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Preparing the Yucca Mountain Multimedia Presentation

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Introduction

In July 2002, the U.S. Congress approved Yucca Mountain in Nevada for development as a geologic repository for spent nuclear fuel and high-level radioactive waste. This major milestone for the country's high-level radioactive waste disposal program comes after more than 20 years of scientific study and intense public interaction and outreach.

The U.S. Department of Energy's (DOE) public involvement activities were driven by two federal regulations—the National Environmental Policy Act (NEPA) and the Nuclear Waste Policy Act (NWPA) of 1982, as amended. The NEPA required that DOE hold public hearings at key points in the development of an Environmental Impact Statement (EIS) and the NWPA required the agency to conduct public hearings in the vicinity of the site prior to making a recommendation regarding the site's suitability. The NWPA also provided a roadmap for how DOE would interact with affected units of government, which include the state of Nevada and the counties surrounding the site.

As the Project moves into the next phase—applying for a license to construct a repository—the challenge of public interaction and outreach remains. It has become increasingly important to provide tools to communicate to the public the importance of the Yucca Mountain Project. Sharing the science and engineering research with the general public, as well as teachers, students, and industry professionals, is one of the project's most important activities. Discovering ways to translate project information and communicate this information to local governments, agencies,

citizens' groups, schools, the news media, and other stakeholders is critical. With these facts in mind, the authors set out to create a presentation that would bring the "mountain" to the public.

"Seeing is Believing"

Many tour participants have stated that they had a much clearer picture of the overall project once they had taken the Yucca Mountain site tour. Actual tour visitors come away with three important conclusions (key messages):

- Yucca Mountain is very dry and remote.
- Many natural and engineered barriers will isolate radioactive waste and protect the environment.
- High-quality science and technology are used to develop a solution that is safe today, while maintaining a flexible design to accommodate future technological innovations.

Many tour participants have noted that Yucca Mountain tells a story even without a briefer present. Standing at the top of Yucca Mountain, one gets a sense that of the site is vast, remote, and dry. Underground, visitors sense the magnitude of the technology and scientific expertise applied to the study of Yucca Mountain.

Unfortunately, most citizens of Nevada and other states do not have the opportunity to take the site tour. Our objective in preparing a multimedia presentation was to "bring the mountain to the masses" so that many more people could "see" the site and come away with these similar messages.

Description

This CD presentation uses a variety of media including video, audio, graphics, and still photography of the Yucca Mountain setting in the Mojave Desert of southern Nevada. The CD includes views of the terrain, descriptions of the geology, locales, and details of the science and engineering tests conducted at Yucca Mountain. In addition, the CD tour includes a short visit to the underground Exploratory Studies Facility, the nearly 7 miles of tunnels, drifts, alcoves and niches in which scientists have conducted tests.

The presentation introduces, via video, project scientists who discuss their areas of expertise and how that applies to the evaluation of the repository and the determination of its performance to protect health and safety. The modularity of the presentation allows easy updates to current project news. Phase one was recently completed as described above. The remaining phases will incorporate additional video of project scientists and deeper layers of scientific and engineering information.

Product Development

History of development – The initial idea for the multimedia presentation was based on two existing products of the Yucca Mountain Communications group: the Yucca Mountain virtual reality tour first produced in 1997 and the External Communications' PowerPoint technical exhibit produced in 2001. We created the Yucca Mountain virtual reality tour on video then transferred it to a CD. This communication product proved popular with the general public. We created the technical exhibit on a PowerPoint slide show using supporting scientific information and graphics. This slide presentation remains an important component of the technical exhibit as it provides in-depth technical information.

The multimedia CD presentation combines video production with still slides. Instead of relying on either restrictive platform, we

combined short video segments, 360-degree views of landscapes, and dramatic visuals to grab and hold the attention of the audience and allow them to easily absorb the numerous concepts presented by a tour.

Product specifications - The Yucca Mountain multimedia tour CD is a standard CD that is capable of playing on any standard computer. It is not a video CD. The CD contains over 80 photos, three 360-degree rotating views, and six short video segments. System requirements to run the presentation are 200 MHz Pentium with 64 MB RAM 2MB Video with Windows 95 Operating system or greater. Software requirement for the 360 degree rotating views is Apple QuickTime version 5 with VR option installed 360's.

We used Director software to create the presentation instead of PowerPoint. Director runs multimedia and has more functions to include rollover button attributes. Hyperlinking works better than with PowerPoint, which is not recommended for heavy multimedia applications. In addition, Director creates an executable program that does not require the software to run the presentation. Mpeg video is supported in Director to run video portions in real-time in contrast to PowerPoint AVI compression issues and video drop frame problems. Director has the system resources built in the program to run the presentation efficiently (Custom programming OOPS, DLL and DirectX X 8 drivers). Director creates a Shockwave formatted presentation that compresses the presentation to run efficiently on a computer making smaller files, quicker transitions, better memory management and more video control.

Selection of information –A picture is worth a thousand words. We selected photos and graphics that best convey the key messages or content focus of the Project.

For example, the photo of the mountain emphasizes the remoteness and the dryness of the desert area. The photo itself is very dramatic and conveys a sense of remoteness.

Another dramatic photo shows a precariously perched boulder in the Yucca Mountain area, which seems ready to topple at any moment. This boulder has stood in this precarious position for several thousands of years. It offers dramatic visual proof that no large earthquakes have rocked this area in the last several thousands of years.

Graphics were stripped of complex labels and simplified where possible. Sound effects were used to accentuate the tour and underground effect. Short video segments with lead project scientists were incorporated to bring in the human element and to provide expert comments and a sense of balance and interest. In one sequence, we show footage of the tunnel train descending into the mountain. In another, we show a sequence of the tunnel boring machine operating in the mountain and then surfacing or "daylighting" upon completion of its 5-mile underground excavation route.

One of the most effective devices in the presentation is the use of 360-degree rotations of views. These 360-degree views are used at three areas for emphasis of key points: 1) the top of Yucca Mountain; 2) The entrance to the ESF tunnel; and 3) at the intersection of the cross-drift tunnel underground.

As we developed the multimedia tour, we tried to keep the overall visual presentation in mind. A layout (attached) for navigating on the CD was selected that made it easy for the operator and followed a path similar to the actual tours. Actual tour stops and key tour discussion areas became the navigation menus and buttons. The layout of the Exploratory Studies Facility, the underground facility where most of the science

testing was done, was used as the backdrop or framework for the multimedia tour.

The CD covers key areas of the geological concept of nuclear waste disposal. An overview section contains information about the need for a repository and why Yucca Mountain was selected. There are navigation buttons for major topical components of the nuclear waste solution such as environment, geology, volcanism, infiltration, seismicity, design, and transportation. Each of these sections is introduced with a short video segment with a lead scientist from the project discussing the goals of the studies. This is in turn followed by 6-10 photos or graphics illustrating the key concepts for each topic.

Additional information buttons are provided at different sections of the Exploratory Studies Facility layout. These bullets open up to photographs and diagrams showing the results of various tests concerning moisture flow, faults, geology, rock strength, and heat effects on the rock. Photos and graphics were selected that simplify and concisely communicate important objectives and results of each scientific test.

Finally, points-of-interest sections were added, to provide additional enrichment discussion about other non-project-related sites in the area of Yucca Mountain.

Initial Feedback, Different Audiences

We first presented the product at the Spectrum 2002 – American Nuclear Society's conference in August 2002, in Reno Nevada where it was well received by an audience of about 500 Nuclear facility managers and conference attendees. This audience has a considerable background in the Nuclear field and very invested in the outcome of a geologic repository.

We were asked to provide the multimedia CD as a substitute for a real tour since there was not enough time in the conference for an actual tour. We focused the CD for the needs of this audience.

The presentation was highly acclaimed by an audience of about 500 management and technical conference attendees. The CD was focused for the needs of this audience.

Education Forum – One week later in August 2002, we presented the same CD in less detail to a group of 18 middle school and high school teachers for Clark County, Nevada, as part of a teacher workshop. The feedback was positive. Most teachers said that the level would be appropriate for their classes, provided a project employee accompanied the presentation. Some teachers even felt that after the tour they could use the CD to communicate some of the key elements of the project. At least one teacher who has extensively involved her classes in the discussion over Yucca Mountain said she was familiar enough with the project concepts to use the CD without project staff. However, it is not our intent at this point to provide the CD without project staff.

We presented the multimedia CD to the Nevada State Science Teachers Annual Conference in October 2002. A group of 27 teachers provided positive feedback about the use of the CD in their classrooms. Most educators felt the presentation would enable them to illustrate Yucca Mountain's key concepts to their students.

US Department of Energy's Yucca Mountain Senior Staff – Positive feedback came from a brief presentation to DOE's senior staff in early October 2002 and resulted in numerous requests to either use the presentation or have the presentation delivered. Since the overview was presented, numerous DOE staff have used the

multimedia presentation at conferences and seminars with positive results.

Exhibit/Conference Exposition Forums – Since September 2002, We have used the multimedia CD as the focal point of the Yucca Mountain technical exhibit. We have shown the CD at several additional technical conferences including the Americas Nuclear Energy Symposia in Miami, Florida, the Geological Society of America's annual conference in Denver, Colorado, American Nuclear Energy's Winter Meeting and Exposition in Washington, DC, and the National League of Cities 79th Congress of Cities and Exposition in Salt Lake City, Utah. Based on feedback from event attendees, we found that most had a much deeper understanding, as well as a clear visual picture of the Yucca Mountain Project after the CD presentation.

Conclusions and Discussion

Currently, the CD is intended for use by a knowledgeable Project staff. It was not designed to stand alone. There are over 60 photos and graphics available to a presenter located under eight different buttons on the Exploratory Studies Facility layout. A presenter can amend a presentation to any length or vary the content according to his audience by navigating to selected content and photos. The design of the CD allows for flexibility.

New "buttons" can be added with additional technical data. Additional video is easily introduced. The presentation format can be modified to a departmental level or be made more project specific with little effort. A standalone version, whether produced on a CD, DVD, or WEB based format is a clear option for future development. Although this avenue would require additional text or audio in order to "substitute" for the presenter, the possibilities for public outreach use are almost endless.