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Risk Prioritization Manual

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Acronyms and Definitions

ANSI	American National Standards Institute
CAA	Clean Air Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DOE	United States Department of Energy
EOC	extent of condition
IAS	integrated assessment schedule
M&O	management and operating
OA	SLAC Office of Assurance
OFI	opportunity for improvement
OSHA	Occupational Safety and Health Administration
RCRA	Resource Conservation and Recovery Act
RPM	risk prioritization model
SC	DOE Office of Science
SLAC	Stanford Linear Accelerator Center
SSO	DOE Stanford Site Office

Document. Issued material that regulates an action or directs an activity in order to facilitate consistent and predictable outcome or that describes, specifies, reports, certifies, provides results or otherwise furnishes information or evidence of data. This material may be recorded on paper or machine-readable or other physical media.

Extent of condition (EOC). A determination of the breadth and depth of the noncompliance – all occurrences of the noncompliance – including where else the problem might have occurred and whether or not the same or similar conditions/systems exist in other programs or processes

Graded approach. A graded approach is allowed by the DOE/SU contract as cities: “application of DOE Contractor Requirements documents, which permits the Contractor to propose to the Contracting Officer alternative and/or tailored approaches based on national, commercial or industrial standards and best business practices to meet the outcomes desired by the Government.”

Likelihood

- *Low.* An impact that is unlikely to occur within the operating life of a facility but not completely precluded from occurring. For example, impacts in this category may occur once in the operating life of one facility out of a population of 100 similar facilities. Impacts with this likelihood are expected to occur less frequently than once per 100 years but more frequently than once per 10,000 years.

- *Medium.* An impact that is expected less frequently than once every 10 years but more frequently than once every 100 years. Impacts with this likelihood are not expected frequently within the operating life of a facility but may occur once in the facility's life.
- *High.* An impact that is expected less frequently than once per year, but more frequently than once every 10 years. Such impacts are expected to occur within the operating history of the facility but have not occurred regularly every year.
- *Very high.* An impact that already exists with certainty or is expected to occur at least once per year. For example, if a facility is known to be out of compliance with a DOE ES&H order, then the likelihood of this impact falls into the very high category. If a condition at a facility has historically resulted in one or more lost-time worker injuries per year and the condition has not been corrected, then the likelihood of this impact also fits this category.

Life cycle. The life of an asset from planning through acquisition, maintenance, operation, and disposition

Opportunity for improvement (OFI). A potential action identified to improve performance or compliance

Risk. A concept used to give meaning to things, forces, or circumstances that pose harm or benefit to people, groups, or organizations, or to what they value. Descriptions of risk are typically stated in terms of the likelihood of harm or benefit from an activity and usually include an identification of what is "at risk" and may be harmed or benefited (for example, health of human beings or an ecosystem, personal property, quality of life, ability to engage in an economic activity); the activity that may occasion this harm or benefit; and a judgment about the likelihood of that harm or benefit occurring.

Risk, programmatic. A risk associated with work at a site, which may upon failure cause schedule delays, cost overruns, or impact to stakeholders, such as the public, site workers, and regulating agencies

Validation. The process of evaluating a product at the end of the entire development process to ensure compliance with requirements or the measurement of effectiveness regarding corrective actions

Verification. Synonymous with assessment. Their use is determined by who is performing the work. Assessments are performed by or for senior management. Verifications are performed by the line organization.

1 Introduction

1.1 Purpose

The Stanford Linear Accelerator Center (SLAC) Office of Assurance (OA) uses a risk-based graded approach consistent with DOE Order 414.1C, "Quality Assurance",[1] to implement an effective and sustainable internal independent assessment program to ensure that the laboratory director and DOE Stanford Site Office (SSO) are provided information and analysis on the extent to which SLAC programs are safe, secure, adhere to ethical and compliant business practices, meet customer requirements, meet reasonable standards of formality, and meet requirements and standards specified in the contract between Stanford University and the United States Department of Energy (DOE) for operation of SLAC.

The risk-based graded approach is implemented without compromising the safety of the public, employees or facilities; adversely impacting the environment; or failing to comply with DOE requirements, rules, and regulations.

1.2 Scope

This manual applies to the process of detailed planning, including prioritization of ES&H programs, issues, and activities relating to internal independent assessment scheduling.

1.3 Applicability

This manual applies to Office of Assurance and other staff involved in risk prioritization.

1.4 Applicable Standards

This procedure is designed to meet the following directives and standards:

- DOE Order 414.1C, "Quality Assurance" (DOE O 414.1C)[2]

1 DOE Order 414.1C, "Quality Assurance", http://www.directives.doe.gov/pdfs/doe/doetext/neword/414/o4141c.html

2 DOE Order 414.1C, "Quality Assurance", http://www.directives.doe.gov/pdfs/doe/doetext/neword/414/o4141c.html

2 Roles and Responsibilities

2.1 Laboratory Director

The laboratory director is responsible for all aspects of SLAC's science and operations programs. He or she has accountability to the DOE through SSO and the Office of Science (SC), as well as the president and provost of Stanford University.

2.2 Director, Office of Assurance

The director, OA is responsible for

- Coordinating and screening risk prioritization input from ES&H program managers
- Developing and maintaining the Integrated Assessment Schedule as appropriate (see Section 6, "Integrated Assessment Schedule"[3]

2.3 ES&H Program Managers

ES&H program managers are responsible for

- Participating in the risk prioritization process, including evaluating and documenting categorization of risks for their applicable ES&H program area(s) in accordance with the requirements of this manual
- Providing the laboratory director and director, OA with sound advice on the controls and verifications that apply to their ES&H program area(s) consistent with their importance to safety, cost, schedule, and success of the program

3 "Integrated Assessment Schedule", https://www-internal.slac.stanford.edu/oa/documents/IAS.pdf

3 Risk Prioritization Approach and Development

The SLAC risk prioritization model (RPM) consists of six core risk categories, developed by Environment, Safety, and Health (DOE/EH) headquarters' staff:

1. Public Safety and Health
2. Site Personnel Safety and Health
3. Compliance
4. Mission Impact
5. Cost-effective Risk Management
6. Environmental Protection

The primary purpose for this model was to provide a tool to assist in developing ES&H management plans. This model combines top-down guidance and bottom-up analysis and decision-making to create a continuous, risk-based, resource-constrained, management process designed to help organizations such as SLAC systematically evaluate risk and then prioritize activities based on relative ES&H impacts and use of limited resources available.

It has been recognized by DOE and SLAC management that many ES&H issues tend to score relatively low using this model due to the bias towards major off-site consequences, such as could result from a nuclear reactor or other high-consequence facility major systems' failure. To address these concerns, within the context of the liabilities possessed by Stanford University, which operates SLAC for DOE under a management and operating (M&O) contract, an additional overlay (or risk category) titled "Reputation" was developed and added to the model by SLAC.

SLAC, historically and currently, commits time and energy to being a good neighbor, promoting good community relations, and conducting outreach activities. We are rightfully proud of our scientific achievements and hold this site open for tours and other activities to keep the community educated and informed. SLAC, as an integral academic unit of Stanford University, shares with the university a concern for avoiding harm to the reputation of the university.

In addition to the reputational damage that can be result from life-safety incidents, reputational issues may also arise from even a misperception of our activities or a misunderstanding of the risks present at SLAC. Additionally, unethical conduct or improper practices with regard to the academic endeavor and business activities may affect reputation and public perception.

Therefore, the addition of this risk category reflects our belief of the importance of considering the perceptions of our neighbors and the broader national community that may exist even though, in fact, there may be no statistically significant risk of harm to persons or the environment as a result of a given circumstance or situation. As such, this sensitivity to public perception may require a proactive approach to the circumstances that the actual risk would not justify.

The RPM is shown in Table 1; likelihood levels in Table 2.

Table 1 Risk Prioritization Model

	Likelihood of Occurrence			
	A	B	C	D
Impact	Very High	High	Medium	Low
Public Safety and Health				
1. Immediate or eventual loss of life/permanent disability	3000	300	30	0.3
2. Excessive exposure and/or injury	300	30	3	0.03
3. Moderate to low-level exposure	30	3	0.3	0.003
Site Personnel Safety and Health				
4. Catastrophic – Injuries/illnesses involving permanent total disability, chronic or irreversible illnesses, extreme overexposure, or death	2000	200	20	0.2
5. Critical – Injuries/illnesses resulting in permanent partial disability or temporary total disability > three months, or serious overexposure	200	20	2	0.02
6. Marginal – Injuries/illnesses resulting in hospitalization, temporary, reversible illnesses with a variable but limited period of disability of < three months, slight overexposure (for example, 5-10 rem) or exposure near limits	100	10	1	0.01
7. Negligible – Injuries/illnesses not resulting in hospitalization, temporary reversible illnesses requiring minor supportive treatment, or exposures below 20 percent of limits	10	1	0.1	0.001
Compliance				
8. Major noncompliance with federal, state, or local laws; enforcement actions; or compliance agreements significant to ES&H and involving potential fines or penalties	150	15	1.5	0.015
9. Major noncompliance with executive orders; DOE orders; necessary and sufficient standards; or secretary of energy directives (notices or guidance memoranda) significant to ES&H but not involving significant potential fines and penalties	75	7.5	0.75	0.0075
10. Marginal noncompliance with federal, state, local laws; enforcement actions; compliance agreements; executive orders; DOE orders; necessary and sufficient standards; or secretary of energy directives significant to ES&H	20	2	0.2	0.002
11. Significant deviation from good management practices	1	0.1	0.01	0.0001
Mission Impact				
12. Serious negative impact on ability to accomplish major program mission	150	15	1.5	0.015
13. Moderate negative impact on ability to accomplish major program mission	75	7.5	0.75	0.0075

	Likelihood of Occurrence			
	A	B	C	D
Cost-effective Risk Management				
14. Significant avoidable costs due to degrading infrastructure, inefficient management systems or program implementation, or accident-related capital loss (annual costs > $5 million, or one-time costs > $25 million)	40	4	0.4	0.004
15. Moderate avoidable costs due to degrading infrastructure, inefficient management systems or program implementation, or accident-related capital loss (annual cost $1M-5M/year, or one-time costs < $25 million)	15	1.5	0.15	0.0015
Environmental Protection				
16. Catastrophic damage to the environment (widespread and long-term or irreversible effects)	2000	200	20	0.2
17. Significant damage to the environment (widespread and short-term effects, or localized and long-term or irreversible effects)	200	20	2	0.02
18. Minor to moderate damage to the environment (localized and short-term effects)	20	2	0.2	0.002
Reputation (additional SLAC risk consideration)				
19. Repeated negative articles in national newspapers, repeated negative newscasts on national TV or radio	1000	100	10	0.1
20. Negative article in national newspapers, negative newscast on national TV or radio, repeated negative articles in local newspapers, repeated negative newscasts on local TV or radio	750	75	7.5	0.075
21. Negative article on front page of local newspaper; negative newscast on local TV or radio	500	50	5	0.005
22. Negative article in local newspaper	250	25	2.5	0.025

Table 2 RPM Matrix Likelihood Levels

	A	B	C	D
Likelihood	Very High	High	Medium	Low
Numerical Value	1.0	0.1	0.01	0.0001
Expectation	≥ 1 in 1 Year	< 1 in 1 year ~ 1 in 10 years	< 1 in 10 years ~ 1 in 100 years	< 1 in 100 years ~ 1 in 10,000 years

4 Process Principles

Risk-based ranking of ES&H program areas supports OA's responsibility to allocate resources to the set of activities most important to safety, quality, and mission since available resources may not be adequate to allow full and immediate implementation of all proposed internal independent assessments.

For example, programs that contribute the greatest risk to safety, quality, and mission are assessed with the greatest rigor and frequency, which is a principle consistent with DOE Order 414.1C. Assessments that fall "below the line" are retained as targets of opportunity to be performed if resources become available or if one of the planned assessments changes in risk or schedule, since the benefits of performing assessments at this level are marginal. This methodology also allows SLAC personnel and customers to anticipate upcoming assessments, understand the basis for scheduling assessments, and to justify allocated resources.

5 Scoring and Ranking

The risk prioritization model (RPM) is a tool that produces the initial rankings based on the risk consequences and likelihood of occurrence for the ES&H program areas.

5.1 Step 1: Assess and Score Risks

Existing risks as a function of the each ES&H program area are considered using the Assurance: Risk Scoring Worksheet.[4]. For each RPM impact category, the OA scorer performs the following steps:

1. Identify all impact levels that could occur because of the current situation
2. Estimate the likelihood for all impacts identified in (1) above. One of the likelihood levels represented by the RPM columns A–D may be chosen. Alternatively, if information is available to support a different likelihood value, that value may be specified.
3. If more detailed information is available on the estimated impacts, specify a consequence multiplier to interpolate between or extrapolate beyond the impact levels designated in the RPM rows
4. Select the combination of impact, likelihood, and multiplier that produces the highest risk score to represent the category in the overall ES&H activity score

The risk score is the sum of the representative risk scores from all categories evaluated by the scorer. For example, if the scorer evaluated the hazardous materials program, the resulting score may be:

- Public Safety and Health – excessive exposure and/or injury from hazardous material release (for example, Plating Shop) with low-level likelihood (RPM Matrix 2D = 0.03)
- Site Personnel Safety and Health – critical impact with high likelihood of a serious injury to an individual because of hazardous materials (RPM Matrix 4B = 200)
- Compliance – major impact with very high likelihood for noncompliance with 10 CFR 835 that could result in penalties (RPM Matrix 8A = 150)
- Mission Impact – Moderate impact with Medium likelihood on mission from a hazardous materials incident (RPM Matrix 13C = 0.75)
- Cost-effective Risk Management – significant impact with high likelihood of costs resulting from hazardous materials (RPM Matrix 14B = 4)
- Environmental Protection – significant impact with high likelihood of environmental damage from hazardous materials (RPM Matrix 17B = 20)
- Reputation – repeated impact with very high likelihood from hazardous materials incident such as chemical hutch ORPS (RPM Matrix 19A = 1000)

The total score would be the sum of these individual scores: 0.03 + 200 + 150 + 0.75 + 4 + 20 + 1000 = 1374.78.

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4 Assurance: Risk Scoring Worksheet (SLAC-I-770-0A19J-002), http://www-group.slac.stanford.edu/oa/documents/assuranceFormRisk.pdf

5.2 Step 2: Adjust Ranking According to Other Planning Factors

Other factors besides risk may influence the ranking of ES&H programs. These factors may include cost, coupling relationships, and other planning factors. After the scoring group completes the RPM scoring and ranking using the RPM, the Office of Assurance may adjust the ES&H program ranking to account for these factors. Scoring adjustments may be made by adding to or subtracting from an ES&H program RPM score to achieve the desired relative ranking for the ES&H program. Scoring adjustments should be thoroughly documented.

5.2.1 Cost of Activities

Although the primary objective of assessing ES&H programs is to provide information to the laboratory director and SSO regarding the extent to which SLAC programs are safe, secure, adhere to ethical and compliant business practices, meet customer requirements, meet reasonable standards of formality, and meet requirements and standards specified in the contract between Stanford University and the United States Department of Energy (DOE) for operation of SLAC, an additional important objective is to achieve risk reduction as efficiently as possible. To promote the efficient use of ES&H resources and the cost-effective conduct of ES&H programs, the Office of Assurance may adjust the priorities of ES&H programs based on the cost of assessment activities (resources, needs) involved.

5.2.2 Coupling Relationships

Two or more dependent subprograms in separate ES&H programs may require simultaneous assessments. In this instance, ES&H program rankings may be adjusted so that the priorities of the dependent subprograms can be assessed at the same time

5.2.3 Other Practical Planning Factors

Practical constraints may change the relative desirability or practicality of certain programs beyond the rankings provided by the RPM scores. Examples of planning factors that may merit adjustments in ES&H program priority include

- Complexity of the involved processes
- Reliability of the engineering and administrative controls
- Skills and experience of the personnel involved
- Maturity of the program (developed, mature techniques/processes versus state-of-the-art or developmental/pilot technology)
- Changes that may affect performance (including regulatory)
- Life-cycle phase (new, midlife, closeout of activity)
- Organizational experience with the program
- Performance measures/indicators, trending downward
- Schedule/commitment or milestones failure
- Time since the last internal independent assessment
- Time since other assessments (external, management, process improvement teams, investigations)

- Opportunities to perform the assessment in conjunction with other organizations (internal or external)
- Work schedules (will a lower-ranked program start or complete before a higher-ranked program)
- Other scheduled assessments (line management self-assessments, process improvement teams) that would be expected to address the area
- Availability of assessment personnel, including technical personnel to perform the assessment
- Certifications, registrations, or other scheduled activities that would be expected to evaluate the program
- Availability of personnel independent of the areas to be assessed
- Budget constraints
- Management or customer requests
- Response/follow-up to previous external assessments
- Perception of program risks by the public or other external stakeholders

6 Integrated Assessment Schedule

After risk-based priorities are established and adjusted, the Office of Assurance uses the ranked list as the primary consideration along with availability of resources in developing and implementing the Integrated Assessment Schedule (IAS). The IAS is a tool that allows external and internal stakeholders to anticipate upcoming assessments. The IAS is reviewed periodically and modified in coordination with the SSO as new information on the program is obtained that changes the estimated risks or reflects changes in available resources. These reviews and modifications occur at regular intervals usually during the monthly OA/ES&H/SSO meetings. [5]

ES&H program areas that have increased in risk can be moved up in the schedule, while others can be moved down. In some cases, ES&H program areas that were "below the line" can be moved up to reflect changes that have occurred since the original planning and ranking was performed. The results of internal independent assessments, which identify good performance, are used to reduce the frequency and depth of future assessments. Areas of poor performance receive increased attention, especially if there are indications that management is unable to correct identified problems. This is because recurring and cumulative deficiencies, even in a low-hazard operation such as SLAC's, may decrease the likelihood of achieving its mission.

Given the likelihood of some or all of these factors being present and the wide variety of SLAC activities, it is impossible to define the "right" assessment frequency that will be adopted from this process. Too few assessments may not keep pace with the changes occurring in the program areas. Too many assessments may distract the organization from focused attention of the safe conduct of work and mission accomplishment. Therefore, it is ultimately the responsibility of the director, OA in consultation with the laboratory director and SLAC management to determine the appropriate mix and frequency/schedule of internal independent assessments to meet customer requirements and ensure mission success.

6.1 Risk Prioritization Model Impacts and Scoring Examples

Explanations of the risk prioritization model (RPM) impacts and scoring follow.

6.1.1 Public Safety and Health

Impact 1: Immediate or eventual loss of life/permanent disability

This impact should be chosen when the program being evaluated could result in permanent disability (loss of limb, sight, hearing) or loss of life by one or more members of the off-site population. It does not address impacts to site workers or visitors. This impact includes immediate deaths and disabling injuries, as well as future cancer deaths or genetic damage and effects that might result from releases of hazardous or radioactive materials that breach the site boundaries. Such releases could be the result of accidents that release hazardous materials within a building combined with failures in building confinement or containment, accidents during off-site transportation, or catastrophic events resulting in direct release of materials such as fire or explosion.

5 "Integrated Assessment Schedule", https://www-internal.slac.stanford.edu/oa/documents/IAS.pdf

Example: A site or facility has proposed a set of seismic safety improvement projects to correct structural and equipment deficiencies that could contribute to building failures during an earthquake. Under current conditions, there is a high likelihood of structural failure during a strong earthquake. Structural failure may result in a chemical release or fire that could spread off-site. Because a number of public facilities and private residences are close to the site boundary, public safety could be threatened and fatalities are possible.

Impact 2: Excessive exposure and/or injury

This impact indicates the potential for excessive exposure or injury to the off-site population, but without the potential for death or permanent disabling injury (that is, recovery from potential injuries is expected). Excessive exposures to radioactive or hazardous materials are those that exceed published acceptable limits.

Example: The example given for Impact 1 could apply to this impact if the potential volume of chemicals released were reduced such that death or permanent injury was not expected. However, public exposures to hazardous substances that exceed limits would still be expected.

Impact 3: Moderate- to low-level exposure

This impact indicates the potential for exposure of off-site population to hazardous or radioactive materials, but these exposures are no greater than published acceptable limits. Immediate deaths or injuries are not expected. Rates of cancer incidence in the population would not detectably increase.

Example: A site or facility must purchase modern radiation survey equipment to comply with Title 10, Code of Federal Regulations, Part 835, "Occupational Radiation Protection",[6] DOE Order 231.1A Change 1,[7] DOE Policy 441.1,[8] DOE Guide 441.1-1B,[9] and American National Standards Institute (ANSI) N323.[10] Existing survey equipment does not meet requirements for lower limits of detection for release of equipment or materials from radioactive materials management areas at the site or facility. Because of this inadequacy in detection instrumentation, contaminated materials may be inadvertently released to uncontrolled areas and subsequently disperse off-site. Because of the nature and volume of the contaminated materials, however, the potential releases would not constitute a threat to public health but could result in a minimal exposure of members of the public to radioactive material.

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6 Title 10, *Code of Federal Regulations*, Part 835, "Occupational Radiation Protection", "Code of Federal Regulations: Main Page", http://www.gpoaccess.gov/cfr/

7 DOE Order 231.1A Change 1, "Environment, Safety and Health Reporting", http://www.directives.doe.gov/pdfs/doe/doetext/neword/231/o2311ac1.html

8 DOE Policy 441.1, "DOE Radiological Health and Safety Policy", http://www.directives.doe.gov/pdfs/doe/doetext/neword/441/p4411.html

9 DOE Guide 441.1-1B, "Radiation Protection Programs Guide", http://www.directives.doe.gov/pdfs/doe/doetext/neword/441/g4411-1b.html

10 American National Standards Institute (ANSI) N323-1978, "Radiation Protection Instrumentation Test and Calibration", http://webstore.ansi.org/default.aspx

See the SLAC Library, http://www.slac.stanford.edu/library/, for available standards.

Impacts 1, 2, and 3 differ in the extent of potential off-site consequences. In considering the potential consequences of a condition at a site or facility, the following factors should be considered:

1. The nature of possible accidents that could occur at the site or facility
2. The potential for off-site release of hazardous or radioactive material in case of an accident
3. The amount and type of hazardous or radioactive material present
4. The potential for deaths, injuries, or exposures of the off-site population

6.1.2 Site Personnel Safety and Health

Impact 4: Catastrophic: injuries/illnesses involving permanent total disability, chronic or irreversible illnesses, extreme overexposure (for example, 1000 rem/yr), or death

This impact encompasses potential permanent effects among the site worker population. Such effects may result from industrial accidents or excessive exposures to hazardous or radioactive materials. This impact includes immediate deaths and disabling injuries, as well as future deaths from latent effects such as cancer.

Example: Seismic example: a structural failure at SLAC that may result in serious injury to 1–100 persons site wide

Impact 5: Critical: injuries/illnesses resulting in permanent partial disability, temporary total disability (>three months), or serious overexposure (for example, 100 rem/yr)

This impact involves injuries, illnesses, or exposures that result in lengthy hospitalization and significant recuperation time but are not expected to result in death or permanent total disability. This impact includes exposures to radioactive or hazardous materials that may exceed published acceptable limits.

Example: Electrical example: individuals receive serious injuries due to contact with exposed electrical contacts

Impact 6: Marginal: injuries/illnesses resulting in hospitalization, temporary reversible illnesses with a variable but limited period of disability (<three months), slight overexposure (for example, 5–10 rem/yr.), or exposure near limits (20–100 percent)

This impact involves worker injuries, illnesses, or exposures that result in emergency room treatment, limited hospitalization, and lost work time. Time required for recuperation from these effects, however, is not extensive.

Example: Traffic example: a site or facility proposes a line item project to improve pedestrian and vehicular safety through roadway modifications. This project will improve sight lines at turns and intersections and widen narrow portions of site roadways. Under current conditions, the site or facility experiences about two road accidents per year. These accidents are typically minor but do occasionally result in injuries requiring limited hospitalization.

Impact 7: Negligible: injuries/illnesses that do not result in hospitalization, temporary reversible illnesses that require minor supportive treatment, or exposures below 20 percent of limits (for example, <1 rem/yr)

This impact involves worker injuries, illnesses, and exposures that would be expected to result in no lost work time (unless the exposure resulted in a cumulative dose exceeding limits). Standard first aid is expected to be adequate treatment.

Example: None provided

6.1.3 Compliance

Impact 8: Major noncompliance with federal, state, or local laws; enforcement activities; or compliance agreements significant to environment, safety, or health and involving significant potential fines or penalties

This impact includes major violations of laws, regulations, codes, enforcement actions, compliance agreements, or standards. These noncompliances have the following characteristics:

1. Violation of the law, regulation, code, enforcement action, compliance agreement, or standard could result in the imposition of fines on DOE or the operating organization, imprisonment of DOE or operating organization personnel, liability for the payment of significant damages, or other legal penalties.
2. The existing situation must represent a major, substantive noncompliance with the law, regulation, code, or standard. If existing conditions are substantially in compliance with only minor exceptions, this impact does not pertain. (See definition of Impact 10 below.)
3. The violated law, regulation, code, or standard must be significant to environment, safety, or health

If an ES&H activity addresses a major noncompliance with an environmental law or regulation, such as the Clean Air Act (CAA), the Resource Conservation and Recovery Act (RCRA), or the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), or it addresses a major noncompliance with a rule subject to penalties under the Price-Anderson Amendments Act, compliance impact should be 8.

In general, noncompliance with a DOE order should be scored using Impact 9 or 10 below because fines or criminal penalties do not typically result from DOE order noncompliance. Likewise, noncompliance with an Occupational Safety and Health Administration (OSHA) requirement or a DOE occupational safety and health order should be scored using Impact 9 or 10 below unless OSHA has the force of law at a site or facility (which is currently not the case at most DOE facilities). If an ES&H activity addresses a major noncompliance with an environmental law and a DOE order simultaneously, the applicable compliance impact with the highest potential risk reduction score should be chosen (in this case, Impact 8).

Example: Findings in OA internal, independent assessments of SLAC's compliance with OSHA and other regulatory body rules

Impact 9: Major noncompliance with executive orders, DOE orders/notices, or secretary of energy policy statements that are significant to environment, safety, or health but do not involve significant potential fines and penalties

This impact includes significant noncompliance with any DOE order/notice or policy statement that is significant to ES&H. To distinguish Impact 9 from Impact 8, noncompliance included under Impact 9 cannot result in fines, imprisonment, or other legal penalties. Impact 9 also includes site or facility noncompliance with laws, regulations, codes, and standards (for example, OSHA, NFPA, ANSI, NEC, MSHA) that are referenced in DOE orders, but do not have the force of law at the site or facility. As with

noncompliance covered under Impact 8, conditions of noncompliance included in this impact must be major, substantive noncompliance and must relate to requirements that are significant to environment, safety, and health. The impact does not include marginal noncompliance, such as minor administrative discrepancies (see definition of Impact 10 below).

Example: A recent assessment finding regarding SLAC's fall protection program (such as ladders, scaffolds, and roof work)

Impact 10: Marginal noncompliance with federal, state, and local laws; enforcement actions; compliance agreements; executive orders; DOE orders; or other rethat are significant to ES&H

This impact includes minor noncompliance with laws, regulations, codes, standards, orders, or directives that are significant to ES&H (the same group of laws and orders that are included in impacts 8 and 9). It is differentiated from impacts 8 and 9, which cover major noncompliance conditions. This impact pertains to conditions in which current ES&H programs largely conform to the requirements of applicable laws and orders but do not fulfill certain marginal or administrative aspects of the requirements. For example, if a site or facility has fulfilled the actual substantive physical requirements of a law or order but has not completed all administrative requirements or paper work, Impact 10 applies.

Example: A site or facility proposes to add one clerical employee to assist the industrial safety manager in support of the hazards communication program that was recently upgraded as required by DOE Order 440.1. The responsibilities of this new employee will be recordkeeping and clerical support for visiting assessment teams. Recent audits have indicated that the program is adequate, but to be in full compliance the site or facility must keep better records of communication activities and provide better clerical support for visiting assessment teams to allow them to obtain a more comprehensive picture of the state of the site or facility's compliance.

Impact 11: Significant deviation from good management practices

This impact indicates a significant deviation from accepted industry or DOE standards for the performance of activities in a given area. Such directives or good practices do not have the weight of a law, DOE order, or DOE policy statement issued by the secretary of energy.

6.1.4 Mission Impact

Example: None provided

Impact 12: Serious negative impact on ability to accomplish major program mission

This impact includes conditions that seriously curtail or prevent accomplishment of the mission of a major program at the site. The condition need not shut down the entire site but must threaten continuation of at least one of the site or facility's major research or production missions. Under this impact, the interruption of the affected program mission must be of sufficient duration to pose serious doubts about the feasibility of accomplishing yearly goals or objectives set for the program.

The program mission impact may be due to regulatory or administrative shutdown of part of a site or facility, a catastrophic accident preventing continued activities, or the unavailability of equipment, staff, or other resources required by the program.

Example: Radiological surveys of chemistry laboratories at a site have revealed previously unknown contamination outside of posted radiological areas. To comply fully with 10 CFR 835,[11] DOE Policy 441.1,[12] and DOE Guide 441.1-1B,[13] the site or facility proposes to fund systematic, detailed surveys of the laboratories and management of any contamination discovered. If this work is not performed, all chemistry division laboratories could be zoned as radiation areas, which would result in loss of effective use of the laboratory facilities and prevent progress in major programs that rely on the facilities.

Impact 13: Moderate negative impact on ability to accomplish major program mission

This impact includes conditions preventing accomplishment of major program missions at a site. Program interruptions considered under this impact are shorter than those included under Impact 12 above. Interruptions included under Impact 13 may pose risks to the achievement of set program goals or objectives, but still allow the possibility that such goals or objectives may be met.

Example: A site or facility must institute a site roadway safety and stabilization program to meet federal and state safety standards. This project will stabilize landslides adjacent to roads at the site. Without this work, the landslides threaten to displace roadways and underground utilities. If this occurred, access and utility supplies to some site buildings could be disrupted, interrupting programs in these locations. Repairs to re-establish access and utilities are not expected to cause an excessive disruption of progress on these programs.

6.1.5 Cost-effective Risk Management

Impact 14: Significant, avoidable cost due to degrading infrastructure, inefficient management systems or program implementation, accident-related capital loss (total cost > $25 million or annual cost > $5 million), or the opportunity for cost savings

Impacts 14 and 15 involve either the loss of DOE capital investment due to accidents or an existing opportunity for cost savings (such as infrastructure upgrades, management systems upgrades, or improved program development). The difference between impacts 14 and 15 is the dollar value shown to be at risk or the dollar value of the cost savings opportunity.

For Impact 14, the loss of investment could include loss of buildings, equipment, materials, finished products, or supplies, in which DOE had invested greater than $25 million. Such loss could be incurred by events such as fire, explosion, human errors, or natural occurrences.

In addition to situations involving financial loss due to accidents, Impact 14 also includes opportunities for cost savings that would have a positive financial impact. Prominent among such opportunities are situations in which an immediate preventive investment can help avoid a potentially greater cost impact in the future. Examples include neglected site or facility infrastructure for which short-term expenditures on physical upgrades or increased maintenance or surveillance can help avoid increased long-term costs due to

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11 Title 10, *Code of Federal Regulations*, Part 835, “Occupational Radiation Protection”, “Code of Federal Regulations: Main Page”, http://www.gpoaccess.gov/cfr/

12 DOE Policy 441.1, “DOE Radiological Health and Safety Policy”, http://www.directives.doe.gov/pdfs/doe/doetext/neword/441/p4411.html

13 DOE Guide 441.1-1B, “Radiation Protection Programs Guide”, http://www.directives.doe.gov/pdfs/doe/doetext/neword/441/g4411-1b.html

continued neglect or degradation or potential catastrophic damage. For Impact 14 to apply, the total cost savings must exceed $25 million.

Impact 14 also includes annual cost impacts greater than $5 million incurred as a result of a condition causing losses to a site or facility's capital stock. Similarly, Impact 14 includes opportunities for recurring annual preventive or other positive financial impacts exceeding $5 million. Examples include opportunities to develop improved ES&H management systems that increase the efficiency of managing ES&H issues, thereby promoting early identification of problems; setting appropriate priorities for addressing issues; and defining cost-effective activities for addressing issues.

Example: A site contractor has proposed launching a behavior-based safety process to improve worker safety and decrease the frequency of on-the-job injuries. The process includes workplace observation and feedback to workers to improve the safety of workplace behaviors. In addition to substantial expected safety improvements, the process is expected to yield substantial annual cost savings through reduction of workman's compensation expenses. The avoided costs could exceed $5 million per year.

Impact 15: Moderate avoidable cost due to degrading infrastructure, inefficient management systems, or program implementation, or accident-related capital loss (total cost <$25 million or annual cost $1 million to $5 million)

This impact is similar to Impact 14, with the exception of the dollar amounts, which include smaller investment losses or cost savings opportunities.

Example: A national laboratory and DOE Operations Office ES&H Division propose to develop an integrated issue management and commitment tracking system to improve the efficiency of ES&H management at the lab, increase accountability, and allow the Operations Office to perform its oversight role more productively. Implementation of such a system is expected to improve the cost-effectiveness of risk management activities with savings expected to approximate $1.5 million per year.

Example: A production site or facility plans to perform a pollution prevention/waste minimization opportunity assessment on one segment of the plant's process and to implement waste minimization activities based on the findings. Preliminary evaluations indicate that the resulting waste reduction would substantially reduce disposal costs. It is estimated that costs could be reduced by around $3 million per year.

6.1.6 Environmental Protection

Environmental impacts are defined as damage to a significant public resource such as air, water, land, or wildlife. These impacts would primarily result from accidents involving the release or spill of radioactive or hazardous materials to the environment.

Impact 16: Catastrophic damage to the environment (widespread and long-term or irreversible effects)

This impact includes the most severe environmental effects, those with both of the following characteristics:

1. The effects spread or may spread over a wide area and are not easily containable in a limited area
2. The effects are irreversible or may only be reversed over a period of several years

Example: A process at a site or facility involves the use of industrial solvents. The site or facility has proposed a project to improve the monitoring of releases from the process. Under current conditions, solvents may be released, disperse off-site, and contaminate groundwater that supplies the drinking water for a nearby community. The water supply would be unusable and an alternative supply would be needed. Cleanup of the groundwater is thought to require 30 years.

Impact 17: Significant damage to the environment (widespread and short-term effects or localized and long-term or irreversible effects)

This impact includes serious environmental effects that are less severe than those considered under Impact 16 above. These impacts must have one of the following characteristics:

1. The effects spread or may spread over a wide area but may be reversed in no more than a year's time, or
2. The effects are confined to a limited area but are either irreversible or require several years to reverse

Example: None provided

Impact 18: Minor to moderate damage to the environment (localized and short-term effects)

This impact includes less severe effects on the environment than those covered in impacts 16 and 17 and include both of the following characteristics:

1. The effects are confined to a limited area
2. The effects may be reversed within a year's time

Example: A site or facility proposes a project to construct double containment of feed lines into a diesel fuel tank to help prevent leaks. Currently, the tank is vulnerable to leaks, which could spill fuel and contaminate the soil in the area surrounding the tank. Because of the volume and location of the tank, however, the contamination will not spread off-site and will not contaminate any water sources. Cleanup should require only a few weeks.

6.1.7 Reputation

Impact 19: Repeated negative articles in national newspapers, repeated negative newscasts on national TV or radio

This impact includes the most severe reputational effects, those with both of the following characteristics:

1. The effects spread or may spread over to other Stanford University entities and organizations
2. The effects are irreversible or may only be reversed over a period of several years

Example: None provided

Impact 20: Negative article in national newspapers, negative newscast on national TV or radio, repeated negative articles in local newspapers, repeated negative newscasts on local TV or radio

This impact includes serious reputational effects that are less severe than those considered under Impact 19 above. These impacts must have one of the following characteristics:

1. The effects spread or may spread over to other Stanford University entities and organizations, or
2. The effects are irreversible or may only be reversed over a period of several years

Example: None provided

Impact 21: Negative article on front page of local newspaper; negative newscast on local TV or radio

This impact includes less severe reputational effects than those covered in Impacts 19 and 20 and include both of the following characteristics:

1. The effects are confined to SLAC
2. The effects are reversible or may be reversed within a year's time

Example: Poor M&O performance results in a published article in the San Francisco Chronicle and reported on Bay Area telecasts.

Impact 22: Negative article in local newspaper

This impact includes minimal/negligible reputational effects than those covered in impacts 19 and 20 and include both of the following characteristics:

1. The effects are confined to SLAC
2. The effects are reversible or may be reversed within a year's time

Example: During an annual community meeting, concerns were raised about the possibility of contaminants migrating off-site or to groundwater. Adjacent land holders took to the local newspaper, via the editorial page and specific articles, the issue of whether the university was appropriately sensitive to the issue, which was linked to the green space maintenance and management plan for university-owned property in Santa Clara County.