PMG-30

PRIORITIZATION GUIDE

U.S. Department of Energy
Office of Engineering and Construction Management

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Preface

This guide was originally developed by the U.S. Department of Energy (DOE) Office of Field Management now the Office of Engineering and Construction Management as part of a project to develop a series of instructional and source materials for better management of all projects undertaken by DOE. This updated guide provides information on the two most widely used prioritization methodologies that are commonly practiced in DOE to rate and rank projects to ensure proper allocation of limited resources. However, other prioritization methods can be used that perform to the criteria established within the Real Property Asset Management Order. It is important to note that the models discussed in this manual are only tools; they are not intended to replace management review and judgment.

The intended audience for this guide is field and headquarters program/project managers, engineers, design engineers, reviewing committees, and line managers. Personnel involved in facility maintenance and operations and decontamination and decommissioning may find applications of these models useful in allocating resources for these activities.

Suggestions or comments for improving this guide are welcome and should be sent to the following address.

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Office of Engineering and Construction Management
Prioritization Guide

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Acronyms and Abbreviations

ADS	Activity Data Sheet
ALARA	As low as reasonably achievable
ANSI	American National Standards Institute
CAA	Clean Air Act
CAMP	Capital Asset Management Process
CBR	Corporate Budget Review
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CSO	Cognizant Secretarial Officer
DNFSB	Defense Nuclear Facilities Safety Board
DOE	Department of Energy
DOT	U.S. Department of Transportation
E&WM	Environmental & Waste Management
EH	Office of Environment, Safety, and Health
EM	Office of Environmental Management
EMAB	Environmental Management Advisory Board
EPA	Environmental Protection Agency
ES&H	Environment, Safety and Health
FTE	Full time equivalent
G&A	General & Administrative
GPP	General Plant Project
H&S	Health & Safety
INEL	Idaho National Engineering Laboratory
IS	Information Systems
M&I	Mission & Investment
MC&A	Material control and accountability
MEM	Management Evaluation Matrix
MIS	Management Information System
MSSA	Master Safeguards and Security Agreement
MUA	Multiattribute utility analysis
NAS	National Academy of Sciences
NFPA	National Fire Protection Association
NNSA	National Nuclear Security Administration
NRC	National Research Council
OMB	Office of Management and Budget
OSHA	Occupational Safety and Health Administration
RBP	Risk-Based Prioritization
RCRA	Resource Conservation and Recovery Act
RDS	Risk Data Sheet
REM	Roentgen-equivalent-man
RPM	Risk-Based Priority Model
S&S	Safeguards & Security

SC	Office of Science
SNM	Special nuclear material
TRU	Transuranic waste
WBS	Work breakdown structure

Executive Summary

This updated prioritization guide was developed by the U.S. Department of Energy (DOE)-Office of Engineering and Construction Management for program/project mangers, engineers, and designers. This guide provides information for consistently applying prioritization methodologies that allocate budget resources to the most important activities.

The two models discussed in this guide are:

- Capital Asset Management Process Prioritization (CAMP),
- ES&H Risk-based Prioritization Model (RPM),

Each of these models is a risk-based system that measures the severity of a problem. Both systems can be used to evaluate a large number of diverse activities. Both systems cover worker health and safety, environmental management, the safeguarding and security of materials, mission activities, projects that are good investments, and the care and feeding of our aging infrastructure. All systems involve rating, scoring, and ranking procedures and are reviewed by field and headquarters management.

CAMP is a simple and direct method of ranking proposed capital projects. It uses four major rating categories to span a wide variety of problems and issues facing the Department. The CAMP method does not require the user to estimate probabilities, but allows probabilistic input when relevant. A well-established and tested system in use since 1991, the CAMP model was updated in 1996 to reflect current DOE strategic plans and missions.

The most widely used model for solving ES&H problems is probably RPM. RPM is the only model directly linked to the Department's budget process. The RPM score is calculated by taking the difference between the risk score before performance of the activity and the risk score after performance of the activity. This score measures the effectiveness of the activities/solution in reducing risks. RPM permits management to adjust RPM rankings to account for cost, precedence, and coupling relationships.

The scope of this guide includes the authority for using each model; program office points-of-contact for additional information and guidance; process attributes and applicability including what each model covers, when and where to use the process, and the model's current development status. Each model is discussed in a separate section that addresses the details of rating, scoring, ranking, and review and adjustment using real-life examples. Finally, in keeping with the advent of performance based contracting and the prioritization requirements in the Real Property Asset Management (RPAM) Order , requirements, performance objectives, criteria, and measurements are provided.

Each discussion of the four models includes an individual reference/reading list, list of definitions, and description of training courses or tools.

The guide does not recommend which prioritization model or methodology to use when rating and ranking projects. With the new RPAM order, Program Offices are responsible for developing, documenting, and maintaining a prioritization system for the acquisition of physical assets. The models discussed in this guide are used by Program Offices to meet this requirement. Any prioritization model that meets the requirements of the Real Property Asset Management Order can be used. Program/project managers should consult their respective operations offices or program officials in determining which method to use.

Prioritization of projects has become a very critical and valuable tool for program/project managers in allocating the Department's resources in a preferred order that is credible, consistent, auditable, and technically sound. All the guide models meet these requirements.

1. INTRODUCTION

This project management guide describes and illustrates the various prioritization systems used by the Program Offices for rating and ranking line item, infrastructure, and major expense projects. This guide provides an overview of the two most widely used risk-based prioritization (RBP) processes in the U.S. Department of Energy (DOE) for determining the preferred order for allocating limited resources to solve problems. As stewards of DOE's assets, managers should plan, acquire, operate, maintain, and dispose of their assets in a cost effective manner. Any model that determines this preferred order must be credible, consistent, auditable, and technically sound. The two models presented in this guide satisfy these criteria. The two systems are:

- Capital Asset Management Process Prioritization (CAMP),
- ES&H Risk-based Prioritization Model (RPM),

Current direction on prioritization is found in the RPAM order. This Order requires "a method for the prioritization of infrastructure requirements," asset management performance measures that address these methods, and a prioritization method for evaluating infrastructure needs associated with operation and maintenance of physical assets. Program Offices are to develop, document, and maintain a system to prioritize the acquisition of programmatic physical assets, including upgrades of site assets.

This guide explains the structure, usage, and applicability of each process. It is not intended to be a comprehensive description of each process or to serve as a training document for any process. The guide provides recommendations on when each method should be used, but it does not recommend a specific methodology to use. DOE O 430.1B gives that responsibility to the Program Offices. Consult your Program Office or Operations Office before selecting and starting any prioritization process. The two methodologies provide points of contact to call if you have any questions.

2. CAPITAL ASSET MANAGEMENT PROCESS (CAMP)

The Capital Asset Management Process (CAMP) prioritization model is available for prioritizing proposed capital projects at DOE sites.

2.1 CAMP Process Specification

2.1.1 Authority

DOE 4320.2, *Capital Asset Management Process*

This Order was replaced by the Life Cycle Asset Management Order (DOE O 430.1) in August 1995 which in turn was replaced by the Real Property Asset Management Order in September 2003.

2.1.2 Program Office Advocates/Assistance

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Under DOE O 430.1B, Real Property Asset Management, Program Offices develop, document, and maintain a prioritization model to use for capital projects and infrastructure needs.

2.2 Process Attributes/Applicability

2.2.1 Applicability

CAMP is used in prioritizing proposals for what are generally referred to as capital projects. These may include line item construction, expense-funded construction, general plant projects, and capital equipment projects for capital projects. This process is used at Environmental Management, National Nuclear Security Administration, and Office of Science sites for capital projects, landlord facilities, and infrastructure needs.

The prioritization process methodology is intended to achieve consistency in the allocation of resources within the same funding source, project reporting, and the accomplishment of DOE goals. Projects are compared by each program only within the same "pot of money" or source of funds. Projects are not compared across programs.

The users or project requestors perform the first step on all types of capital projects in the CAMP rating process. They identify all construction and equipment projects necessary to accomplish site missions. They perform the initial ratings on all line item and major expense projects with planned new starts in the budget year and the budget year plus one. Projects rated and submitted previously are

not rated again unless revisions to the project have occurred that would change the rating.

The CAMP prioritization process can be used for Line Item and major expense projects planned for the out years and for other types of projects such as Major Items of Equipment (over $1M), General Plant Projects, Productivity Improvement Projects, Accelerator Improvement Projects, maintenance (operating expense) projects, Capital Equipment Acquisitions (under $1M), and any related pre-decisional activities. Because of the diversity from one site to another, users may have to develop a site-specific, implementation prioritization procedure.

The most important thing to remember is that the process is only a tool, and it is not intended to replace management review and judgment.

2.2.2 Development Status

The CAMP model matrix was initially developed in 1990-91 at the Y-12 plant in Oak Ridge, Tennessee, with input from a wide cross-section of DOE and M&O staff involved in capital projects, under the auspices of the DOE Albuquerque Capital Assets Task Group. In 1994, a subcommittee was formed from the CAMP Planning and Analysis Group to update the matrix to reflect the Department's current values and culture. Recent improvements to the model include the addition of subcategories—Infrastructure, Business Benefits, National Business Strategies/ Partnerships, and Asset Condition—reflect these changing values. This subcommittee consisted of users, contractors, and DOE personnel with broad participation from M&O contractors, Field and Operations Offices, and Headquarters Program Offices (Defense Programs; Energy Research; Field Management; Environment, Safety and Health (ES&H); and Environmental Management). This subcommittee plans to meet biennially to update the matrix as necessary to reflect Department goals and strategic plans.

2.3 Approach Summary

The CAMP prioritization model is a systematic, risk-based method of establishing priorities for proposed capital projects at DOE facilities. The method is organized around a priority rating system for capital-related problems and issues that are benchmarked according to four major categories.

- Health and Safety (H&S),
- Environmental and Waste Management (E&WM),
- Safeguards and Security (S&S), and
- Mission and Investment (M&I).

Proposed capital projects are rated by means of the CAMP model by placing them directly on a scale on or near existing benchmarks. Benchmarks are organized within a major category in subcategories to facilitate the rating process. Each major category with its subcategories and benchmarks is organized into four CAMP Prioritization Matrices. (See the matrices located at the end of Section 2. An additional matrix covering all four major categories has been provided in Table V.) Because the need for capital projects may stem from a variety of sources that are not readily comparable and that may not be similarly quantifiable in terms of risk, the CAMP Prioritization Process is a simple and direct

method for locating projects on a risk-weighted scale without the requirement to estimate probabilities when this is not possible or appropriate.

Weights have been integrated into the structure and scaling of the benchmarked matrices. The categories, subcategories, and benchmarks reflect current DOE priorities for capital projects based on the problems and issues these projects are designed to solve.

Proposed projects that are rated in more than one of the four major categories receive extra credit for solving problems in multiple areas through the CAMP prioritization model. This process results in the assignment of numerical priority scores--one per project--by which proposed capital projects can be compared. Projects are normally rated in groups by site and then reviewed for consistency among the rating matrices and with judgment regarding priorities. Project rankings may be modified relative to the numerical ratings to factor in considerations of cost, special site requirements, and other circumstances. DOE field offices further review projects and adjust rankings or even ratings where appropriate. All rating adjustments are constrained by the benchmarks on the rating scales. Further reviews are conducted at the Headquarters level prior to establishing final funding recommendations.

2.4 Process Principles

The steps in the CAMP prioritization process are: (1) problem/project assessment, (2) rating, (3) scoring, (4) ranking, and (5) review/adjustment.

2.4.1 Problem/Project Assessment

Problem/project assessment is the process of characterizing the need for and scope of a proposed capital project in terms of the problems or issues it is designed to address, the degree to which those problems/issues are actually solved by the capital project, and the impact of not funding the proposed project or delaying it. Typically, each site prepares documentation for proposed capital projects as part of its overall capital planning function. This documentation is generally sufficient to allow for prioritization within the CAMP system.

2.4.2 Rating Process

The **rating** of proposed projects requires the use of the four major category matrices provided at the end of this section. The arbitrary numerical scale used in the system ranges from 20 (which represents good condition with few problems) to 80 (which represents extremely serious and near-term problems). For many of the subcategories within a matrix, the benchmarks do not extend to 80, either because the priority of a severe problem in that specific area is less than the priority for other areas, or capital construction does not represent a viable solution to such a serious and immediate problem.

The initial rating step is to evaluate the relevance of the major categories. When a major category is relevant, one or more subcategories are selected as most applicable to the proposed project. For a subcategory, benchmarks are shown on the matrix that describe the condition and give its numerical rating. The proposed project is "placed" on the scale within a subcategory on or near existing benchmarks. For each appropriate subcategory, a project may be rated in 5-point intervals, which

allows the person performing the rating to interpolate between the given benchmarks as desired. Within a major category, the overall category rating is selected from the highest subcategory rating identified on the matrix. The rationale here is that the subcategories are considered to be different aspects of the same general problem (such as a health and safety problem), and projects should not receive extra weight for scores in multiple subcategories within the same major category. This also discourages "gaming" of the system.

2.4.3 Scoring Process

With regard to overall project **scoring**, a scoring rule is provided that does give projects additional credit for scores in multiple major categories. The rationale here is that the major categories represent fundamentally different problems, and that projects that solve several different problems should have higher priority than projects that solve only one, other things being equal.

The scoring rule combines ratings in each of the four major categories, with a default score of 20 for any category that has not been scored. If a project is rated in only one major category, its overall score is the same as that category rating. Each additional category may credit the overall project score up to 3 points (up to 9 points total if all four major categories are involved). The full 3 points are awarded if the additional major category rating is equal to or near the highest major category rating. Less credit is awarded on a pro rata basis depending on the additional category rating relative to the highest category rating. Major categories that are rated low or defaulted at a 20 rating generate no additional points for the overall score.

The calculation for the CAMP prioritization score is as follows.

OVERALL SCORE =
HIGHEST MAJOR CATEGORY RATING +
3 x (NEXT CATEGORY RATING - 20)/(HIGHEST CATEGORY RATING - 20) +
3 x (NEXT CATEGORY RATING - 20)/(HIGHEST CATEGORY RATING - 20) +
3 x (NEXT CATEGORY RATING - 20)/(HIGHEST CATEGORY RATING - 20)

2.4.4 Ranking Process

The initial **ranking** of projects follows directly from the numerical scores obtained in the scoring process described above.

To minimize bias and provide consistency during the project rating and ranking, the process must include management participation. As an *option*, management could establish a focal point and a rating or review committee. These personnel would form the nucleus of the line management review and should promote consistency, equitable application of ratings, and fair and accurate comparisons.

These same steps or a variation should occur during DOE review. This starts with the DOE at the installation and progresses to the Operations Office and finally to Headquarters. DOE involvement

and participation including upper management will lead to the formalization of a capital budget, which is used to implement projects that are carried out to correct prioritized deficiencies.

2.4.5 Review and Adjustment

The **review** and validation step is necessary to ensure that projects have been credibly and reasonably scored and that overall project rankings are in line with expectations, or that differences are well understood. The first step in the review is to look at projects as a set, examining each project score for reasonableness and performing pairwise-comparisons to determine if relative rankings are reasonable as well. This review involves both a project-by-project review as well as a score "crosscut," which is used to examine all projects in a certain scoring range. This review process may result in either changes to the score for a project or simply changes in the ranking (without changing the score).

Project score changes should be well-justified and are always bounded by the benchmarks on the matrices. Any project with a high score must be considered higher priority than all benchmarks with lower numerical values. Sometimes, the relative ranking of a set of projects may be altered without changing the numerical scores simply by identifying considerations at the site, field office, or Headquarters level, which may not have been adequately factored into the overall prioritization. The validity of a recommended ranking change will, of course, be evaluated carefully by higher levels of management.

2.5 Approval Process

Once a project has been rated and ranked, it proceeds through an approval process that includes the sites, the field office, and Headquarters. The following paragraphs describe this process. It is important to note that the process described is not consistent for every DOE level of management from the site all the way to Headquarters, but could be labeled as typical.

DOE at Site. DOE oversight at an installation/site should always include management review and approval of the site's project rating and rankings. This management review and approval process may include contractor project and program manager presentations of each project and justification for the rating selection. Some sites have a DOE representative as a voting member on the contractor's rating committee. This DOE representative can then brief DOE management on the justification for the project ratings and validate the project rating scores. These are examples of DOE site involvement, and there are probably many other procedures that would be equally acceptable.

DOE Field Office. The DOE Field Office priority rankings should always include management's review and approval of the site's project rating and rankings. Some Field Offices have a Rating Committee that rates projects based on presentations from the site's contractor program and project managers. This Rating Committee is almost a necessity if the Field Office is responsible for many sites involving multiple contractors. The Rating Committee provides the first step in the line management review of projects. The first management review begins the project normalization process to ensure that projects from the various sites can be compared. The second step for Field Office management review may include an upper management review council. The Field Office CAMP Coordinator would present, the Rating Committee's rankings to this review council prior to obtaining the Field

Office Manager's approval. The Field Office Manager's approval would be the last step in this review process. All of the various levels of DOE management review and approval for the project rankings will help minimize bias and tend to normalize all the projects across the various sites.

DOE Headquarters. Headquarters may re-rate and will re-rank each proposed "new start" line- item project. Headquarters program offices base their rating scores on the project justifications developed and stated on the project documentation provided by the sites. Therefore, it is very important to have an excellent justification document that gives the significant reasons that support the identified rating criteria subcategory "drivers." Headquarters program offices value the CAMP rating process because it minimizes bias and results in a consistent and objective rating for all projects DOE-wide.

2.6 Real-Life Examples

Two rating examples are provided below. Very detailed explanations have been provided to facilitate understanding. These are actual projects that have been generalized slightly for illustrative purposes.

2.6.1 Example 1: Utility System Modernization

Description and Justification. This project will replace parts of an essential utility system (electrical) for a large multipurpose DOE site. The utility system is the only source of electricity for the site, which contains one-of-a-kind facilities for an ongoing national defense mission as well as one-of-a-kind waste disposal facilities serving the entire DOE complex.

The utility system is connected to the electricity source through two switching stations that have experienced frequent outages over the past 3 years. Some essential major components of the switching stations are so old that suppliers no longer stock parts. Failure of one of these major components, an event judged likely within the next 10 years, could close down the entire site for several weeks until replacements could be located and installed, resulting in delays in meeting mission assignments, particularly at the defense facility.

Step 1 - Identify the Relevant Rating Categories and Subcategories. The CAMP prioritization system does not restrict the number of subcategories that can be rated and it is in the interest of project proponents to rate all subcategories that apply. Each subcategory should be systematically examined to determine if it applies to the problem being remedied by the proposed project. Looking first at the Health & Safety prioritization matrix sheet, for example, does this utility system modernization deal with a problem of **H&S: Compliance with Orders and Laws**?[1] No. Does the project deal with a problem of **H&S**: Technological Base? No. Does it deal with **H&S**: Industrial Hygiene? The process is continued until all subcategories that apply have been identified.

Not until we reach **H&S: Infrastructure** do we get close to a situation that may represent a problem. The utility system is infrastructure. However, both from the category heading and from the prototypical descriptions within the subcategory, it is clear that the intent of that subcategory is to identify situations in which an infrastructure problem may cause injury or death. The description of this project does not mention this possibility and for the purpose of this example, we will assume that the justification has all the relevant information. In real life, some relevant information may have been omitted from the justification; systematic review of all subcategories will help to surface such omissions so that the additional information can be added to make the description complete.

Turning to the environmental and waste management subcategories within the Environment & Waste

[1]For convenience, the notational convention is adopted in which category and subcategory are shown in bold type separated by a colon (**Category: Subcategory**). Categories are abbreviated: H&S for health & safety; E&WM for environmental & waste management; S&S for safegurards and security; M&I for mission & investment.

Management Prioritization Matrix Sheet, each is found to be irrelevant until we reach **E&WM: Infrastructure**. (Each of the categories has a subcategory called Infrastructure, with the only difference being the type of secondary impact that infrastructure inadequacies may cause.) Failure of the electrical system could have an impact on the waste disposal operation at the site. Continuing in a similar manner through the remainder of the subcategories, only one more, **M&I: Infrastructure**, is identified as relevant. This is found in the Mission & Investment Prioritization Matrix Sheet The utility system modernization project will be given rating scores on these two subcategories.

Step 2 - Assign Rating Scores to Each Relevant Subcategory: Subcategory scores are assigned by comparing the severity of the situation described in the project justification with that of the prototypical situations on the subcategory scale. The real life situation is unlikely to correspond exactly to any of the prototypical ones, but usually one can use the prototypes to bracket the real situation being rated.

Working first with **M&I: Infrastructure,** it should be determined whether this problem is as severe as the prototypical 70: "System failure highly likely, with associated loss of critical/strategic mission capability." The national defense facility meets the definition of a strategic facility (see Glossary); it is an essential facility in the accomplishment of a strategically-important national mission. Yet the project does not rate a 70 because the subcategory does not represent a "highly likely" system failure that would result in "loss" of "mission capability." At worst, failure of the switching station would cause delays.

Does the project rate a 60: "System failure likely, with associated inability to meet overall mission assignment"? The probability language, likely, is a match, but the consequence is delay, which is not likely to jeopardize an overall mission assignment. How about 50: "System failure possible, with occasional inability to meet some significant mission requirements"? This consequence, occasional inability to meet some significant mission assignments, is in concert with the delay described in the project description/justification. However, the probability of failure of this electric system is "likely," higher than the "possible" described for a 50 rating. Thus, the rating is higher than 50 and lower than 60; this subcategory rates a 55.

A similar procedure should be followed to assign a rating for the **E&WM: Infrastructure** subcategory. The score will be lower because only failures causing violations or excessive waste generation or severe environmental impact score points. Failures of this electric system may cause delays in the acceptance of wastes from other DOE sites, delays approximately equal to the length of the system outages. If these delays, days to weeks at most, cause additional violations of waste storage permits at shipping sites, then the project could score 40 (at most) in this subcategory. One could argue that even a 40 is too high, unless the system failures cause "numerous occasional" violations; however, as will be seen in the next section, the computation is not very sensitive to whether we assign a value of 30 or 40 to this subcategory.

Step 3 - Compute the Aggregate Rating Score. According to the CAMP aggregation rules, the category scores are as follows.

H&S:	20 (the default for unrated categories)
E&WM:	40
S&S:	20
M&I:	55

The category scores are combined by adding to the highest category score (55 in this case) up to 3 additional points for each rated category, according to the formula 3 * (secondary category score - 20)/(highest category score - 20).

The two category scores, 55 and 40, should be combined according to the CAMP formula.

M&I:	55
E&WM:	+2 [3 * (40-20)/(55-20)]
Total Score	57

2.6.2 Example 2: Central Supply Facility Construction

Description and Justification: This project is to design, procure, and construct a Central Supply Facility for a large DOE site to replace existing deteriorated facilities scattered throughout the site. Functions of the facility will include receiving, storing, distribution, property management and shipping of general supplies, hazardous materials, and records.

The supply facilities are responsible for storing all records for the site and currently provide inadequate fire separations/enclosures in the storage area. Condition assessment survey findings based on DOE's CAS/CAIS system cited deteriorating sprinkler systems in the existing supply facilities, resulting in a potential for extensive fire damage, property loss, possible injury/death to personnel, and consequently a disruption of operations and services. The current facilities violate the American Disability Act regulations; industrial hygiene is adversely affected due to friable asbestos in the exterior building enclosure of many of the buildings; lighting and ventilation systems are inadequate, and the electrical and mechanical systems are unprotected and constitute a safety hazard.

Accountability of material, equipment, and staff time is compromised because records are stored in various buildings, inviting misplacement of records and theft and loss of equipment. The current facility hampers the efficient circulation and moving capabilities of property, equipment, and staff resulting in an inefficient operation that impairs the facility's ability to meet requirements and missions of the operating division.

Step 1 - Identify the Relevant Rating Categories and Subcategories. The CAMP model does not restrict the number of subcategories that can be rated and it is in the interest of project proponents to rate all subcategories that apply. Each subcategory should be examined systematically to determine if it applies to the problem being remedied by the proposed project. Does this central supply facility deal with a problem of **H&S: Compliance with Orders and Laws**? Yes. Does the project deal with a

problem of **H&S: Technological Base**? No. Does it deal with **H&S: Industrial Hygiene**? Yes (and so on).

As a result of step 1, the following subcategories are selected.

H&S: Compliance with Orders and Laws
H&S: Industrial Hygiene
H&S: Industrial Safety
H&S: Fire Protection
S&S: Protection of Property from Theft and Loss
M&I: Mission Capability, Capacity, and Quality

Step 2 - Assign Rating Scores to Each Relevant Subcategory. Subcategory scores are assigned by comparing the severity of the situation described in the project justification with that of the prototypical situations on the subcategory scale. The real-life situation is unlikely to correspond exactly to any of the prototypical ones, but usually one can use the prototypes to bracket the real situation being rated.

Beginning with **H&S: Compliance with Orders and Laws**, the continuous violations of the Americans with Disabilities Act are judged to be "minor," rating a 40. The rating for **H&S: Industrial Hygiene** is based on the asbestos. The situation is not as bad as 50, which indicates "Frequent violation...leading to minor injuries - no controls in place"; however, it is worse than 30, and does not provide "Routine acceptable performance." The situation can be mitigated because the asbestos is in the exterior building shell so that exposure potential only exists when maintenance work penetrates the shell, in which case administrative controls can prevent exposure. Thus, the situation corresponds to 40, "Prevent against frequent violation of exposure standards only through administrative controls."

The **H&S: Industrial Safety** rating is based on the unprotected electrical and mechanical systems. This situation does not meet "established internal objectives," so is worse than 30. However, the Description and Justification does not mention any injuries, so the situation is not bad enough to rate a 40 and is assigned a 35. **H&S: Fire Protection** is harder to peg. It is not as bad as a 60 because no losses are noted in the Description and Justification and the 60 prototype says "significant property losses routine." It clearly rates higher than 30, which is described as "acceptable risk." A 40 rating, associated with "Events with minor injury likely," is probably not high enough because the Description and Justification says "possible injury/death." The situation in the existing supply facilities appears close to that described at a rating of 50, "serious injury moderately likely...occasional significant property loss." The subcategory **S&S: Protection of Property** is assigned a rating of 35; existing facilities are apparently not quite up to "standard industrial protection" standards, which would rate a 30, but no losses have yet occurred, a requirement for a 40 rating. The subcategory, **M&I: Mission Capability, Capacity, and Quality** is rated a 40, "Adequate...; problems likely."

Step 3 - Compute the Aggregate Rating Score. According to the CAMP aggregation rules, the highest subcategory rating in a major category becomes the category rating. The category scores are as follow.

H&S:	50
E&WM:	20 (the default for unrated categories)
S&S:	35
M&I:	40

The overall score is computed by adding to the highest category score (50 in this case) up to 3 additional points for each rated category, according to the formula 3 * (secondary category score - 20)/(highest category score - 20).

Combining according to the CAMP formula, the total score is:

H&S:	50
M&I:	+2 [3 * (40-20)/(50-20)]
S&S:	+2 [3 * (35-20)/(50-20)]
Total Score	54

2.7 Measuring for Results

Two types of "results" are discussed here: (1) successful implementation of a prioritization methodology designed to rank proposed capital projects in a consistent fashion, and (2) actual selection of proposed capital projects which accurately reflect department priorities.

2.7.1 Performance Objectives

With respect to the capital prioritization method itself, the objective is to implement a risk-based method which creates an environment in which effective and consistent project selection can take place. The CAMP Prioritization model meets this objective.

Regarding the subsequent selection of capital projects, the objective is to identify and rank proposed projects which effectively address problems and issues at DOE sites based on DOE values and priorities. The CAMP Prioritization model provides a mechanism for accomplishing this, especially through the inclusion of factors from four diverse major rating categories.

2.7.2 Performance Criteria

Performance criteria for establishment of the capital project prioritization method relate to site adoption and implementation of an adequate method; DOE field and headquarters understanding and use of the method; and ability of DOE to integrate site results into DOE-wide project priorities where appropriate. There is no current assessment available of the degree to which these criteria are being achieved with the CAMP Prioritization model, since DOE is in a transition between the requirements

of the CAMP Order and those of the LCAM Order.

A performance criterion regarding actual selection of capital projects is the ability to validate capital project rating scores and their linkage to benchmarks. The existence of explicit benchmarks with the CAMP Prioritization model allows for this validation to occur, with differing results from different DOE sites, depending on the degree of understanding of the model and the aggressiveness with which it has been applied.

2.7.3 Performance Measures

Measures for the prioritization method itself tend to be qualitative, and include whether an approach has been selected and implemented at a site (or field or headquarters); the degree to which that approach meets requirements that an approach be risk-based and consistent with Departmental values and priorities; and whether the implementation is adequately utilizing the features on the chosen method. Measures such as these are now under consideration regarding capital project prioritization as it relates to the implementation of the LCAM Order.

Possible measures for the actual selection of capital projects include the results of review and validation exercises which examine the extent to which project rankings change when ranked by an independent group using the same method, and a comparison with judgment-based orderings for small numbers of proposed projects. The latter approach has been used in the development and refinement of the CAMP Prioritization methodology. The independent rankings approach is encouraged on an ongoing basis for CAMP Prioritization model implementation and may be used at the Headquarters level in integrating project recommendations.

2.8 References/Reading List

DOE Order 430.1, *Life-Cycle Asset Management Order*.

Capital Asset Management Process Handbook, Section 8 - Prioritization Process; Suggested CAMP Prioritization Procedure, Appendix I

DOE Order 4320.2A, *Capital Asset Management Process*.

Memorandum from K.C. Baker (FM-20), November 18, 1994, *Supplemental Prioritization Information*. Contains guidance and background on use of recently updated prioritization matrices. Capital Asset Management Process Prioritization Training Handouts, DOE FM-20 training materials for CAMP prioritization.

Department of Energy Capital Asset Management Process: Risk Based Prioritization System, Martin Marietta Energy Systems Y/GP-154, October 1991. Contains development history and analytical background for methodology of the system prior to 1994 updating.

Summary Report on CAMP Prioritization Update Support, SAIC, September 1994. Provides description of the update process and rationale.

Summary Comparison of Key DOE Risk-Based Prioritization Approaches, SAIC, March 1994. Provides comparison of main features of five selected DOE prioritization methods, before recent CAMP update.

2.9 Definitions for Terms Used in Prioritization Matrix

ALARA (As low as reasonably achievable). An approach to radiation protection to control or manage exposures (both individual and collective to the workforce and general public) so that they are as low as social, technical, economic, practical, and public policy considerations permit. ALARA is not a dose limit but a process, which has the objective of dose levels as low as reasonably achievable.

Capacity and Capability. Related terms for describing mission readiness; capability refers to the ability to perform while capacity refers to the achievable production rate.

Criticality. The assembly of fissile material in a quantity and configuration that causes a self sustained nuclear chain reaction. DOE's program to avoid accidental nuclear criticality is defined in DOE Order 420.1, FACILITY SAFETY.

Infrastructure. Utility and other support systems on the DOE site that support the category specific equipment and facilities. For example, the site electrical distribution system is infrastructure that supports the operation of radiation monitors (Health and Safety category), waste processing facilities (Environmental and Waste Management category), perimeter detection and alarm systems (Safeguards and Security category) and production facilities (Mission and Investment category).

MSSA (Master Safeguards and Security Agreement). A formal agreement requiring the joint approval of the Field Element manager and the cognizant Program Secretarial Officers for the levels of protection of graded safeguards and security interests from theft, sabotage, and other malevolent acts associated with special nuclear material (SNM) or vital assets that may adversely affect national security or the health and safety of the public.

Pairwise-Comparisons. Pairwise-comparisons are comparisons of proposed projects two at a time. This is dones to better understand relative rankings.

Payback (Simple Payback). The length of time required to pay for an investment from the resulting stream of savings or revenue. Simple payback is an undiscounted measure of costs relative to benefits, computed as the ratio of one time cost to annual savings. For projects with more complicated cost and savings streams (e.g., recurring costs or declining savings), it will be necessary to compute a discounted present value cost and an annualized revenue or savings stream before computing the simple payback period. See OMB Circular No. A-94 Revised, "Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs."

Probability and Frequency Languages. The languages used in the benchmark rating criteria for all four major categories (see Tables I through IV) and their respective subcategories have many different

terms. Standardized languages and algorithms minimize the possibility of misinterpreting benchmark rating criteria for all four major categories and their respective subcategories. Definitions of these terms are subject to different interpretations among the various users. Those standards and their corresponding ranges are shown in the tables below.

PROBABILITY LANGUAGE	
Standardized Terms	Range (Events/Year)
Essentially Impossible	($<10^{-8}$)
Extremely Unlikely	(10^{-8}-10^{-6})
Unlikely	(10^{-6}-10^{-3})
Slightly Likely	(0.001-0.1)
Possible	(0.01-0.1)
Moderately Likely	(0.1-0.4)
Likely	(0.4-0.7)
Highly Likely	(0.7-1.0)

FREQUENCY LANGUAGE	
Standardized Terms and Synonyms	Frequency Range (Context Dependent)
Consistent(ly), continuous, almost always	>98% of the time
Routine(ly), generally	>90% of the time
Frequent(ly), often, common	12 to 120 per year
Many, numerous	10 to 100 per year
Some, several	5 to 50 per year
Occasional(ly), few	1 to 10 per year

REM (Roentgen-equivalent-man). A measure of the biological effect of ionizing radiation, one REM is a dosage of ionizing radiation that will cause the same biological effect as one roentgen of x-ray or gamma-ray.

SNM (Special Nuclear Material). The acronym for "special nuclear material and/or tritium," consistent with colloquial usage in some parts of the DOE complex. The Atomic Energy Act of 1954 defines "special nuclear material" to include uranium enriched in the isotope 233 or in the isotope 235, and plutonium. By Atomic Energy Act definition, tritium is "by-product material."

SNM Accountability. A program set up to assure a high level and uniformity of protection for nuclear material. Program safeguards include those measures required to prevent, detect, and/or deter threats of diversion, theft, sabotage, and/or accidental or inadvertent loss of SNM. The criteria involved in the material control and accountability (MC&A) systems and procedures can be found in DOE Order 5633.3B.

Strategic Facilities. Facilities that are essential for meeting goals of programs of national strategic importance, typically but not necessarily involving national security.

Technological Base (R&D). A subcategory of each of the four matrix categories that refers to research and development opportunities to expand the technological base available for solving the problems in that category.

Attachments: Major Category Matrices

Attached are the four major category rating matrices.

I. HEALTH and SAFETY RATING CRITERIA SUBCATEGORIES

Score	Compliance with Orders and Laws	Technological Base (R&D)	Industrial Hygiene	Industrial Safety	Fire Protection	Health Physics	Criticality	Infrastructure
20	In compliance, but upcoming problems slightly likely	Develop new approaches, techniques, and methodologies to improve health and safety operations	Very effective program to limit exposure below standards	Few concerns, with occasional minor incidents	Property loss extremely unlikely or of trivial value	Effective ALARA program	Deviation minor change from approved conditions or procedures (Category 1)	
30	Consistently in compliance, with occasional minor deviation; not best management practice	Develop new methodologies, processes, and techniques to improve/enhance health and safety mission capability and efficiency; high R&D risk	Routine acceptable performance in maintaining exposure at/below standards	Meeting established internal objectives	Standard industrial protection, with acceptable risk; some property losses expected	Moderate exposure to the public slightly likely (1-5 REM/yr); exposure to workers up to 1 REM/yr moderately likely	Infraction significant change from approved conditions or procedures but no realistic way to cause a criticality (Category 2)	
40	Frequent minor violations	Develop necessary methodologies, processes, and techniques in support of critical health and safety mission objectives; high R&D risk	Prevent against frequent violation of exposure standards only through administrative controls	Minor injuries exceed goals	Events with minor injury likely		Event with probability approximately 10^{-3}	System frequently inadequate or occasional failure, with numerous associated minor injuries likely
50	Frequently in compliance, but serious violations occasionally occur	Develop new methodologies to improve/enhance health and safety mission capability and efficiency; acceptable R&D risk	Frequent violation of exposure standards leading to minor injuries no controls in place	Minor injuries frequent, or serious injury moderately likely	Serious injury moderately likely; standard industrial protection; occasional significant property loss	Continuous low-level exposure to the public likely (.01-1 REM/yr); high exposure to workers slightly likely (10-100 REM/yr)		System failure possible, with serious injury moderately likely
60	Serious violations frequent, or some continuing minor deviations with shutdown possible	Develop necessary methodologies, processes, and techniques in support of critical health and safety mission objectives; acceptable R&D risk	Potential substantial danger to site personnel through exposure; near-term action required	Serious injury likely	Serious injury likely; significant property losses routine	Excessive exposure to the public slightly likely (5-100 REM/yr); worker exposure above regulatory limits likely (5-10 REM/yr)	Violation continuation of activity would significantly increase probability of criticality (Category 3)	System failure likely; serious injury likely
70			Substantial danger to personnel; fatalities possible	Fatalities possible	Fatalities possible	Moderate exposure to the public likely (1-5 REM/ yr); worker fatality slightly likely	Event credible with possibility 10^{-6}	Life-threatening system failure highly likely
80			Life-threatening situation highly likely	Life-threatening situation highly likely	Life-threatening situation highly likely	Life-threatening situation highly likely	Criticality or near criticality (Categories 4 and 5)	

II. ENVIRONMENTAL and WASTE MANAGEMENT RATING CRITERIA SUBCATEGORIES

Score	Compliance with Orders and Laws	Technological Base (R&D)	Liquid and Hazardous Waste	Solid and Hazardous Waste	Airborne Pollutants	Waste Minimization	Environmental Restoration	Corrective Activities	Infrastructure
20		Develop new approaches, techniques, and methodologies to improve environmental and waste management operations			Consistently meets requirements	Process generates relatively little waste	Decontamination and decommissioning (D&D) at sites with no present imperatives		
30	Consistently in compliance, with occasional minor deviation; not best management practice	Develop new methodologies, processes, and techniques to improve/enhance environmental and waste management mission capability and efficiency; high R&D risk	Occasional discharge exceeding material goals		Emissions currently within permitted levels, but hard to maintain	Process generates more waste than an efficient process	Remedial actions/D&D needed to reduce risk, promote compliance, or maintain mission continuity		
40	Occasional/or frequent minor violations	Develop necessary methodologies, processes, and techniques in support of critical environmental and waste management mission objectives; high R&D risk	Occasional violation of discharge limit	Occasional inadequacy of permitted storage/handling/transport/packaging/disposal capacity	Emissions occasionally exceed permitted levels by a small amount	Process generates excessive waste			System frequently inadequate or occasional failure, with numerous occasional environmental permit violations
50	Frequently in compliance, but serious violations occasionally occur	Develop new methodologies to improve/enhance environmental and waste management mission capability and efficiency; acceptable R&D risk	Many or immediate violations; lack of adequate storage/treatment/handling/transport/packaging facilities	System capacity frequently inadequate	Emissions frequently exceed permitted levels by a large amount	Process generates waste that exceeds regulatory limits	Remedial actions/D&D required by in-force agreements	Out-of-compliance with requirements, but no signed agreement	System failure possible, associated with occasional serious environmental violations or frequent excessive waste generation
60	Serious violations frequent; violation of law with potential serious civil or criminal problems	Develop necessary methodologies, processes, and techniques in support of critical environmental and waste management mission objectives; acceptable R&D risk	Offsite discharge extremely high on occasion (not life-threatening)	System inadequate with likely serious environmental impact; shutdown possible	Emissions extremely high on occasion (not life-threatening)	Process generates excessive waste such that severe environmental impact is likely	Actions required as part of a signed interagency agreement	Actions required as part of a signed inter-agency agreement	System failure likely, with associated frequent serious violations of environmental regulations or law
70			Offsite discharge extremely high on occasion (life-threatening possible)	System inadequate with highly likely serious environmental impact; near-term significant risks	Emissions extremely high on occasion (life-threatening possible)		Remedial actions/D&D required to protect from near-term significant risks	Actions needed within 1 year to prevent significant risks	System failure highly likely, expected to result in severe environmental impact or extremely high emissions

III. SAFEGUARDS and SECURITY RATING CRITERIA SUBCATEGORIES								
Score	Compliance with Orders, Regulations, Policies, MSSA	Technological Base (R&D)	SNM Accountability	Protection of SNM	Protection of Class. Info., Technology, and Parts (Non-SNM)	Protection of Property from Theft and Loss (Non-SNM, Non-Classified)	Protection from Hostile Action	Infrastructure
20	Consistently in compliance, with some minor deviations	Develop new approaches, techniques, and methodologies to improve safeguards and security operations	Consistently meets standards	Very secure only remote, unlikely scenarios could succeed		Some small losses expected		
30	Routinely in compliance, with some minor deviations; not best management practice	Develop new methodologies, processes, and techniques to improve/enhance safeguards and security mission capability and efficiency; high R&D risk	Frequent or minor problems, but compensatory measures available	Theft or diversion possibilities acceptably countered	Theft or diversion possibilities normally countered	Standard industrial protection	Safe and secure; normal concerns	
40	Frequently in compliance, but serious violations occasionally occur for classified information, technology, and parts	Develop necessary methodologies, processes, and techniques in support of critical safeguards and security mission objectives; high R&D risk	Accountability difficult within reasonable response time, but resolution moderately likely			Occasional significant loss; frequent minor loss		System frequently inadequate or occasional failure, with associated frequent minor security/safeguards problems
50	Serious violations frequent for classified information, technology, and parts, or many continuing violations	Develop new methodologies to improve/enhance safeguards and security mission capability and efficiency; acceptable R&D risk	Serious problems; accountability uncertain within reasonable response time	Theft or diversion possibilities that evade initial detection systems		Occasional major loss	Cannot reasonably assure protection; serious injury possible	System failure possible, with occasional serious security violations
60	Frequently in compliance, but SNM violations occasionally occur	Develop necessary methodologies, processes, and techniques in support of critical safeguards and security mission objectives; acceptable R&D risk	Numerous SNM violations	Cannot reasonably assure protection	Loss of classified information, technology, or parts is likely (intentional or unintentional)		Cannot reasonably assure protection; serious injury likely	System failure like-ly, with associated serious violations or inability to reasonably assure SNM protection
70	Many serious violations for classified information, technology, and parts; many SNM violations; pervasive lack of compliance with SNM regulations			Reasonable scenarios likely; deviation or theft pathways apparent			Terrorist attack or hostage situation likely with fatalities possible	System failure high-ly likely, with numerous SNM violations or deviation/theft pathways apparent
80	Extreme threat to SNM or permanent (highly likely)							

IV. MISSION and INVESTMENT RATING CRITERIA SUBCATEGORIES

Score	Compliance with Orders, Initiatives, and Directives	Business Benefits	Technological Base (R&D)	Mission Capability, Capacity, and Quality	Asset Condition	Infrastructure	National Business Strategies/ Partnerships
20	In compliance, but upcoming problems slightly likely		Develop new approaches, techniques, and methodologies to improve operations	Adequate to meet mission requirements	Good performs to original specs with routine preventive maintenance		High likelihood of moderate growth over long-term in direct jobs and economy; DOE involvement required due to technology hurdles
30	Consistently in compliance, with occasional minor deviations; not best management practice		Develop new methodologies, processes, and techniques to improve/enhance mission capability and efficiency; high R&D risk	Adequate to meet mission requirements, but improvements warranted	Adequate but cannot perform to all original specs; some corrective maintenance required		High likelihood of moderate growth over near-term or large growth long-term in direct jobs and economy; DOE involvement required due to technology hurdles
40	Frequent minor violations	Project payback 8-10 years for projects with continuing need	Develop necessary methodologies, processes, and techniques in support of critical mission objectives; high R&D risk	Adequate to meet mission requirements; problems likely	Fair occasional sub-standard operation; extensive corrective maintenance	System frequently inadequate or occasional failure, with associated frequent minor impact on operation/mission	High likelihood of large growth over near-term in direct jobs and economy; DOE involvement required due to technology hurdles
50	Frequently in compliance, but serious violations occasionally occur	Project payback 4-7 years for projects with continuing need	Develop new methodologies to improve/enhance mission capability and efficiency; acceptable R&D risk	Moderately likely not to meet mission requirements	Poor consistent sub-standard performance	System failure possible, with occasional inability to meet some significant mission requirements	
60	Serious violations frequent, or many continuing minor deviations with shutdown possible	Project payback 0-3 years for projects with continuing need	Develop necessary methodologies, processes, and techniques in support of critical mission objectives; acceptable R&D risk	Cannot meet mission capability; or unique capability in jeopardy	Poor operations/mission threatened or at risk	System failure likely, with associated inability to meet overall mission assignment	
70					Critical strategic facilities inoperable	System failure highly likely, with associated loss of critical/strategic mission capability	
80							

V. CAMP SUMMARY CRITERIA

Score	Summary for Action	Manager's Summary Criteria			
		Health & Safety	Environmental & Waste Mgmt.	Safeguards & Security	Mission & Investment
20	Few problems. Few identified opportunities for improvement.	In compliance with toxicological and radiological exposure standards. Safe workplace with occasional minor incidents.	Consistently meets regulatory requirements. Remedial actions not justifiable on the basis of risk reduction.	Consistently meets SNM accountability standards. SNM very secure. No credible threat from hostile action.	Asset adequate for mission requirements. R&D would improve operations. Promotes moderate economic growth long term.
30	Minor improvements are warranted to enhance fulfillment of mission requirements and to further reduce slight risks to workers and the public.	Occasional minor violations of toxicological or radiological exposure standards. Site personnel exposed to acceptable risks. Slight likelihood of moderate exposure to the public.	Regulations difficult to meet. Occasional excessive toxic or radioactive releases. Remedial actions could reduce risk or promote compliance or mission continuity. Efficiency improvement could reduce waste.	Not best management practice. Frequent minor problems meeting SNM accountability standards. Possibility of theft of SNM acceptably countered. Secure against hostile action.	Asset adequate for mission requirements but cannot meet all original specs. Corrective maintenance needed. High-risk R&D could enhance mission capability. Promotes moderate economic growth near term.
40	Improvements needed to ensure ability to meet mission requirements and to reduce minor risks to workers and the public.	Excessive reliance on administrative controls to prevent frequent minor toxicological or radiological exposure violations. Minor injuries likely. 1E-8 probability of criticality.	Occasional releases of toxic or radioactive substances in excess of regulatory limits. Waste handling capacity occasionally inadequate.	SNM accountability difficult within reasonable response time. Serious violations occasionally occur for classified information, technology, or parts. Occasional losses of ordinary property.	Occasional substandard operation. Extensive corrective maintenance needed. High risk R&D needed to support critical objectives. Promotes rapid economic growth near term. Project payback by 10 years.
50	Improvements needed to avoid failure to meet mission requirements and to reduce serious risks to workers and the public.	Minor injuries frequent or serious injury moderately likely. Continuous low level exposure to the public. High exposure to workers slightly likely. Frequent violations of exposure standards.	Frequent releases of toxic or radioactive substances far exceeding regulatory limits. Waste generation exceeds regulatory limits. Inadequate waste handling facilities. Remedial action required.	Serious problems with SNM accountability. Undetected theft of SNM possible. Inadequate protection against hostile action; serious injury possible. Serious violations frequent for classified information, technology, or parts	Consistent substandard performance. Failure to meet mission requirements moderately likely. R&D with acceptable risk could enhance mission capability. Project payback within 7 years.
60	Near-term action needed to prevent serious injuries and protect the ability to meet mission requirements.	Serious injury likely. Frequent serious violations of toxicological or radiological exposure standards. Potential danger to site personnel. Excessive exposure to the public slightly likely.	Severe environmental impact likely (not life threatening). Frequent serious violations of environmental regulations or law. Remedial actions required by signed interagency agreement.	Cannot reasonably assure protection of SNM; numerous violations. Inadequate protection against hostile action; serious injury likely. Likely loss of classified information, technology, or parts.	Overall mission at risk. Unique capability in jeopardy. R&D with acceptable risk could support critical mission objectives. Project payback within 3 years.
70	Immediate action needed to avoid worker fatalities and serious risk to the public.	Worker fatality slightly likely. Multiple fatalities possible. Likely moderate exposure of the public to toxic or radioactive substances. 1E-6 probability of criticality.	Occasional off-site releases, possibly life threatening, of toxic or radioactive substances. Highly likely serious environmental impact.	SNM theft likely. Terrorist attack likely; fatalities possible. Many serious violations for classified information, technology, or parts. Pervasive SNM noncompliance.	Critical strategic facilities inoperable. Further loss of strategic mission capability due to infrastructure failure highly likely.
80	Many lives at stake. Act now.	Life threatening situation highly likely. Near criticality.	Not available for rating.	Highly likely extreme threat to SNM or personnel.	Not available for rating.

3. ENVIRONMENT, SAFETY AND HEALTH RISK-BASED PRIORITY MODEL (RPM)

The Environment, Safety and Health Risk-Based Priority Model (RPM) is available to facilitate ES&H activity ranking within the DOE ES&H Management Planning Process.

3.1 RPM Process Specification

3.1.1 Process Authority

In November 1991, the Secretary of Energy directed DOE Headquarters programs to develop a consistent Departmental methodology to identify and improve management of its environmental, safety, and health programs. It was recognized that within a tightly constrained budget environment "some activities will need to be eliminated, reduced in scope, or stretched out in time to accommodate new and higher priority initiatives and enhancements to ongoing programs." In response to the Secretary's direction, the Office of Environment, Safety, and Health (EH) coordinated the development and implementation of a risk-based DOE ES&H Management Planning Process that defines, prioritizes, and allocates budget resources to the most important ES&H activities.

The requirements for the ES&H Management Planning Process have evolved over the years. The term "ES&H Management Plan" has evolved to mean the generic process by which each site conducts and reports on its ES&H planning, programming, budgeting, work commitment making/execution, and performance evaluation activities on an annual basis. Most significantly, with the implementation of Integrated Safety Management (ISM), the process emphasis has shifted away from using a Headquarters specified data system, towards integration of ES&H planning, budgeting and work execution processes into the individual site business systems. As a result, use of the implementing software for the ES&H Management Planning Process is now optional. However, sites are still expected to provide risk-based ES&H planning, budgeting, and work commitment information during the annual Departmental budget process. Planning information generated through the process is used to support management decision-making during the Department's corporate budget review process, and ES&H "crosscut" budget information derived directly from the ES&H Management Plan is submitted to the Office of Management and Budget (OMB) and then to Congress in support of the Department's budget request. The ES&H Risk-Based Priority Model (RPM) is the management "tool" specifically developed to facilitate ES&H activity ranking within the DOE ES&H Management Planning Process.

3.1.2 Program Office Advocates/Assistance

The Office of Performance Assessment and Analysis of the Office of Environment, Safety and Health (EH-3), in its missions and functions, serves as the focal point for collection, analysis and dissemination of environment, safety, and health program planning, budgeting, and execution information for the Department. The Environment, Safety, and Health Management Plan is a process that enables consistent identification of needed Departmental environment, safety and health

activities; risk-based priority setting; effective budget decision-making and allocation of environment, safety and health resources; and improved accountability for environment, safety, and health performance on the part of DOE line programs and operating contractors.

Frank Tooper, of the Office of PerformanceAssessment and Analysis, is responsible for the ES&H component of Contract Reform and use of the ES&H Management Planning process as a critical part of the contract reform initiative.

The principal points-of-contact for obtaining assistance in the implementation of the ES&H Management Plan and prioritization using the ES&H RPM are Raymond W. Blowitski, EH-3, 301-903-9878 and Patricia Bean, EH-3, 301-903-3909.

3.2 Process Attributes/Applicability

3.2.1 Introduction

ES&H issues and the activities proposed to resolve these issues are evaluated and ranked using the DOE RPM. The RPM is a multi-attribute utility model designed to support DOE management decision-making. Issues can be ranked based on the risk associated with the current situation (i.e., the level of consequences that might occur if the identified problem is not mitigated and the likelihood of experiencing those consequences). ES&H activities developed to address the issues are ranked based on their risk-reduction potential (i.e., the difference in expected risk before and after implementation of the activity).

ES&H planners use the RPM to derive an ES&H activity score by assessing the relative level of risk posed by current conditions (before the activities are performed), and the relative level of risk expected to remain after the activities are performed. The ES&H activity score is calculated by taking the difference between the risk score before performance of the activity and the risk score after performance of the activity. The figure-of-merit for ranking an ES&H activity using the RPM, therefore, is the risk reduction expected to be achieved by the activity. This ensures that the score assigned to an ES&H activity is a measure of the effectiveness of the work being performed in the activity in reducing risks, rather than a measure of the magnitude of current problems or issues that the activities are defined to correct.

"Risk" is defined as the product of consequence and probability. The scores assigned to risks by the RPM are derived from numerical weights that represent various levels of severity of adverse impacts (consequences). The impact weights are then multiplied by the likelihood of occurrence (probability) of the impact. Each risk score assigned by the RPM is, therefore, the product of an impact weight and impact likelihood.

The RPM matrix (depicted in Table I at the end of this process description) provides the structure for examining both impact and likelihood and combining them into a risk-based ES&H activity score. The rows of the matrix define impact levels; the columns define likelihood levels. Each matrix cell (row and column combination), therefore, defines a risk level. Each matrix cell contains a numeric weight corresponding to the product of impact weight and likelihood.

The RPM matrix includes impacts in six categories that represent the major types of risks important to ES&H activities.

(1) Public Safety and Health addresses potential adverse impacts on the health and safety of the *off-site* population surrounding a site or facility.

(2) Site Personnel Safety and Health addresses potential adverse impacts on the safety and health of individuals *inside the site or facility boundary*, i.e., site workers and visitors.

(3) Compliance addresses failures to comply with laws, regulations, compliance agreements, Executive Orders, and DOE Orders related to Environment, Safety and Health. Such failures may adversely affect the confidence of DOE or other agencies in the ability of the site or facility to operate while protecting the public, workers, and the environment.

(4) Mission Impact addresses potential adverse impacts on the ability to perform the research or production mission of the site or facility or the ability to carry out important parts of the mission.

(5) Cost-Effective Risk Management addresses potential accidental losses to a site or facility's capital investment (buildings, equipment) or an existing opportunity for cost savings, such as infrastructure upgrades, management systems upgrades, or improved program development.

(6) Environmental Protection addresses potential adverse harmful impact on natural resources (air, water, land, wildlife).

Each of the six categories includes two or more impacts representing different levels of impact severity. For example, the Site Personnel Safety category includes four impacts of decreasing severity: catastrophic, critical, marginal, and negligible. A detailed description of the RPM impacts with examples is included in Section 3.4.4.

The Cost-Effective Risk Management category differs from the other categories in that it allows managers to assess the benefits of an ES&H activity on the organization's ability to manage its risks efficiently, protect its capital investment, take preventive action before risks to the public, workers, or environment develop, and reduce overall costs/risks.

As shown in Table II at the end of this section, the columns of the RPM (A through D) represent four likelihood levels used in assessing the risk reduction benefit of activities. Each likelihood level has an associated numerical value, which is multiplied by the impact weights to derive the risk value for each matrix cell in the matrix column corresponding to the likelihood level. The likelihood levels are as follows.

(1) A. Very high likelihood indicates an impact already exists with certainty or is expected to occur at least once per year. For example, if a site or facility is known to be out of compliance with a DOE ES&H Order, the likelihood of this impact falls into the *very high* category. If a

condition at a site or facility has historically resulted in one or more lost-time worker injuries per year and the condition has not been corrected, the likelihood of this impact also fits this category.

(2) B. High likelihood indicates that an impact 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 site or facility, but have not occurred regularly every year.

(3) C. Medium likelihood indicates that an impact 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 site or facility, but may occur once in the site or facility's life.

(4) D. Low likelihood impacts are unlikely to occur within the operating life of a site or facility, but are not impossible. For example, impacts in this category may occur once in the operating life of one site or 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.

The RPM matrix includes discrete values for severity of impact (the rows of the matrix) and the likelihood of experiencing these impacts (the columns of the matrix). These discrete values should be adequate to support prioritization of ES&H activities in most instances. However, if more precise risk assessment information is available, the RPM can accommodate such information. More precise information can be incorporated in two ways.

- Instead of using the discrete likelihood levels, the RPM can accept any likelihood between 0.0001 and 1.0, and

- a consequence multiplier can be applied to each impact to interpolate between or extrapolate beyond the discrete impacts levels of the RPM.

Adjusting Likelihood Values. As noted, in addition to the four discrete likelihood levels included in the RPM, any likelihood value from 0.0001 to 1.0 may be assigned if sufficient information is available on which to base a more precise likelihood estimate.

Example: A portion of a non-reactor nuclear facility Safety Analysis Report analyzes a scenario in which an extreme overexposure of workers could occur. The likelihood of this scenario is estimated to be 10^{-3} per year. A fix has been defined to remove the possibility of this scenario. In deriving the RPM score for an ES&H activity representing implementation of the fix, Impact 4 (extreme over-exposure of workers) applies. Because the estimated likelihood of the scenario falls between the representative likelihoods for RPM columns C and D (10^{-2} and 10^{-4}), this likelihood value may be entered directly in the Information System; the risk score for the impact-likelihood combination representing this scenario is 2 (=10^{-3} times 2000). Note that a likelihood value other than one of the RPM matrix column likelihoods was

used in this case because specific information was available (i.e., part of a facility SAR) to support a different value.

Consequence Multiplier Adjustments. A consequence "multiplier" is also included in the RPM to allow a more precise assessment of impacts beyond that afforded by the discrete matrix row values. The consequence multiplier can be used to interpolate between (or extrapolate beyond) the discrete levels of the impacts defined in the RPM. For example, in scoring impacts in the Public Safety and Health and Site Personnel Safety and Health categories, the multiplier can be used to adjust for the number of persons affected by the impact.

The consequence multiplier should only be used when sufficient, documented analysis is available to justify more precise levels. The consequence multiplier is not intended for application to the "Compliance" category, because the impact scale in this category is not considered to be continuous.

For example, the consequence multiplier that can be applied to the Public Safety and Health or Site Personnel Safety and Health categories accounts for the size of the population impacted. The RPM weights in each RPM matrix cell in these categories have been assigned based on an assumption that each impact affects 10 persons. If a significantly higher or lower number of persons is expected to be affected by an impact, however, different weights are appropriate. Specifically, the weight should vary proportionally to the number of affected persons.

The RPM cell weights may be used exactly as given in the matrix, without adjustment, if the ES&H activity scorers determine that the implicit assumption of ten persons being affected by the impact is sufficient to score an ES&H activity appropriately. If the number of persons expected to be affected by an impact diverges from this assumption significantly (either higher or lower), so that the RPM cell weights do not represent the risk benefits of the ES&H activity appropriately the ES&H Management Planning process allows for an additional adjustment factor to be specified to multiply by the RPM cell weights.

The appropriate adjustment factor equals the number of persons expected to be affected divided by ten. For example, if 100 persons are expected to be affected by an impact, the multiplier equals 10 (i.e., 100 persons affected, divided by 10 persons implicit in RPM weights). If no more than one person is expected to be affected, the multiplier equals 0.1 (i.e., 1 person affected, divided by 10 persons implicit in RPM weights).

The consequence multiplier can be applied for those impact categories with continuous impact scales (e.g., number of injuries, risk management investment dollars) and where additional quantitative risk assessment information is available to establish a basis for the more precise values. The multiplier should not be used to interpolate between levels of compliance.

Example: A national laboratory plans a program to reduce lost time injuries to lab workers. Currently, such injuries occur at a rate of 100 per year. The proposed program intends to reduce this rate significantly. An ES&H activity is prepared to represent this program. In scoring this ES&H activity, Impact 6 (lost-time worker injuries) applies with a RPM likelihood category of A (greater than once per year). In addition,

the number of persons affected by the impact significantly exceeds the 10 per year assumption implicit in the RPM weight for Impact 6. The appropriate multiplier for 100 injury victims per year is 10 (=100/10). This results in a scaled weight for the Site Personnel category equal to 1000 (Impact 6, Likelihood A RPM weight equals 100, multiplied by a scaling factor of 10).

Through the combined use of the continuous likelihood scale and the consequence multiplier, site or facility scorers can fully use the results of any available information from detailed, quantitative risk assessments. The RPM can reflect the most detailed risk assessment information available, while still maintaining its simple matrix structure to facilitate discussion and communication of these risks.

3.2.2 Applicability

The RPM was specifically developed to support prioritization of ES&H issues and activities; accordingly, the categories and weights of the RPM are optimized to rank ES&H programs. However, the RPM has been tailored to rank site-wide indirect activities at several DOE facilities, and is the model on which both the Surplus Facilities Inventory Assessment (SFIA) Threat-Based Priority Model and the Management Evaluation Process (MEP) that were once used by EM were developed. Coverage of the RPM includes ranking of ES&H issues and the proposed/actual work activities to address these issues. The RPM is used to rank all types of ES&H activities including those funded by direct funding sources: operating, capital equipment, general plant project, or line item project, and those funded by indirect or allocable cost arrangements.

The RPM can be used to evaluate site-wide ES&H risks, programs, and activities from initial issues/hazard ranking, through budget formulation and decision-making, and ES&H program execution, regardless of type or funding source. The RPM is used to evaluate issues and activities of many different types including occupational safety improvements, capital upgrade projects, infrastructure maintenance, improvements in conduct of operations, etc.

The RPM is used at several DOE facilities located throughout the United States and by several Headquarters Programs. Facilities using the process range from small solar energy laboratories and fossil energy facilities, to large nuclear weapons facilities.

3.2.3 Development Status

The ES&H Management Planning Process and the RPM are fully developed processes that have been used successfully through ten complete Departmental budget cycles. Furthermore, an optional PC database system, the Environment, Safety and Health Management Plan Information System (ES&H MPIS), which includes a detailed User's Manual, has been available for over 10 years to support the production, analysis, and use of ES&H Management Plans and to conduct prioritization using the RPM. The ES&H MPIS was designed using FoxPro development software and is distributed to all DOE facilities via the internet as a run-time application. The user interface consists of menus, windows, dialogues, and other features that facilitate communication with the database system. General information on the ES&H Management Plan can be obtained from the following URL:

http://tis.eh.doe.gov/bps/eshplan.htm. The ES&H MPIS software can be downloaded from the following URL: http://tis.eh.doe.gov/bps/eshplan/software.htm. The ES&H MPIS users manual and other guidance can be downloaded from the following URL:

http://tis.eh.doe.gov/bps/eshplan/document.htm.

In addition to direct input and update of data, the MPIS provides powerful but easy-to-use filtering, indexing (sorting), and output reporting capabilities. The Database System includes an RPM "Scoring Screen" for each issue or activity record and a "Resource Screen" that captures budget costs of an activity in a variety of resource categories. The ES&H MPIS supports efficient risk-management and resource allocation by presenting activities in risk-ranked order, displaying budget cut-off lines and scenarios, and allowing automatic deferral to later years of less important activities that fall "below the line." The database system is comprised of four major modules.

(1) Assessments, in which users can enter records and provide information about specific assessments (evaluations, etc.) that spawn ES&H issues.

(2) Issues, in which users can enter records and provide information about specific ES&H issues identified in the assessments. Many issues can be linked to an assessment in the database.

(3) Activities, in which users can enter records and provide information about specific ES&H activities defined to resolve the identified issues. Activities can be linked to issues within the database and through issues to assessments.

(4) Milestones, in which users can enter records and provide information about the specific tasks or deliverables associated with an Activity and the due dates for these accomplishments. By linking the Milestones to Activities (and thereby to Issues and Assessments), this module allows the MPIS to serve as a powerful, integrated commitment management and tracking system.

In addition, the ES&H MPIS database has an optional infrastructure module that can be activated to plan for either ES&H related infrastructure activities, or general (non-ES&H) infrastructure activities.

3.3 Approach Summary

A comparison of priority setting methods is best achieved within the context of their intended use or management processes. With regard to the RPM, the DOE ES&H Management Planning Process produces a plan through a combination of top-down guidance and bottom-up analysis and decision-making. It is a continuous, risk-based, resource-constrained, management process designed to improve DOE and contractor use of available resources to manage ES&H risks. The process is designed to help managers produce and communicate integrated information necessary for environment, safety and health strategic planning and operational management. Both the development and output of the ES&H Management Planning Information are required annually as part of the Departmental budgeting process. The major steps of the Plan development process are the following.

(1) Strategic Planning Guidance is provided by the Secretary of Energy, and key ES&H issues are identified by Cognizant Secretarial Officers (CSOs), the National Nuclear Security Administration (NNSA), and the Assistant Secretary for Environment, Safety, and Health (EH).

(2) Headquarters managers provide direction to operating facilities, including budget targets to be used in preparing field planning data.

(3) Field Elements conduct a needs analysis to identify ES&H needs and risks, identify ES&H activities/programs to address the needs or risks, and document these ES&H activities. If using the optional software, the ES&H activities are entered into the ES&H Management Plan Information System database.

(4) ES&H activities are ranked using the DOE ES&H RPM. The ranking is reviewed by successive levels of management; other planning factors (such as precedence and coupling relationships between ES&H activities, strategic factors, etc.) are applied to adjust rankings. (A complete description of the RPM ranking process is provided in Section 3.2.1).

(5) Available resources are allocated to the activities. The ranked listing of ES&H activities is used to support budget decision-making during the Department's Corporate Budget Review (CBR) process. Less important activities that cannot be accomplished within prescribed budget constraints are reduced in scope or deferred to subsequent years.

(6) Corporate budget review decisions are reflected in the ES&H Management Plans, and an ES&H "crosscut budget" is prepared for OMB.

(7) Final OMB allowances are reflected in the ES&H Management Plans, and a revised ES&H "crosscut budget" is prepared to accompany the Department's congressional budget request.

(8) Budget decisions and planning implications are communicated back to the operating facilities, and the updated ES&H Management Plans provide the baseline for incorporation into the ES&H program executed during the budget year and for the next annual planning and budget formulation cycle. The ES&H activities that complete the budget cycle and eventually receive funding and management approval will make up the execution work plans and become ES&H commitments.

The RPM supports but does not replace the expertise of field and headquarters staff and management. The RPM is viewed as one tool within an overall management process that structures and focuses management decision-making. The RPM does not attempt to encompass all factors or provide all information required to determine the ultimate priority of an issue or activity. The ES&H planning process is designed to allow various factors important to the setting of priorities to be incorporated into the final adjusted ranking. Such factors include strategic considerations concerning the expected lifetime of the site or facility, the level of uncertainty in the risk evaluation, or project management considerations such as precedence relationships among activities. The RPM is not

intended to provide a concise quantification of risk, but to structure management experience and knowledge (and any available quantitative risk data) into a defensible and traceable relative ranking of ES&H issues and activities.

3.4 Process Principles

3.4.1 ES&H Activity Scoring and Ranking with the ES&H RPM

Available resources may not be adequate to allow full and immediate implementation of all proposed ES&H programs and activities. Risk-based ranking of ES&H activities supports management's ability to allocate resources to the set of activities that will most reduce risk during the planning period. ES&H managers and planners should assess the risk-reduction benefits of each ES&H activity and rank them accordingly.

The ES&H RPM is the tool provided to produce the initial activity rankings. Operating organization planners use the RPM to derive risk-reduction scores for each ES&H activity. This risk-reduction benefit score is the primary consideration for establishing the relative ranking of ES&H activities. However, site or facility, Operations Office, and Headquarters management may adjust the ES&H activity rankings to account for additional planning factors not considered by the RPM. In addition, Operations Office and Cognizant Secretarial Officer (CSO) ES&H planners are responsible for reviewing priorities for consistent application of the RPM and may adjust ES&H activity scores to ensure consistency in Departmental prioritization and budgeting for ES&H activities. After the risk-based priorities are established and adjusted, management will use the ranked list of ES&H activities to allocate available resources to the most important activities.

3.4.2 ES&H Activity Ranking Steps

Three major steps are associated with ranking ES&H activities:

(1) Use the RPM to characterize and score the existing risks addressed by the ES&H activity;
(2) Characterize and score the risks that would remain after implementation of the ES&H activity;

(3) Apply other planning factors to adjust ES&H activity scores and produce the ES&H activity rankings. The difference between the scores in the first two steps is the risk-reduction score. The last step also includes Operations Office and CSO adjustments to ensure consistent and correct application of the RPM.

The RPM provides a convenient framework for structuring risk information and focusing site or facility management and staff expertise on the assessment of risks related to ES&H issues and activities. It is strongly recommended that ES&H activity scoring at a site or facility be performed by an evaluation group with expertise in diverse fields and extensive experience with a site or facility's operations, potential risks, and operating history. This enhances the quality of the information used in the activity risk scoring and the validity of the ES&H activity rankings.

The operating organization scoring group should provide documentation of the basis for RPM scoring as well as the basis for scoring adjustments by operating organization management, Operations Office reviewers, and CSO reviewers. Thorough and clear documentation is essential for effective review and use of the ES&H activity risk-based rankings by decision-makers as the ES&H planning information is rolled up. High-quality documentation of the ES&H activity ranking process is particularly important to support Headquarters budget deliberations and to provide feedback from Operations Office and CSO reviewers to operating organizations.

Step 1: Assess and score risks before ES&H activity implementation.

The ES&H activity scoring group will consider existing risks addressed by the discrete activities included in the ES&H activity. Each ES&H activity should include an *appraisal* section, in which the ES&H activity preparer should document these risks. The scoring group will consider the risks documented in the ES&H activity along with any additional risks that apply.

For each RPM impact category, the scorers perform 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 *before* performance of the ES&H activities is the sum of the representative risk scores from all categories that are scored by the scoring team. For example, if the scoring team determined the "before" score of a hypothetical activity included:

- a very high likelihood for a worker overexposure to radiation (RPM Matrix 6.A. = score 100),
- A very high likelihood for a major noncompliance with 10 CFR 835 that could result in penalties (RPM Matrix 8.A. = score 150), and
- A very high likelihood for serious negative impact on the mission, e.g., shut down special nuclear material processing (RPM Matrix 12.A. = score 150)

The total before score would be the sum of these individual scores, e.g., 100 + 150 + 150 = 400. If using the optional software, the risk score is calculated automatically in the ES&H Management Plan Information System upon entry of the selected matrix cells.

Step 2: Assess and score risks after ES&H activity implementation and calculate ES&H activity risk reduction score.

After using the RPM to determine the ES&H activity risk score for existing risks, the scoring group will consider the effect on site or facility risks of performing the activities defined by the ES&H activity and the level of risk remaining after performance of the activities. The group will consider risks documented in the ES&H activity appraisal section along with any additional applicable risks. The scorers will derive the risk scores for the expected condition *after* completion of the activities in the same manner as they determined the before risk scores before ES&H activity implementation in Step 1. The risk score for the ES&H activity *after* completion of the ES&H activities is the sum of the representative risk scores from all categories that are scored by the scoring team. For example, if the scoring team determined the "after" score of the hypothetical activity provided in the previous example would include the following risk reduction benefits:

- a reduction of the likelihood for a worker overexposure to radiation from very high to low (RPM Matrix 6.D. = score 0.01),
- A reduction in the likelihood from very high to low for the major noncompliance with 10 CFR 835 that could result in penalties (RPM Matrix 8.D. = score 0.015), and
- A reduction in the likelihood for potential for serious negative impact on the mission, from very high to low e.g., low likelihood for shut down special nuclear material processing (RPM Matrix 12.D. = score 0.015)

The total after score would be the sum of these individual scores, e.g., 0.01 + 0.015 + 0.015 = 0.04. Again, if using the optional software, risk score is calculated automatically in the ES&H Management Plan Information System.

The net ES&H activity risk reduction score is the difference between the *before* risk score, calculated in Step 1, and the *after* risk score, calculated in Step 2. Using the previous examples, the risk reduction score would be the before score, 400, minus the after score, 0.04, = the net risk reduction score = 399.96. The net risk reduction score would indicate a very effective ES&H activity with regards to risk reduction. This net risk reduction score is also calculated automatically within the ES&H Management Plan Information System, if used. Comparing these risk reduction scores for all ES&H activities at a site or facility offers a preliminary relative ranking of the ES&H activities. ES&H activities with high scores represent activities that are most effective in reducing current risks at the site or facility, while ES&H activities with low scores offer low benefits in curbing risk.

Step 3: Adjust ranking according to other planning factors.

Other factors besides the risk reduction potential of activities may influence the ranking of ES&H activities. These factors may include cost, precedence and coupling relationships, and other planning factors. After the scoring group completes the RPM scoring and ranking using the RPM, operating organization management and Operations Office and CSO reviewers may adjust the ES&H activity ranking to account for these factors. Scoring adjustments may be made by adding to or subtracting from an ES&H activity RPM score to achieve the desired relative ranking for the ES&H activity. Scoring adjustments should be thoroughly documented for the ES&H activity. If using the optional

software, this information is documented in the "scoring comments" section in the ES&H Management Plan Information System.

Cost of Activities. Although the primary objective of implementing ES&H activities is to remove or reduce major risks, 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, managers may adjust the priorities of ES&H activities based on the cost of activities included in each ES&H activity. Following are examples of situations in which scoring adjustments based on ES&H activity cost may enhance the ES&H activity rankings.

- Managers should adjust upwards the ranking of low-cost ES&H activities with substantial risk reduction to ensure such activities are near the top of the ranked list of ES&H activities.

- Managers should reassess each high-cost ES&H activity with a high or moderate risk reduction score to determine if some subset of activities in the ES&H activity or some alternative activities could provide comparable benefits for lower cost. This may require redefinition, reformulation, or repackaging of corrective actions included in the ES&H activity.

Precedence and Coupling Relationships. Implementation of activities in some ES&H activities may not be feasible without previous implementation of activities in other ES&H activities. If the prerequisite ES&H activity is ranked below the dependent ES&H activity, site or facility managers may want to adjust the ranking of the prerequisite ES&H activity to reflect a realistic priority of activities. Similarly, two or more activities in separate ES&H activities may require simultaneous implementation. In this case, ES&H activity rankings may be adjusted so that the priorities of the dependent activities allow them to be performed in the same budget period.

Other Practical Planning Factors. Practical constraints may change the relative desirability or practicality of certain activities beyond the rankings provided by the RPM scores. Examples of planning factors that may merit adjustments in ES&H activity priority include:

- expected life of a site or facility;

- changes to site or facility mission;

- strategic goals of the Department, EH, or the Program Office;

- management workloads and the ability to provide adequate management and oversight to the activity;

- staff loads and ability to hire additional staff;

- uncertainties in changing requirements;

- uncertainties in obtaining project benefits; and

- perception of site or facility risks by the public or other external stakeholders.

After each ES&H activity has received an RPM risk reduction score and the ranking has been adjusted, the result is a ranked list of site or facility ES&H activities for use in resource allocation.

Operations Office and CSO planners should review the results of operating organization ES&H activity scoring and ranking to ensure consistent application of the RPM and proper scoring adjustments. This review may result in additional ranking adjustments at the Operations Office or CSO level.

As part of their review, responsible managers should assess those ES&H activities representing significant risks for which effective mitigating activities have not been identified. This may be the case if ES&H activity scoring results in both a high *before* and a high *after* score, indicating that the ES&H activity does not fully address some significant risk of concern. The low risk-reduction score, if viewed alone, may result in deferral of the activity. However, if this activity is deferred, the significant current risk would remain unmitigated. Such ES&H activities should be evaluated further to determine if alternative corrective activities would more successfully reduce the risks or if risk reduction is not practical due to other considerations. Compensatory actions, which reduce current risks in the near-term while longer-term solutions are being developed, should always be considered for high- or moderate-risk situations.

3.4.3 Resource Allocation

After the risk ranking of ES&H activities has been completed, the next step in the ES&H Management Planning Process is to allocate available resources to these activities. This process establishes which ES&H activities will be funded within target level budgets and the level of funding associated with each activity. This process also identifies ES&H activities that cannot be funded under current resource limitations.

The allocation of resources to ES&H activities is a multistep process that involves all levels of the Department. Allocation of available resources to ES&H activities requires that budget targets (or resource constraints) be established. Because there are often several different funding sources for ES&H activities, separate targets may be required to allocate resources to ES&H activities funded from these different sources. For example, one funding limitation would be needed for ES&H activities funded out of the site-wide overhead pool, and a separate target would be needed for ES&H General Plant Projects (GPPs), which are funded out of the site's GPP appropriation.

Targets for programmatic funding should be provided by each CSO as part of the Departmental budget process. In some instances, these budget targets are summary (decision unit) level values. In such cases, targets for use in allocating resources to ES&H activities are derived from these summary level targets. For activities funded by allocable cost mechanisms, funding targets must also be derived by operating organization budget personnel. For example, operating organization management (with Operations Office approval) is responsible for determining the size of the overhead pool of resources, and the portion of the overhead funds that will be allocated to ES&H activities.

After targets have been defined, the following major steps should be followed in allocating resources to ES&H activities for each funding source.

(1) Produce the ranked list of ES&H activities. If using the optional ES&H Management Plan Information System software, this listing can be easily produced as a report. This list shows activities in order of priority and their cumulative cost.

(2) Starting with the highest ranking activities on the list, determine which activities can be supported within the target funding level (i.e., draw a line on the ranked list where the cumulative cost of activities in the ranked list equals the target level of funding). This budget target can be input to, and shown on the output report from, the optional ES&H Management Plan Information System.

(3) Operating organization financial management, ES&H, and senior management should assess the implications of this first cut at differentiating funded from unfunded activities. This review should examine both the funded and unfunded activities. The following questions should be considered.

- Are all essential ES&H programs covered within the current funding target?
- Are any significant ES&H risks not being addressed because the proposed activity falls "below the funding line"?
- Are any of the unfunded ES&H activities critical to achieving the Department's ES&H strategic goals or programmatic missions?
- Do any of the unfunded ES&H activities represent sound risk management investments or provide important preventive benefits that will yield long term benefits?
- Are certain ES&H programs, or parts of these programs no longer essential due to changing mission, program needs, etc.?
- Could any activities "above the line" be done more cost effectively to free resources to fund some of the currently unfunded ES&H activities?

(4) After this review, the ES&H activity rankings, funding levels, and target budgets should be adjusted to reflect management's final decisions. To ensure management's ES&H resource allocation decisions are consistently captured and communicated, the ES&H activities should be characterized as follows.

- Management's relative priorities should be reflected by adjusting the relative ranking of the ES&H activities. As discussed in the previous section, this is accomplished by adding or subtracting points from the raw ES&H activity RPM score to move it up or

down in the relative ranking. The justification for these changes should be documented as Scoring Comments.

- Activities to be funded should be designated as "Target". This designation is made in the Funding Case field of the optional ES&H Management Plan Information System. Activities that management determines cannot be funded within the budget target should be designated as "Unfunded."

- The ES&H activity annual cost profile for all funded ES&H activities should be consistent with funding decisions and budgets for the appropriate fiscal year.

3.4.4 RPM Matrix Impacts and Scoring Examples

Public Safety and Health

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

This impact should be chosen when a potential result of a condition being evaluated could lead to 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 (e.g., fire, explosion).

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 (i.e., 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, DOE Order 231.1, DOE Policy 441.1, DOE Guide 441.1-1, and American National Standards Institute (ANSI) N323. 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.

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; and

(4) the potential for deaths, injuries, or exposures of the off-site population.

Site Personnel Safety and Health

Impact 4: Catastrophic: Injuries/illnesses involving permanent total disability, chronic or irreversible illnesses, extreme overexposure (e.g., 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: 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. Persons inside the deficient buildings would be at risk and fatalities are possible.

Impact 5: Critical: Injuries/illnesses resulting in permanent partial disability, temporary total disability (> 3 months), or serious overexposure (e.g., 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.

Impact 6: Marginal: Injuries/illnesses resulting in hospitalization, temporary reversible illnesses with a variable but limited period of disability (<3 months), slight overexposure (e.g., 5-10 rem/yr.), or exposure near limits (20-100%)

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: 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% of limits (e.g., < 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.

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 non-compliances 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* non-compliance 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 non-compliance 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 non-compliance with a rule subject to penalties under the Price-Anderson amendments act, Compliance Impact should be 8.

In general, non-compliance 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 non-compliance. Likewise, non-compliance 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 non-compliance 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: A site or facility has proposed a project to expand its hazardous waste storage and disposal capability. Currently, hazardous waste handling capability is inadequate, so that waste remains in temporary storage locations for longer than 90 days. This is a violation of RCRA and the site or facility may be fined by the EPA. Because this example involves non-compliance with an environmental law, it would be scored with Compliance Impact 8.

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 noncompliances with any DOE Order/Notice or policy statement that is significant to ES&H. To distinguish Impact 9 from Impact 8, noncompliances 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 (e.g., OSHA, NFPA, ANSI, NEC, MSHA) that are referenced in DOE Orders, but do not have the force of law at the site or facility.[2]

[1]OSHA may have the force of law at a minority of facilities. At these facilities, significant non-compliances with OSHA would be included under Impact 8.

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

Example: A recent audit finding indicated that the Hazards Communication Program at a site or facility is not in compliance with the requirements of DOE Order 440.1. All aspects of the program are lacking, including surveillance, communications, and recordkeeping. A site or facility proposes to add five full time equivalents (FTEs) to upgrade the Hazards Communication Program.

Impact 10: Marginal noncompliance with Federal, State, and local laws; enforcement actions; compliance agreements; Executive Orders; DOE Orders; or that 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 record keeping 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.

Mission Impact

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 a 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 fully comply with Title 10 Code of Federal Regulations, Part 835 Occupational Radiation Protection, DOE Policy 441.1, and DOE Guide 441.1-2 as low as reasonably achievable (ALARA) guidelines, 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.

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 > $25M or annual cost > $5M), 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 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 $5M per year.

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

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 $1.5M 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 of the assessment. Preliminary evaluations indicated that the resulting waste reduction would substantially reduce disposal costs. It is estimated that costs could be reduced by around $3M per year.

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.

- The effects spread or may spread over a wide area and are not easily containable in a limited area, *and*
- 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.

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

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.

- The effects are confined to a limited area, *and*
- 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. Clean-up should require only a few weeks.

3.5 Measuring Results

ES&H planning information developed and prioritized using the ES&H Management Planning Process can provide a basis for defining the ES&H performance measures, objectives and commitments, required annually by the Department of Energy Acquisition Regulations (DEAR) in Title 48 Code of Federal Regulations (CFR) Clause 970.5223-1 "integration of environment, safety and health into work planning and execution", by which contractor ES&H performance will be evaluated and through which ES&H accountability will be established. Existing site processes should be used to propose, review, and establish contractually-binding performance measures. The ES&H Management Planning process does not mandate the specific performance objectives, criteria, and measures to be used, but instead is designed to communicate answers to basic risk-management questions concerning ES&H activities.

- Who, specifically, is responsible and accountable for ES&H performance at each site, and how is this accountability enforced?

- What specific performance measures will be used to evaluate progress and ensure accountability for ES&H performance?

- What is the achieved level of ES&H performance?

Award/incentive fee criteria and performance milestones, based on the performance of ES&H activities, should be incorporated into existing site incentive systems for the execution year for use with the Department of Energy Acquisition Regulations (DEAR), Title 48 Code of Federal Regulations (CFR) Clause 970.5215-3 "conditional payment of fee, profit, or other incentives – facility management Contracts".

3.6 References/Reading List

Department of Energy Acquisition Regulations (DEAR), Title 48 Code of Federal Regulations (CFR) Clause 970.5223-1 (formerly 970.5204-2) "Integration of Environment, Safety and Health into Work Planning and Execution"

Environment, Safety and Health Guidance for Fiscal Year (Budget Year) Budget Formulation and Execution

DOE Budget Formulation Handbook, Field Budget Process, Chapter IV, Section 1 "Environment, Safety and Health: Supplementary Budget Submission Guidance"

Department of Energy Acquisition Regulations (DEAR), Title 48 Code of Federal Regulations (CFR) Clause 970.5215-3 (formerly 970.5204-86) "Conditional Payment of Fee, Profit, or Other Incentives – Facility Management Contracts"

3.7 Definitions

Allocated (Indirect) Cost/Funding. A cost that is incurred by an organization for common objectives and that cannot be identified specifically with a particular project or activity.

Commitment. A written declaration by contractors to accomplish certain activities or meet certain conditions, as described in the ES&H Management Plan.

Direct Costs/Funding. Any costs that can be specifically identified with a particular cost objective that are directly related to and are being incurred principally for the benefit of the program receiving the charges.

ES&H Activities. Work conducted whose primary intent is to protect the health and safety of the public, workers, and the environment.

ES&H Management Plan. The generic process by which each site conducts and reports the results of its annual ES&H planning, programming, budgeting, work commitment making, and performance evaluation to its Headquarters and Field Element Managers, the Chief Financial Officer, and EH in response to the annual budget call.

ES&H Management Plan Information System (MPIS). An optional computer-based system in which the information, obtained through the application of the ES&H Management Planning Process can be collected, analyzed, and reported.

Program Execution Guidance. Guidance developed jointly by DOE Headquarters and Operations/Field Offices and issued to contractors that provides programmatic assumptions, expected outcomes, milestones, performance measures, financial controls, and reporting requirements; to be used to develop, implement, and monitor fiscal year operations at a site.

Risk-Based Priority Model (RPM). A methodology for establishing risk rankings of the ES&H activities at DOE sites. The ranking method relates likelihood of occurrence of these risks and their adverse potential effects on the public, site personnel safety and health, compliance issues, program mission, management investment, and environmental protection. This method provides the essential information for deriving ES&H activity priorities.

Roll-up. The flow and integration of data at the contractor, Operations/Field Office, and Headquarters levels.

Target Funding Level. The total available funding specified in the Budget Control Tables provided by Headquarters.

Unfunded Activity. ES&H work that is desirable to conduct, but for which target funding is not anticipated to be provided, based on planned program direction and budget decision-making.

3.8 Training Courses/Program Assistance

Information concerning implementation of the ES&H Management Planning Process, including prioritization with the RPM, can be obtained from the following web site: "http://tis.eh.doe.gov/bps/eshplan/index.htm".

Questions concerning the ES&H Management Planning Process and the RPM should be directed to Raymond W. Blowitski, EH-3, at 301-903-9878 or Patricia Bean, EH-3, at 301-903-3909.

TABLE I.
ES&H RISK-BASED PRIORITY MODEL (RPM)

IMPACTS	LIKELIHOOD OF OCCURRENCE A VERY HIGH	B HIGH	C MEDIUM	D LOW
CATEGORY: PUBLIC SAFETY & 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
CATEGORY: SITE PERSONNEL SAFETY & HEALTH				
4. Catastrophic - Injuries/illnesses involving permanent total disability, chronic or irreversible illnesses, extreme overexposure (e.g., 1000 rem), or death	2000	200	20	0.2
5. Critical - Injuries/illnesses resulting in permanent partial disability or temporary total disability >3 months, or serious overexposure (e.g., 100 rem)	200	20	2	0.02
6. Marginal - Injuries/illnesses resulting in hospitalization, temporary, reversible illnesses with a variable but limited period of disability of < 3 months, slight overexposure (e.g., 5-10 rem), or exposure near limits (20-100%)	100	10	1	0.01
7. Negligible - Injuries/illnesses not resulting in hospitalization, temporary reversible illnesses requiring minor supportive treatment, or exposures below 20% of limits (e.g., < 1 rem)	10	1	0.1	0.001

TABLE I.
ES&H RISK-BASED PRIORITY MODEL (RPM) (Continued)

CATEGORY: COMPLIANCE				
8. Major noncompliance with Federal, state, or local laws; Enforcement Actions; or Compliance Agreements significant to ES&H and involving significant potential fines or penalties	150	15	1.5	0.015
9. Major noncompliance with Executive Orders; DOE Orders; or Secretary of Energy Directives (Notices or Guidance Memoranda) significant to ES&H and 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; 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
CATEGORY: 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
CATEGORY: COST EFFECTIVE RISK MANAGEMENT				
14. Significant avoidable cost due to degrading infrastructure, inefficient management systems or program implementation, or accident-related capital loss (total cost > $25M, or annual cost $1M-5M)	40	4	0.4	0.004
15. Moderate avoidable cost due to degraded infrastructure, inefficient management systems or program implementation, or accident-related capital loss (total cost < $25M, or annual cost $1M-5M)	15	1.5	0.15	0.0015

TABLE I.
ES&H RISK-BASED PRIORITY MODEL (RPM) (Continued)

CATEGORY: 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 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

TABLE II. 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

The likelihood levels are defined in section 3.2.1.

A. Very high likelihood indicates an impact already exists with certainty or is expected to occur at least once per year. For example, if a site or 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 site or 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.

B. High likelihood indicates that an impact 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 site or facility, but have not occurred regularly every year.

C. Medium likelihood indicates that an impact 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 site or facility, but may occur once in the site or facility's life.

D. Low likelihood impacts are unlikely to occur within the operating life of a site or facility, but are not completely precluded from occurring. For example, impacts in this category may occur once in the operating life of one site or facility out of a population of 100 similar sites or 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.

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