II

Can We Talk?: Communications Management for the Waste Isolation Pilot Plant, a Complex Nuclear Waste Management Project

Steven A. Goldstein, Sandia National Laboratories
Gwen M. Pullen, Sandia National Laboratories
Daniel R. Brewer, Sandia National Laboratories

PMI *Proceedings*, 1995, pp. 572–81

Synopsis

This case describes the efforts made in the United States to create a permanent radioactive waste repository located underneath the earth's surface. The project has an estimated operational life approaching fifty years and a total project cost approaching $9 billion. The case focuses on communications involved in the project, and how different communications challenges are addressed. Many challenges are faced given the contentious nature of the project. The methods describe the use of a questionnaire to develop an understanding of the public knowledge of the project and its associated technology. This case serves as an excellent example of the challenges and methods for project communications management and includes specific references to the *PMBOK Guide* section on project communications management.

Learning Objectives

Through the reading of this case and its study using the discussion questions, students should gain a better understanding of:

- project communications management
- public relations as it relates to project management
- project stakeholder management
- the challenges of managing mega-projects.

Discussion Questions and Possible Answers

1. Based on your project management knowledge, what would be an organized way of dealing with the different groups that have vested interests in the project?

   a. This case describes a project management technique which appears to use stakeholder management concerning planning, organizing, directing

motivating, and controlling (see Cleland's *Project Management: Strategic Design and Implementation*, 2nd ed., Chapter 6, Project Stakeholder Management). This is a very effective way of managing groups with vested interests. This is also briefly described in section 2.2, The Project Management Context, of the *PMBOK Guide*.

2. The management of this case relies on the use of advanced techniques such as electronic networking, performance assessment, and a system prioritizing method. Describe one of these subprojects and comment on the feasibility of this project without the use of this tool.
   a. Electronic networking allowed for communication facilitation through E-mail and online documentation. Without the use of these techniques, the project would run into redundant and inefficient communications such as duplicate messages to project managers.
   b. Performance assessment allowed for an assessment of the project and its compliance to regulations governing its operations. The techniques used involved data collection, database creation, and simulation of possible scenarios. These techniques and the use of their technology allow for an understanding of the degree of compliance of the repository to regulations.
   c. System prioritizing is a decision-aiding analysis tool useful for balancing project constraints. It defines which activities can be combined in a viable manner. Again, its technique and technology allow the project team members to gain an understanding of the nuclear waste repository project.
3. Do you see any potential problems with the electronic networking system as it is described? What rules should be followed for the use of such a system?
   a. As it is described, there is not clear accountability for any changes made to online documents. This creates the potential for communication problems. All relevant project team members must be told in a timely manner of any changes made in the project scheduling, resource utilization, etc. A rule for using such a system is described in *PMBOK Guide*, section 10.1.1, which states that project resources should be expended only on communicating information which contributes to success or when lack of communication can lead to failure.
4. The challenge described in explaining the behavior of the waste repository describes methods and models used but ends with a statement that the full explanation of the process is impossible except to those highly technically oriented. How should this communications problem be handled? Support your answer with reference to the project management literature.
   a. The project team, through the development of the CD-ROM and survey are attempting to address the questions of those not technically oriented enough to understand the full repository technology. This planning and communications must permeate all segments of the project through communications management as described in *PMBOK Guide*, chapter 10, Project Communications Management.
5. In a project of this sort the two main challenges appear to be the use of new technology and the selling of this idea to the public. Would these two segments of the project be better handled as two distinct projects?
   a. The separation of these two segments would have both advantages and

that those who understand and work with the technology would not necessarily be the spokespeople to the public. Likewise, an advantage would be the project team members responsible for the technology would not be distracted with the public relations problems.

Additional Discussion Points:

One of the surveys done for this project tried to determine how the general public perceived the concept of experts as unbiased depending on the source of their funding. It is an important consideration when discussing project communications to focus on what are real and perceived risks associated with a project. Students can research this real versus perceived risk topic and discuss how to handle the gap from a project management perspective.

This topic is discussed by Cleland in *Project Management: Strategic Design and Implementation*, 2nd ed., in Chapter 7 in the section on public perception and advocacy. An example of the ranking of common risks by various pubic groups is displayed in table 7.1 and the management of this problem is discussed.

Can We Talk?: Communications Management for the Waste Isolation Pilot Plant, a Complex Nuclear Waste Management Project

Steven A. Goldstein, Sandia National Laboratories
Gwen M. Pullen, Sandia National Laboratories
Daniel R. Brewer, Sandia National Laboratories

PMI *Proceedings*, 1995, pp. 572–81

Introduction

The Sandia National Laboratories' (SNL) Nuclear Waste Management Program is pursuing for the United States (U.S.) Department of Energy (DOE) an option for permanently disposing radioactive waste in deep geologic repositories (1). Included in the program are the Waste Isolation Pilot Plant (WIPP) project for the U.S. defense program mixed waste (chemically hazardous materials and transuranic [TRU] radioactive waste—defined as elements heavier than Uranium containing more than 100 nanocuries/gram of alpha emitters with half-lives greater than twenty years), the Yucca Mountain project (YMP) for spent power reactor fuel and vitrified high-level waste, projects for other waste types, and development efforts in environmental decision support technologies.

WIPP and YMP are in the public arena, of a controversial nature, and provide significant management challenges. Both projects have large project teams, multiple organization participants, large budgets, and long durations; are very complex; have a high degree of programmatic risk; and operate in an extremely regulated environment requiring legal defensibility. For environmental projects like these to succeed, SNL's program is utilizing nearly all areas in PMI's *Project Management Body of Knowledge (PMBOK Guide)* to manage along multiple project dimensions such as the physical sciences (e.g., geophysics and geochemistry, performance assessment, decision analysis), management sciences (controlling the triple constraint of performance, cost, and schedule), and social sciences (belief systems, public participation, and institutional politics). This discussion will focus primarily on communication challenges active on WIPP. "How is the WIPP team meeting the challenges of managing communications?" and "How are you approaching similar challenges?" will be questions for a dialog with the audience.

WIPP as a Nuclear Waste Management Project

The Waste Isolation Pilot Plant is a multiphase project with an estimated duration approaching fifty years and a total project cost approaching $9 billion. The pursuit of a site for the repository culminated in 1975 with selection of underground bedded salt formations near Carlsbad, New Mexico. Public Law 96-164 (U.S. DOE National Security and Military Applications of Nuclear Energy Authorization Act of 1980) formally established the project. During siting, extensive surface-based testing was conducted to evaluate the site suitability, a repository appropriate to the conditions of the site was designed, and analyses were conducted to determine facility safety. This phase ended with the publication of an environmental impact statement in 1980 and a decision to proceed with the next phase, site and preliminary design validation, during which two vertical shafts were constructed, an underground testing area was excavated, and various geologic and hydrologic experiments were conducted. The design validation was followed by further collection of site data and by the construction of above-and below-ground facilities. The surface facilities necessary to receive waste and considerable underground excavation were completed, including rooms for further experimentation and some rooms designed for eventual permanent waste emplacement (2).

The project currently is in what is termed the "predisposal" phase and is completing experiments and modeling required to submit a compliance certification application to the U.S. Environmental Protection Agency (EPA) and other regulatory entities. Assuming WIPP is successfully certified, subsequent phases will involve transport and permanent emplacement of waste during the disposal phase (planned to begin in 1998), a closure phase for decontamination and decommissioning, and a post-closure phase during which the site will be actively monitored. WIPP's final completion date for sealing the waste-filled repository may approach the year 2025.

DOE's mission for WIPP is "to provide a technically, scientifically, and institutionally sound disposal decision recommendation to the Secretary of Energy based on a thorough evaluation of repository and system performance (including operational excellence, transportation, packaging, characterization, and certification), informed public participation, and institutional and regulatory acceptance" (2). An extended project team of over 900 people is comprised of DOE's Carlsbad Area Office (CAO) and several major contractor participants, including Sandia National Laboratories (as scientific advisor), Westinghouse Waste Isolation Division (as site management and operating contractor), and the WIPP technical assistance contractor, a consortium of companies providing administrative and management support. The team is split among three principal locations: the repository site (26 miles southeast of Carlsbad), the city of Carlsbad, and Albuquerque, New Mexico (285 miles from Carlsbad).

Major WIPP Communication Challenges

Communication challenges for a project of this size and complexity are extensive, including:

- establishing technical, cost, and schedule baselines which all project team participants endorse

- managing information for volumes of compliance-related documentation, (database linking, document control, records management, appropriately rigorous quality assurance)
- designing a full suite of project planning and status reporting systems and tools (e.g., work breakdown structure, work packages, logic-linked resource-loaded schedules, configuration management system)
- communicating within and between various "layers" of a geographically distributed project team (electronic networking, file transfers, video-teleconferencing, scheduling and management of a multitude of meetings and reviews)
- implementing DOE's public participation program to ensure that "public participation is a fundamental component in program operations, planning activities, and decision-making" (3) (The "public" includes technical oversight groups and the academic community, regulators, lay-level parties, and groups with a vested interest (either pro or con).)
- evaluating, executing, and communicating programmatic decision analysis methods which consider participants' viewpoints for work scope prioritization and decision-making
- communicating risk, managing perception and image, and controlling rumor mill and "damage" in a project regularly in the public limelight.

This paper focuses on three of these likely to be of common interest to other environmental projects, namely: "classical" project management communications (in the management science dimension), programmatic decision-making (physical science), and public group and regulator interactions (social science).

"Classical" Project Management Communication

Challenge: How do you share dynamically changing information among geographically separated team members?

Approach: Electronic networking within a distributed project team.

WIPP has over 100 work breakdown structure (WBS) elements. Until recently, the process of accumulating data related to scope, cost, and schedule for these elements was performed manually and has proven to be time consuming and labor intensive. Task leaders developed estimates in their individual formats (using tools like Microsoft Word, WordPerfect, Excel, etc.); budget specialists then input the submitted information into a database such as FoxPro.

With the introduction of local area networks and Windows-based applications, electronic networking has been used to alleviate much duplication of effort. Employing graphical user interface technology, a network tool was developed which used a "point-and-click" capability to enable a menu-driven, user-friendly system much more efficient in collecting and processing project planning information. This system allowed an easy and straightforward way of updating work scope, schedule, and cost baselines as different funding scenarios were being developed. The planning requirements Sandia faced were:

- short time fuses—four weeks for initial fiscal year budget scenario development and typically four days for responding to differing DOE budget cases
- system which interfaced with both IBM/PC and Macintosh platforms

- capability for real-time, online reporting
- capability for word processing features (spell checking, formatting, etc.).

The network planning tool provided a transparent interface wherein task leaders in separate functional organizations and sites could make changes for different planning scenarios quickly, with no subsequent rekeying or manipulation of information required by project administrative staff. Without this network planning tool, rapid-turnaround, multiple-scenario planning would have taken much longer, cooperation of the technical staff would have been much lower, and quality of the plans would have been inferior.

In concert with network-based planning tools, SNL's WIPP project team has implemented a common electronic calendar for scheduling project-level events, video teleconferencing capabilities between the major project team locations, and extensive E-mail and file transfer capabilities to reduce communication transit time and rework of documentation.

Programmatic Decision-Making Communication

Challenge: How do you explain waste repository behavior predicted for 10,000 years in an understandable way?

Approach: Use performance assessment as a method of communicating safety and regulatory compliance.

Performance assessment (PA) is a quantitative, probabilistic process for assessment of risks that is used in analyzing the ability of the WIPP disposal system to comply with select regulatory requirements related to long-term performance. For WIPP, PA is used to estimate the cumulative releases of radionuclides and the associated uncertainties of the calculations. PA is also used to estimate releases of Resource and Conservation Recovery Act (RCRA)-regulated wastes.

Using laboratory and field data (and in some cases input from formal expert elicitations, published technical literature, and handbook values), computer models are formulated to estimate the behavior of and physical changes in the WIPP repository and the geologic features that surround it. These estimates are an assessment of the performance of the repository. A complete assessment:

- develops conceptual models of physical and chemical processes through interpretation of data and professional judgments by scientific staff, and communicates these models to PA numerical modelers and analysts
- identifies the features, events, and processes (FEPs) that might affect the disposal system
- examines the effects of these FEPs on the performance of the disposal system
- estimates the cumulative releases of contaminants, considering the associated uncertainties, caused by all significant FEPs
- compares the releases to the applicable EPA Code of Federal Regulations (CFR) to determine whether or not the predicted repository behavior violates the regulations.

Three parallel developmental stages are fundamental to the PA methodology for WIPP:

- identifying those future events that may have a significant effect on repository performance (and "screening out" defensibly all other scenarios that have little or no effect)
- acquiring a database and developing numerical models capable of simulating repository performance
- developing a procedure to assess compliance with the regulatory requirements (4).

For evaluating compliance with quantitative requirements of applicable long-term radioactive waste regulations, the results of performance assessment (PA) predictions are combined in a graphical form that can be compared with the release limits given in 40 CFR 191, Appendix A, Table 1. The graphical form of PA results is a complementary cumulative distribution function (CCDF). When a CCDF is graphed together with the normalized release limits, the probability that WIPP releases will exceed the regulatory release limits can be determined directly from the graph.

A CCDF typically includes uncertainty in both model parameter values and in future events and processes that may influence release from the repository (although at the WIPP site, human intrusion by drilling is considered the only future event that might lead to release). Uncertainty in future events is typically incorporated into WIPP CCDFs using random sampling. Parameter distributions are sampled by Latin Hypercube Sampling (LHS), and random (Monte Carlo) sampling is used to create possible drilling histories for the WIPP area.

CCDF plots typically are constructed as follows (4). Probabilistic distribution functions are assigned to important repository performance parameters, and those distributions are statistically sampled to ensure that all possible values, including extreme outliers, are properly represented. Performance is simulated using the selected parameter values, and for evaluating compliance, each resulting set of release values is weighted by the probability that the scenario simulated by that set will occur. Representative scenarios are simulated repeatedly, and the final composite plot reflects in a fairly easy-to-view graphical format the probabilistically predicted overall disposal system performance. Multiple plots can be superimposed to examine multiple conceptual models of repository behavior. While this modeling method is recommended by the EPA's Code of Federal Regulations for demonstrating regulatory compliance, it remains a continuing challenge for PA's practitioners to explain fully and credibly its subtleties, assumptions, uncertainties, and limitations to any but highly technically experienced public and oversight groups.

Challenge: How do you communicate to build consensus for making decisions on work scope priorities in a highly complex, coupled system?

Approach: Develop an analysis tool for aiding decision-making.

In March 1994, Sandia embarked on an effort to create a new decision-aiding analysis tool called the system prioritization method (SPM). Such a tool is useful and perhaps even necessary for balancing environmental (and other) project triple constraints, wherein:

- the schedule is aggressive
- resources are constrained

- work scope for completion is ill-defined
- linkage of WBS elements to compliance demonstration requirements are not rigorously mapped
- work scope prioritization and down-selection decisions are required to accommodate work scope changes (scope "creep"), and making these decisions based upon information (rather than intuition or seat-of-the-pants) requires processing of massive amounts of data, models, calculations, and "what-if" scenarios.

This tool is intended to define what might be the most viable combination of "activities," including scientific investigations, engineering alternatives (EA), and waste acceptance criteria (WAC), for supporting the final WIPP compliance application. Each activity has an associated cost, duration, two or more predicted outcomes, and a probability of occurrence for each predicted outcome.

A scientific investigation can be any logical combination of scientific subtasks and could, for example, include a number of field, lab, and modeling components. Scientific tasks can also include novel analyses, bounding calculations, or literature searches to document technical positions. Engineered alternatives represent specific engineering design modifications of either the WIPP facility or waste forms that could be implemented to improve the performance of the disposal system and help assure its ability to comply with regulatory performance requirements. Waste acceptance criteria represent constraints on the specific type, form, or quantity of radioactive, hazardous, or non-regulated material to be considered for disposal at WIPP. These constraints could be implemented to improve the performance of the disposal system.

The SPM process calculates the probabilities of certain sets of activities demonstrating compliance with portions of the regulations that apply to permanent disposal of radioactive wastes and RCRA-listed hazardous materials. SPM provides results in the form of a decision matrix to identify high likelihood of success, cost- and schedule-effective programmatic paths (5). For this particular WIPP application, SPM had eight key steps:

- development of a technical baseline
- . specification of the SPM compliance indicator (CI), a binary measure (i.e., either 1 or 0) of whether the WIPP disposal system is predicted to succeed or fail in meeting the selected performance requirements (although some studies were performed to examine the effect of continuous rather than binary indicators)
- evaluation of the baseline CI for the WIPP disposal system using models and data from the technical baseline (4)
- Identification of activities available to the WIPP project that, if implemented, would have the potential to impact the system's CI
- elicitation of information from the project about what might evolve if specific activities are implemented (potential outcomes)
- evaluation of the performance of the disposal system using the potential outcomes of the activities and combinations of activities (activity sets)
- execution of a decision analysis and the creation of a decision matrix
- implementation of selected activities.

These steps are iterated as necessary until baseline calculations indicate compliance. Once this occurs, the preparation of a formal PA for regulatory compliance demonstration purposes can begin.

A prototype iteration of SPM (SPM-1) was completed in September 1994. It served as a benchmark and test bed for developing tools needed for a second iteration (SPM-2). SPM-2 was completed in March 1995 and is aiding in programmatic selection of efforts most closely linked to compliance demonstration.

As a starting point for establishing a baseline, SPM-2 developed position papers on technical and scientific issues or key modeling methods and presented them for review and comment to WIPP project public and oversight groups and regulators as part of WIPP's public participation program. Interdisciplinary teams that formed for both the technical position papers and for defining the SPM-2 baseline also provided a major portion of information on activities considered in SPM-2, and were elicited (by external facilitators) for the outcomes of those activities.

SPM uses performance assessment (PA) computer codes to generate mean CCDFs and RCRA contaminant concentrations to estimate the probability that an activity will contribute to the ability of the WIPP program to demonstrate compliance with regulatory criteria. This probability for demonstrating compliance (PDC) is the quantitative probability that, if the activity set is completed, the resulting design and information base for WIPP would be sufficient to demonstrate compliance with selected portions of the regulations. PDC, activity cost, and duration for each SPM programmatic option (activity) comprise an SPM decision matrix.

SPM-2 analyses looked at over 600,000 possible activity sets. Many of the analyzed activities had no impact on the CI, which subsequently allowed them to be removed from the decision matrix and reduced the number of activity sets to roughly 46,700. Because each activity set had multiple outcomes, the number of CCDFs needed to complete the SPM-2 analysis was roughly 1,350,000. A CD-ROM containing just under 200 megabytes of information, including the decision matrix and software tools for analysis, post-processing, and graphical display, was distributed to the DOE and public groups to assist them in understanding all SPM-2 information and the rationale for subsequent decisions. A key attribute of this CD-ROM is the capability of its software to search for and track terms, technical issues, assumptions, and concepts across all references supporting SPM-2 and in appropriate sections of the regulatory criteria (which are included on the CD-ROM).

SPM-2 successfully demonstrated a number of concepts. It:

- created a program element decision matrix that aids in the identification of lowest cost, lowest risk, and shortest paths towards compliance
- provided a single, high-information-density reference source (CD-ROM based) containing conceptual models, calculations, assumptions, compromises, sensitivities and uncertainties, and the leverage each program element has on the compliance demonstration argument
- brought project participants and public groups together in defining relevant issues to be addressed in a compliance application
- developed user-friendly visualization tools allowing public groups to study large decision matrices
- performed analyses showing the contribution of major WIPP activities, including EAs and WACs, toward a successful demonstration of compliance with selected EPA long-term performance regulations.

Public Group/Regulator Communication

Challenge: How do public groups form opinions about safety and risk of environmental projects?

Approach: Research what opinions about technical credibility are based upon in various domains (6).

Successful performance assessment involves not only accumulation and organization of scientific information about how well a facility (like WIPP) will contain wastes, but requires that the credibility of the assessment be retained in the following "domains": scientific (e.g., National Academy of Sciences review panels, academic community technical experts), regulatory (EPA, state environment department), and public (both lay public and groups with a vested interest in nuclear waste). Failure to achieve and retain credibility in any of these domains results in a high probability of failure of the performance assessment effort.

Sandia has partnered with the Institute for Public Policy at the University of New Mexico to perform a series of studies of how technical information about WIPP's performance and regulatory compliance is understood and evaluated in various domains. These studies consider the roles of both the social and physical sciences in the regulatory compliance process. The focus of the study is on three major tasks:

1. Evaluation of how members of the public receive, understand, and utilize WIPP information. Assess:

- current sources and content of WIPP information
- effectiveness of alternative information sources
- effectiveness of alternative approaches to providing WIPP information.

2. Evaluation of Sandia patterns of communication with public groups:

- views of the public substantially affect Sandia's communication with those groups
- views of the public about safety can be understood as "implicit theories" that are often at substantial variance with those held by technical experts
- understanding how Sandia scientific staff and spokespersons view the public is necessary to develop training for more effective communication, and for critical examination of Sandia's own "implicit theories" of appropriate performance assessment.

3. Development of an understanding of how PA takes place in the regulatory and political process:

- develop an understanding of how scientific uncertainty is used in PAs conducted for controversial policy initiatives (like WIPP)
- understanding of ways in which regulatory agencies and public interest groups affect the conduct of PAs
- assess ways in which a scientific research organization can best respond to current and future PA needs.

From the public perspective, the WIPP PA amounts to a set of scientific claims about the acceptability of risks associated with the facility. Claims about the safety of WIPP are made by many sources and range from apocalyptic damage to perfect containment. When assessing such claims in a WIPP-specific survey that sampled 1,200 New Mexico citizens and another 600 U.S. citizens, a large fraction of the public (both NM and nationwide)

Scientist's Organization	Favor	Neutral	Against
National Academy of Sciences	24%	64%	12%
National Laboratory	54%	36%	10%
United States EPA	24%	28%	48%
United States DOE	66%	24%	10%
National Environmental Group	15%	23%	62%
Private Contractor	70%	21%	9%

FIGURE 1 PERCEIVED BIAS TOWARD OPENING A NUCLEAR WASTE FACILITY -BY TYPE OF SCIENTIFIC EXPERT

was found to be remarkably sophisticated at filtering and weighting the scientific and technical information that they receive.

Among the more important findings of the survey are that members of the public are able to make quite reasonable guesses about what kinds of positions on the risks of nuclear waste disposal will be taken by scientists from differing organizations. Respondents in the survey were asked to indicate whether statements made about opening a nuclear waste storage/disposal facility by a diverse set of "experts" would likely be: 1) biased in favor of opening the facility, 2) neutral and unbiased, or 3) biased against opening the facility.

As shown in Figure 1, National Academy scientists were expected to be the most "neutral," and private contractors the least neutral. (As used here, the term "private contractor" refers to a [typically] for-profit company hired by the DOE to perform the role of site owner-operator or managing and operating contractor.) Scientists working for private contractors, the DOE, and national laboratories (including Sandia) were perceived to be likely to make statements biased in favor of opening a nuclear waste facility, while those working for environmental groups and the EPA were seen to be likely to make statements biased against opening such a facility.

A second important finding is that, in assessing the credibility of scientific claims about the safety of a nuclear waste facility, members of the public place great emphasis on the independence of scientists from those who fund the research. For example, the survey respondents were asked whether they strongly agreed, agreed, disagreed, or strongly disagreed with the following statement: "For scientists to do unbiased work, they must have independence from whoever funds the research." The response pattern is shown in Figure 2.

Both the national and NM survey respondents tended to agree or agree strongly with the statement. In addition, majorities in both samples agreed or agreed strongly with the statement that "scientists are likely to give the answers that are preferred by whoever pays them." It is clear that there is significant skepticism about funded research, and that the credibility of PA results is likely to be affected by perceptions of the degree to which the funding agency (in the WIPP project's case, the DOE) is believed to interfere with the way in which the PA scientists and those providing technical inputs into PA go about their work.

A third finding of import for credibility of PA results concerns the ways in which prior expectations about the positions (or biases) of scientists from different organizations affect the ways in which members of the public weigh (and utilize) information that comes from these scientists. When lay citizens

Response	New Mexico	United States
Disagree Strongly	3%	1%
Disagree	13%	15%
Agree	48%	47%
Agree Strongly	36%	37%

FIGURE 2 "FOR SCIENTISTS TO DO UNBIASED WORK, THEY MUST HAVE INDEPENDENCE FROM WHOEVER FUNDS THE RESEARCH"

hear scientific claims about the safety of WIPP, the credence given those claims is dependent on their perceptions of the biases of the scientist making the claim and the difference between the citizens' prior beliefs about safety and the claims made by the scientist. If the scientist is perceived to be biased in favor of opening WIPP, citizens tend to give greatest weight to scientific claims that suggest that risks are greater than they had previously believed (7). Thus, the stronger and more widespread the public perception that a scientist (or her organization) is biased in favor of opening a nuclear waste facility, the less likely it is that the public will believe claims from that scientist that the risks posed by the facility are smaller than had been previously believed.

What has historically made Sandia's PA different from other claims about WIPP safety is that the pubic has tended to perceive Sandia to have a relatively high degree of scientific independence and competence, and to be relatively unbiased on the matter of whether WIPP is sufficiently safe to open. As shown above in Figure 1, Sandia scientists rank second only to National Academy scientists in perceived neutrality. This gives Sandia scientists a greater base of credibility with the public than is true of other sources of scientific claims about the safety of WIPP, including scientists from DOE, environmental groups, private contractors, and even the EPA. Other survey results show that the relative credibility of Sandia scientists tends to be largest among those members of the public who are presently not committed for or against opening WIPP. How successful the WIPP project is at preserving this relative advantage for Sandia will depend, in part, on Sandia's ability to maintain a degree of credible scientific independence from federal sponsors in providing PA results.

A more general survey on beliefs associated with risks of nuclear waste management and WIPP (8) presents other concepts on how to communicate risk to various public group domains. Some conclusions are:

- Public groups who perceive themselves to be knowledgeable about WIPP tend to express greater support for opening the facility.
- When considering options for defense program transuranic waste disposal (i.e., leave it where it is now, ship it to WIPP, or find an alternative site), a plurality of survey respondents in Idaho and New Mexico support sending wastes to WIPP. In addition, the greater the self-rated knowledge about WIPP, the greater the support for shipping wastes to WIPP.
- While radioactive wastes are indeed seen as risky, members of the public can and do make distinctions among the relative levels of risk that result from different kinds of policies for managing those wastes.

In response to some of these observations, a modified method of measuring public group opinions is being developed. In the past, members of focus

groups were asked to share their perceptions of a problem such as transportation, storage, or disposal of nuclear waste. At recent group sessions, at the conclusion of the formal session, participants were given the opportunity to ask questions of one or more technical experts on radiation, nuclear waste management, and the WIPP facility expressing topics of interest or concern to them. In part, the results of these sessions will permit Sandians to learn about concepts that members of the public deem important for understanding the safety of WIPP. This kind of learning is critical if the technical community is to conduct performance assessment that can bridge the gap between public and expert understandings of the risks associated with radioactive materials. At the same time, observations from these focus group sessions will be made on differing methods for providing scientific information to the public about issues which may have a significant non-technical component. Assessments will be made on the impacts of methods and information in changes that may occur in the public's opinions of risk.

Challenge: How do you manage involvement in your project of various public groups?

Approach: Base interactions upon an active public participation program.

There are upwards of a dozen oversight groups and another two dozen recognized local, national, tribal, institutional, and international public groups with interests in the process by which WIPP decisions are made and the impacts of those decisions. A Stakeholder Outreach Strategic Plan (9), written by the DOE/CAO, "supports a new paradigm of shifting from secrecy required by the nuclear weapons program to emphasis on gaining public trust in DOE's activities." A decision whether or not to open WIPP for permanent disposal of waste encompasses not only technical and scientific concerns but also a balance among technical, regulatory, and political and public policy issues and concerns raised by local, national, institutional, tribal, and international public groups. Some WIPP public group concerns and needs identified by the DOE include:

1. Public group issues might contribute to schedule delay or preclude WIPP's opening:

- concerns about the potential safety and environmental impacts that could result from geologic disposal of radioactive waste
- concerns about waste transportation accidents and the potential for release of radioactive and hazardous materials to the environment
- concerns that the DOE will evade regulations
- concerns that the DOE does not recognize tribal issues
- concerns about government inefficiency
- concerns about nuclear proliferation
- concerns about a highly aggressive project schedule.

2. Public officials require current, accurate information to participate effectively in decisions affecting WIPP activities. These key decision-makers must be responsive to the issues of their broad-based constituents.

Some potentially affected public groups have limited or no information about WIPP; others do not see its relevance to their needs. Issues include:

- lack of public knowledge about the project
- differing priorities.

Some public group outreach goals being pursued by DOE to address WIPP project concerns are to:

- develop and enhance relationships with other federal offices in New Mexico to improve coordination on shared issues, including land use management, transportation, waste management, public health and safety, and environmental protection
- encourage and facilitate broad public participation in planning and decision-making processes
- enhance awareness of concerns, needs, and cultural practices of the sovereign tribal nations
- foster international exchange and support.

SUMMARY

Guiding the multiyear, multibillion dollar, multiparticipant, somewhat contentious WIPP radioactive waste project to a successful conclusion provides the opportunity to experience nearly all aspects of communication planning, information distribution, progress reporting, and administrative closure elements as outlined in the *PMBOK Guide*. The project currently is preparing for its submittal of formal regulatory documents to the EPA and state of New Mexico, targeted for late 1996, and is planning and distributing information using a number of approaches, some of which are described in this paper.

While ongoing for some time, progress reporting will occur in earnest as feedback on the credibility and completeness of WIPP's compliance argument is generated by regulatory and public communities. Communications management in the legal arena of the regulator is a next major step on the horizon. Administrative closure will await the outcome of the regulators' and public's assessments of what was communicated and how effectively it was delivered.

REFERENCES

1. Lynch, R. W., et. al. 1991. "Deep Geologic Disposal in the United States: The Waste Isolation Pilot Plant and Yucca Mountain Projects." Sandia Report SAND90-1656 UC-721, Sandia National Laboratories, May.

2. Department of Energy, WIPP: Strategy for the Waste Isolation Pilot Plant Test Phase. 1991. DOE/EM/48063-2 (Oct.); Department of Energy, Carlsbad Area Office Strategic Plan. 1995. DOE/WIPP93-025 Rev. 1, (Mar.).

3. O'Leary, H. R. 1994. Secretary of Energy memo to all DOE employees, Guidance on Implementation of the Department's Public Participation Policy, July

4. Bertram-Howery, S. G., and P. N. Swift. 1990. Status Report: Potential for Long-Term Isolation by the Waste Isolation Pilot Plant Disposal System. Sandia Report SAND90-0616 UC-721, Sandia National Laboratories. June.

5. Prindle, N. H., F. T. Mendenhall, Jr., and D. M. Boak. SPM-2 Final Report, Sandia National Laboratories (to be published).

6. Material in this section was provided by Hank Jenkins-Smith and Carol Silva, UNM Institute for Public Policy, University of New Mexico, Albuquerque, New Mexico.

7. For a general discussion of this relationship, see Jenkins-Smith, H. C., and G. Bassett. 1994. "Perceived Risk and Uncertainty of Nuclear Waste: Differences Among Science, Business, and Environmental Group Members." Risk Analysis 14, no. 5, pp. 851–56, Oct.

8. Jenkins-Smith, H. C., and A. Fromer. 1993. "Public Assessment of the Risks from Managing Transuranic Wastes: The View From Idaho and New Mexico." University of New Mexico, Institute for Public Policy, Department of Political Science. Dec.

9. Department of Energy, Carlsbad Area Office Stakeholder Outreach Strategic Plan. 1995. DOE/WIPP-95-1088, Apr. Also related is the Carlsbad Area Office Stakeholder Outreach Implementation Plan (under preparation).

ACKNOWLEDGMENT

This work was supported by the United States Department of Energy under Contract DE-AC04-94AL85000.

Study Questions

"CAN WE TALK?": COMMUNICATIONS MANAGEMENT FOR THE WASTE ISOLATION PILOT PLANT, A COMPLEX NUCLEAR WASTE MANAGEMENT PROJECT

1. Based on your project management knowledge, what would be an organized way of dealing with the different groups that have vested interests in the project?

2. The management of this case relies on the use of advanced techniques such as electronic networking, performance assessment, and a system prioritizing method. Describe one of these subprojects and comment on the feasibility of this project without the use of this tool.

3. Do you see any potential problems with the electronic networking system as it is described? What rules should be followed for the use of such a system?

4. The challenge described in explaining the behavior of the waste repository describes methods and models used but ends with a statement that the full explanation of the process is impossible except to those highly technically oriented. How should this communications problem be handled? Support your answer with reference to the project management literature.

5. In a project of this sort the two main challenges appear to be the use of new technology and the selling of this idea to the public. Would these two segments of the project be better handled as two distinct projects?