil penalty or when considering the amount of the civil penalty: (1) the safety significance of the noncompliance, (2) initiative by the contractor in identifying and reporting the noncompliance, and (3) the timeliness and effectiveness of corrective actions.

- On May 26, 1999, Secretary Richardson issued the Department's first Compliance Order which specified milestones to ensure prompt and effective corrective actions for recurring deficiencies. The Compliance Order was issued contemporaneously with a PNOV with a Civil Penalty of \$330,000 to Fluor Daniel Hanford, Inc. (FDH). FDH was cited for a number of events involving work process, design, procurement, and quality improvement deficiencies in the Spent Nuclear Fuels Project, K-Basins, and other Project Hanford Management Contract facilities.

Enforcement Letters

- On April 15, 1999, an Enforcement Letter was issued to Stony Brook University Hospital concerning an event at the Radiation Therapy Facility.
- On June 10, 1999, an Enforcement Letter was issued to Mason & Hanger



Corporation as a result of an onsite review of the Price-Anderson Amendments Act nuclear safety program at the Pantex Plant.

- On July 30, 1999, an Enforcement Letter was issued to Lockheed-Martin Energy Systems, Inc., concerning the unexpected uptakes of a radioactive material by employees at the Y-12 Plant.
- Of the 168 reports closed without action by the PAAA Enforcement Office in 99Q2, 30 (18%) were self-identified by responsible contractor via the Noncompliance Tracking System and 138 (82%) were identified independently by the PAAA Enforcement Office.

Indicator

19. Integrated Safety Management System Implementation Status

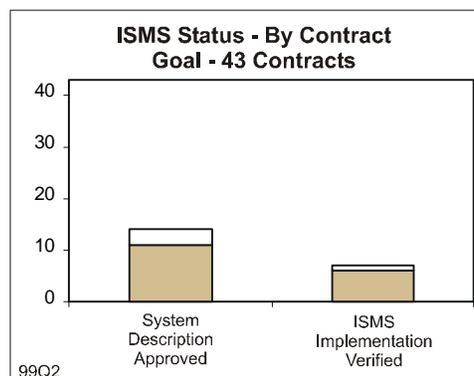
Definition

Integrated Safety Management (ISM) addresses the systematic process of ensuring the integration of all elements of environment, safety, and health (ES&H) into one ES&H system, with a focus on accomplishing work safely. All DOE sites are to have verified ISM Systems (ISMSs) in place by September 2000.

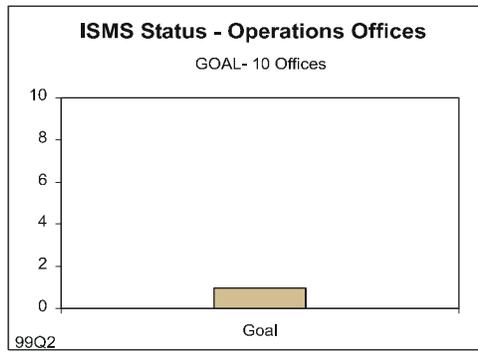
For the purpose of this PI, ISMS implementation will be tracked throughout the Department of Energy complex by "Contract" and by "Operations Office," rather than by site. Some sites may have more than one contract, with several facilities applicable to a given contract. To track by contract, 41 data points were established, with each data point representing one contract; in addition, two Government-Owned Government-Operated (GOGO) facilities are being tracked for a total of 43 data points. It is recognized that contracts may not be equal in complexity and level of effort based on the number, nature of hazards, and type of facilities involved. For a more detailed tracking of site/facilities implementation, refer to: http://www.eh.doe.gov/ism/scheds/14_FACLST.pdf.

For each contract, two items will be tracked and reported. These items are "System Description Approved" and "ISMS Implementation Verified." The Systems Description Approved column on the "ISMS Status – By Contract" chart, implies that a respective contractor has submitted a description of its safety management system that conforms to the guidance on preparation and content provided to them, and has been approved by the DOE Approval Authority. The ISMS Implementation Verified column on the same chart implies that the contractor's safety management system conforms to the requirements of the approved ISMS description that was submitted, and has been verified as such. For Operations Office tracking, shown on the "ISMS Status – Operations" chart, only the "ISMS Implementation Verified" will be tracked since Operations Offices are not required to submit "System Descriptions" for approval.

In the case of a contract in which several facilities are involved, the respective contract would not be shown as having its "ISMS Description" approved, or its "ISMS Implementation Verified" until all applicable facilities have achieved their respective "approval" and verification "completed."



Source: DOE Safety Management Implementation Team
Top color on each band represents the change in status from January to May 1999.



Source: DOE Safety Management Implementation Team

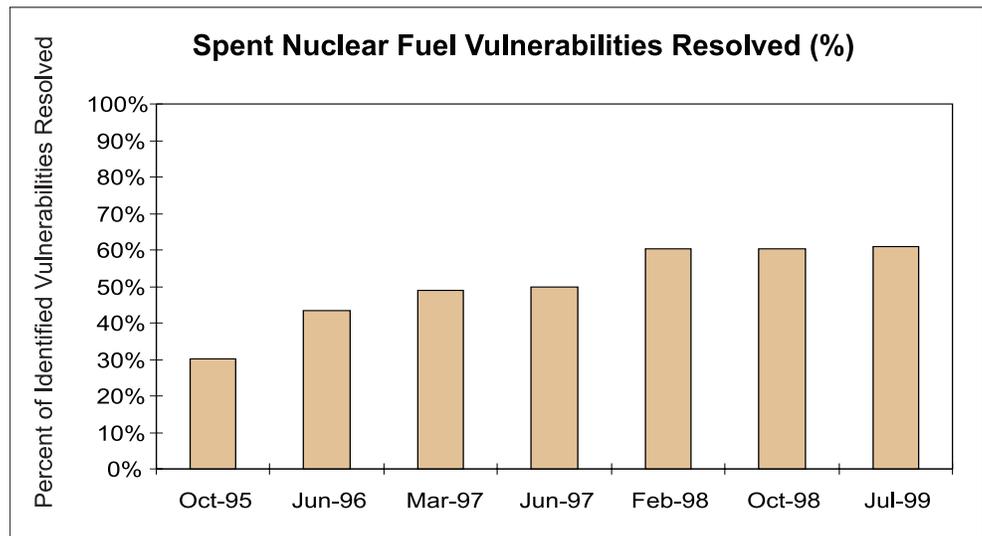
- Of the 10 "Priority Facilities" identified by DOE in its ISMS implementation plan, four have implemented their ISMS. For the six remaining, five are scheduled for implementation in the second half of 1999, and one in 2000.

Key Observations

Indicator | **20. Spent Nuclear Fuel Vulnerabilities Resolved**

Definition | Number of resolved spent fuel vulnerabilities divided by the total number of vulnerabilities as defined in *Spent Fuel Working Group Report on Inventory and Storage of the Department's Spent Nuclear Fuel...and Their Environmental, Safety, and Health Vulnerabilities*, Volume 1, November 1993.

An ES&H vulnerability is defined in the spent fuel vulnerability report as "conditions or weaknesses that could lead to unnecessary or increased radiation exposure of workers, release of radioactive material to the environment or radiation exposure to the public." A resolved vulnerability implies that the cited condition no longer exists, the risk has been minimized to an acceptable level, or the risk has been evaluated at an active facility and judged to be acceptable. Vulnerabilities can be characterized as material/packaging (e.g., storage of unstable and corrosive solutions), facility condition (e.g., facility weakness), or institutional (e.g., loss of experienced personnel) vulnerabilities. The vulnerabilities were ranked by significance based on the likelihood of an accident and the perceived consequences.



Source: EM-67, Report on Status of Corrective Actions to Resolve Spent Nuclear Fuel Vulnerabilities

Key Observations

- 106 spent nuclear fuel vulnerabilities were identified at 8 sites based on the report issued in 1993.
- The most spent nuclear fuel vulnerabilities (34 percent) were identified at Hanford, which currently maintains 86 percent of the DOE total spent nuclear fuel inventory by weight.

Additional Analysis

- There were 542 identified corrective actions for the 106 spent nuclear fuel vulnerabilities. Of these 542 corrective actions, 462 (85 percent) have been completed.

Table 1

Spent Nuclear Fuel Site	Vulnerabilities Identified	Vulnerabilities Resolved	Percent Resolved
Hanford	36	23	64%
Idaho	33	11	33%
Savannah River	21	20	95%
All Others	16	11	69%
Total	106	65	61%

- The table above indicates the breakdown of spent nuclear fuel vulnerabilities as of 97Q2 by location and the progress in resolving the identified vulnerabilities.

Indicator

21. Plutonium and HEU Vulnerability Milestones Resolved

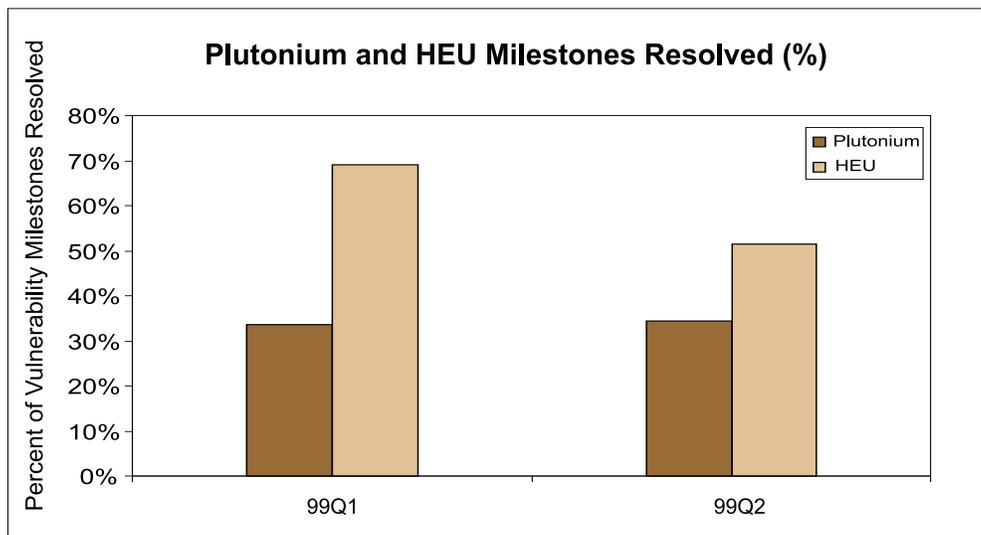
Definition

Number of resolved plutonium and HEU vulnerability milestones divided by the total number of vulnerability milestones.

This indicator will be used to measure the progress in resolving the total of 299 Plutonium and 168 HEU ES&H vulnerabilities found in the respective assessment reports. The status of the vulnerabilities is tracked as "Milestones" by EM-66, Office of Nuclear Materials Stewardship. Each vulnerability may have one or more milestones associated with it.

Vulnerabilities are defined in the *Plutonium Working Group Report on Environmental, Safety, and Health Vulnerabilities*, Volume 1, November 1994 (DOE/EH-0415), and in the *Highly Enriched Uranium Working Group Report on Environmental, Safety and Health Vulnerabilities Associated with the Department's Storage of Highly Enriched Uranium* (DOE/EH-0525). An ES&H vulnerability is defined as "conditions or weaknesses that could result in the exposure of workers or the public to radiation, or in releases of radioactive materials to the environment."

A resolved vulnerability implies that the cited condition no longer exists, the risk has been minimized to an acceptable level, or the risk has been evaluated at an active facility and judged to be acceptable. Vulnerabilities can be characterized as material/packaging (e.g., storage of unstable and corrosive solutions), facility condition (e.g., facility weakness), or institutional (e.g., loss of experienced personnel) vulnerabilities. The vulnerabilities were ranked by significance based on the likelihood of an accident and the perceived consequences.



Source: EM-66, Draft Plutonium Vulnerability Management Summary Report and the Plutonium and HEU Vulnerability Milestone Database.

- There were 299 plutonium vulnerabilities identified at 13 sites. These vulnerabilities are tracked as “Milestones”, of which there are 336 total, with 223 remaining open.
- There were 168 HEU vulnerabilities identified at 13 sites. These vulnerabilities are tracked as “Milestones”, of which there are 212 total, with 70 remaining open.
- Thirty-three HEU vulnerabilities were resolved through 99Q1 as part of the DNFSB Recommendation 97-1 Implementation Plan actions.

Key Observations

Plutonium Vulnerability Milestones

- The most plutonium vulnerability milestones (87) were identified at Rocky Flats, which maintains 80 percent of the DOE total plutonium inventory by weight. Of these 87 milestones, 4 have been eliminated and an additional 9 have had the risk reduced to an acceptable level.

Additional Analysis

Table 1

Plutonium Site	Milestones Identified	Milestones Resolved	Percent Resolved
Rocky Flats	87	13	15%
Los Alamos	60	11	18%
Savannah River	40	17	43%
Hanford	71	21	30%
All Others	78	28	36%
Total	336	90	27%

Vulnerability resolution status has been updated for this report from the Plutonium Vulnerabilities database.

HEU Vulnerability Milestones by Site

The table on page 67 summarizes vulnerability milestones on a site basis as of 99Q2. Note that Oak Ridge Y-12 Plant stores a far greater amount of HEU (greater than 189 metric tons) than any other site. Also note that Oak Ridge National Laboratory and Idaho National Environmental Engineering Laboratory have the largest quantities of U-233 as shown in parentheses (424 and 351.6 kilograms, respectively). Actual inventories of U-233 are classified in cases where exact amounts are not shown.

HEU Site	HEU Inventory*	Milestones Identified	Milestones Resolved	P.I.= % Resolved
Oak Ridge Y-12 Plant	>189.0	54	39	72%
Rocky Flats Env. Tech Site	6.7	30	12	40%
Los Alamos National Lab	3.2 (>1.0)	19	2	11%
Idaho Nat. Engineering & Environmental Lab	>1.0 (351.6)	58	33	57%
Savannah River Site	13.8	9	4	44%
Oak Ridge K-25 Site	1.5	9	5	56%
Oak Ridge National Lab	1.2 (424.0)	6	–	–
All Others		27	0	0%
Total		212	95	51%

* Inventory of HEU produced in metric tons and U-233 in kilograms (shown in parentheses).

**Includes planned dismantlement.

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Indicator

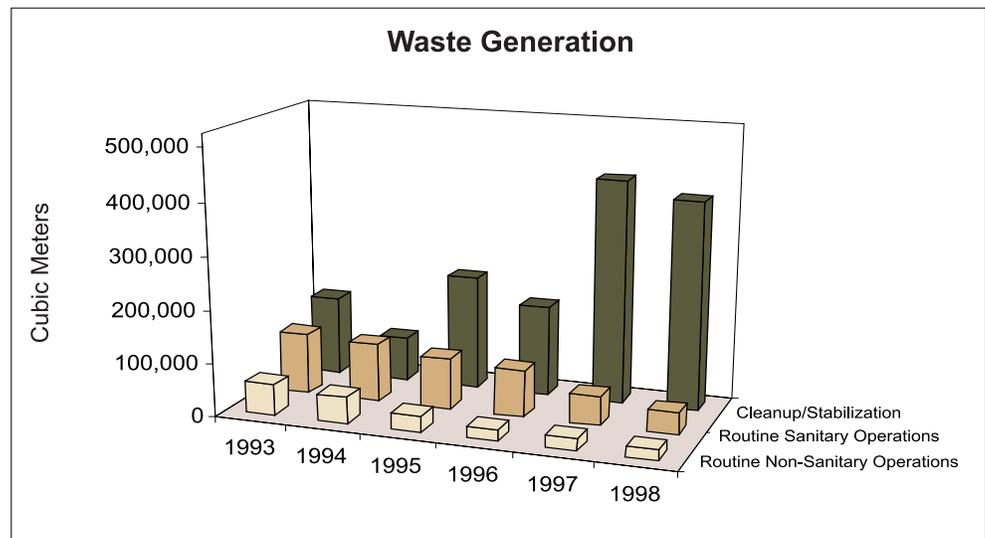
22. Waste Generation

Definition

Total amount of waste generated, in cubic meters, for all DOE sites. Generated waste types include: High-Level Radioactive, Transuranic, Low-Level Radioactive, Low-Level Mixed Hazardous, and Sanitary. These waste types are generated during routine operations or cleanup/stabilization activities.

Routine operations waste consists of normal operations waste produced by any type of production operation; analytical and/or research and development laboratory operations, treatment, storage and disposal operations; "work for others;" or any other periodic or recurring work that is considered ongoing in nature.

Cleanup/stabilization waste, including primary and secondary waste, is generated by the environmental restoration of contaminated media (soil, groundwater, surface water, sediments, etc.), stabilization or nuclear and non-nuclear (chemical) materials, and deactivation and decommissioning of facilities.



Source: Office of Pollution Prevention, Office of Environmental Management, Annual Report of Waste Generation and Pollution Prevention Progress 1997.

Key Observations

- DOE sites reported implementing 650 pollution projects in 1998, which resulted in a 35% increase in waste reduction compared to 1997 and a cost savings/cost avoidance estimated at \$159 million. This compares favorably to the \$101 million in cost savings/cost avoidance experienced in 1997.
- In 1998, for the first time since 1994, the Department's recycling volumes fell below what was reported the year before. This was attributed to the fact that in 1997, several large "one-time only" recycling projects were conducted throughout the Complex.
- Excluding sanitary waste, routine operations waste generation decreased 16 percent compared to 1997 and has decreased 67 percent from 1993 to 1998.
- DOE exceeded its commitment for waste reduction in Fiscal Year 1998, and expects to exceed its commitments for Fiscal Year 1999.

The following 2 tables subcategorize waste generation based on production source: routine or cleanup/stabilization activities.

Additional Analysis

**Waste Generated During Routine Activities
(cubic meters)**

Waste Type	1993	1994	1995	1996	1997	1998
High-Level Radioactive	1,708	2,071	2,496	2,670	1,994	2,237
Transuranic	709	546	339	302	267	172
Low-Level Radioactive	40,874	31,870	21,896	15,053	16,533	13,653
Low-Level Mixed	3,331	3,133	1,338	1,371	1,373	1,198
Hazardous	12,463	12,520	4,103	3,057	2,880	2,067
Total excluding Sanitary Waste	59,085	50,140	30,172	22,453	23,047	19,328
Sanitary*	116,795	110,305	96,891	88,939	55,590	40,761
Grand Total	172,283	160,445	127,063	111,392	78,637	60,089

* In 1993, some sites optionally separated and reported sanitary waste as routine operations or cleanup/stabilization waste. Beginning in 1994, Sanitary waste was required to be separated and reported as routine operations or cleanup/stabilization.

- Sanitary waste, the largest waste type generated, accounted for 68 percent of the total 1998 routine waste generated Complex-wide.

**Waste Generated During Cleanup/Stabilization Activities
(cubic meters)**

Waste Type	1993	1994	1995	1996	1997	1998
High-Level Radioactive	0	0	0	0	0	0
Transuranic	458	214	156	202	119	346
Low-Level Radioactive	88,161	44,217	86,825	64,971	326,574	340,927
Low-Level Mixed	45,533	14,039	4,636	2,133	2,168	4,970
Hazardous	31,675	8,900	22,679	29,901	12,747	13,264
Total excluding Sanitary Waste	124,827	67,370	114,596	97,207	341,635	359,507
Sanitary	26,222	16,010	103,027	74,982	83,481	36,200
Grand Total	151,049	83,380	217,623	172,189	425,116	395,707

- In 1998, the 45 DOE reporting sites generated approximately 395,700 cubic meters of waste from cleanup/stabilization activities, including sanitary waste. This waste represents 87 percent of the total DOE waste generated. Excluding sanitary waste, waste generated from cleanup/stabilization activities increased 188 percent from 1993 to 1998.
- From 1997 to 1998, transuranic waste resulting from cleanup/stabilization activities increased by approximately 191 percent, mainly due to increased decontamination and decommissioning activities at the plutonium processing buildings at the Rocky Flats Environmental Technology Site.
- Low-level mixed waste generated from cleanup/stabilization activities increased by approximately 126 percent from 1997 to 1998. Most sites reporting cleanup/stabilization waste generation of low-level mixed waste in 1997 reported an increase in 1998 due to accelerated cleanup activities.
- In 1995, two reports to the Environmental Management program, the National Academy of Sciences, and the Independent Technical Review Team recommended shifting the responsibility for the newly generated waste back to the mission programs. The studies showed that if the waste generator paid the cost of managing waste, the waste generators, as decision-makers would be motivated to consider alternatives that reduce the generation of waste. In Fiscal Year 1997, this concept was pilot tested in 14 sites. In Fiscal Year 1998, the Pilot Projects continued to report success and progress toward achieving the goals of Re-Engineering.
- Preliminary results indicate that mission program generators are seeking and implementing alternatives to reduce waste generation due to high cost of waste handling and disposal.

**DOE Complex-Wide waste generation and pollution prevention
accomplishments**

Operations/ Field Office	Waste Generation (Cubic Meters)	Waste Reduction (Cubic Meters)	Reported Cost Savings Avoidance (from Waste Reduction)
Albuquerque	31,281	19,204	\$86,017,000
Chicago	9,704	22,729	\$7,050,000
Idaho	9,965	1,145	\$9,410,000
Nevada	8,987	1,979	\$892,000
Oakland	11,464	2,093	\$3,381,000
Oak Ridge	25,075	64,887	\$22,675,000
Ohio	311,752	1,882	\$2,582,000
Richland	20,351	17,533	\$16,269,000
Rocky Flats	8,518	1,634	\$420,000
Savannah River	16,506	1,557	\$10,588,000
Headquarters	2,194	13,470	\$78,000
Total	455,797	148,113	\$159,363,000

- Albuquerque, Chicago, Oak Ridge and Richland represent the Operations Offices that experienced the greatest waste reduction in 1998.
- Those sites reporting the greatest cost savings/avoidance within the DOE Complex in 1998 were Albuquerque, Oak Ridge, Richland, and Savannah River.
- Richland reported the greatest waste source reduction accounting for 81 percent of the total 1998 waste reduction.

The Secretary's Commitments to the President in EQ and ES&H (for FY99)

Environmental Quality (EQ) and Environment, Safety, and Health (ES&H) commitments as part of the Secretary of Energy's Performance Agreement with the President for Fiscal Year 1999 are summarized below.

More information related to the status of these commitments can be obtained from DOE's Office of Policy or via the World Wide Web at: <http://hst.dync.doe.gov/solmidyr99/>. Status is defined as follows:

Success/Fully Successful – During the year this means that we have already met or exceeded the measure of success in the agreement. After the year, it means we met or exceeded the target for the measure.

On Track/Successful – During the year this means that we are on track to meet the measure without assistance. After the year, it means we effectively achieved the target performance level.

Behind/Partially Successful – During the year this means that we are behind schedule, but expect to reach the measure of success without assistance from outside the lead and supporting offices. After the year, it means we accomplished at least half of the target level of performance.

In Trouble/Failing – During the year this means that we have already missed the measure or expect to miss it unless there is assistance from outside the lead and supporting offices, i.e., help from the Secretary, President, or Congress is necessary. After the year, it means we did not make progress on the performance and an explanation is usually provided.

Unspecified – During the year this means that the status has not been reported.

Environmental Quality (FY99)

Aggressively clean up the environmental legacy of nuclear weapons and civilian nuclear research and development programs, minimize future waste generation, safely manage nuclear materials, and permanently dispose of the Nation's radioactive wastes.

Our Commitments

EQ1: Reduce the most serious risks from the environmental legacy of the U.S. nuclear weapons complex first.

STATUS: On Track

EQ1-1 Reducing Worker, Public, and Environmental Risks

Identify and fund projects to reduce the most serious risks first and prevent further increases in relative risk at all sites. **(EM)**

Success measure description:

- Stabilize and safely store about 6 metric tons of heavy metal of spent nuclear fuel (SNF). [Note: SNF data excludes information that is controlled or classified.]
- Stabilize approximately 33,000 kilograms of bulk plutonium residue and 40 liters of plutonium solution, and 332 containers of plutonium metal/oxides.

EQ2: Clean up as many as possible of the Department's 53 remaining contaminated geographic sites by 2006.**EQ2-1 Accelerate and Complete Geographic Site Cleanup**

Complete cleanup at 43 of the Department's 53 remaining sites by 2006. Continue cleanup at the 10 remaining sites, including the five largest sites, scheduled for completion in the post 2006 time-frame. Cleanup progress is measured by completion of geographic sites where EM is responsible for remediation of contaminants and other material. Interim progress is demonstrated by cleaning up portions of the EM geographic sites, referred to as "Release Sites" and "Facilities". Cleaning up these areas ultimately leads to the completion of the entire geographic site. **(EM)**

Success measure description:

- Complete 80 facility decommissionings. (This will bring the number of completed facility decommissionings to about 530 out of a total inventory of approximately 3,350 facilities.)
- Complete 120 facility decommissioning assessments.
- Complete remediation at 3 geographic sites, increasing the total completed to 68 of 113 geographic sites. (This is a milestone of a FMFIA corrective action plan.)
- Complete 310 release site assessments.
- Complete 165 release site cleanups. (This will bring the number of completed release site cleanups to about 4,290 out of a total inventory of approximately 9,700 release sites.)

EQ3: Safely and expeditiously dispose of waste generated by nuclear weapons and civilian nuclear research and development programs and make defense high-level radioactive wastes disposal-ready.**EQ3-1 Making Disposal Ready and Disposing of Waste Generated During Past and Current DOE Activities**

Safely and expeditiously make disposal-ready and dispose of waste generated during past and current DOE activities. Prepare transuranic (TRU) waste for disposal at the Waste Isolation Pilot Plant (WIPP) and ship as soon as legal and regulatory constraints are removed. **(EM)**

Success measure description:

- Ship 100 to 200 cubic meters of TRU waste to WIPP for disposal.
- Make disposal ready 700 cubic meters of transuranic (TRU) waste.
- Produce 15 canisters of HLW at the West Valley Demonstration Project.
- Produce 200 canisters of high level waste (HLW) at the Defense Waste Process Facility at the Savannah River Site.
- Dispose of 15,000 cubic meters of mixed low level waste (MLLW).
- Dispose of 73,000 cubic meters of low level waste (LLW).

STATUS: On Track**STATUS: On Track**

STATUS: On Track

EQ-4: Prevent future pollution**EQ4-1 Preventing Future Pollution**

Incorporate pollution prevention, including waste minimization, recycling, and reuse of materials, into all DOE activities in accordance with Executive Order 13101.

Success measure description:

- Reduce, by 10 percent, the waste resulting from the execution of cleanup, stabilization and decommissioning activities from the annual planned baseline volumes; **(EM)**
- Reduce routine waste generation by 45 percent based on 1993 waste generation rates. (Data for reporting will be available at the end of calendar year 1999.) **(EM)**
- Implement projects that reduce/avoid the generation of radioactive, mixed, and hazardous wastes by 2,000 cubic meters. **(EM)**

EQ5: Dispose of high-level radioactive waste and spent nuclear fuel in accordance with the Nuclear Waste Policy Act as amended.

STATUS: On Track

EQ5-1 Continuing with Yucca Mountain Site Characterization

Complete the scientific and technical analyses of the Yucca Mountain site, and if it is determined to be suitable for a geologic repository, obtain a license from the Nuclear Regulatory Commission. **(RW)**

Success measure description:

- Complete peer review of the total system performance assessment to provide formal, independent evaluation and critique;
- Complete repository and waste package design inputs for use in total system performance assessment for the repository license application;
- Publish a draft Environmental Impact Statement (EIS). The Nuclear Waste Policy Act requires a Final EIS to accompany the site recommendation.

EQ-6: Reduce the life-cycle costs of environmental cleanup.

STATUS: Behind

EQ6-1 Reducing Environmental Cleanup Costs through Enhanced Performance

Significantly enhance performance, increase efficiency, and reduce costs through increased use of fixed-price competitive contracting, optimized project sequencing, recycling, and other waste minimization techniques, privatization, systems engineering, and benchmarking. **(EM)**

Success measure description:

- Continue the development and implementation of the privatization strategy by:
 - Commence Phase II (Design completion and facility construction) of the Idaho National Engineering and Environmental Laboratory (INEEL) Advanced Mixed Waste Treatment Project (AMWTP);

- Award the contract for the INEEL Spent Nuclear Fuel (SNF) Dry Storage Project; and
- Award the contract for the Oak Ridge Waste Disposal Project (Design completion/construction/operation).

EQ6-2 Developing and Deploying Innovative Cleanup Technologies

Develop and deploy innovative environmental cleanup, nuclear waste, and spent fuel treatment technologies that reduce cost, resolve currently intractable problems, and/or are more protective of workers and the environment. **(EM)**

Success measure description:

- Meet all commitments made to the Ohio Environmental Protection Agency and the Defense Nuclear Facilities Safety Board to ensure the safety of the Department's inventory of depleted uranium hexafluoride. **(NE)**
- Maintain the Fast Flux Test Facility in a safe, environmentally-compliant standby condition to permit implementation of an anticipated Secretarial decision in FY 1999 to deactivate or pursue potential restart to support a range of national research reactor requirements. **(NE)**
- Complete the conversion and disposition of 100 percent of the secondary sodium coolant from the Experimental Breeder Reactor-II and 40 percent of the Fermi reactor sodium coolant in storage at Argonne National Laboratory-West. **(NE)**
- Accomplish 60 innovative technology deployments.
- Demonstrate 22 alternative technology systems that meet the performance-specification based needs as identified by the Site Technology Coordination Groups.
- Make 40 alternative technology systems ready for implementation with cost and engineering performance data.
- Complete the demonstration of the electrometallurgical spent fuel treatment technology by the end of FY 1999 using Experimental Breeder Reactor-II spent nuclear fuel. **(NE)**

EQ6-3 Completing Deactivation of Surplus Facilities

Reduce operating costs by completing deactivation of surplus facilities and placing them in a safe and environmentally sound condition, requiring minimal surveillance and maintenance. **(EM)**

Success measure description:

- Complete 65 surplus facility deactivations.

EQ-7: Maximize the beneficial reuse of land and effectively control risks from residual contamination.

EQ7-1 Making DOE Lands and Facilities Available for Other Uses

In conjunction with stakeholders, develop comprehensive land use plans for DOE

STATUS: On Track

STATUS: Success

STATUS: On Track

sites that provide information on alternative uses, ownership, environmental requirements, and implementation schedules. **(EM)**

Success measure description:

- Complete mission justification analysis for land and facilities at 5 of the remaining 15 sites. **(FI)**
- Release a background report on Long-term Stewardship ("Moving from Cleanup to Stewardship") by March 31, 1999. (This report was one of the commitments published in the June 1998 Paths to Closure document.)
- Begin the formal study on long-term stewardship pursuant to the 1998 Programmatic Environmental Impact Statement (PEIS) settlement agreement, which requires a public scoping and comment process; and complete the scoping process portion of the study.

Environment, Safety, and Health

The mission of the Office of Environment, Safety, and Health is to develop innovative, unique, and cost-effective approaches for the protection of Department of Energy workers, the public, and the environment.

Our Commitments

STATUS: Success

CM1-1 *Instituting a Sound ES&H Culture*

Integrate and embed risk-based, outcome-oriented environment, safety, and health (ES&H) management practices into the performance of DOE's day-to-day work. Clearly identify and fund ES&H priorities and ensure resources are appropriately spent on those priorities. **(EH)**

Success measure description:

- Prevent fatalities, serious accidents, and environmental releases at Departmental sites.
- Implement Integrated Safety Management Systems at all major management and operations contracts.
- Provide expanded access to information on health related risks from operating our facilities to ensure that minority and low-income populations, which may be disproportionately adversely impacted by DOE facilities, understand the Department's environmental justice goals and strategies. **(ED)**
- Conduct oversight special reviews, assessments, evaluations, and inspections of such topics as emergency management, safety management, accidents, and safeguards and security.
- Prepare a draft Department of Energy implementation plan for the Administration's Clean Water Initiative.

STATUS: On Track

CM1-3 *Ensuring Employees are Qualified in Their ES&H Responsibilities*

Ensure that all DOE employees are appropriately trained and technically competent commensurate with their ES&H responsibilities.

Success measure description:

- *Improve Federal technical workforce capabilities at defense sites by implementing the FY 1999 milestones of the Revised Implementation Plan for DNFSB Recommendation 93-3.*

CM1-4 Investigating Feasibility of Independent External Oversight of Safety and Health at DOE Sites

Work with the Nuclear Regulatory Commission and the Occupational Safety and Health Administration to evaluate the costs and benefits of independent external regulation of safety and health. (EH)

Success measure description:

- *Complete the ongoing pilot projects which assess DOE facilities against the standards that the NRC believes would be appropriate to ensure radiological safety.*

CM2-4 Developing a Public Health Agenda for DOE Sites

Work with the Department of Health and Human Services (DHHS) to prepare a consolidated and coherent strategy for worker and public health effects studies and activities.

Success measure description:

- *Issue an initial status report on the development of a public health agenda by December 31, 1998; and a final public health agenda for each site, which reflects customer and stakeholder input, shall be issued by September 30, 1999.*

STATUS: Success**STATUS: Success**

Relationship to DOE Annual Performance Plan Goals

Establish Priorities & Eliminate Hazards

DOE ANNUAL PERFORMANCE for FY2000	PERFORMANCE INDICATORS
<p><u>DOE's Four Businesses:</u> <u>Environmental Quality</u> <i>How we will reduce the environmental, safety, and health risks and threats from DOE facilities and materials, safely and permanently dispose of civilian spent nuclear fuel and defense related radioactive waste, and develop the technologies and institutions required for solving domestic and international environmental problems.</i></p> <p><u>Environmental Quality:</u> <u>Objective 3</u> <i>Safely and expeditiously dispose of waste generated by nuclear weapons and civilian nuclear research and development programs and make defense high-level radioactive waste disposal-ready</i></p>	<ol style="list-style-type: none"> 1. Total Recordable Case Rate 2. Occupational Safety and Health Cost Index 3. Electrical Safety 4. Industrial Operations Safety 5. Chemical Hazard Events 6. Reportable Occurrences of Releases to the Environment 7. Cited Environmental Violations 8. Environmental Permit Exceedances 9. Radiation Dose to the Public 10. Worker Radiation Dose 11. Radiological Events 18. Price-Anderson Amendments Act Enforcement 20. Spent Nuclear Fuel Vulnerabilities Resolved 21. Plutonium and HEU Vulnerability Milestones Resolved 22. Waste Generation
<p><u>Corporate Management:</u> <u>Environment, Safety, and Health</u> <i>How we will ensure the safety and health of workers and the public, and protect and restore the environment.</i></p> <p><u>Corporate Management:</u> <u>Objective 1</u> <i>Ensure the safety and health of the DOE workforce and members of the public, and the protection of the environment in all Departmental activities.</i></p>	<ol style="list-style-type: none"> 1. Total Recordable Case Rate 2. Occupational Safety and Health Cost Index 3. Electrical Safety 4. Industrial Operations Safety 7. Cited Environmental Violations 8. Environmental Permit Exceedances 9. Radiation Dose to the Public 10. Worker Radiation Dose 11. Radiological Events 12. Near Misses and Safety Concerns 13. Inadequate Procedures/Procedures Not Followed 16. Environmental Compliance

Performance Requirements

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Summary of Process

B1. Overview

One of the critical success factors identified in the Department of Energy's (DOE) Strategic Plan for environment, safety and health is, "how will we ensure the safety and health of workers and the public, and protect and restore the environment." This report describes a new approach for measuring the performance of DOE operations in these areas and thereby supporting management decisions aimed at "ensuring the safety." The general concept is to focus on key factors with the most impact on worker and facility safety and the environment.

Summary of Process

1. Overview

1.1 Initial Performance Measures

2. Data Analysis - Analyses Performed

3. Significance Analysis

Data collection was limited to available data (e.g., ORPS, CAIRS, Site Environmental Reports). The process was non-intrusive and did not expend site resources. As such, the performance indicator components may not sufficiently measure all facets of environment, safety and health. Experience from this report, along with customer feedback from the attached survey form, will be evaluated.

This report was reviewed by a multi-disciplinary team with expertise in nuclear and facility safety, environment, worker safety and health, health studies, and planning/administration. The team is identified at the end of this appendix.

B1.1 Initial Performance Indicators

The performance indicators included in this report are identified in the following table. Selection of the indicators involved both evaluation of the overall safety significance as well as tests of availability. A process was established where all potential indicators were evaluated with respect to significance to the ultimate goal of measuring performance in environment, safety and health. With respect to availability, a decision was made to select indicators from existing data streams to avoid, for now, levying a burden on field activities for additional data. Primarily, indicators are derived from data within four data systems and one annual report:

- *Occurrence Reporting and Processing System (ORPS)*—A system originally designed for notification of nuclear as well as non-nuclear occurrences in the field. For all indicators based on occurrence reports, data prior to 93Q1 has been removed from the graphs and analysis.
- *Computerized Accident/Incident Reporting System (CAIRS)*—A system for collecting data associated with occupational injury and illness events and statistics.
- *Radiation Exposure Monitoring System (REMS)*—A system for collecting data on individual radiation doses received by DOE complex workers.
- *Environmental Compliance Database*—A system maintained by the Office of Environmental Policy and Assistance.
- *Annual Site Environmental Reports*

There are, of course, limitations resulting from using the data for other than the purpose for which it was collected. Furthermore, the availability of data should not be confused with relevance to measuring performance. Indicators should be selected based on their impact on the operations being examined, not solely because the data exist. Although some of the selected indicators may be of interest to other audiences, it is likely that other valid indicators exist that should be analyzed and trended to provide the appropriate perspective (e.g., facility, contractor, program management) on performance.

PI Component	Data Source
I. Accidents/Events	
1. Total Recordable Case Rate	Computerized Accident/Incident Reporting System/ EH-51
2. Occupational Safety and Health Cost Index	Computerized Accident/Incident Reporting System/ EH-51
3. Electrical Safety	Review of Occurrence Reports, EH-33 Field Office Contacts
4. Industrial Operations Safety	Review of Occurrence Reports, EH-33 Field Office Contacts
5. Chemical Hazard Events	Quarterly Review of Chemical Safety Concerns/ Occurrence Reporting and Processing System, EH-52/EH-53/BNL
6. Reportable Occurrences of Releases to the Environment	Review of Occurrence Reports, EH-33
7. Cited Environmental Violations	Environmental Compliance Tracking Database, EH-41
8. Environmental Permit Exceedances	Annual Site Environmental Reports, EH-41
9. Radiation Dose to the Public	Annual Reports to Environmental Protection Agency (EPA) by Each Site, EH-41
10. Worker Radiation Dose	Radiation Exposure Monitoring System (REMS), EH-52
11. Radiological Events	Review of Occurrence Reports, EH-33
II. Precursors	
12. Near Misses and Safety Concerns	Review of Occurrence Reports, EH-33
13. Inadequate Procedures/Procedures Not Followed	Review of Occurrence Reports, EH-33
14. Safety System Actuations	Review of Occurrence Reports, EH-33
15. Safety Equipment Degradation	Review of Occurrence Reports, EH-33, Field Office Contacts
III. ES&H Management	
16. Environmental Compliance Milestones Met	EM Progress Tracking System (PTS), EH-41
17. Open DNFSB Recommendations	Safety Issues Management System (SIMS), S-3.1
18. Price-Anderson Amendments Act Enforcement	Office of Enforcement and Investigation Database, EH-10
19. ISMS Implementation Status	DOE Safety Management Implementation Team
IV. Hazards	
20. Spent Nuclear Fuel Vulnerabilities Resolved	Reports on Status of Corrective Actions to Resolve Spent Nuclear Fuel Vulnerabilities, EM-67
21. Plutonium and HEU Vulnerability Milestones Resolved	Plutonium Vulnerability Management Summary Report, EM-66; Office of Site Operations, DP-24 Highly Enriched Uranium ES&H Vulnerabilities Status Report, RFFO; Field Office Contacts
22. Waste Generation	Waste Minimization Reporting System, EH-41

B2. Data Analysis—Analyses Performed

The data analysis results are summarized in the DOE Performance Indicator Report. They are intended to identify areas which should be further investigated (to identify areas that may require intervention as well as good practices to share across DOE); they do not provide absolute answers in themselves. Data analyses include:

- Looking for statistically significant trends over time,
- Comparison to historical averages or benchmarks (e.g., Bureau of Labor Statistics for similar industries),
- Normalization of events to opportunities (e.g., construction related events divided by construction hours worked or construction dollars spent),
- Examination for statistically significant trends in types of operations, severity or type of events, and causes.

Typically, the historical baseline is established using existing data excluding the most recent quarter. Where possible, data were analyzed by quarter. In some cases, data were also viewed monthly to reveal any interesting seasonal effects not evident in the quarterly data grouping. Where appropriate, sites were contacted to provide perspective for unusual data values or trends. Data sources for several of these measures are annual; the need for more frequent data must be evaluated for future reports.

The data can also be used to perform other special analyses and reports (such as trends in causes and types of events). These analyses and reports could support special needs, such as oversight preparation and programmatic reviews. Root cause data is analyzed based on information from the preceding quarter as there is an inherent time lag between event notification and final identification of a root cause. To capture the maximum number of root causes for analysis purposes, the preceding quarter is examined.

B3 – Significance Analysis

The application of significance ranking in the context of performance indicators can be used to aid DOE and contractor management in determining where they need to apply resources to mitigate hazards or to improve safety. It is anticipated that as experience is gained, significance ranking will be applied to other performance indicators.

Significance of events is assigned in accordance with Table 1, EH-33 Performance Indicator Significance Criteria, in Appendix B-3 of this report. The table was developed for use with the PI report with input from various significance ranking models, including Savannah River's Significance Categories Matrix, Hanford's Priority Planning Grid, and from limits provided by various DOE Orders.

There are four significance rankings – Level 1 through 4 – with Level 1 being the most significant and Level 4 the least. Generic criteria for areas such as worker and public safety are combined with PI-specific criteria (i.e., Electrical Safety) to rank the significance of events. For example, a minor event that would be ranked as Level 4 (least significant) under the generic criteria would, in accordance with the PI-specific criteria for Electrical Safety, be ranked as Level 3 if an electrical shock was involved. For cases where there is no PI-specific criteria, the generic criteria are used.

It is expected that more PI-specific criteria will be developed as experience is gained with the current system and based on feedback from readers of this report.

Table 1 - EH-33 Performance Indicator Significance Criteria

Worker Safety	Level 1	Level 2	Level 3	Level 4
	Loss of life			
	Permanent disability			
	Injury with >30 days of lost work time	Injury with hospitalization or lost work time	Injury requiring medical treatment	Minor injury - no treatment, no lost work days
Public Safety	Level 1	Level 2	Level 3	Level 4
	Offsite exposure near or above limits, moderate injuries	Low-level radiation or chemical exposure	Minor injury	Public inconvenience
Environmental	Level 1	Level 2	Level 3	Level 4
	Major on-site environmental damage with cleanup costs >\$5M	On-site environmental damage with cleanup costs >\$500K	On-site environmental damage with cleanup costs >\$250K	Reportable release with minor or no impact
	Off-site environmental damage with significant cleanup costs	On-site environmental damage with minor cleanup costs	Release to environment that exceed regulatory limits	
Facility Safety	Level 1	Level 2	Level 3	Level 4
	Willful management disregard or direction to staff to disregard safety requirements, policies, or procedures	Widespread failure or lack of one or more facility safety programs	Findings indicating major deficiency or lack of compliance with safety documents	Administrative or isolated non-compliance
		Unreviewed Safety Question	OSR / Tech Spec violation	
		Major loss of configuration control in nuclear facility	Technical analysis cannot support conclusions needed for compliance document	
		DOE authorization required for startup or restart	Failure of corrective action to prevent recurrence	
External Compliance	Level 1	Level 2	Level 3	Level 4
	Willful violation of federal, state, or local laws or regulations	Several instances of non-compliance that indicate major deficiency or lack of a compliance program	Isolated or single noncompliance	Administrative or isolated non-compliance
Cost / Schedule	Level 1	Level 2	Level 3	Level 4
Cost	>\$5M	>\$1M	>\$250K	>\$100K
Schedule	Significant project delay		Minor project delay	Failure to meet milestone
Electrical Safety	Level 1	Level 2	Level 3	Level 4
			Electrical Shock, RF burn	
			Contact with energized equipment that should have been de-energized	

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Glossary

Baselines

Baselines provide an historical reference point used to show how the current period compares to past experience. Generally, historical baselines are established using existing data excluding the most recent reporting period. For the data that originates from CAIRS, the two most recent quarters are excluded to account for the lag in data reporting. Baselines established for data originating from occurrence reports are reevaluated each time the governing reporting order changes.

Causes of Occurrences

Causes of occurrences are determined by performing event investigations and may be identified as direct, contributing, or root causes.

- **Direct Cause:** The cause that directly resulted in the occurrence.
- **Contributing Causes:** The cause(s) that contributed to the occurrence, but by itself would not have caused the occurrence.
- **Root Cause:** The cause that, if corrected, would prevent recurrence of this and similar occurrences.

Cause categories are selected from the following:

1. **Equipment/material problem:** An event or condition resulting from the failure, malfunction, or deterioration of equipment or parts, including instruments or material.
2. **Procedure problem:** An event or condition that can be traced to the lack of a procedure, an error in a procedure, or procedural deficiency or inadequacy.
3. **Personnel error:** An event or condition due to an error, mistake or oversight. Personnel errors include inattention to details of the task, procedures not used or used incorrectly, communication problems, and other human errors.
4. **Design problem:** An event or condition that can be traced to a defect in design or other factors related to configuration, engineering, layout, tolerances, calculations, etc.
5. **Training deficiency:** An event or condition that can be traced to a lack of training or insufficient training to enable a person to perform a desired task adequately.
6. **Management problem:** An event or condition that can be directly traced to managerial actions or methods. Management problems include inadequate administrative control, work organization/planning deficiency, inadequate supervision, improper resource allocation, policies not adequately defined, disseminated or enforced,

The Cost Index is computed as follows:

$$\text{Cost Index} = 100 [(1,000,000) * D + (500,000) * T + (2,000) * LWC + (1,000) * WDL + (400) * WDLR + (2,000) * NFC] / \text{HRS}$$

where

- D = the number of fatalities,
- T = the number of permanent transfers or terminations due to occupational illness or injury,
- LWC = the number of lost workday cases,
- WDL = the number of days away from work
- WDLR = the number of restricted workdays,
- NFC = the number of non-fatal cases without days away from work or restricted workdays, and
- HRS = the total hours worked.

Cost Index Formula

Facility function identifies the type of facility or the activity/function performed by the facility. Possible facility functions are listed below.

Facility Function

- Plutonium Processing and Handling
- Special Nuclear Materials Storage
- Explosive
- Uranium Enrichment
- Uranium Conversion/Processing and Handling
- Irradiated Fissile Material Storage
- Reprocessing
- Nuclear Waste Operations
- Tritium Activities
- Fusion Activities
- Environmental Restoration Operations
- Category "A" Reactors
- Category "B" Reactors
- Solar Activities
- Fossil and Petroleum Reserves
- Accelerators
- Balance-of-Plant (e.g., offices, machine shops, site/outside utilities, safeguards/security, and transportation)

The following terms are related to occurrence reporting, as required by DOE Order 232.1A, *Occurrence Reporting and Processing of Operations Information*.

**Occurrence Categories
(Types of Occurrences)**

Occurrence categories are arranged into 10 generic groups related to DOE operations and include the following:

1. Facility Condition
 2. Environmental
 3. Personnel Safety
 4. Personnel Radiation Protection
 5. Safeguards and Security
 6. Transportation
 7. Value Basis Reporting
 8. Facility Status
 9. Nuclear Explosive Safety
 10. Cross-Category Items
-

**Price-Anderson
Amendments Act (PAAA)**

Price-Anderson Amendments Act (PAAA). The 1988 Price-Anderson Amendments Act extended indemnification to DOE operating contractors for consequences of a nuclear incident. At the same time, Congress required DOE to begin undertaking enforcement actions against those contractors who violate nuclear safety rules. The regulatory basis for the enforcement program is published in 10CFR820, Procedural Rules for DOE Nuclear Activities. Enforcement actions may include the issuance of Notices of Violations and, where appropriate, civil monetary penalties of up to \$100,000 per violation per day. The mechanism allows DOE to penalize a contractor for unsafe actions or conditions while providing positive incentives for contractors to strive for an enhanced nuclear safety culture through attention to compliance to standards and requirements, self-identification of problems, reporting noncompliance's to DOE and initiating timely and effective corrective actions.

Severity of Occurrence

Severity of occurrence indicates the degree of significance associated with the different types of occurrences.

- **Unusual Occurrence:** A non-emergency occurrence that exceeds the Off-Normal Occurrence threshold criteria; is related to safety, environment, health, security, or operations; and requires immediate notification to DOE.
 - **Off-Normal Occurrence:** Abnormal or unplanned event or condition that adversely affects, potentially affects, or is indicative of degradation in the safety, safeguards and security, environmental or health protection, performance, or operation of a facility.
-

Statistical Process Control (SPC) is the application of statistical techniques to control a process.

TEDE = External Dose Contribution + Internal Dose Contribution. Prior to 1993, the method for calculating the internal dose contribution changed from an annual internal dose to a dose committed over 50 years. Although one may expect this change would result in higher reported doses, the elimination of the "legacy" doses from previous years' exposures resulted in lower reported doses.

Statistical Process Control (SPC)

Total Effective Dose Equivalent (TEDE)

Product Improvement Survey Form

Purpose of the Product - The Office of Operating Experience Analysis and Feedback, EH-33, developed this set of indicators for measuring the performance of DOE operations in the areas of Worker Safety and Health and the Environment. The indicators are intended to measure the Department's success in its strategic goal to manage and improve its environmental, safety, and health (ES&H) performance. The major customers for these indicators are expected to be the senior leadership of DOE.

In order to assess the effectiveness of this performance indicator report, we would appreciate your assistance by providing responses to the following (check one):

- | | | | | |
|---|--|-----|--------------------------|----|
| 1. Do you use indicators to measure performance? | <input type="checkbox"/> | Yes | <input type="checkbox"/> | No |
| 2. Do you feel that improved methods for measuring performance are needed? | <input type="checkbox"/> | Yes | <input type="checkbox"/> | No |
| 3. Would you make management decisions based on this kind of information? | <input type="checkbox"/> | Yes | <input type="checkbox"/> | No |
| 4. Does DOE-wide ES&H performance matter to you? | <input type="checkbox"/> | Yes | <input type="checkbox"/> | No |
| 5. What are your information needs with regard to measuring Department-wide ES&H success: | | | | |
| <input type="checkbox"/> | Moderate detail concerning the Department ES&H success | | | |
| <input type="checkbox"/> | Light detail concerning the Department ES&H success | | | |
| <input type="checkbox"/> | Quickpulse of the Department ES&H success | | | |
| <input type="checkbox"/> | I have no need for the information on a regular basis | | | |

Report Evaluation - From your review of this report, *and in consideration of the purpose stated above*, mark the number that most closely corresponds to your reaction to the following statements.

- | | | <i>Strongly
Agree</i> | | <i>Neutral</i> | | <i>Strongly
Disagree</i> | |
|---|---|----------------------------------|-----|-----------------------|--------------------------|-------------------------------------|---|
| 6. The performance indicators are relevant to the measurement of overall DOE ES&H performance. | ⑦ | ⑥ | ⑤ | ④ | ③ | ② | ① |
| 7. The report layout (text and graphics) is logical and easy to understand. | ⑦ | ⑥ | ⑤ | ④ | ③ | ② | ① |
| 8. The data presented in this report are consistent with my impressions of DOE's ES&H performance. | ⑦ | ⑥ | ⑤ | ④ | ③ | ② | ① |
| 9. The performance indicators provide a "balanced" view (e.g., successes and problems) of DOE's ES&H performance. | ⑦ | ⑥ | ⑤ | ④ | ③ | ② | ① |
| 10. This report helps measure DOE's success in managing and improving its ES&H performance. | ⑦ | ⑥ | ⑤ | ④ | ③ | ② | ① |
| 11. This report is useful in communicating information on DOE's ES&H performance to external customers. | ⑦ | ⑥ | ⑤ | ④ | ③ | ② | ① |
| <hr/> | | | | | | | |
| 12. Would you be willing to expend time/travel funds to participate in product improvement sessions? | | <input type="checkbox"/> | Yes | | <input type="checkbox"/> | No | |
| 13. Based upon your stated needs, does this report meet your expectations? | | <input type="checkbox"/> | Yes | | <input type="checkbox"/> | No | |

Please fax completed survey form to Samuel Rosenbloom, EH-33, at 301-903-2329

