EVOLUTION OF NRC AND PUBLIC ATTITUDES REGARDING PUBLIC OUTREACH

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QUALITY OF DATA, ANALYSES, AND CODE DEVELOPMENT

DATA: All CNWRA-generated original data contained in this report meet the quality assurance requirements described in the Geosciences and Engineering Division Quality Assurance Manual. Sources for other data should be consulted for determining the level of quality for those data.

ANALYSES AND CODES: No scientific or engineering software was used in the analyses contained in this report.

EVOLUTION OF NRC AND PUBLIC ATTITUDES REGARDING PUBLIC OUTREACH—LETTER REPORT

The U.S. Nuclear Regulatory Commission (NRC) Yucca Mountain public outreach program began in 1999 with the purpose of conveying information to stakeholders and the public in an open, transparent way. The public outreach team was drawn from NRC and Center for Nuclear Waste Regulatory Analyses (CNWRA®, or the Center) staff members engaged in other Yucca Mountain-related technical projects who could contribute to public outreach. The first public meetings were held in Las Vegas and Beatty, Nevada, on March 23 and 25, 1999, and discussed the proposed 10 CFR Part 63 rule. During these meetings, the public outreach team encountered a lack of trust and suspicion among the members of the public. One attendee at the Beatty meeting was quoted as saying, "I hear what you're saying, but I don't believe you."[1] The staff realized that there were many misconceptions and barriers that needed to be overcome to create a relationship of trust and began earnest efforts to create an effective public outreach program. This report includes descriptions of two major areas of focus—communication media and public meetings—as well as a discussion about the evolution of national and agency attitudes throughout the course of the program.

Communication media is an important part of a public outreach program. The team made significant efforts to develop educational tools to help NRC convey its messages in a clear and trustworthy way. Recognizing that each audience is different and that there are a variety of learning styles, the team utilized a number of different media. The development of these tools was a learning process, and the team continually improved its approaches and added products to its collection of resources. The main types of media included Microsoft® PowerPoint® presentations, posters, fact sheets, and a brochure, a slideshow, and a 3D model. This report summarizes the media used in the public outreach program and discusses the perceived success of these types of media.

During the first public meetings in 1999, NRC came prepared with PowerPoint presentations and copies of the Federal Register notice. Presentations for the outreach program were usually about 30 minutes or less in length and covered a single specific subject. The presenter was typically a technical expert for the subject matter or worked on a team that considered the particular topic (Figure 1). While PowerPoint presentations remain a staple form of media used by the public outreach program, initially, they were not used to best advantage, nor were they well tailored to the audiences to which they were presented. Over time, however, as the outreach program grew in sophistication, every presentation went through individual and team reviews before each public meeting. These reviews ensured that the content fit the audience and context of the meeting, accurately represented factual information, adequately met legal requirements, and was clear and easy to understand. Authors learned to use a mix of text, pictures, and occasionally video on the slides, being careful to keep the slides uncrowded and easy to view from a distance. Presentations were sometimes made available ahead of time to meeting participants via email or the NRC website, or were printed to distribute at the meetings. Afterward, presentations were archived into the NRC Documents Access and Management System and often posted to the NRC Website. Separate from presentations at public meetings, two oral presentations utilizing PowerPoint were also made at the Geological Society of America (GSA) convention in fall 2009 as a public outreach effort.

[1]J. Kotra, personal communication, November 10, 2010.

Figure 1. A Technical Staff Member Gives a PowerPoint Presentation at a Public Meeting in Tecopa, California

As a result of the 1999 public meetings, the staff recognized that additional visual aids would be helpful. The public outreach team began quickly developing three posters for use at an upcoming meeting. The first poster was titled "Protecting Public Health and Safety at the Proposed Geologic Repository at Yucca Mountain, Nevada." The poster shows the roles of federal agencies involved in the licensing process (Figure 2). The second poster, titled "U.S. NRC Oversight of the Proposed Repository at Yucca Mountain: Opportunities for Public Involvement," depicted the steps in the licensing process and suggested ways for the public to be involved in these steps (Figure 3). Among the ideas that NRC wanted to convey in these two posters was the independence of NRC and the large role that NRC plays in the licensing process. Size and placement of the NRC representation in the graphics was carefully considered to stress the agency's importance. Special attention was also given to the colors, fonts, and shapes used in the posters to avoid visual cues that might be negative or alarming. The third poster explained the CNWRA technical capabilities and its role in assisting NRC in the licensing decision (Figure 4). The content of the poster included more text and several

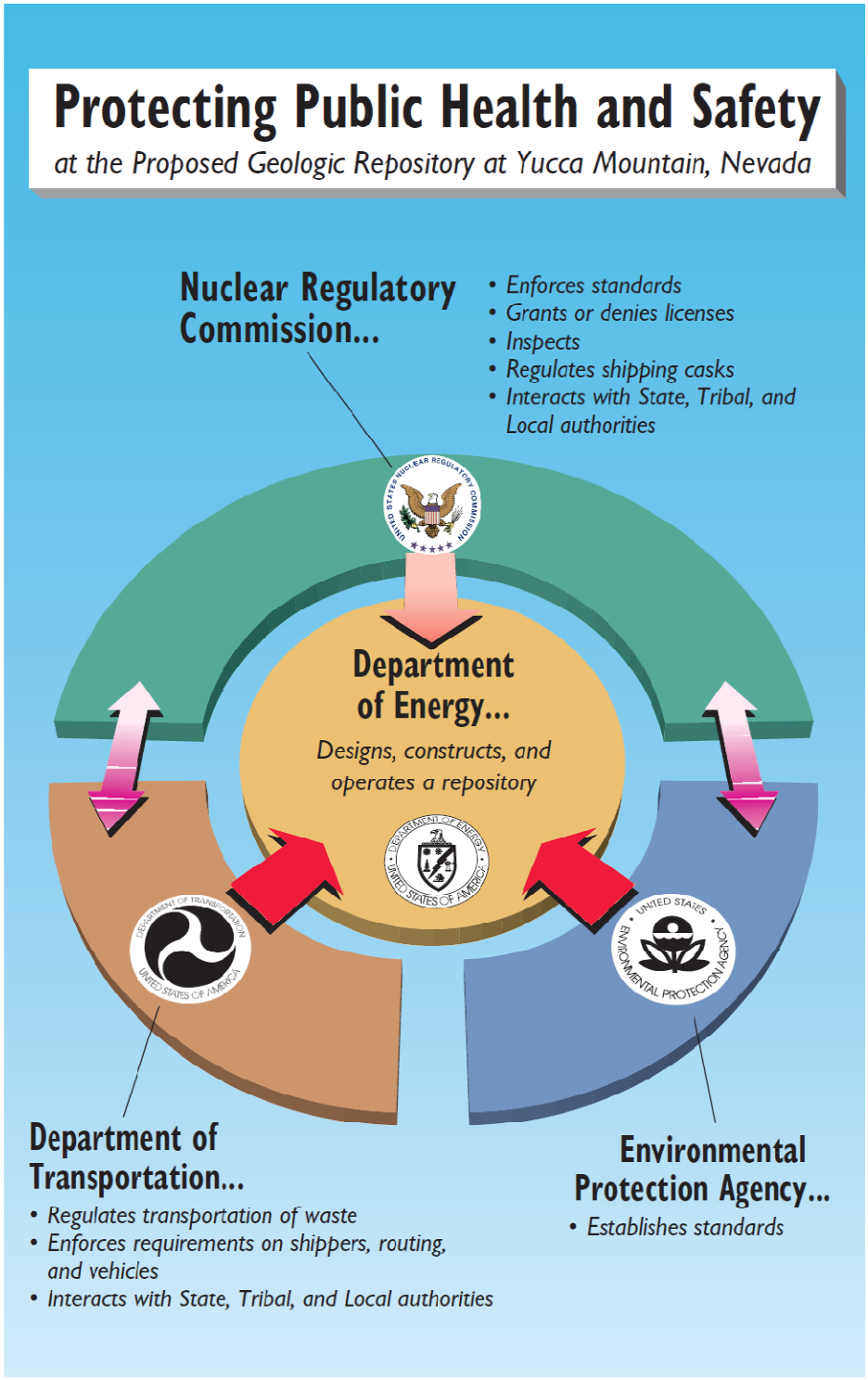


Figure 2. One of the First Public Outreach Posters, "Protecting Public Health and Safety at the Proposed Geologic Repository at Yucca Mountain, Nevada"

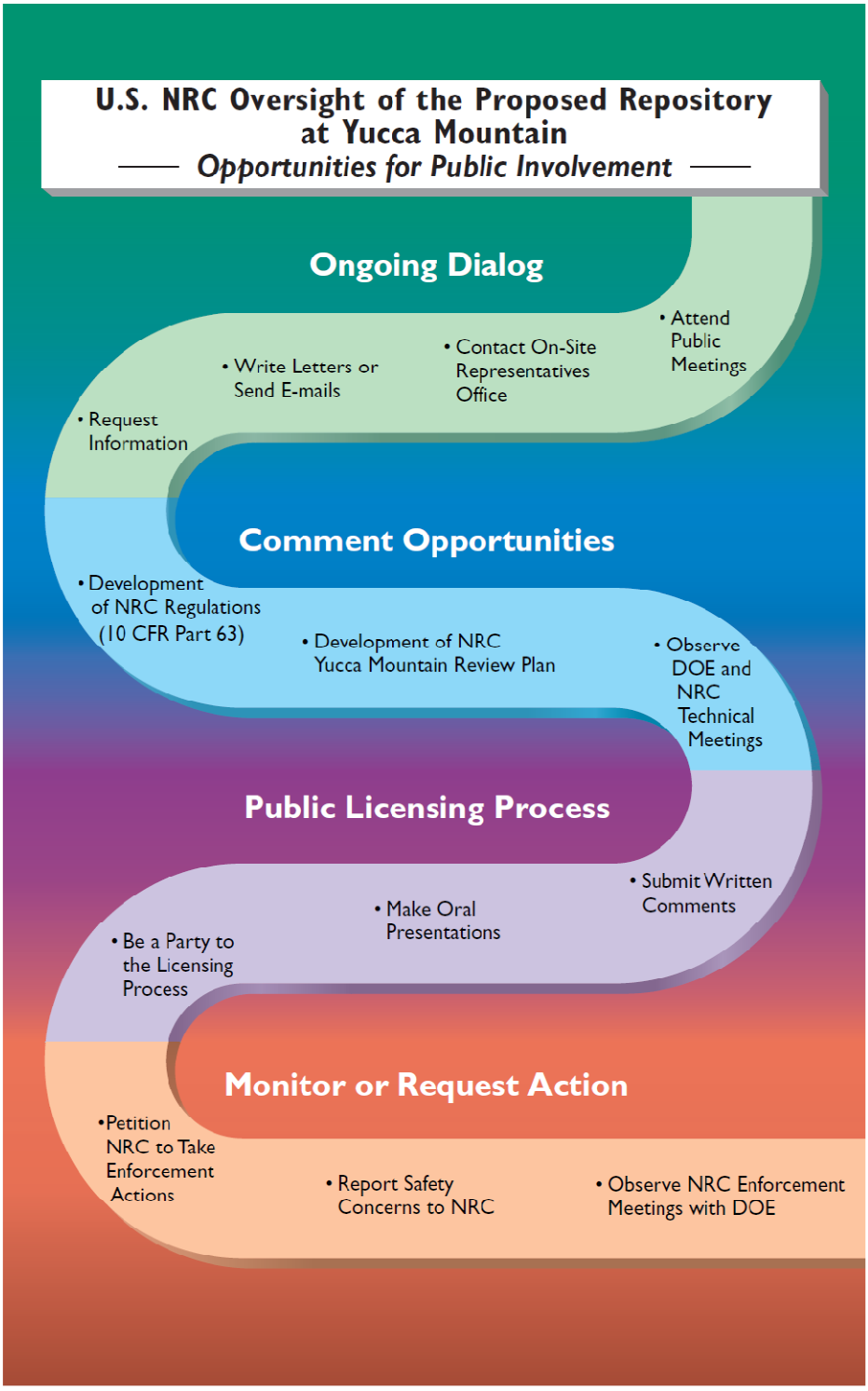


Figure 3. Another of the First Public Outreach Posters, "U.S. NRC Oversight of the Proposed Repository at Yucca Mountain: Opportunities for Public Involvement"

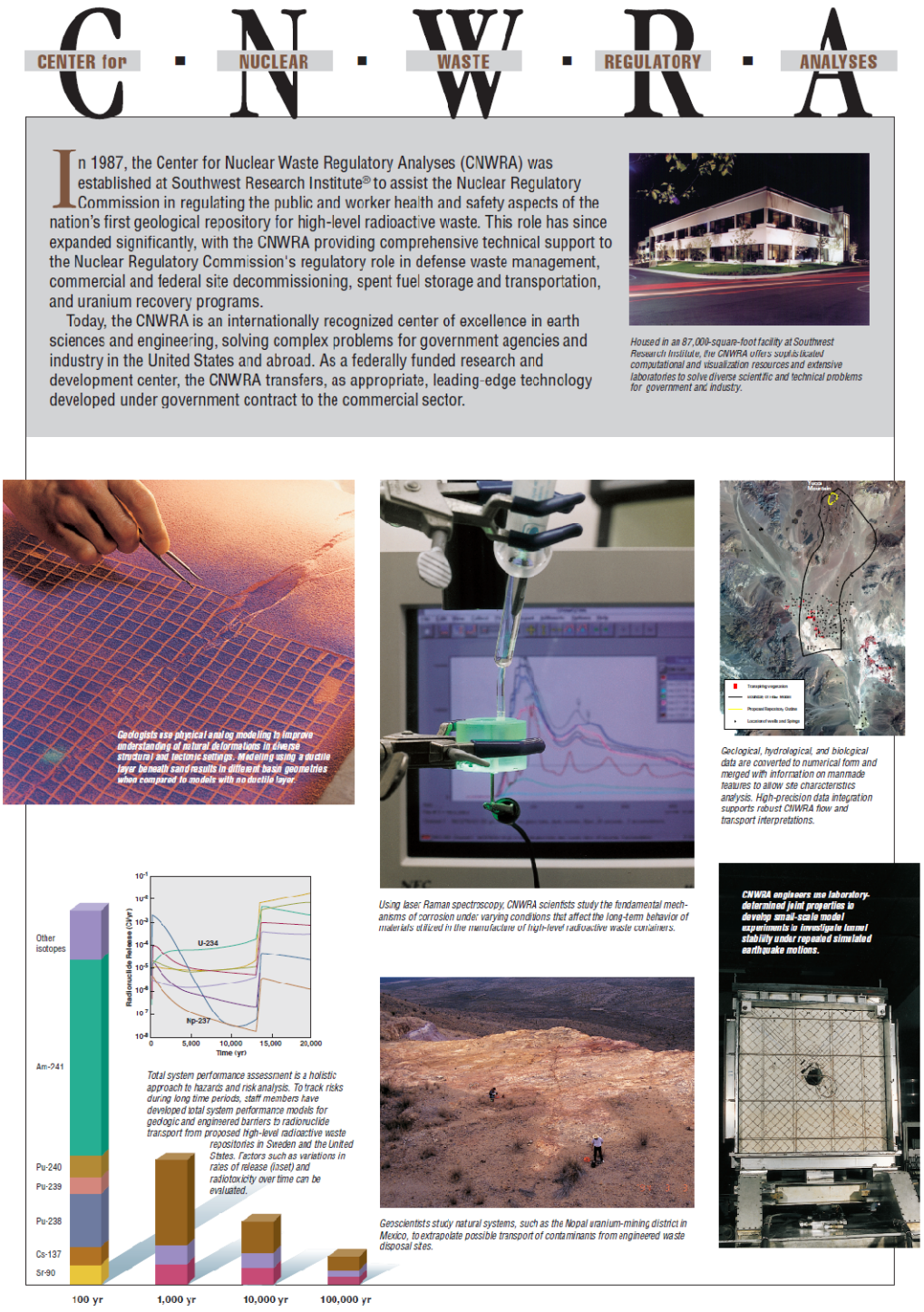


Figure 4. Third of the Original Posters, "CNWRA Technical Capabilities and Its Role in Assisting the NRC in the Licensing Decision"

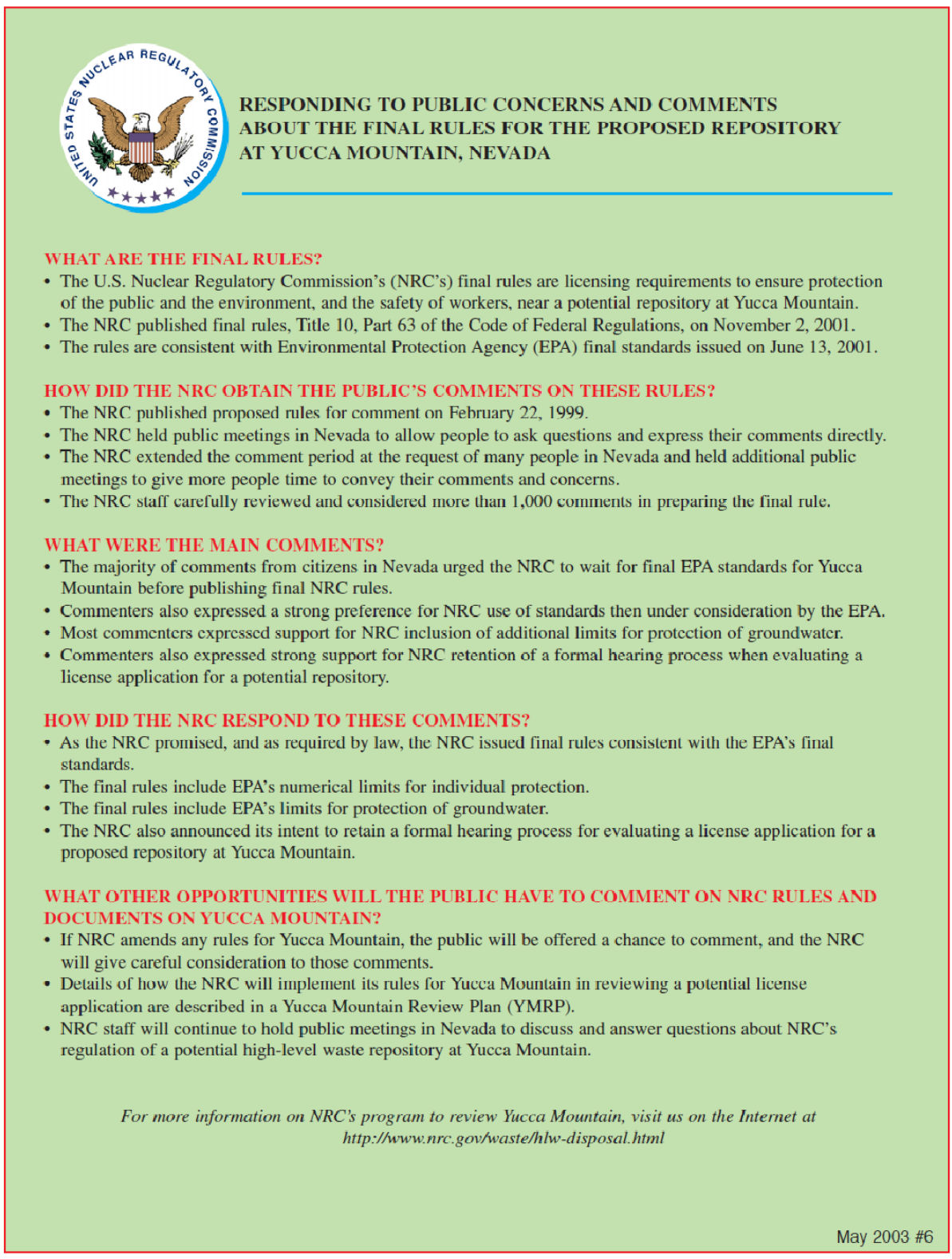
photographs of investigative activities, including laboratory and field work. These three posters were displayed on easels at the meeting and served as focal points for discussions with meeting attendees. The posters were subsequently heavily used at other meetings and open house events and were displayed at the On-Site Representatives office and at NRC headquarters. Additional posters were added later, including a performance assessment poster and a large map of the Yucca Mountain vicinity featuring locations important to licensing. The three original posters, and later the performance assessment poster, were also printed in an 11 × 17-in size to use as handouts. The team added a page of explanatory text to the back side of these sheets, and these became the first information sheets or fact sheets, the most common form of media used in the NRC public outreach program. The fact sheets were designed to concisely explain a specific legal aspect or regulatory requirement concept. The format of subsequent fact sheets was an 8.5 × 11-in sheet, double or single sided, often in question and answer format (Figure 5). Some fact sheets had a graphical depiction on one side, designed to grab the viewer's attention and introduce a concept, while the text on the other side elaborated on the concept and provided more in-depth information.

Designing the information sheets required thoughtful input and cross-discipline effort. While the technical staff provided most of the technical content, a plain language version of the text was required to make the information sheets useful and understandable to a nontechnical audience. The public outreach team utilized nontechnical NRC staff and support staff, to screen the information sheets for readability. Once the language was modified satisfactorily to accurately convey the intended messages in an understandable way, Office of the General Counsel staff reviewed the materials and ensured that they accurately represented and complied with the legal obligations of NRC.

One of the fact sheets that took considerable effort to put together was the two-sided "Key Technical Issues" fact sheet (Figures 6 and 7). This was particularly challenging because the input was solicited from many technical staff that did not normally work on the public outreach team, and many of the staff found it difficult to condense their task descriptions into plain language. However, once completed, this particular fact sheet was highly successful and was even used in a news interview 2 weeks after its release. Rather than having to summarize the technical subjects, the journalist was able to use language directly from the fact sheet, avoiding loss of accuracy in translation. The effort to put technical terms into lay terms proved to be worthwhile.

An NRC calling card was also developed as a simple, small handout. The size of a business card, the calling card carried basic information about the NRC purpose and how to contact NRC for more information about the program. Figures 8 and 9 show the outside and inside of the card. Because these cards were portable, staff members distributed these cards at meetings, open houses, conferences, and casual events.

The public outreach team conducted multiple workshops for tribal governments and for affected units of local government. Staff prepared notebooks to distribute to workshop attendees. The notebooks contained copies of the fact sheets, printouts of PowerPoint presentations, and small versions of the posters, as well as newly developed glossaries to improve understanding of



RESPONDING TO PUBLIC CONCERNS AND COMMENTS ABOUT THE FINAL RULES FOR THE PROPOSED REPOSITORY AT YUCCA MOUNTAIN, NEVADA

WHAT ARE THE FINAL RULES?

- The U.S. Nuclear Regulatory Commission's (NRC's) final rules are licensing requirements to ensure protection of the public and the environment, and the safety of workers, near a potential repository at Yucca Mountain.
- The NRC published final rules, Title 10, Part 63 of the Code of Federal Regulations, on November 2, 2001.
- The rules are consistent with Environmental Protection Agency (EPA) final standards issued on June 13, 2001.

HOW DID THE NRC OBTAIN THE PUBLIC'S COMMENTS ON THESE RULES?

- The NRC published proposed rules for comment on February 22, 1999.
- The NRC held public meetings in Nevada to allow people to ask questions and express their comments directly.
- The NRC extended the comment period at the request of many people in Nevada and held additional public meetings to give more people time to convey their comments and concerns.
- The NRC staff carefully reviewed and considered more than 1,000 comments in preparing the final rule.

WHAT WERE THE MAIN COMMENTS?

- The majority of comments from citizens in Nevada urged the NRC to wait for final EPA standards for Yucca Mountain before publishing final NRC rules.
- Commenters also expressed a strong preference for NRC use of standards then under consideration by the EPA.
- Most commenters expressed support for NRC inclusion of additional limits for protection of groundwater.
- Commenters also expressed strong support for NRC retention of a formal hearing process when evaluating a license application for a potential repository.

HOW DID THE NRC RESPOND TO THESE COMMENTS?

- As the NRC promised, and as required by law, the NRC issued final rules consistent with the EPA's final standards.
- The final rules include EPA's numerical limits for individual protection.
- The final rules include EPA's limits for protection of groundwater.
- The NRC also announced its intent to retain a formal hearing process for evaluating a license application for a proposed repository at Yucca Mountain.

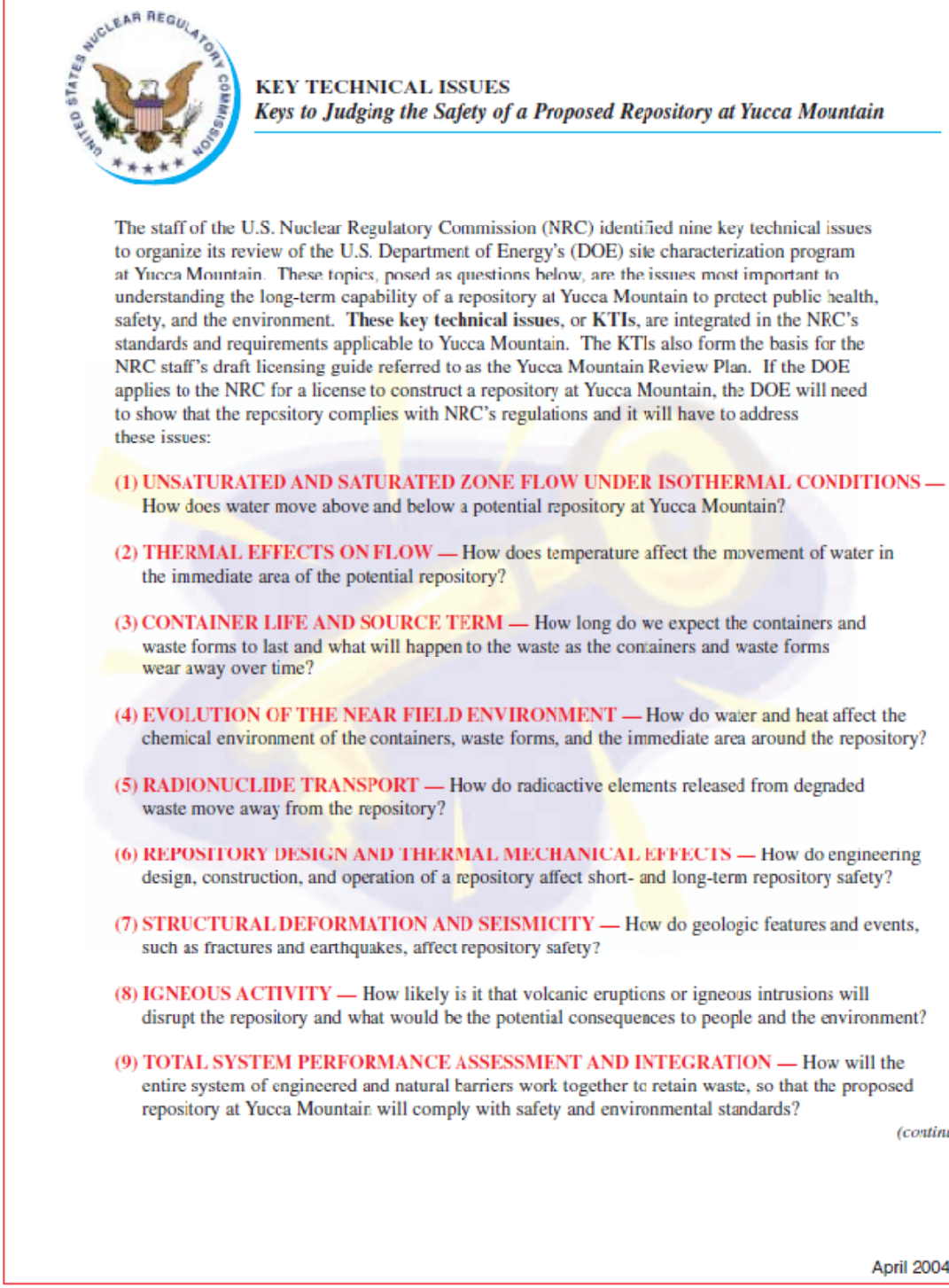
WHAT OTHER OPPORTUNITIES WILL THE PUBLIC HAVE TO COMMENT ON NRC RULES AND DOCUMENTS ON YUCCA MOUNTAIN?

- If NRC amends any rules for Yucca Mountain, the public will be offered a chance to comment, and the NRC will give careful consideration to those comments.
- Details of how the NRC will implement its rules for Yucca Mountain in reviewing a potential license application are described in a Yucca Mountain Review Plan (YMRP).
- NRC staff will continue to hold public meetings in Nevada to discuss and answer questions about NRC's regulation of a potential high-level waste repository at Yucca Mountain.

For more information on NRC's program to review Yucca Mountain, visit us on the Internet at http://www.nrc.gov/waste/hlw-disposal.html

May 2003 #6

Figure 5. Single-Sided Fact Sheet "Responding to Public Concerns and Comments…" in Question-Answer Format



KEY TECHNICAL ISSUES

Keys to Judging the Safety of a Proposed Repository at Yucca Mountain

The staff of the U.S. Nuclear Regulatory Commission (NRC) identified nine key technical issues to organize its review of the U.S. Department of Energy's (DOE) site characterization program at Yucca Mountain. These topics, posed as questions below, are the issues most important to understanding the long-term capability of a repository at Yucca Mountain to protect public health, safety, and the environment. **These key technical issues**, or **KTIs**, are integrated in the NRC's standards and requirements applicable to Yucca Mountain. The KTIs also form the basis for the NRC staff's draft licensing guide referred to as the Yucca Mountain Review Plan. If the DOE applies to the NRC for a license to construct a repository at Yucca Mountain, the DOE will need to show that the repository complies with NRC's regulations and it will have to address these issues:

(1) **UNSATURATED AND SATURATED ZONE FLOW UNDER ISOTHERMAL CONDITIONS** — How does water move above and below a potential repository at Yucca Mountain?

(2) **THERMAL EFFECTS ON FLOW** — How does temperature affect the movement of water in the immediate area of the potential repository?

(3) **CONTAINER LIFE AND SOURCE TERM** — How long do we expect the containers and waste forms to last and what will happen to the waste as the containers and waste forms wear away over time?

(4) **EVOLUTION OF THE NEAR FIELD ENVIRONMENT** — How do water and heat affect the chemical environment of the containers, waste forms, and the immediate area around the repository?

(5) **RADIONUCLIDE TRANSPORT** — How do radioactive elements released from degraded waste move away from the repository?

(6) **REPOSITORY DESIGN AND THERMAL MECHANICAL EFFECTS** — How do engineering design, construction, and operation of a repository affect short- and long-term repository safety?

(7) **STRUCTURAL DEFORMATION AND SEISMICITY** — How do geologic features and events, such as fractures and earthquakes, affect repository safety?

(8) **IGNEOUS ACTIVITY** — How likely is it that volcanic eruptions or igneous intrusions will disrupt the repository and what would be the potential consequences to people and the environment?

(9) **TOTAL SYSTEM PERFORMANCE ASSESSMENT AND INTEGRATION** — How will the entire system of engineered and natural barriers work together to retain waste, so that the proposed repository at Yucca Mountain will comply with safety and environmental standards?

(continued)

April 2004-KTI

Figure 6. Key Technical Issues Fact Sheet, Front and Back Sides

FREQUENTLY ASKED QUESTIONS

WHY DOES THE STAFF OF THE U.S. NUCLEAR REGULATORY COMMISSION (NRC) MEET WITH THE U.S. DEPARTMENT OF ENERGY (DOE) BEFORE IT HAS SUBMITTED A LICENSE APPLICATION?

The Nuclear Waste Policy Act provides for NRC interaction with the DOE before the DOE is ready to file a license application. During prelicensing interactions with the DOE, the NRC staff continually stresses that, to prepare a high-quality license application, the DOE will have to address the **key technical issues**, or **KTIs**. The NRC conducts public technical exchanges to gain a better understanding of how the DOE is addressing the KTIs.

CAN THE PUBLIC ATTEND THESE MEETINGS?

Yes. These technical exchanges are open to all stakeholders, including representatives of the State of Nevada, Tribal governments, affected units of local governments, and interested members of the public. We conduct these technical exchanges in a public forum to increase public awareness of the issues and the transparency of the interaction process.

WHY DOES THE NRC WANT THE DOE TO RESOLVE THE KTIs?

The NRC wants to assure that enough information is available on each KTI to enable the NRC to begin a review of the license application if the DOE decides to submit it. Once the NRC accepts the license application for review, it has 3–4 years, by law, to complete its review.

WHAT DOES IT MEAN TO SAY AN ISSUE IS RESOLVED?

An issue is resolved when the NRC staff has no further questions or comments about how the DOE is addressing that issue. It should not be viewed as any sort of prejudgment of the outcome of the NRC staff's safety evaluation of that issue once a license application is under review. Relevant new information (for example, changes in design) could raise more questions or comments about a previously "resolved issue."

HOW WILL THE NRC DECIDE WHETHER AN ISSUE IS RESOLVED?

The NRC staff reviews information provided by the DOE and evaluates that information relative to what is required by acceptance criteria that are based on requirements in our rule.

WHAT ARE ACCEPTANCE CRITERIA AND WHERE ARE THEY DOCUMENTED?

Acceptance criteria are the measure by which the NRC staff judges the acceptability of DOE information for a possible license application. An example acceptance criterion is "data are sufficient for model justification." These criteria and their bases were developed over several years, and are described in a series of publicly available reports. A final Yucca Mountain Review Plan, published in July 2003, organizes these criteria in one document. The final review plan reflects input from the public and has been approved by the Commission.

For more information on NRC's program to review Yucca Mountain, visit us on the Internet at http://www.nrc.gov/waste/hlw-disposal.html

Figure 7. Key Technical Issues Fact Sheet, Front and Back Sides

Figure 8. Exterior of the NRC Calling Card. The Card Was Folded in Half to Form a Regular Business-Card-Sized Handout.

Figure 9. Interior of the NRC Calling Card. The Card Was Folded in Half To Form a Regular Business-Card-Sized Handout.

terminology used during the workshops. Workshop attendees found the notebooks to be useful, and they also served as good resources for staff members for subsequent interactions.

The 10 CFR Part 63 rule played an important role in the licensing of Yucca Mountain and was a crucial aspect to explain to stakeholders and the public. Because staff felt that more information was needed than could be contained in a single fact sheet, the team developed a full color, 20-page brochure entitled "Judging the Safety of a Repository at Yucca Mountain, Nevada." The brochure included discussions about standards and regulations used, multiple barrier requirements, what makes a repository safe and postclosure activities. It also included a glossary drawn from the notebooks used for tribal workshops and a postage-paid feedback card. While the brochure was widely distributed and received significant praise from the recipients, none of the feedback cards were returned.

A self-contained computer slide show was another form of media used to convey information about the NRC partnership with CNWRA. The slide show, which ran automatically on a continuous loop, was approximately 8.5 minutes long and had an instrumental soundtrack. The slides presented the CNWRA technical capabilities, including computer modeling, laboratory investigations, field studies, and performance assessment. Each of the nine key technical issues was presented, including appropriate visual representations of experiments or models. The slide show ran during NRC Open House events and the annual reviews at the Center. The slide show highlighted the work that the Center did to support the NRC independent review. The slide show was well received at these events: participants at the meetings stopped to watch the presentation video and made positive comments. The slide show was also intended for use at a kiosk at future conference events, but the opportunity for use in those venues did not arise.

The NRC website served as another form of media for public outreach. Use of this resource was somewhat limited, however, due to heavy administrative constraints on the format and content. Also, because a separate organization controlled updates to the website, public outreach team members could not work on the site themselves. The rigorous approval process requiring multiple levels of authorization also slowed down the process of updating the website, making it difficult to post timely information. Because of these limitations, the website mostly functioned to distribute basic information in the form of text rather than having a variety of pictures, graphics, videos, or interactive tools and was a one-way street with no opportunity for direct user interaction. Feedback on the website has been limited, but much of the feedback has reflected a need for a more user-friendly interface and a less stilted structure.

The public outreach team developed a booth for use at a GSA conference. Booth development was partially motivated by the meeting location (Reno, Nevada) and partially by the audience, as GSA meetings are the largest formal gatherings of geoscientists. NRC and Center staff hosted the booth, talking with hundreds of visitors over several days and distributing copies of the fact sheets and posters. Visitors to the booth included advisory board members, employees of the U.S. Department of Energy, professors, students, and researchers. The booth exhibit contained the large previously developed posters (Figures 10 and 11). The primary messages discussed (i) that, NRC is the independent regulator and (ii) how NRC would evaluate safety through performance assessment. The booth also featured a poster promoting other talks that NRC staff were presenting on Yucca Mountain-related issues at the conference. Feedback on the booth was very positive, and NRC staff members were often asked at subsequent conventions whether they had a booth again.

Figure 10. Photo of the Booth at the Geological Society of America Meeting

Lastly, the team developed a three-dimensional (3D) model of a cross section of Yucca Mountain as a visualization tool (Figure 12). The model measured about 3 ft tall, 2 ft across, and 1 ft wide. Representative layers of the underground, including the various layers of tuff, the saturated zone, and the repository horizon, were carefully scaled. A mock drift was added in the center to show placement and also at the side of the model as a cutaway to show placement of the waste packages (Figure 13). To make the model interactive, small light-emitting diode lights and a soundboard were added with prerecorded informational sound bites. If one of the buttons was pushed, a light would come on at the appropriate location and a sound bite describing the feature would play. This model was displayed at public meetings, at the On-Site Representatives office and at NRC headquarters. While it proved difficult to transport, it was a useful focal point and received significant attention from viewers.

Most public outreach products were designed for a broad, nontechnical audience. However, a few additional posters and fact sheets were created that targeted a more technically knowledgeable audience. These fact sheets were generally used at conventions, technical exchanges, or visits to the NRC headquarters or On-Site Representatives office. Additionally,

Figure 11. Visitors at the Geological Society of America Booth Talking With NRC and CNWRA Staff

the materials developed for the public outreach program gained much wider usage throughout the agency by providing preapproved text and graphics that could be easily copied and pasted into other documents or presentations. Several other forms of media were considered for the public outreach program but were not utilized. First, the team drafted a storyboard concept for computer visualization tool. This visualization tool would have been an animated, narrated video distributable via website or CD-ROM explaining the Yucca Mountain biosphere, the process by which water travels through Yucca Mountain, and how radionuclides might be transported to the surrounding environs. Because of decreased funding, lower time allotments, and other staff commitments, this project was not developed past the initial draft. Another form of media considered but not used was holographic images. The holograms are visualization tools that could have depicted various aspects of Yucca Mountain, similar to a 3D poster. These tools were not used, primarily because of the prohibitive expense, but also because of the limited portability and use and because additional supporting materials such as posters would also have been required. Lastly, the public outreach staff discussed the use of podcasts and weblogs to distribute information about the Yucca Mountain hearings. Because the hearings never took place, these tools were not developed past the initial brainstorming phase.

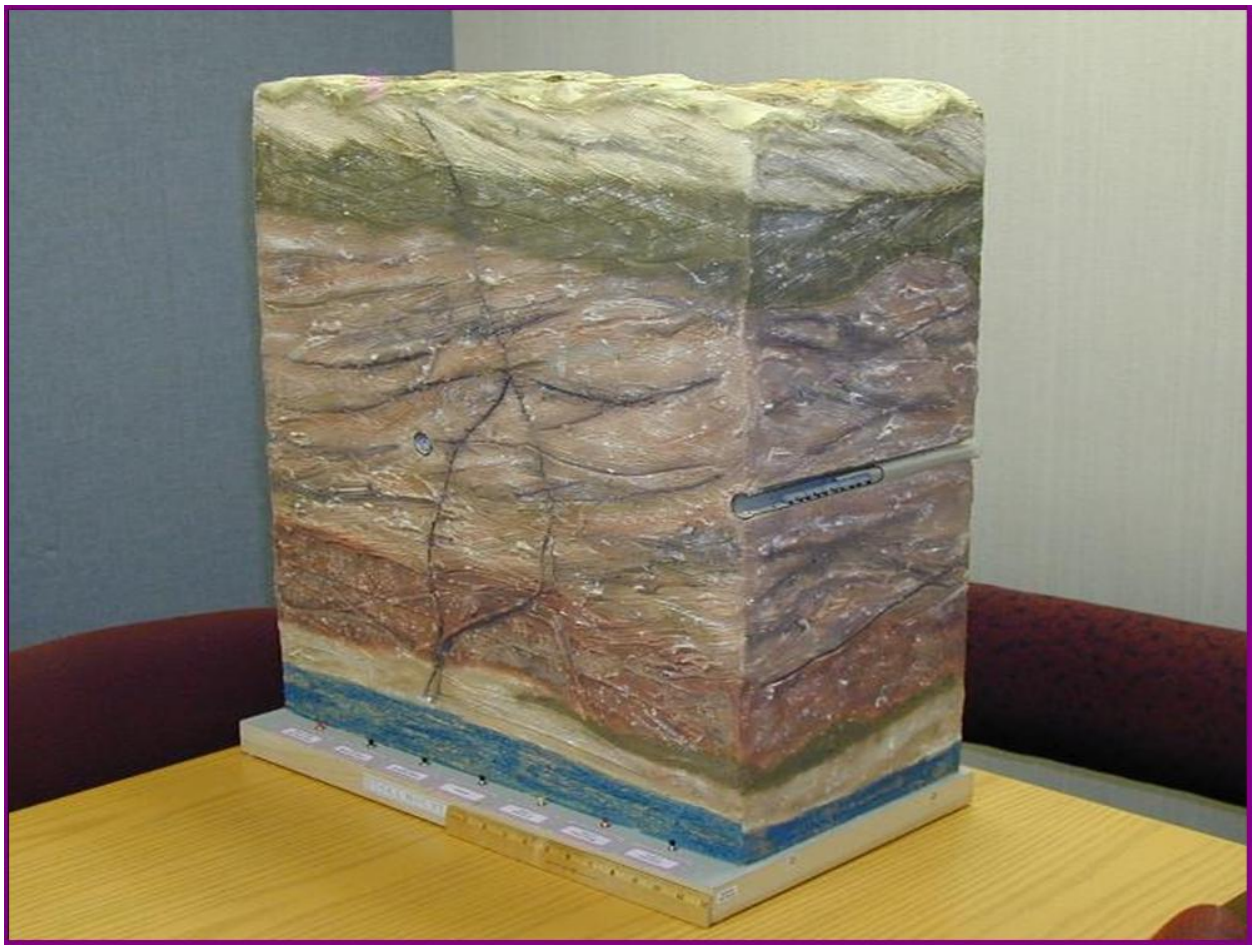


Figure 12. The 3D Model of Yucca Mountain Showing a Cutaway View of the Underground Repository Area

Overall, the media used in public outreach have been designed with two major purposes in mind: (i) convey a key idea in a clear, concise way and (ii) create products with a long shelf life that could be usable in a variety of applications, so that a library of resources could be built for future use. This approach was very successful. The simpler and more clear the material, the wider the audience it could serve. Adding additional technical information and complicating layers was not helpful if the message was lost. As the program progressed, fact sheets underwent periodic, minor revisions to ensure currency and accuracy, and a few sheets were closed out, but for the most part the materials produced became a permanent part of the repertoire and the newer material supplemented the older material. Furthermore, this approach helped relieve the stressful schedule often associated with developing new products. Because there was often a very short lead time before public meetings or events, new materials had to be developed on a compressed timeline. The short schedule was complicated by the large amount of input required from various offices and all of the public outreach staff working only "part time" on the project while actively engaged in other departments. Early in the program, the staff realized the benefit of having a set of materials that could apply to a wide variety of audiences and that did not expire quickly.

Figure 13. A Cutaway Area of a "Drift" on the 3D Model Showing Model Waste Packages and the LED Indicator Lights

The public outreach staff learned four important lessons that applied to all media types. First, accessibility and portability made media easier to utilize. Keeping a library of presentations, fact sheets, and brochures on hand facilitated quick preparation for meetings or visits. Posters could be posted at sign-in tables, handed out as information sheets, sent as mailers, put into notebooks, or posted on the NRC website. The larger 3D model and booth materials were more difficult to transport and were used less often and with fewer audiences. Second, staff tried to adapt to stakeholder needs rather than expecting the stakeholders to adapt to the agency. While still introducing new materials that conveyed information that the staff deemed important, media were particularly well received when they were presented as a direct response to stakeholder input because the public and stakeholders felt they were being heard. Third lesson learned was the importance of having a diverse public outreach team. Having a variety of technical and nontechnical backgrounds helped ensure that the materials produced were understandable to the broadest possible audience. The nontechnical team members were most adept at providing a perspective on the transparency of the information and ensuring plain language was used.

Fourth, the development of the media used for public outreach has been a continual and positive learning process for the staff. These tools explain the NRC role at Yucca Mountain for stakeholders and the general public in a clear and transparent way. Feedback on the materials may not necessarily have been verbal or written, but the tools allowed a longer, more focused dialogue with stakeholders that strengthened positive relationships and opened avenues for more effective communication. The experience gained regarding communication media through the public outreach program is not only useful and applicable to future repository programs, but also to other programs throughout NRC.

Public meetings have been one of the most important methods of communication in the NRC Yucca Mountain public outreach program. NRC staff held public meetings to educate and inform the public, as well as to gather important feedback and input for NRC decisionmaking. Over the course of the program, the structure and format of the public meetings evolved as more experience was gained. Staff learned many important lessons throughout the development of the program, and these lessons contributed to continual improvement and overall success.

When the outreach program began, the agency had recently begun enhanced public rulemaking, including more in-depth stakeholder interactions, specifically about controversial rulemakings. These rulemakings were expected to receive many public comments, and it became necessary to collect comments in a different way than the typical format of written submissions. The intent was to assure the public that concerns were being heard by taking transcripts of public meetings and giving the comments made during those interactions the same attention as written comments. This approach allowed the agency to reach a broader audience and solicit input from groups that might not otherwise be aware of the rulemakings or feel comfortable providing written remarks.

The first NRC public meeting pertaining to Yucca Mountain issues was held in March 1999. At that time, a proposed 10 CFR Part 63 had been published for comment. Some staff felt that stakeholders were put off, perceiving that the proposal seemed fully formed and that it was likely that no additional input would be included. Although the meeting was held to explain, gather additional input, and hear concerns about the proposed rulemaking, no plain language summaries or materials were made available to explain the process or contents of the rule. Several NRC staff members were present, including Janet Kotra and Tim McCartin, who had assisted in drafting the 10 CFR Part 63 proposed rule. A discussion panel also included U.S. Department of Energy (DOE) staff, advocacy group members, and representatives of Nye and Clark Counties. NRC and DOE staff gave presentations, and then the panelists led a question-answer session. Two meetings were held: the first at University of Nevada Las Vegas in Las Vegas, Nevada, and the second at the community center in Beatty, Nevada. The presentations were the same for each meeting, but the audience was different in each community.

At these meetings, NRC staff faced negative feelings from many audience members as a result of prior experiences as “downwinders” with U.S. Department of Defense (DOD) actions. NRC had not yet established credibility with the stakeholders, and staff were viewed with skepticism due to a lack of demonstrated independence from other government agencies from Washington, DC, that the communities clearly did not trust. Many questions posed were unanticipated and centered around transportation, DOE and DOD actions, and the ways criteria were being applied differently at the Waste Isolation Pilot Plant versus Yucca Mountain. Many of the questions were not in NRC’s purview. Staff felt that the answers they could provide were not convincing and that they were less than effective and not adequately prepared. The

questions in Beatty, Nevada, were even more difficult: they included a wider range of topic areas, and NRC preparation had focused narrowly on the proposed rule. Staff felt that the lack of preparation was more obvious in that venue. Questions addressed to NRC staff included why Yucca Mountain had been designated as the site of study, how NRC was distinct from DOE, and how NRC would deal with previous "messes" created by government entities. Citizens who had viewed pilots from Nellis Air Force Base flying stunts raised emergency planning as a topic of importance. Previously, DOE had had a lack of attendance at its meetings, but audience members had driven hundreds of miles to attend the NRC meeting and ask these questions. Preparation for difficult and off-topic questions at these meetings had not been given priority, but based on the experiences of these meetings, preparation strategy and priorities changed.

NRC staff began gathering information on how to improve their public interactions. Based on information gained at a seminar on risk communication, staff began message mapping, anticipating follow-up questions that might be asked during the meetings, and preparing answers. For the 10 CFR Part 63 proposed rule, the public comment period was extended in response to public comments. The next meetings were held in June 1999 in Las Vegas, Amargosa Valley, and Caliente, Nevada. In preparation for these meetings, NRC staff worked through the NRC training center with Beverly Silverberg. The topical areas covered were broadened, and an introduction was included in the presentations giving information on the role and responsibilities of NRC and explaining how NRC's public comment period works. The speaker base was broadened to include expertise on transportation and biological effects. For the first time in the outreach program, preparation included dry runs with videotaping and plain language edits to viewgraphs. The preparation helped team members feel comfortable, supported, and more self-aware. The increased success of these three meetings proved the effectiveness of advance preparation. This set a positive precedent for future meetings.

The meeting in Caliente provided a unique opportunity for NRC to garner trust with the public. Some community members came to the meeting to protest, but attempts were made to discourage distribution of protest literature and opposition signage. The NRC branch chief, Bill Reamer, stepped in and enabled the protestors to attend the meeting and have their literature displayed, but on a separate table. The citizens expressed concern about why they felt they couldn't trust the government and were afraid of being lied to. The welcoming of opponents at the meeting helped attendees feel less defensive and feel that NRC listened fairly to all parties in attendance.

Additional lessons learned from these meetings included how to make members of the public feel welcome in the meetings and not be defensive. Furthermore, interactions with stakeholders at these and previous meetings had indicated a significant need for more background on program history. Because some staff members were tasked with many activities (logistics coordination, interactions with stakeholders, preparation of materials, and speaking at the meeting), another important lesson learned was to include enough staff members so staff would not be overtasked. Spreading the team too thinly caused undue stress on the staff members and hindered proper preparation. Finally, another lesson learned was the importance of breaking down the hierarchy inherent in organizations to include every team member's input. Valuable contributions were gained from all staff members on the team, regardless of their position level in the agency, and each team member was encouraged to contribute freely. Team members without technical backgrounds often tend to understand technical matters in a manner more akin to members of the lay public. Consequently, they may provide useful input for improving the language used in outreach materials.

One challenge in preparation was communication between internal offices at NRC. There was concern that press releases or positions taken by one branch might conflict with those of another branch or otherwise cause public concern. The issue of waste being shipped through downtown Las Vegas, Nevada, was one such conflict, which occurred when a bounding analysis in an impact evaluation was released in a document published by another office. Without a context for those scenarios, stakeholders became very concerned and public outreach staff were not aware that the issue had arisen. Significant coordination was required to ensure that whenever possible, the public outreach team knew what messages from other NRC offices were being released in case questions about those positions or documents arise at public meetings.

In November 1999, a new format was introduced for public meetings. A roundtable discussion was held to discuss Yucca Mountain technical issues, such as whether subsystem criteria or a more risk-informed approach should be used. Staff wanted a public discussion with representatives holding differing points of view to discuss why performance-based standards were to significant the decisionmaking, and whether that approach lessened stringency of standards and was therefore less protective. At this meeting, major interests were represented at the table, including advocacy groups, DOE, and NRC. Presentations were interspersed with opportunities for questions from the audience, and the table discussion was broken into discrete topics to help the audience follow the conversation. This effort to change the format was based on previous experiences, as segments of shorter length allowed people to ask questions in a more timely fashion. The intention was to create a dialogue, having a conversation with the audience rather than lecturing. This approach received an overall positive response. Comments from the audience that were off topic were easier to incorporate if they were shared more often throughout the discussions. While the comment period was over by the time this meeting was held, NRC staff included as much of the input received as possible into the final development of 10 CFR Part 63.

In May 2000, the staff planned to hold public meetings based on feedback received from the 1999 Beatty, Nevada, meeting that the hearing process was not well understood. Planning and preparation for the meetings proceeded on schedule until 3 weeks before the meetings, it was decided that public meetings could not be held about the NRC hearing process. With very little notice, the staff then had to change the content of the meeting to cover the licensing process to make it more general, and another speaker was brought in to talk about the inspection process that would be applied to Yucca Mountain if it received a construction authorization. This public meeting was also held in two parts: a daytime meeting in Las Vegas, Nevada, for “professional” stakeholders who worked in related fields, and an evening meeting in Pahrump for a broader lay audience. Presentation topics included the NRC role and responsibilities, the licensing support network (LSN), the process of an acceptance review, the docketing procedure, and what would happen when the license application was filed. The turnout for the meeting was good: it included national nongovernmental organizations as well as local organizations, and interactions with the groups were constructive.

Despite the success and good reception of the meetings, many new challenges arose. For one, a last-minute change of venue was required to ensure enough space for participants. This situation underscored the importance of visiting the venues ahead of time to ensure proper facility size and accommodations. Also, a decision had been made not to have public outreach meetings discussing the NRC hearing process because of the possibility that the process would change, but the public viewed making the hearing process less formal as a potential “fast track to Yucca.” The audience still wanted to have a later meeting concerning the hearing process. Additionally, because the meetings were not limited to a specific length of time, staff found

themselves pressed for time and exhausted by holding two lengthy meetings in one day. Staff struggled to balance being responsive and answering all the questions with respecting attendees' time. NRC attorneys also faced the new challenge of defining the line between staff answering legitimate questions about NRC's licensing process and what could be perceived as offering legal advice. This challenge persisted throughout the program. Lastly, NRC staff received comments by one meeting attendee that could be taken as threatening, and security at the meetings became a larger focus. After this meeting, staff corrdinated in advance with staff from security for all public outreach meetings.

In 2001, NRC staff finally held public outreach meetings with information about the hearing process. These meetings provided another step in the learning process about meeting preparation. During the dry run for these meetings, now standard practice, tensions arose between the technical staff and Office of the General Counsel staff about the content as well as the understandability of the presentations to the lay public. This tension was based, in part, on fundamentally different views of the public and stakeholders held by the attorneys and the staff members. Staff struggled to reach agreement about the acceptability of presenting general information about NRC's adjudicatory process as opposed to providing legal advice. Staff members from the two offices also disagreed extensively over how best to edit presentations for plain language. Because the dry run was not perceived as successful, another dress rehearsal was needed, and this subsequently became common practice. In the end, the final meetings went well and were well received. County representatives felt that they received needed answers to give to their constituents.

Staff gained important experience about how the makeup of a community can affect the course and reception of a public outreach meeting during the Mesquite, Nevada, meeting in 2001. At a previous meeting, NRC staff had received a request to visit Mesquite, Nevada. Many meeting attendees were retired military or had traveled from across the Arizona and Utah borders. The meeting, held at the local community center, had a different atmosphere than many previous meetings because of the makeup of the population. Most of the citizens were very patriotic, pro-Nevada Test Site, and pro-government, and they were suspicious about environmental groups or advocacy groups. The attendees had many questions about safety and the roles of DOE versus NRC and had a different approach to the situation than those attendees at Clark County meetings held in Las Vegas. The group showed some skepticism, but was openminded and eager to hear about NRC's role and responsibilities. The atmosphere provided the opportunity to explain the processes as well as convey a message of openness. Because the previous stakeholder interactions were not representative of the viewpoints of those encountered in Mesquite, this experience was valuable in showing the importance of reaching out to communities besides those immediately surrounding Las Vegas, Nevada, and being prepared for a response to meetings based on differing stakeholder composition. The NRC staff made more concerted efforts to reach out to or visit as many affected units of local government (AULG) as possible.

During April 2002, NRC staff visited several communities in Nevada to present an overview of activities related to the potential repository. The trip served as an opportunity to demonstrate a visible "passing of the baton" from Bill Reamer to Janet Schlueter, the incoming branch chief for the High-Level Waste Division, and preserve a sense of continuity to the public. As part of building long-term relationships with the communities, the staff felt it was important to have a familiar format and familiar faces. The meeting held in Tonopah, Nevada, provided another unique perspective for NRC staff, as Tonopah had been home for the development of the stealth bomber, and citizens were very proud of this achievement and very patriotic. While there was still some "anti-Yucca" sentiment, the community was interested in potential economic

benefits of having rail lines to support Yucca Mountain. Citizens expressed suspicion that the Las Vegas, Nevada, community would stonewall the project, or use political clout and take the economic and labor force benefits if the project did go through, and therefore appreciated the attention NRC had given to Tonopah residents. Many citizens in different parts of the state, whose issues primarily focused on transportation, wanted to have input into the environmental impact statement (EIS). The NRC staff needed to be able to explain the NRC process, with the evolving understanding that most public concerns had to do with the National Environmental Policy Act and the EIS. An important lesson learned was how to anticipate concerns of the community and explain how individuals and affected communities could put their concerns forward to the appropriate regulatory bodies.

In Ely, Nevada, NRC staff had an opportunity to address the town council. This opportunity was important because Ely had specifically requested that NRC visit, which is generally a good indicator that communication with NRC staff is viewed as positive and useful. Eureka County, Nevada, representatives also drove to Ely to talk with NRC staff. Eureka County, Nevada, was primarily interested in pragmatic issues such as timing of input, how to participate in the hearing process, how to learn about the process of submitting contentions, and becoming a party to NRC's hearing process. Prompted by these inquiries, NRC staff developed material to explain these points for later workshops.

Two important lessons came from the Yucca Mountain Review Plan (YMRP) public meetings. First, at one of the meetings a local politician attended the meeting with his own television reporter and used the meeting as a venue for grandstanding. His comments off camera to the NRC staff were very complimentary, but on camera he took a much harsher stance. The staff were courteous and answered his questions, but learned to prepare for politicians who may use the meetings as personal campaigning venues and to plan for dealing with the situation accordingly to keep discussions on topic. Secondly, at another YMRP public meeting, NRC staff answered questions from a reporter, who subsequently printed only part of the discussion. The printed story prompted questions from a Commissioner, who called on the NRC staff member to explain the situation and the answer that had been given. Having a transcript clearly demonstrated that staff had given an acceptable answer to the question. Transcripts could be used not only for sharing information about the meeting with members of the public who could not attend, but also for internal review and demonstration of adherence to agency policies.

Effective advertising and notification of public meetings were other important lessons learned throughout this process. Small newspapers and circulars were used to advertise the meetings, and the NRC onsite representatives were able to find local publications or other news distribution points. While larger ads sometimes drew inflammatory attention from outside activist groups, local ads posted on community bulletin boards or local news sites effectively reached people in advance of meetings. Federal register notices and appropriate press releases were also issued according to NRC practice.

Obtaining an appropriate facility proved key to all of the public meetings. Not only was facility size an important factor, but also the technical capabilities in the room, such as screen size for presentation slides, sound systems, and transcription equipment. Comfortable and adequate seating was crucial, but having space for side conversations, poster display areas, and snack areas also enhanced the overall atmosphere and hence the effectiveness of the meetings.

Furthermore, having the right staff on hand for meetings was extremely important. Not only were public outreach staff necessary for meetings, well-prepared technical experts ready to answer technical questions and legal staff to assist with legal matters were also needed. A

variety of expertise on the team from both NRC and the Center for Nuclear Waste Regulatory Analyses contributed to overall success, as members of the team were drawn from not only the high-level waste branch, but also from transportation, environmental, and fuel cycle staff. Discussions were kept on track and fruitful by having an expert facilitator, who also assisted in forming a prioritized agenda and contacting appropriate parties to participate in discussions.

An additional general lesson learned was the significance that stakeholders place on evidence that their concerns are heard. After citizens in Beatty, Nevada, commented about emergency planning concerns, NRC staff made efforts to incorporate those concerns into subsequent presentations on how emergency preparedness plans were written and interpreted. Staff also received positive feedback from occasions when NRC speakers were able to remember and repeat input received during previous meetings, including personal concerns from individual attendees. Not surprisingly, it was important to the stakeholders to not only feel that NRC staff listened attentively, but also were willing to act on the issues that were presented.

While these first meetings laid the foundation for the public outreach work, throughout the duration of the program, several additional public outreach meetings were held that built on the success and lessons learned from previous meetings. Topics included further explanation of the NRC roles and responsibilities, the licensing process, regulation of transportation of nuclear waste, and the YMRP. The format typically included brief presentations by NRC staff (10-15 minutes) and subject matter experts interspersed with question-answer sessions with the audiences and roundtable discussions. Venues for the public outreach meetings varied depending on the nature of the meeting, but outreach staff continued to make every effort possible to hold meetings in the directly affected communities. Community centers continued to be commonly used. For meetings or workshops that included many different communities, Las Vegas, Nevada, often served as a central and easy to travel to location. Once in place, the NRC hearing facility at Las Vegas, Nevada, was used several times. Public meetings were consistently well received and attended by representatives of a wide variety of interests. Feedback from the meetings continued to be positive.

Aside from the public meetings, the public outreach team held stakeholder workshops and meetings for Native American tribes. The tribal workshops started because very few representatives from Native American tribes attended the public meetings. In an effort to better serve that community, mailing lists of tribal contacts were obtained from other agencies and used for notification of a variety of agency actions. Tribal participants offered perspectives on sovereignty and history regarding Yucca Mountain and views on the NRC regulatory framework, and NRC provided information on the NRC role, issues surrounding 10 CFR Part 63, and transportation. Overarching discussions included factors that affected tribal government understanding and evaluation of documents on high-level radioactive waste disposal and transportation, and whether there were unique Native American cultural perspectives on science and the natural world that might affect NRC approaches to providing information to or obtaining information from tribal governments. Considering the sensitive nature of past relationships between tribal governments and the U.S. government, NRC staff felt that it was particularly important to actively seek out and demonstrate attentiveness to Native American concerns.

Three workshops were also held for AULGs, including tribal governments. Participants at the workshops included representatives from most city and county governments surrounding the Yucca Mountain area, as well as citizen groups. NRC staff members spoke about several subjects pertinent to the AULGs, including NRC's licensing process, the formal hearing process, criteria governing adoption of a final environmental impact statement for the proposed repository at Yucca Mountain, transport of spent nuclear fuel, and the role and use of the LSN.

Opportunities were given for question-answer sessions with members of the public as well. Particular focus was placed on how AULGs could participate in the hearing and contention processes. These meetings were well attended and well received, with the original meeting followed by two requested subsequent meetings. NRC staff learned that Native American tribal governments were different than other stakeholder groups and expected to be treated as sovereign nations rather than "just members of the public." Although the tribal requests could not always be fully satisfied, staff strove to treat the spirit behind these requests with dignity. These tribal interactions occurred primarily before NRC had many of its current tribal communications support resources in place, and members of the public outreach team were able to contribute to these internal improvements.

The NRC high-level waste repository safety public outreach team also benefitted from stakeholder interactions in international circles. In August 2000, the Forum on Stakeholder Confidence, or FSC, was established when the Radioactive Waste Management Committee (RWMC) of the Nuclear Energy Agency decided that it needed to form a group to take a disciplined look at societal factors affecting the management of radioactive waste management facilities. RWMC had noted the lack of public acceptance that had plagued earlier programs in Canada, the United Kingdom, and Sweden, and the considerable opposition that arose when new sites were considered for characterization. Another common problem that FSC was expected to confront was the inability of technical and policy experts to understand or be understood when they spoke to concerned members of the lay public. Another promising focus for the new forum was the increasingly visible role of the regulator in building public confidence. At the initial forum meeting, Janet Kotra gave a talk on the efforts being made to improve the NRC meeting format, the goals for future meetings, how NRC explained its agency role, and NRC's efforts at creating a dialogue with the stakeholders.

The FSC structure includes technical meetings as well as site and stakeholder visits, with emphasis not on technical matters but on interactions with the local communities. All of these venues provided an opportunity to interact with other agencies and discover both unique and common problems among stakeholder groups. Issues of safety and confidence do not always have the same definitions based on the sensitivity of the stakeholders, and working groups could solve problems together with a variety of experience bases. The forum follows changes in the international radioactive waste management community and allows sharing of experiences and growing together. However, participating countries had to be careful not to appear to send an unofficial national endorsement of a country's preferred course, or send a particular message to the public or stakeholders. Literature from the forum has been useful in helping NRC understand other outreach programs and results. Also, participation in this forum has informed NRC actions in the public outreach realm and was needed for information and validation. Participation also opened up other opportunities because of personal connections, international visibility for NRC, and increased awareness of other international activities.

The insights gained from the public outreach meetings and stakeholder interactions benefitted not only the stakeholder communities and the NRC high-level waste repository safety program, but also other parts of the agency. Other groups around the agency noticed the success of the high-level waste repository safety outreach program and requested public outreach team input and materials. In 2003, the agency began to recognize the need to increase stakeholder confidence in NRC. Members of the public outreach team were invited to join the Commission's task force to evaluate public communications and to provide strategies for enhancing communications at all levels of the agency. The outreach staff provided useful insights to the team based on experience gained in public outreach meetings and international interactions.

It is also important to note that over the course of the program, both the attitude of the nation and technology underwent significant changes that affected the program. It is commonly understood that over the past decades, the attitude of American society toward government has become less trustful and more skeptical. Societal attitudes during the era of nuclear weapons development evolved to include expectations for open dialogue, transparency, and citizen participation in decision making. Public outreach, as a whole, has increased significantly over the past decade during which the Yucca Mountain public outreach program was active, including public outreach for government programs in the sciences. Under the older paradigm, information was traditionally passed in a one-way manner—government to citizens. With the explosion of readily available information via search engines on the internet, the public is now able to gather its own information and come to conclusions and understandings that are not necessarily consistent with information passed on from the government agencies. Demand has increased for transparency and citizen engagement because of this increase in knowledge and a stronger sense of entitlement for participation in government activities. Agency and government views, therefore, have had to evolve along the lines of these expectations and provide additional opportunities for participation and feedback. Evidence of this cultural change can be seen in the NRC "Open Government Plan," issued June 7, 2010, which includes an initiative for enhancing stakeholder engagement.

When the Yucca Mountain outreach program began in earnest in 1999, the World Wide Web was still in a relatively early stage of development and social media was a fledgling idea. Communication about the early meetings was primarily accomplished through phone calls, emails, and paper-notice distribution. By the end of the program, NRC had in large part moved toward an internet-based information distribution system, where meeting notices, transcripts, presentations, and other media were available via the NRC High-Level Waste website, and notifications were sent to meeting participants primarily via electronic means. However, the HLW staff faced new challenges within the NRC organization when attempting to use of the internet for communication. As previously discussed, posting timely information to the NRC website was burdensome due to the heavy administrative constraints and multiple-level required reviews. As the organization as a whole moved toward embracing the "e-government" movement and the need for more thorough internet communications, additional resources were brought to NRC for web development and more information could be posted to the websites with fewer hindrances. As recently as April 2011, the NRC website underwent a significant redesign that reflects the agency's recognition of a need for better internet presence.

NRC never fully embraced social media for use in the Yucca Mountain public outreach program. Because of agency caution about the potential for negative interactions, inability to provide timely responses, and concerns about demands on staff time, weblogs, Facebook, and other social media outlets were not added to the NRC's public outreach portfolio. However, note that during 2011, NRC added a blog to its main site and has begun (in some departments) using web conferencing and webcasts to increase participation in public meetings. As technology continues to develop and social media gains further acceptance among government agencies, social media could come to play an important role for NRC in effectively communicating with the public in future repository programs.

NRC staff attitudes toward public outreach generally became more positive as the program progressed. As mentioned in other parts of this report, some challenges arose among staff regarding what information should be presented to the public and what, if any, advice was appropriate to give regarding stakeholder participation. Toward the beginning of the program, messages and dialogue were more tightly controlled, with little room afforded for deviation from preapproved text. Although diligence in ensuring technically and legally correct responses

always remained critically important, staff recognized the positive response of the public to open dialogue rather than prepared scripts. As more staff members gained experience interacting with the public, comfort rose, and staff began encouraging this type of open approach not only in the public outreach program but also elsewhere within the agency.

Overall, the Yucca Mountain program interactions with stakeholders, especially through public meetings and educational media, improved greatly over the course of the program and were seen as beneficial and positive by both the agency and stakeholder communities. The meetings conveyed information to the public and gathered important input for decisionmaking. Through effective preparation, carefully considered messages, and meaningful discussions, NRC was able to build trust, confidence, and long-term relationships. Lessons learned in this program can benefit future public outreach programs and ensure continued success with stakeholder interactions.