UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	**Docket No. PAPO-00**
	)	
U.S. DEPARTMENT OF ENERGY	)	**ASLBP No. 04-829-01 PAPO**
	)	
(High Level Waste Repository:	)	
Pre-Application Matters)	)	**October 29, 2007**

MOTION TO STRIKE DOE'S OCTOBER 19, 2007 LSN RECERTIFICATION AND TO SUSPEND CERTIFICATION OBLIGATIONS OF OTHERS UNTIL DOE VALIDLY RECERTIFIES

EGAN, FITZPATRICK & MALSCH, PLLC
Charles J. Fitzpatrick
Joseph R. Egan
Martin G. Malsch
12500 San Pedro Avenue, Suite 555
San Antonio, TX 78216
Telephone: 210.496.5001
Facsimile: 210.496.5011

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On October 19, 2007, the Department of Energy ("DOE") purported to recertify its Licensing Support Network ("LSN") database, more than three years after unsuccessfully attempting initial certification on June 30, 2004. For the reasons discussed below, Nevada moves that DOE's recertification be struck as unlawful and contrary to NRC's regulations. Its LSN submission is not simply defective, but blatantly so – omitting numerous critical, core technical documents and modeling basis information necessary for licensing and for formulating contentions.

DOE's premature recertification is the apparent consequence of its headstrong commitment to an aggressive project schedule. When DOE found itself unable to avoid delays because of NRC's LSN requirements, it chose to flout the very LSN regulations it insisted NRC adopt, shirking repeated promises it had made about compliance. With unabashed cynicism, DOE now bases its recertification on a fatally undisciplined and unlawful new "interpretation" of what NRC's rules require. The result is an affront to all those concerned with the safety and integrity of Yucca Mountain licensing. Notwithstanding DOE's self-imposed schedule, the PAPO Board should not hesitate to insist on DOE's full compliance with NRC's LSN requirements.

Likewise, because of its material omissions and defects, DOE's purported recertification does not constitute the event that triggers the 90-day period specified in 10 C.F.R. § 2.1003(a) for LSN certification by Nevada and other prospective parties, and, accordingly, such obligations should be suspended by the Board until 90 days after DOE validly recertifies its LSN database.[1]

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[1] Counsel for DOE and Nevada conferred by telephone on October 25, 2007, in an effort to resolve the differences reflected in this motion, but no agreement could be reached. Any Documentary Material placed on the LSN by DOE after October 19, and particularly after Nevada's conference of counsel for the filing of this motion, should be disregarded by the Board, as an effort to preempt that which is the subject of the motion before the hearing.

I. INTRODUCTION

A. LSN Regulatory Requirements

In certifying its LSN database under 10 C.F.R. §2.1009(b), DOE is required to represent that "the documentary material specified in [10 C.F.R.] §2.1003 has been identified and made electronically available." Section 2.1003(a)(1) provides that "DOE shall make available, no later than six months in advance of submitting its license application for a geologic repository, . . . an electronic file including bibliographic header for all documentary material (including circulated drafts, but excluding preliminary drafts) generated by, or at the direction of, or acquired by [DOE]." A second category of Documentary Material required for DOE's certification is prescribed in §2.1003(a)(2), which states that DOE shall make available "in electronic image format, subject to the claims of privilege in §2.1006, graphic-oriented documentary material that includes raw data, computer runs, computer programs and codes, field notes, laboratory notes, maps, diagrams and photographs, which have been printed, scripted, or hand written." Section 2.1003(a)(2) lists 15 categories of graphic-oriented documentary material which must be made publicly available by DOE.

On July 23, 2007, Nevada filed a Motion for Declaratory Ruling to Define and to Compel Compliance by DOE with 10 C.F.R. §2.1003(a), asserting, based on public information and statements by DOE personnel and contractors, that if DOE certified its LSN database prior to the end of 2007, such database would be materially incomplete, lacking many of the most critical documents that DOE had for years identified as containing information it would cite and rely on in the Yucca licensing proceeding.

This Board concluded on September 10, 2007, that Nevada's motion was premature, in that the actual content of DOE's LSN database when certified could be determined only at such

time, as is now the case. The Board's September 10, 2007 Order had the effect of affording DOE an opportunity to reconsider its plan to recertify prematurely.

B. **DOE's Apparent Motivation for Skirting LSN Requirements**

DOE has long ignored a requirement in Section 114(b) of the Nuclear Waste Policy Act that it must have filed its License Application ("LA") within 90 days after its Yucca site recommendation to the President and Congress became final on July 23, 2002, more than five years ago. There is no other law or regulation prescribing a date by which DOE must file its LA or certify its LSN database. Accordingly, the dates which have repeatedly been referred to by DOE as "deadlines" for LSN certification and LA filing are wholly self-imposed and likely politically motivated.

The LA "deadline" has been recited so frequently and inflexibly by DOE's highest officials that troops in the field were told they will "all" be "out of a job" if they do not meet them, and "any slips in schedule will be recovered by cutting scope. There is no allowance for not meeting schedule." Indeed, the three priorities Yucca workers were told they must satisfy are "schedule, defensibility, and credibility *in that order*" (Ex. 1, LSN DN2002319598) (emphasis added).[2] An August 2007 Government Accountability Office report confirms that DOE's Yucca project director had long made submission of the LA by June 2008 the project's top strategic objective and management priority (Ex. 2 at 13). DOE's desperation to recertify its LSN database "on schedule" regardless of technical credibility or actual completeness is illustrated as recently as August 21, 2007, when the director of Yucca's Office of Quality Assurance reported to his boss that a scheduled QA surveillance "to evaluate the status and processes of the LSN

[2] Exhibit numbers refer to document excerpts which are appended to this motion, including the pertinent page or pages of the cited exhibit. Also appended to this motion is the declaration of Nevada consultant Mike Thorne.

submittal was *cancelled* due to LSN time constraints to complete the LSN submittal on schedule" (Ex. 3) (emphasis in original).

C. **Summary of Nevada's Position**

In this motion, Nevada will show that:

(1) A principal purpose of the LSN is to provide parties a full and fair *six months' access* to all of DOE's core technical documents and modeling basis Documentary Material that it intends to cite and rely on in the licensing proceeding *before* DOE tenders its LA to NRC – the "Six-Month Rule."

(2) DOE itself insisted that NRC adopt the Six-Month Rule.

(3) Embracing the rationale advanced by DOE and other parties in support of DOE, NRC adopted the Six-Month Rule.

(4) DOE adopted detailed plans and schedules that would adhere to and implement the Six-Month Rule.

(5) When it became clear that meeting LSN requirements would likely delay the project's self-imposed schedule, DOE abruptly changed course, ignoring the Six-Month Rule and adopting a public stance directly opposite to that which it had previously articulated, even rewriting its answers to "Frequently Asked Questions" ("FAQs") posted on its website, all in an effort to abdicate the obligations it had previously embraced.

(6) Implementing its new plan, DOE certified its LSN *knowing* that key Documentary Material it will cite and rely on in its LA is neither complete nor available on the LSN.

(7) As the purported legal basis for its incomplete certification, DOE adopted a strained and undisciplined interpretation of NRC's "supplementation" requirements for LSN that eviscerates the Six Month Rule and is unlawful.

II. NRC's ADOPTION OF LSN's "SIX-MONTH RULE"

More than 18 years ago, NRC adopted rules aimed at ensuring the complete availability to the parties of all relevant Documentary Material long before the commencement of any licensing proceeding for a Yucca repository. Specifically, the NRC plan, initially denominated "Licensing Support System" but later changed to LSN, moved the substantial and time-consuming task of document discovery by all parties from its usual position *after* the filing of an LA and before the commencement of hearings, to a time well before the filing by DOE of its LA. Recognizing the enormity of the nation's first repository licensing proceeding, NRC's goal was to ensure that all parties had thorough access to relevant documents and a substantial period of time to review them, so as to enable those parties to prepare high quality contentions. In 1989, NRC published a Final Rulemaking establishing the basic procedures for the licensing proceedings, providing for the identification and submission of discovery documents before the LA would be tendered by DOE, and explaining its purpose as "[e]nabling the comprehensive and early review of the millions of pages of relevant licensing material by the potential parties to the proceeding, so as to permit the earlier submission of better focused contentions resulting in a substantial saving of time during the proceeding." 54 Fed. Reg. 14925, 14926 (1989).

Twelve years later, in 2001, NRC promulgated amendments to clarify the timing of participant compliance certifications. During the comment period preceding issuance by NRC of its final rulemaking, six entities filed comments. The most prominent of these were DOE's (Ex. 4), which, NRC noted, urged NRC *not* to follow its plan to utilize DOE's Site Recommendation as the trigger for DOE's obligation to certify its LSN document collection: "While we support early access to information, we believe that there is a more effective way to facilitate preparation of focused contentions [for the licensing proceeding] and ensure an efficient licensing process than tying the Department's certification of its Documentary Material to the Site

Recommendation." *Id*. at 1. DOE recommended that the initial certification of compliance be required six months before the submission of the LA. *Id*. at 1-2. NRC's amendments focused on DOE's stated rationale for "ensuring that interested members of the public have a full six months in advance of submission of the License Application to review the Department's documentary material." *Id*. at 2. Paraphrasing DOE's words, NRC stated, "If certification were tied to the Site Recommendation, as it is in the proposed rule, it would be 'virtually impossible' to predict how much time would be available for review of the Documentary Material before the License Application is submitted. In contrast, tying the certification to the License Application would ensure a defined period of time for review." 66 Fed. Reg. 29453, 29459 (2001).

Accordingly, NRC balanced competing goals between the need to provide an adequate amount of time for participants to review the Documentary Material in advance of the LA on the one hand, and the need to be as efficient as practicable in providing this information on the other. The Commission was concerned that if certification were required too far ahead of the LA, it would include documents that might later become irrelevant or obsolete or that came at a time when there was no certainty there would even be a licensing proceeding. On the other hand, if the certification came too late, it would not provide the parties a sufficient amount of time to review, assimilate, and analyze the Documentary Material DOE intended to cite and rely on in its LA. NRC struck a balance between these competing considerations.

Indeed, NRC adopted DOE's proposal *in toto*, both as to the benchmark or trigger that would prompt DOE's obligation to certify its LSN, and as to the appropriate lead time. As to the first, the Commission said it "[a]grees that tying availability and certification to the date DOE submits (tenders) the License Application is a relatively simple and straightforward approach to this issue." *Id*. With respect to the appropriate lead time, NRC ruled, "The Commission believes that providing for a six-month period of DOE Documentary Material availability before DOE

submits (tenders) the License Application reflects an appropriate amount of pre-license application review time for participants to prepare for the licensing proceeding." *Id*. NRC realized that there was no statutory- or regulatory-mandated time by which DOE would be required to initiate the "pre-license application phase" by certifying its LSN document collection. It would be up to DOE to determine when the Documentary Material supporting its LA was complete and ready to be certified.

It would be disingenuous for DOE now to suggest that because the contentions of Nevada and other parties will not be due until after NRC's acceptance review (which immediately **follows** DOE's filing of its LA), additional time has been "tacked on" to the six-month period after DOE's initial LSN certification and should constitute a reason for relaxing the Six-Month Rule. Any such suggestion fails for two obvious reasons: First, the Six-Month Rule specifically does not include the period *after* the LA, but is the six-month period immediately *preceding* submission of the LA ("DOE shall make available, no later than six months in advance of submitting its License Application . . ."). Second, all parties involved in the drafting and commenting on the Six-Month Rule were well aware of the important activities which *followed* DOE's LA filing (*i.e.*, acceptance review, docketing and contentions), and these were not "add-ons" to, nor intended to circumvent, the period envisioned by the Six-Month Rule. For example, while advising potential intervenors concerning a seemingly short 30-day window for them to act after NRC's notice of receipt of DOE's repository application and publication of the notice of hearing, NRC explained:

> And while 30 days is short, remember what we talked about a little while ago, DOE has to have all of their documents online six months before they submit the application, and that would be three months before – there would be an additional three months before it's docketed. So, really nine months before this notice would come out DOE's material should be online and available to anybody.

Ex. 5 at 90-91. Well aware of the entire schedule, DOE and the other parties unanimously agreed on adopting the rule as it now stands, requiring all DOE's Documentary Material to be publicly available a **full six months** *before* **DOE's LA filing**.

NRC also soon thereafter promulgated Regulatory Guide 3.69, which does not address the timing issue, but prescribes in greater detail the types of Documentary Material required to be included in the LSN. By its own terms, Reg. Guide 3.69 (Ex. 6) is consistent with the requirements for the content of an LA in 10 C.F.R. §63.21, and with the licensing information specified in NRC's Yucca Mountain Review Plan, NUREG-1804. Among the types of information required by Reg. Guide 3.69 to be included on the LSN are design of structures, systems, and components important to safety; design criteria and design bases; design methodologies; repository design and design analyses; performance assessments; system description and demonstration of multiple barriers; scenario analysis and event probability; and model abstractions with respect to numerous areas including climate and infiltration, flow paths in the unsaturated zone, radionuclide transport, volcanic disruption, airborne transport, quantity and chemistry of water, *etc.* *Id*. at 3.69-4. The Reg. Guide makes clear that "[m]uch of the information that supports the licensing proceeding will be based on the use of *methodologies, computer codes, and models*. Such information should be available via the LSN." *Id*. at 3.69-3 (emphasis added). More generally, all technical reports and analyses by all parties are required to be on the LSN. *Id*. at 3.69-7.

In 2004, NRC fine-tuned 10 C.F.R. Part 2 with a further amendment reaffirming the basic obligation adopted by NRC in 2001: "The Commission also notes that the history of the LSN and its predecessor, the Licensing Support System, makes it apparent it was the Commission's expectation that the LSN would, among other things, provide potential participants with the **opportunity to frame focused and meaningful contentions** and to avoid the delay potentially

associated with document discovery, by requiring parties and potential parties to the proceeding **to make *all* their Subpart J-defined Documentary Material available through the LSN prior to** the submission of the DOE application." 69 Fed. Reg. 32836, 32843 (June 14, 2004) (emphasis added).[3]

III. DOE's PLANNING IN ADHERENCE TO THE SIX-MONTH RULE

After having successfully lobbied NRC to adopt a rule requiring all LA-supporting Documentary Material to be on the LSN at the time of its initial certification, DOE undertook in apparent good faith to implement adherence to that rule. In schedule after schedule, and statement after statement, both public and in private, DOE reconfirmed its determination to abide by the Six-Month Rule and to make publicly available *all* of its key licensing documents at least six months before it tendered its LA to NRC. Indeed, DOE set (*see infra*) an internal target of *eight months*' lead time, to be doubly sure of not compromising the six-month window. As early as October 18, 2000, DOE officials prepared a draft LSN Strategic Approach ("LSNSA") (Ex. 7) acknowledging the LSN goal: "Early provision of these documents in an easily searchable form would allow for a thorough and comprehensive technical review of the LA by all parties/potential parties to the licensing proceeding, resulting in better-focused contentions." *Id*. at 4-5. DOE recited its understanding that its LSN must be certified six months prior to its submission of the LA and that the initial certification would include all "those documents that are known to directly support the LA." *Id*. at 11.

In early 2001, DOE prepared a "Strategic Decision Support Team Issues List and Description" (Ex. 8) in which it described licensing strategy policy and strategic assumptions.

[3] NRC agreed in its August 2007 response regarding the declaratory judgment: "There is a clear expectation that the majority of documents supporting DOE's License Application will be available on the LSN at the time of DOE's initial certification. It is well established that one of the purposes of the LSN is to facilitate the timely review of DOE's application by providing access to relevant documents before the application is submitted, rather than through the traditional discovery process." NRC Response at 4.

Anticipating that the completion of its technical work would predate the submission of its LA by a substantial time, DOE assumed that "[d]uring the six month period prior to LSN certification, the schedule will accommodate early and phased review by NRC of completed programmatic, design, and science & analysis documentation." *Id*. at 37. DOE specified that "*documentation supporting the license application will be 'frozen' at the time of LSN certification*" (*id*.), and "LSN certification will occur six months prior to the License Application submittal. There will be no substantive safety related changes between certification of the LSN and License Application submittal (documentation supporting the LSN will be 'frozen')." *Id*. (emphasis added). Obviously, there was no suggestion that DOE's initial LSN certification could be constituted simply of whatever it happened to have completed and available at the time. An October 5, 2001 draft of DOE's LSNSA (Ex. 9) reiterated that "The Commission [NRC] believed that the LSN could facilitate the timely NRC technical review, and the timely Petitioner 'discovery-type' review of DOE's license application by providing access to relevant documents before DOE submits its license application. . . . The NRC also believed that early provision of these documents would allow for a thorough, comprehensive technical review of the license application by all parties and potential parties to the HLW licensing proceeding, resulting in better-focused contentions. . . ." *Id*. at 14.

The LSNSA draft of October 31, 2000 (Ex. 10) focused both on the type of documents required to be on the LSN at the time of initial certification and on when those documents needed to be LSN-ready: "Upon the initial implementation . . . of the OCRWM LSN, the following Documentary Material and associated first level reference material will be made available electronically: AMRs [“Analysis Model Reports”] and associated first level references; PMRs [Process Model Reports] and associated first level references; Site Description

Documents; all Correspondence and Electronic Mail Relevant to the License Application; System Description Documents (SDD's) and associated first level references; . . ." *Id*. at 12.

On December 10, 2001, DOE issued draft "Technical Guidance for License Application Planning" (Ex. 11) which was even more specific in setting out the schedule for completion of technical documents supporting the LA and in providing sufficient margin to ensure the job was done correctly:

> *The technical basis for the LA*, which will support LA preparation and any eventual NRC review, *must be essentially complete* ***eight months*** *prior to LA submittal* to support BSC's initial LSN certification process. BSC will complete the initial certification of the LSN to the DOE *seven months prior to LA submittal so that DOE has one month to prepare their initial certification to the NRC six months prior to LA submittal as required by 10 C.F.R. Part 2, Subpart J.*"

Id. at 3 (emphasis added). Repeating the point, DOE stated, "Documentation supporting the [LA] should be completed in time to support the initial certification process for the LSN. LSN certification will occur six months prior to [LA] submittal. This means *technical products should be* ***completed eight months prior*** *to the scheduled LA date*." *Id*. at 21 (emphasis added).

The anticipated completeness of DOE's technical documentation supporting the LA is made clear from this Guidance document. It also explains what DOE would be doing during the six-month "hiatus" between its LSN certification and LA filing (contradicting DOE's current stance that if it were truly expected to certify all of its technical LA-supporting documents six months prior to LA, it would have nothing left to do in that interim). Thus, at page 5, the Technical Guidance states:

> To support the DOE goal of submitting the LA to the NRC by December 2004, inputs to the LA will be conducted in a phased manner. As illustrated in the strategic planning schedule, the first drafts of the programmatic sections of the LA need to be completed by December 2003. The draft sections on design, science, preclosure safety assessment, and total system performance assessment need to be completed by March 2004. The LA review schedule has been shortened to 38 weeks. Technical and regulatory reviews of draft LA sections by the affected offices within the DOE, as well as Naval Reactors, must occur in parallel to make the initial review process as efficient as possible. The review of draft sections must be sufficiently complete along with the essential supporting technical

> basis documents before the initial BSC LSN certification process begins, eight months prior to LA submittal. DOE management review of and concurrence on the integrated LA, and production of the final document, will take place during the six months following initial LSN certification. Changes and additional information developed during the DOE management review will be included in the LSN with a supplementary certification at the time of LA submittal.

Id. at 5-6.

The Guidance goes on to focus on the content of the Total System Performance Assessment for licensing ("TSPA-LA"), which it had stated should be complete by March 2004, prior to DOE's initial LSN certification:

> There will be a single total system performance assessment (TSPA) developed and documented in accordance with applicable procedures, as part of the technical basis for the LA. The TSPA will be developed to be a defensible case that provides reasonable expectation that postclosure performance standards are met, considering the use of best available science and necessary simplifying assumptions needed to obtain acceptance by the NRC. The TSPA is expected to reflect a combination of some models and parameters that represent a reasonably expected behavior of the system and other models and parameters that are more conservative. . . . Bechtel SAIC Company (BSC) will continue to utilize a logic sequence involving test planning, data collection, AMR development and revisions (including abstractions), PMR revisions, TSPA analyses, sensitivity analyses, and eventually documenting the information in Chapter 8 of the LA. . . . The data and software used in support of model development and TSPA analyses will be qualified, and models will be validated (i.e., information presented to provide confidence that the models are valid for their intended use), consistent with applicable Project procedures.

Id. at 9-11.

Around April 22, 2002, in a presentation entitled "Licensing Support Network: A New Path Forward" (Ex. 12), DOE gave examples of the Documentary Material it was required to make available on the LSN to include "AMR/PMR, detailed data, models, computer codes, methodologies, QA pedigree (*id*. at slide 7)," and it observed what the PAPO Board has itself emphasized: "An incomplete LSN has the potential to draw the licensing proceedings beyond the 3-year window mandated in the NWPA." *Id*. at slide 11.

In early 2002, DOE produced yet another strategy document entitled "Strategic Basis for License Application Planning for a Potential Yucca Mountain Repository" (Ex. 13). Focusing on

the content of the initial LSN certification, DOE explained, "*The technical basis for the LA,* which will support LA preparation and any eventual NRC review*, must be essentially complete at the time of initial certification* of the LSN*,* six months prior to LA submittal as required by 10 CFR Part 2, Subpart J." *Id*. at 2 (emphasis added). Speaking to the necessity to prepare and review draft chapters of the LA, DOE added, "The review of draft [LA] chapters must be complete *along with essential supporting technical basis documents* before initial LSN certification, six months prior to LA submittal." *Id*. at 8 (emphasis added). *See also,* Exs. 14, 15, and 16, all of which confirm DOE's intent to adhere to the Six-Month Rule.

DOE continued throughout 2003 and early 2004 to generate schedules, both internally and for presentation to third-party organizations, each having in common DOE's legally correct and consistent interpretation of its obligations under 10 C.F.R. 2, Subpart J: To certify and make available to the public an LSN document collection at least six months prior to submission of its LA that would contain all the core technical documents and modeling basis documents DOE intended to cite and rely on in its subsequent LA. *See e.g.,* Exs. 17, 18, and 19. In early 2004, DOE created a draft "Performance Assessment & Modeling Assumptions and Work Sequence" (Ex. 20), in which it reconfirmed both the schedules and the LSN commitment it had reiterated so many times before. DOE again stated that "documentation supporting the license application will be 'frozen' at the time of LSN certification." *Id*. at 10. DOE went on to assure that "LSN certification will occur six months prior to the License Application submittal. There will be no substantive safety related changes between certification of the LSN and License Application submittal (documentation supporting the LSN will be 'frozen')." *Id*. at 11. Finally, the document contained a bar chart representing key benchmarks. *Id*. at 12-13. LSN certification was indicated in the first half of 2004. More importantly, the schedule again called for pre-LSN completion of all the major technical documentation, including final design and final TSPA

inputs. Coincident with the entry "LSN certification" on the DOE calendar is the entry "LA documentation 'freeze.'" *Id*. at 13.

By mid-2002, DOE's Russ Dyer had become the Yucca project's chief engineer. In a memo on June 3, 2002 to then-OCRWM Director Margaret Chu (Ex. 21), he discussed the purpose of the LSN as providing "access to relevant documents before any LA is submitted, and is intended to supplant the need for the traditional document discovery process after the LA is submitted." *Id*. at 1. Importantly, he observed that *"The first objective however is to ensure all information required to fulfill the criteria in the YM Review Plan (YMRP) is available within the LSN." Id*. (emphasis added). Since the Yucca Mountain Review Plan, NUREG 1804, is NRC's "bible" for its analysis of every component of DOE's LA, it follows that the information Dyer cited is that which DOE intended to rely upon in support of its LA.

Contemporaneous with its initial unsuccessful attempt to certify its LSN in June 2004, DOE published on its website a "Frequently Asked Questions" list (Ex. 22). There, DOE explained that 10 C.F.R. 2, Subpart J requires DOE "to provide the general public and parties to the licensing hearing with electronic access to **all documentary material relevant to the licensing proceeding**." *Id*. at 1 (emphasis added). DOE emphasized, "NRC regulations require that the relevant documents be loaded in the LSN and be available electronically six months prior to DOE's submittal of the Yucca Mountain license application." *Id*. DOE added, "The Nuclear Waste Policy Act directs the NRC to issue its licensing decision within 3 years after the DOE license application is submitted. Given this short period of time, the LSN will provide access to *all documents that are relevant to the Yucca Mountain license proceeding in advance of the license application submittal* and will be used instead of the traditional NRC document discovery process." *Id*. at 3 (emphasis added). Addressing in detail the type of documents which

meet the description of "all documents that are relevant to the Yucca Mountain license proceeding" and which must, therefore, be on the LSN in advance, DOE explained:

> The two main reports that DOE must produce to demonstrate compliance with NRC performance objectives are a pre-closure safety analysis and a post-closure performance assessment. Any document bearing on information contained in these reports – including description and technical basis of the repository design; identification of structures, systems, and components, equipment, and process activities; description of the geologic setting and natural features, events, and processes; technical basis for including or excluding degradation, deterioration, and alteration processes of engineered barriers; technical basis for the identification of hazards, event sequences, and consequences; and choice of supporting data, analytical methods, models, treatment of uncertainties, and assignment of probabilities . . . must be included in the LSN.

Id. at 33.

In addition, DOE hypothesized:

> Q. Are modeling and uncertainty and sensitivity analyses required to be included in the LSN?
>
> A. Yes. DOE will be required to develop complex predictive models of repository performance. Models will be used to analyze natural features, events, and processes; to develop the design of engineered systems, to assess repository performance; to evaluate the expected impact of the repository on reference biosphere; and to demonstrate compliance with performance objectives.

Id. at 32.

DOE enumerated other required contents of the initial LSN certification, including documents related to the validation and verification of software used in support of the TSPA, *id*. at 33-34, all documents bearing on the design of structures, systems, components and equipment important to safety and to waste isolation, *id*. at 37, documents related to engineering activities such as identification and resolution of safety questions, and the design, procurement, fabrication, manufacture and construction of barrier systems, surface facilities, underground facilities, monitoring equipment, post-closure monuments, and other structures, systems, and components important to safety and to waste isolation, all of which "must be included in the LSN," according to DOE. *Id*. at 35.

IV. THE PAPO BOARD's CONSTRUCTION OF THE SIX-MONTH RULE

The PAPO Board has consistently interpreted the Six-Month Rule under 10 C.F.R. Section 2.1003 to require DOE to make available *all* its Documentary Material *at the time of its initial LSN certification*, explicitly rejecting the view that DOE could make available simply that which happened to be available, with "supplementations" occurring later. In its August 31, 2004 Order (vacating DOE's initial LSN certification), the Board made observations which clarify DOE's LSN obligation:

- Restating the most compelling and basic premise for the existence of the LSN in the first place, PAPO said:

  > *DOE bears the burden to support all points required for a license, and DOE's certification initiates the entire licensing process. A full and fair six-month document discovery period, where all of DOE's documents are to be available to the potential parties and the public, is a necessary precondition to the development of well-articulated contentions and to the Commission's ability to meet the statutory mandate to issue a final decision within three years*. These important objectives cannot be met unless we require DOE to make every reasonable effort to make *all* its documentary material available at the start.

  (Order at 17-18) (emphasis added).

- Confirming that the only true deadline for DOE to announce its initial LSN certification is one of DOE's own choice – namely, the day on which all Documentary Material is made available – PAPO stated:

  > If on the day of DOE's self-imposed document production deadline, DOE was not quite finished, that deadline, not compliance with 10 C.F.R. §2.1003, is what now must yield.

  Id. at 17.

- DOE's recent protestations that it will repeatedly "supplement" its incomplete LSN "as quickly as possible" avail DOE little, when it can simply wait a few months and certify its LSN when it is complete in the first place. As PAPO stated:

  > DOE's failure to make all of its documentary material available on June 30, 2004, is not excused by its indicated intent to supplement its initial production at a later time. To accept such a proposition would destroy the

> six-month document discovery period that is critical to the entire licensing proceeding.

Id. at 35.

- Refusing to authorize DOE to predicate an incomplete LSN certification on an arbitrary deadline, PAPO observed:

> In this context, the good faith standard as applied to DOE's duty to produce all documents is a rigorous one, requiring DOE to make every reasonable effort to gather, to assess for privilege, and to produce all documentary material at the outset, without regard to artificial or self-imposed deadlines. . . .

Id. at 18.

> The timing of DOE's document production is substantially within its control. As far as Subpart J is concerned, DOE can produce its documents whenever it is ready.

Id. at 5.)

- DOE has now purported to certify a knowingly incomplete LSN and then plans to supplement its contents in increments later. A similar suggestion in 2004 was rejected by PAPO:

> The short answer, however, is that any documents produced in response to a Board order would not have been available for the entire six-month discovery period – which availability, as we have seen, is a central feature of the regulatory scheme.

Id. at 35-36.

- While the crux of Nevada's complaint in 2007 is DOE's certification of an LSN that is incomplete because key documents are in development or not yet prepared, the Board's 2004 observation (where the issue was documents already in existence yet omitted from the LSN) is equally valid in either circumstance:

> In light of the substantial disruption, delay, and confusion that such incompleteness will cause to the pre-license application six-month document discovery process, we must conclude that DOE's June 30, 2004 document production did not meet the requirement that it, in good faith, make all of its documentary material available as of the date of its initial certification as required by 10 C.F.R. §2.1003.

Id. at 36.

V. DOE RECERTIFIED *KNOWING* THAT KEY DOCUMENTS IT WILL CITE AND RELY ON IN ITS LA ARE NEITHER COMPLETE NOR LSN-AVAILABLE

A. Unfinished Key Documents Generally

The sequence of steps required of DOE for LSN compliance is clear: After having conducted the necessary tests and analyses, DOE is to create the Documentary Material which DOE will cite and rely on in its LA; DOE is to make that Documentary Material publicly available on the LSN and certify that it has done so; and then, DOE is to tender its LA to NRC at least six months after LSN certification. As discussed *supra*, NRC and DOE concurred on the clear meaning of the Six-Month Rule at the time it was adopted. But when DOE realized it would have difficulty meeting an early 2008 LA filing date, and even greater difficulty in meeting a late-2007 LSN recertification date, it faced the choice of either embracing a more realistic project schedule or abandoning its prior endorsement of the Six-Month Rule, which would necessitate radically changing positions regarding its meaning. DOE chose the latter.[4]

FAQs: Nowhere is this sea change more evident than in DOE's new FAQs adopted in July 2006, blatantly reneging on positions published to its own staff and contractors in its FAQs in 2004. A comparison is telling:

1. The 2004 FAQs relating to 10 C.F.R. 2 state: "This regulation includes provisions that require DOE to provide the general public and parties to the licensing hearing with electronic access to **all** documentary material relevant to the licensing proceeding" (Ex. 22 at 1) (emphasis added).

[4] DOE's certification is deficient on its face. Conceding for the sake of argument that DOE has made available all Documentary Material "in existence as of a reasonable cutoff date" before certification, the certification would still merely assert that DOE was certifying as publicly available whatever documentation it has completed as of October 19, 2007, without regard to what portion that constituted of **all** the core technical documents and modeling basis on which DOE knows it will rely in its License Application.

2. The current version of DOE's FAQs were revised to state: "This regulation includes provisions that require DOE to make electronically available documentary material relevant to the licensing proceeding" (Ex. 23 at 1).

3. The 2004 FAQs state: "The NRC regulations require that the relevant documents be loaded in the LSN and be available electronically six months prior to DOE's submittal of the Yucca Mountain license application" (Ex. 22 at 1).

4. The foregoing sentence is omitted in its entirety from the 2006 FAQs (Ex. 23 at 1).

From recently available documentation, including documents placed on LSN by DOE both before and after its recertification and in public statements made by DOE, it is clear that DOE has chosen to knowingly and intentionally deprive the other parties to this proceeding of access to critical DOE Documentary Material required by 10 C.F.R. Section 2.1003 to be publicly available. DOE knows precisely the core technical documents and modeling basis information that will comprise its actual LA, and it has made projections estimating the earliest date on which many of those essential documents will be completed. Some, like the all-important TSPA-LA, and certain key AMRs, will not be complete until 2008. Some, like the Probabilistic Volcanic Hazard Analysis – Update ("PVHA-U"), discussed *infra*, will not be revealed until *after* LA submission. Yet, DOE has now certified its LSN as "complete" (and therefore in adherence to the Six-Month Rule) at a time which it knows is well before many critical documents are completed, much less made publicly available on the LSN. DOE has done so for precisely the same reason that it attempted to certify an incomplete LSN database on June 30, 2004: It publicly vowed to meet an unrealistic LA date, and it believed it *must* recertify its LSN database prematurely to avoid breaching that vow. For nearly two years, DOE has been promising that its LA would be filed with NRC by June 2008 at the latest. Ward Sproat, DOE's

new Yucca director, has committed to myriad entities, including NRC, the Nuclear Waste Technical Review Board, and the U.S. Congress, with ever increasing passion and certainty, that he guarantees the June 2008 LA filing.

There are a number of critical LA-supporting core technical documents and modeling basis, like the TSPA-LA and AMRs and others which DOE *knows* it will cite and rely on in the LA, which have long been discussed by DOE as critical components of the LA, but which are *not* complete and/or *not* on the LSN despite DOE's current recertification. DOE's admission of these deficiencies is accompanied now by its incorrect assertion that it is *not required* to have all Documentary Material it will cite and rely on in the licensing proceeding available on the LSN at initial certification; rather, DOE now says it can initially certify its LSN any time it pleases, without regard to whether the LSN contains all (**or theoretically any**) of the Documentary Material DOE intends to cite and rely on in the licensing proceeding. In DOE's view, it can simply certify "whatever documents it has ready at the time" in its initial certification, and then "supplement" with the remainder whenever they finally become complete. How DOE's current position squares with the LSN's function as "pre-License Application discovery" is inexplicable. DOE's new position altogether ignores the Six-Month Rule and DOE's longstanding commitments to abide by it.

By order of the PAPO Board, DOE began in June 2005 reporting its best estimate of its LSN recertification date and its LA filing date. Beginning on July 19, 2006, DOE began reporting that it anticipated filing its LA in June 2008 and certifying its LSN database six months before that, in December 2007. In April 2007, DOE modified its prediction, still holding to the June 2008 LA date but suggesting a possible earlier LSN certification date. Accordingly, DOE's actual certification date comes two months earlier than its initial predictions. One might assume that since DOE's LSN certification has moved up, this would indicate the accelerated completion

of its Documentary Material. On the contrary, DOE's own forecasts make clear that there will be critical documentation remaining incomplete *well into 2008*, and these are obviously absent from the current LSN. It is obvious that DOE no longer regards the certification of a complete LSN database (one containing all core technical documents and modeling basis Documentary Material DOE intends to cite and rely on licensing) to be an independent goal or even a legal requirement; rather, DOE places all focus on meeting an arbitrary LA filing date, with the LA tail wagging the LSN dog. Recent DOE statements reinforce this error.

Document Schedules: On March 23, 2007, in a presentation to the Affected Units of Local Government ("AULG"), DOE's Ward Sproat reported that DOE had not run the complete TSPA-LA yet because many AMRs were still being revised and checked. He admitted that the LSN would be incomplete at initial certification, and that important technical information would go into the LSN only after recertification. On March 28, 2007, Mr. Sproat spoke at a Quarterly Management Meeting to representatives of DOE and NRC. When asked by Nevada counsel about the anticipated completeness of DOE's LSN database at the time of recertification, Mr. Sproat admitted that DOE would be revising AMRs and other technical documents after the LSN certification, but generously assured the audience that DOE would put those documents on the LSN whenever they became final. On June 26, 2007, in a Technical Exchange meeting between DOE and NRC on quality assurance, presentations were made by DOE's Warther and McMahon. At slide 12 of Warther's presentation (and identical slide 1) of McMahon's, each presented the same schedule of events leading up to and including delivery of the LA to NRC in June 2008. One of the key completion dates in anticipation of the LA was for DOE to "approve LA supporting products," but this was not expected to occur until "February 2008" (Ex. 24).

Other DOE documents make clear the *2008 completion date* for critical technical information necessary for supporting the LA at the time of its submittal. In a January 4, 2007

analysis, discussing a product called "Designs Available for LA" as being on the critical path to the LA, the author warned: "This activity is not scheduled to finish until 4/17/08, which is after the 2/29/08 due to RW-1 [Yucca Director Sproat]" (Ex. 25 at 6).

TSPA: A March 12, 2007 Summary of the "History and Status of TSPA for Yucca Mountain" authored by DOE contractor Sandia discussed the long history of iterative TSPAs on the Yucca Mountain project beginning in the 1980s (which may account for why the LSN produces thousands of responsive "hits" to a general search for any information "concerning" TSPA, many of which have no current value). The summary explains: "All TSPA work since 2002 is unpublished, and all is categorized by the DOE General Counsel as privileged, in anticipation of future litigation. No results have been presented in public since 2002, and all TSPA-related material provided to this panel that postdates the TSPA-FEIS must be treated as privileged" (Ex. 26 at 1). The summary concludes: "The current project schedule calls for TSPA results to be released for public comment as part of the Draft Supplement to the Environmental Impact Statement [“SEIS”] in October 2007. Final documentation of the TSPA-LA will occur in the fall of 2007, and text and results will be incorporated in the Safety Analysis Report (the *primary component* of the License Application) for delivery to DOE *in January 2008*." *Id*. at 3 (emphasis added). Documents delivered to DOE by Sandia must undergo a lengthy DOE approval process before final release.

DOE's carefully secreted TSPA-LA is further discussed in a May 22, 2007 "Draft Guidance on TSPA," which poses and answers a question: "The Lead Lab has asked whether the draft TSPA-LA AMR and technical input documents for the TSPA (such as TDIPs) are privileged." DOE's response: "The draft TSPA-LA AMR and drafts of any technical input documents are not required to be released under FOIA. Nor are they required to be made available on the LSN. The withholding of these documents from non-Yucca Mountain personnel

during the audit of the TSPA would be consistent with the protected status of these documents" (Ex. 27).

Thus, it is clear that recently released (October 12, 2007) information pertaining to DOE's TSPA-SEIS is *not* the same as the TSPA-LA to be completed in 2008 and to be relied upon in the licensing proceeding. Indeed, language in the recently published SEIS makes clear that "the TSPA-SEIS model for the analyses in this Repository SEIS is in the process of being finalized for purposes of the compliance assessment to be included in the application DOE intends to file with NRC for construction authorization . . . ." (Ex. 28 at 5-3). *See* Declaration of Nevada's TSPA expert Mike Thorne appended to this Motion, which also points out that even the TSPA-SEIS as it stands is incomplete.

There can be no question of the critical importance to Nevada, the NRC, and other stakeholders of the actual, final TSPA-LA – which, when (and if) it finally becomes available in 2008, will contain the most significant information supporting DOE's position in the licensing proceeding. NRC has told Nevada that its "staff expects that the U.S. Department of Energy (DOE) will provide full and complete access to any information that staff finds necessary for conducting its review. This includes access to the Total System Performance Assessment ("TSPA") code and its supporting documentation" (Ex. 29 at 1). As recently as September 28, 2007, NRC addressed the issue more expansively:

> During the execution of the TSPA [by DOE], the results of the calculations are saved in computer files containing both the results of overall performance (*e.g.*, estimates of dose) as well as intermediate results (*e.g.*, infiltration rates, degradation rates of waste packages, timing and release rate of radionuclides from the waste package, timing and release rate of radionuclides from the saturated zone). The computer program and files of DOE's TSPA allow NRC to review and confirm the many calculations within the TSPA and to examine the parameters, models and assumptions. **This information is expected to be in the license application**, which will be available to all stakeholders.

(Ex. 30 at 1-2) (emphasis added). None of this TSPA-LA backup, let alone the TSPA-LA itself, is currently on the LSN.

In its September 28 correspondence, NRC explained that the TSPA fulfills two functions: the first being to integrate many process level models (*e.g.*, infiltration, radionuclide transport, corrosion) in order to simulate overall system performance and produce estimates of expected dose; the second being to iterate these performance simulations many times over, varying certain input parameters within ranges that capture natural variability and uncertainty. NRC insisted that "the input data, calculations, and linkages between processes can be followed in the DOE TSPA." *Id*. Encl. at 1. This must be contained in the LA and made available to all parties. DOE accordingly does know and has known for years that the TSPA-LA is the most important aspect of its advocacy in the licensing proceeding and is Documentary Material which *must* therefore be present in its initial LSN certification.

But DOE's schedule-driven approach required it reject these facts. In a recent exchange of letters between representatives of Nevada and DOE, OCRWM Director Ward Sproat rejected Nevada's position, saying "we disagree with your assertion that the Licensing Support Network (LSN) regulation requires DOE to make available the TSPA and its associated computer code at the time of DOE's initial certification. To the contrary, the LSN regulations provide for an initial certification by DOE and then a supplemental certification when DOE submits the license application. That two-part process clearly presupposes that all of DOE's analyses need not be completed at the time of DOE's initial certification. . ." (Ex. 31 at 1). Mr. Sproat is new at YMP and apparently is not familiar with the history of the LSN and the import of its Six-Month Rule. He articulates a vision of a continuum of DOE work on its core technical documents and modeling basis all the way through LA submittal. In his view, the "real" certification of that work as being publicly available would occur contemporaneously with the filing of DOE's LA; an "interim" certification, disclosing whatever happened to be complete at the time would occur

earlier (herein, on October 19, 2007). That vision is totally foreign to the regulatory compliance required.

In a July 10, 2007 conference among counsel for DOE and Nevada, DOE counsel admitted that not all Documentary Material to be cited and relied upon by DOE would be complete by the time of LSN certification, but argued that LA-supporting Documentary Material not on LSN at certification would be made available within a reasonably short time after certification, "in a matter of months."[5] If DOE's anticipated delay in completing its LA documentation were really so short, why did DOE not simply wait until its core technical documents and modeling basis are *complete* and *on the LSN* before recertifying it? The answer is obvious: This would require slippage in the anticipated DOE LA filing date of June 2008 – a possibility DOE is apparently prohibited from considering.

Preclosure Safety Analysis: There have been a number of other indicators of significant critical Documentary Material that will not be complete until at least sometime in 2008. DOE made a presentation at a DOE/NRC Quarterly Management Meeting on March 27, 2007 (Ex. 32) in which (in slide 4) DOE depicted a schedule for completion of pre-LA filing activities. It specified "Preclosure Safety Analysis Technical Activities" to continue through February 2008. DOE went so far as to depict its LSN certification date on the same calendar in December 2007, that very juxtaposition proving that DOE's certification is intended to predate the completion of relevant licensing documentation. *Id*.

Unavailability of preclosure safety analysis information until February 2008 was subsequently addressed by Michael Frank, head of the Bechtel team responsible for analyzing

[5] Since the time of that conference, DOE's schedule of February 2008 for TSPA completion has itself been put into doubt. In a recent memorandum to Ward Sproat from the Director of his Office of Quality Assurance, Mr. Larry Newman warned, "It appears that there may be a lack of resources needed to support BSC and Lead Lab technical activities to meet the February 29, 2008 milestones" (Ex. 3, *supra*, at 3).

dozens upon dozens of "event sequences" to determine their impact on the viability of the project. In a presentation to the NWTRB on September 19, 2007 (Ex. 33), just 30 days before DOE's purported certification, Mr. Frank discussed the various event sequence "scenarios" his team must evaluate as part of the pre-closure safety analysis and the various triggering or "initiating" events which must be considered. "In this study," he said, "we're going to have probably a couple hundred of these types of diagrams in order to capture the array of initiating events, and system responses." *Id*. at 158. One of the NWTRB members, Andy Kadak, impressed by the enormity of the task ahead, asked, "What you've described here is probably a four- or five-year process. Now, is this going to be a part of a license application?" Mr. Frank responded, "Yes." *Id*. at 176. Mr. Frank assured the Board, "It is really just a question of time before it really does all come together." *Id*. at 179-80. Another member of the Board asked, "Any idea of when that comes?" Mr. Frank responded, "Our stated due date for BSC delivery of a licensing application, with all supporting analyses done, is end of February 2008." *Id*. at 180.

The preclosure safety analysis in general, and the numerous event sequence scenarios which it will encompass, are critical components of DOE's LA, and DOE's "position in the licensing proceeding" ought to have been – but was not – available on the LSN at the time of recertification. The necessity for inclusion in the LA of the work of Mr. Frank and his team has long been known to DOE. In February 2002, DOE published a "Preclosure Safety Analysis Guide," which recited in pertinent part:

> *Information Base for Preclosure Safety Analysis in Support of License Application for Construction Authorization*. The premise of the PSA process is that sufficient information exists to (1) define the kinds of event sequences (scenarios) that can credibly occur in the kinds of operations that are known or expected to be necessary for receiving, handling, processing, packaging, transporting, and storing waste forms, (2) estimate their frequency (likelihood), and (3) estimate their consequences.

(Ex. 34 at 4-9, 4-10).

DOE recently (August 2007) published an **interim** report on "Preliminary Preclosure Nuclear Safety Design Bases" (Ex. 35). It was called an "informal study" and conceded that "the results of this study are subject to change as the preclosure safety analysis to support the license application is completed." It went on to say "Placeholders have been created for information that is not available at this time." *Id*. at 7. This recent status report merely confirms the state of unpreparedness with respect to preclosure safety analysis, not anticipated by DOE to be complete until at least February 2008.

Surface Facility Design: Addressing the NWTRB on the same day as Mr. Frank, BSC's Robert Slovik discussed the status of design of surface facilities planned to be built at Yucca. These are the structures in which the canisters of nuclear waste planned to be received from utilities would be accepted, loaded into containers, and moved out for either storage or emplacement. Accordingly, they are structures critically affected by DOE's potential earthquake assessments and aircraft crash hazard analyses. Because Mr. Slovik did not indicate when the design of these buildings would be complete in his presentation, the NWTRB Chairman asked, "Can you tell us where we are now with respect to the design and where you expect to be, say, at the time of the filing of the license application?" Mr. Slovik responded, "At the time of the completion of the license application, we expect to be . . . 35-to 40 percent done on important to safety system structures and components" (Ex. 33, *supra*, at 138.) In other words, even this partial structural design information will only be available at the time of LA, and not **today**, and especially not the time of DOE's LSN recertification.

Key Technical Issues: Prior to 2002, DOE and NRC negotiated some 293 agreements, each requiring DOE action to close each particular Key Technical Issue ("KTI"). In November 2001, NRC sent a "sufficiency letter" (Ex. 36) to DOE regarding the status of its work on the proposed repository, conditioning its sufficiency finding on DOE's *completion* of the work

promised in the 293 KTI agreements. *Id*. at 5. On July 23, 2004, however, DOE informed NRC it would no longer continue the process of working through the established KTI procedure of exchanges of information with NRC until resolution was reached (Ex. 37). Instead, DOE told NRC that, with respect to the remaining KTIs not yet closed, DOE would simply address them "**after** DOE submittal of the LA." *Id*. at 2 (emphasis added). DOE reconfirmed its intention as recently as the DOE/NRC Quarterly Senior Management Meeting on March 27, 2007, stating that its remaining key technical agreement items would not be addressed until they are incorporated in the LA (Ex. 32, *supra*, Slide 11). (This is not to say that they will still be characterized by DOE as "KTIs" in the LA; the point is that the responsive information, which is prerequisite to a complete LA, will not be made available until that time.) Accordingly, this constitutes an additional collection of Documentary Material that is not available on the LSN despite DOE's recertification, but one which will certainly be relied on by DOE in the LA.

AMRs/TDIPs: DOE's Russ Dyer provided Nevada with a schedule of anticipated completion dates for DOE's Yucca AMRs at the end of March 2007 (Ex. 38). There were important AMRs not scheduled to be finished until November or December 2007 or later. Even assuming that all the other AMRs on the list were completed on precisely the timeline DOE anticipated, that would leave several AMRs still incomplete and obviously not available on DOE's LSN as of its recertification date.

The importance of the AMRs and their relationship to the ultimate TSPA-LA cannot be overstated. *See* Thorne Declaration. DOE's own website currently explains: "Using data from our site characterization studies we have developed hundreds of computer models, called analysis models. These models simulate the different geologic, hydrologic, physical, and chemical processes of the repository. Our Analysis Model Reports are documents that describe the individual analysis models and how the respective parts of the repository work" (Ex. 39 at 1).

DOE has long intended (and still intends) that its AMRs, once completed sometime in 2008, will be critical elements of its LA and critical aspects of its compliance with NRC's License Application Review Plan, NUREG-1804 Rev. 2. Accordingly, DOE has prepared charts systematically explaining "AMR mapping to LA" (Ex. 40) and "AMR mapping to Yucca Mountain Review Plan" (Ex. 41) to assure accurate coverage of those requirements by DOE's AMR collection.

Facing the prospect of an incomplete AMR collection, yet needing to continue preparing its TSPA computer runs, DOE adopted the tactic of *substituting a different document* for the AMR, as an interim information source or "placeholder" for its ongoing TSPA work. The substitute information is drawn from what are referred to as TSPA Data Input Packages ("TDIPs"). DOE has made it clear, however, that TDIPs and AMRs are *not* the same thing, and that TDIPs provide only **some** of the information ultimately to be produced in its AMRs. DOE explains, "TDIPs will be prepared to provide documentation of inputs for use in the TSPA . . . . **TDIPs . . . are not a scientific analysis or modeling study** (although they may reference these studies), but rather contain information necessary to explain the use of parameters in the TSPA and their justification. As such, they are the starting point for traceability of the inputs to TSPA, back to their original source." *See* "Technical Work Plan for: Total System Performance Assessment Parameter Selection and Documentation with TSPA Data Input Package (TDIP)" (Jan. 2007), Ex. 42 at 4 (emphasis added).

In April 2007, a DOE QA audit surveillance team made it clear that the information contained in a TDIP was well short of that required to be contained in the corresponding AMRs, criticizing DOE for describing a TDIP as an "analysis." The team pointed out that, by definition, **TDIPs cannot be analyses or calculations** and that DOE's characterization of them as "analyses" was inaccurate (Ex. 43 at 3).

Establishing the primacy of the AMRs themselves as inputs to the final TSPA-LA and LA, the QA surveillance team concluded that the "revised AMRs are necessary to support completion of the TSPA model report, which is required for the License Application" (Ex. 43, *supra*, at 4). Again, several AMRs are absent from the LSN – including the critically essential TSPA AMR, as well as ultimate products such as the TSPA-LA itself, for which the AMRs serve as foundational building blocks. Just three weeks ago, Sandia released a QA audit finding "in the case where data values changed between TDIP process and the final AMR, no formalized controls were identified to ensure that the correct values were used" (Ex. 44).

Seismic Analysis: DOE's contractor supervisor Michael Denlinger made a May 30, 2007 presentation at an NRC/DOE Technical Exchange Meeting on Yucca Repository layout and operations (Ex. 45). He explained the DOE/Bechtel approach to seismic analysis and reported that DOE's Tier 1 analysis (to be used by DOE in the LA) would not be completed until at least February 2008, and its Tier 2 analysis (aimed at confirming Tier 1 analysis results and providing the basis for detailed design calculations) would not be available until at least May 2008. *Id*. at 3. Needless to say, neither the Tier 1 nor the Tier 2 seismic analyses are available on LSN despite DOE's formal recertification.[6]

Volcanism: In another area illustrating incomplete DOE preparation, DOE has, since 2004, been conducting an expert elicitation on the subject of Probabilistic Volcanic Hazard Analysis ("PVHA"). This topic involves the risk of volcanic activity in the Yucca region, including the likely frequency thereof. In 1996, DOE produced its original expert elicitation on this subject. Subsequent to its publication, as recently reported (Ex. 46) by DOE contractor

[6] Nevada has become aware of a vitally important document regarding the long-term behavior of the rock (tuff) which comprises most of Yucca Mountain. That document ("Long-Term Mechanical Behavior of Yucca Mountain Tuff and Its Variability – Final Technical Report for Task ORD-FY04-021") criticizing the utterly insufficient investigation of this subject performed to date by DOE; yet, the document, prepared **for DOE**, is unavailable on DOE's LSN. Nevada is attempted to obtain a hard copy of the report through other means.

Kevin Coppersmith on May 15, 2007, "new aeromagnetic and ground magnetic data became available suggesting possible buried volcanic centers in Crater Flat." *Id*. at 12. According to DOE, the new information indicated only a "modest increase in the mean annual frequency of intersection of the repository" by a volcano. *Id*. However, NRC staff concluded that the information DOE submitted did not provide an adequate technical basis to evaluate the likely impacts of the new aeromagnetic and ground magnetic data on the volcanic hazard estimate and that additional information was needed. *Id*. DOE made a regulatory commitment to complete additional field studies, including aeromagnetic surveys, and to conduct an update to the 1996 PVHA (to be denominated PVHA-U, for Update). *Id*.

In response to this new information and NRC's demand, DOE reconvened a panel of experts, comprised mostly of the 1996 group, to conduct an updated expert elicitation. According to Mr. Coppersmith, DOE will not reveal the outcome of this new work until just after its LA, supposedly because it will not be completed and available in time despite the fact that all the input of the expert panel would be complete by July 2007. *Id*. at 25, 32. Instead, DOE will rely on information that is 11 years old, which has been proven to be both inaccurate and incomplete. This critical analysis of the new expert panel is of course unavailable on LSN.

DOE has somehow found a way *not* to complete its updated expert elicitation or make it publicly available in four long years; but the unfavorable new aeromagnetic survey information from 2004 has been acquired and analyzed by NRC's Center for Nuclear Waste Regulatory Analysis ("CNWRA") and made the subject of an August 2007 report (Ex. 47). The findings of that report are:

- "There may be twice as many basaltic volcanoes in the Yucca Mountain region than considered in the original 1996 DOE hazard assessment."

Id. at i.

- "The new DOE information and analyses also support the hypothesis that past volcanism in the Yucca Mountain region is temporally clustered. . . . This leads to an episodic recurrence rate of 11 to 16 volcanoes per million years, which is substantially greater than the longer term average rate of about 5 volcanoes per million years and an order of magnitude greater than the 1 to 3 volcanoes per million years in the original 1996 DOE assessment."

Id. at ii.

- "Based on these data, it appears that temporal clustering is an important feature of the Yucca Mountain system that should be accounted for in volcanic probability models."

Id.

The absence of the PVHA-U from the LA (and obviously, from the LSN) raises completeness issues with respect to both. But there is yet another problem which DOE itself discovered caused by the missing PVHA-U. In April 2007, DOE planned a "vulnerability assessment" ("Technical Work Plan for: Defensibility of Technical Products Supporting the License Application") with respect to potential problem areas affecting its ability to proceed with an LA (Ex. 48). It defined "vulnerability" as "a condition in a particular part of the technical or QA basis for the post-closure safety case that weakens the defensibility of the LA and opens the LA to potentially damaging criticisms." *Id*. at B-4. DOE explained:

> Interactions of personnel between the PA System Integration Department and the Licensing Department as a part of the current work scope have identified a vulnerability: the technical basis for calculating the **probability** of a volcanic event is not the same as the technical basis for calculating the **consequences** of the same volcanic event. The **probability** calculation (*i.e*., the results of the Probabilistic Volcanic Hazard Assessment) is about 10 years old, while the **consequence** calculation relies, in part, on more recent data. The significance of this inconsistency will be examined and quantified for the compliance assessment. A possible approach for the mitigation plan would be to **use the results of the current Probabilistic Volcanic Hazard Assessment** [*i.e*., the Update] (when they become available) **in future iterations of PA analyses** during license defense (*i.e*., the NGPA [Next Generation Performance Assessment]) **so that it reflects consistent technical bases** for both the probability calculations and the consequence calculations.

Id. at B-15 (emphasis added).

Given the LSN's history, what DOE suggests is truly stunning: A year before its planned LA, DOE is already aware of critical technical information from its PVHA-U which it intends *not* to use in connection with its LA, but will hold back and reveal later.

Quality Assurance: In addition to the vast number of technical documents relating to Yucca that are not yet complete or available on the LSN, DOE recently made clear its intent to rely for the LA and licensing proceeding on a new version of its QA procedures. Thus, so-called "QARD Rev. 20" does not yet exist and will not exist, nor be available for LSN inclusion, until at least some time in the spring of 2008. (NRC/DOE Technical Exchange Meeting, 9/13/2007.)

Technical Data System: Purely by accident, Nevada came across a draft Sandia critique of DOE's vitally important Technical Data Management System ("TDMS") done in March 2007 entitled "Concept of Operations for the Yucca Mountain Project Technical Data Management System" (Ex. 49) (the odd title given the document on the LSN – TDMS_Master_3-28-07 – precluded its being found by any reasonable combination of search words). The report was devastating, observing: "We found serious issues and gaps in the technical data management in our analysis." *Id*. at 11. "We recommend that the current Technical Data Management System be replaced." *Id*. "The TDM Systems cannot guarantee the 'correctness' of the process nor the 'correctness' or authenticity of the data, and, consequently, accountability for license defensibility may fail in certain cases." *Id*. at 15. When Nevada made inquiry, it was chastised by DOE for its "speculation" and being "premature" in relying on such a draft document (Ex. 50 at 1-2), ignoring the fact that the document was simply the only available version placed on the LSN by DOE. While DOE's indignant reaction came only three days after Nevada raised the issue, more than a month has gone by since Nevada requested the final version of the Sandia report, with Nevada receiving no response. Nevada has carefully searched the recently certified LSN database of DOE, and has not located the final version of the Sandia report despite its clear LSN

relevance and its ominous consequences with respect to the reliability of DOE TDMS documentation. (Nevada **has** secured a copy of the final document by other means, a FOIA request, and confirmed that all of the grave criticisms found in the original are likewise repeated verbatim in the final edition of the Sandia report, which, however, is conspicuously missing from the LSN. *See* Ex. 51 at xiii and 2.

In sum, Nevada now confronts an LSN recertified at a time when DOE still has unfinished critical AMRs, unfinished Preclosure Safety Analysis technical activities, a large number of unfinished technical voids reflected in KTIs not to be resolved until LA, unfinished seismic analyses, unfinished analyses of potential volcanic activity at Yucca, and an unfinished TSPA-LA – the most important document to be cited and relied on by DOE in its LA. Nevada has engaged experts to review and analyze these issues so as to be in a position to frame well-designed contentions. But Nevada and all other parties are now stymied in their preparation for licensing by DOE's premature and inadequate LSN recertification. DOE's position is unsupported by NRC's regulatory architecture, by this Board's prior interpretations of that architecture, and it would preclude the "full and fair six months access" assured to all parties.

B. <u>DOE's "Vulnerability Assessment</u>"

Through its contractor Sandia, DOE undertook beginning in early 2007 a complete analysis of the "core technical and modeling basis supporting submittal of an LA to the NRC on or before June 30, 2008" (Ex. 48, *supra*, at 2). This so-called "vulnerability assessment" is not complete, and will not be complete, until much closer to DOE's planned LA submittal date of June 2008. This work was motivated by correspondence from Sandia to DOE on November 30, 2006, in which Sandia warned DOE: "The technical basis supporting the postclosure safety analysis must be of a sufficiently high caliber to be defensible under the considerable scrutiny to which it will be subjected during the licensing process beginning with the submittal of the LA. . .

. However, at this time the technical basis for the postclosure safety analysis is not of the necessary caliber" (Ex. 52 at 2).

Sandia explained that deficiencies which had already been identified in the technical basis "*represent vulnerabilities* in the technical and modeling basis of the postclosure safety analysis contained in the LA, and their existence *decreases the defensibility* of the LA. To increase the defensibility of the LA and increase the likelihood of a successful LA, these vulnerabilities must be identified and eliminated as much as practically possible." *Id*. at 2 (emphasis added). Realizing that this "time-sensitive" work had to be prioritized, Sandia offered: "**The 'core technical basis' must be defensible and qualified in time for LA submittal**; the remainder of the technical basis can be dealt with during license defense." *Id*. at 4 (emphasis added); and said "This VA will strengthen and qualify the core technical basis of the LA postclosure safety case by addressing known vulnerabilities, thus ensuring the legal admissibility of the technical basis." *Id*.

Significantly, in its headstrong push for LA submittal by June 2008 at any cost, any thought of addressing the necessity for completing the Documentary Material and making the core technical basis documents eventuating from the VA and its remediation work available on the LSN (with LA submittal six months thereafter) apparently did not even occur to DOE or its contractors and was not mentioned. DOE would create separate teams to assess the "vulnerabilities." One, for example, would review models and analyses "to determine whether a given model or analysis, **as documented in its AMR**, satisfies relevant regulatory requirements and [Yucca] acceptance criteria." *Id*. at 6 (emphasis added).

Discussing the possible inclusion in the TSPA of previously excluded FEPs (features, events, and processes), Sandia stated: "If the revision entails changing the status of the FEP from screened out (excluded) to screened in (included) (or *vice versa*), the affected inputs or

models will be modified for the TSPA-LA (if possible) and/or for the PMA and the NG PA." *Id*. at 12 (emphasis in original). Needless to say, the decision to include FEPs, which had previously been screened out, would require enormous changes to TSPA-LA inputs and models. With respect to the model analysis team, Sandia said it would "begin by considering existing review comments and responses to identify those comments that pertain to potential model vulnerabilities and continue by reviewing AMRs that document models/analyses that are direct feeds to the TSPA-LA." *Id*. at 13.

The final vulnerability assessment plan adopting Sandia's suggestions was published in April 2007. As presaged by Sandia's earlier correspondence, the assessments were to be conducted in a timeframe and purely for the purpose of achieving a June 2008 LA submittal at all cost. Accordingly, "[i]n conducting the vulnerability assessments planned in this TWP, emphasis will be placed on the timely discovery and **resolution of issues relating to the core technical and modeling basis supporting submittal of an LA to the NRC on or before June 30, 2008**" (Ex. 48 at 2) (emphasis added). After the LA submittal, work would continue regarding technical products "outside the core technical and modeling basis." *Id*. at 2. Importantly, the TWP defines what those "core technical products and modeling basis" documents include, each of which are prerequisites to a successful LA:

- Data/parameter traceability and qualification
- Consistent treatment of parameter uncertainty
- Traceability and qualification of software
- FEPs screening
- Models and analyses
  - Model inputs
  - Model assumptions
  - Technical basis of model
  - Model confidence-building
  - Model conclusions
  - Consistency between models

Id. at 8.

One of the tasks assigned to Sandia in the TWP was to create "a map of both direct and indirect TSPA **inputs into the TSPA-LA system model architecture, using a top-down architecture of parameters, FEPs, submodels, and analysis and model reports (AMRs)**." *Id.* at 4 (emphasis added). Suffice it to say, if 10 C.F.R. Part 2 and the LSN are to have any serious role as "pre-License Application discovery supplanting the traditional post-LA discovery," then the foregoing LA-essential documents need to be complete and available to Nevada, the NRC, and the other parties "a full and fair six months" before DOE files its LA. While this was at one time exactly what DOE had planned, meeting its schedule eventually took primacy over the rules.

Sandia's November 30, 2006 proposal for a "vulnerability assessment" (which later was implemented with the blessing of DOE) was calculated to have an effect far more serious than simply the belated production and verification of "the core technical documents and modeling basis supporting the submittal of a docketable License Application by June 30, 2008." That eleventh-hour schedule by itself simply precluded any possibility that the critical products of the effort would be included on any LSN certified by DOE during 2007. More ominously, DOE's plan for refraining to complete or make available its most critical documentation before LA submission became another of DOE's "gotcha" games. This is evident in the concluding paragraph of Sandia's letter proposing this eleventh-hour scenario:

> The elimination or mitigation of potentially **significant vulnerabilities** will be completed before the issues are raised as NRC Requests for Additional Information (RAIs), or as potentially damaging **legitimate challenges** or "surprise issues" raised by external groups during the licensing process. **A measure of success is that the DOE will already be prepared with reviewed and approved documented responses**, and informed managers to facilitate rapid, focused, and appropriate responses that resolve these issues, limiting their potential negative effects and building credibility and confidence with the licensing boards and public.

Ex. 52 at 16 (emphasis added).

The DOE plan, then, is to "tease" the parties with incomplete or unfinished "core technical documents and modeling basis" to allow the appearance of "significant vulnerabilities" and "potentially damaging legitimate challenges" right up until LA or beyond, and then to respond to those vulnerabilities and challenges when they are inevitably raised with information "*already prepared with reviewed and approved documented responses*." This, in the cynical opinion of DOE and its contractors, is "a measure of success." Nevada submits that a greater "measure of success" would be for DOE to make its reviewed, approved, documented responses to those "damaging legitimate challenges" publicly available **before** LA, on its recently certified LSN. Demonstrating that this DOE "shell game" mentality has filtered down to the field from the executive office, a project employee recently observed in an email: ". . . Egan has instructed his staff to write 3000 contentions. How cool would it be if they were all aimed at conservatism in TSPA and we come in with an expected value result. Their work would be wasted" (Ex. 53).

DOE's "vulnerability assessment" scheme should not be permitted to serve as a mechanism for concealing the true, final "core technical documents and modeling basis" from the other parties, including the NRC and Nevada. Neither should DOE's prepared responses to those "vulnerabilities" be withheld until the licensing proceeding is underway. Rather, DOE's LSN should be struck or suspended until all such documents are in final form, and DOE's recertification of its LSN has actual validity.

VI. DOE's MISCONSTRUCTION OF RULES TO "SUPPLEMENT"

In its recent letter to Nevada (Ex. 31, *supra*), DOE adopted the position that, because 10 C.F.R. §2.1009(b) requires DOE to provide an updated certification of its LSN at the time it files its LA, it is therefore authorized to defer completion of many of its key technical work products until after its initial LSN certification so long as those technical documents are completed in time to submit them with the LA. DOE cites no authority for this proposition. Its expedient new

position contradicts the plain language of 10 C.F.R. §2.1003, which requires "all" Documentary Material to be made available with DOE's initial certification. This proposition directly contradicts years of DOE's own prior planning, scheduling, and regulatory interpretations, which provided for the completion of all technical work products that would be cited and relied upon in the LA a full *eight months* before filing, in order that DOE would have two months' time in which to load the documents onto the LSN database, giving plenty of margin to adhere to the Six-Month Rule. DOE now suggests that the NRC regulation does not mean what it says, and that LSN is nothing more than a "trail marker" *en route* to the LA – a point in time in which DOE gives notice of its plan to file the LA six months hence. DOE claims it may make available a collection of *whatever it happens to have complete* at the preselected time, regardless of how much or how little that is. Mr. Sproat's position suggests that DOE must be free to work on and complete the core technical documents and modeling basis Documentary Material it will cite and rely on in the licensing proceeding during the time **after** its initial LSN certification and before LA, because "Why else would there be a requirement to update the certification?"

In fact, there are many reasons why NRC's regulations would require *all* parties to supplement their initial LSN certifications (Section 2.1003(e)) and DOE to update its LSN certification at LA. First, there are many types of Documentary Material required to be made available by DOE and the other parties, separate and apart from the technical documents supporting DOE's LA. One need only browse through DOE's current 3.4-million-plus LSN document collection to realize that, in actuality, the vast majority of documents presently in DOE's LSN are documents *other than* core technical documents supporting its LA.

Of the three categories of Documentary Material defined in Section 2.1001, the first type is information that a party will cite or rely on in the licensing proceeding. The second type embraces documents that do not support the parties' positions. For example, after the PAPO

Board's August 31, 2004 decision forced DOE to go back and survey millions of emails for possible inclusion in its LSN, the result was a huge quantity of such emails being added. One discrete category of emails which made headlines were emails among certain USGS personnel working at Yucca that raised profound questions about the level of quality assurance implementation at Yucca and even the possibility of document fabrication. Suffice it to say, email traffic between and among DOE and its contractors will continue on a daily basis, between the time of LSN certification and LA submittal. To the extent these emails criticize DOE positions (for instance, positions to be put forth in its LA), DOE would be required to include such emails in its LSN database, after its initial certification, and subject to its recertification at the time of LA. That is only one example of Documentary Material which will obviously be generated after LSN certification and before the LA.

As another example, NRC long ago reported to the PAPO Board that its LSN collection had passed the 25,000-document mark. Presumably, since NRC has not yet "taken a position" with respect to the licensing of a Yucca repository, few if any of the documents in NRC's LSN are documents which NRC plans to "cite or rely on" in support of **its position** in the licensing proceeding. Yet, NRC has deemed the documents relevant Documentary Material. In short, there are many rational reasons why the LSN document collections of every party will continue to accrue documents on a routine basis. That is the reason for NRC's requirement for "supplementation" (Section 2.1003(e)) and LSN recertification by DOE at LA (Section 2.1009(b)). This does not in any way justify DOE's deferring the completion of its *core critical technical documents* and modeling basis, the foundation on which it *will* build its LA and which it *will* cite and rely on during the licensing proceeding – documents which it identified years ago as the very heart of its LA. Were DOE permitted to "certify" its LSN first, and then add these critical documents at some later, undefined date, it would destroy the efficacy of the Six-Month

Rule and undermine the entire concept of pre-LA discovery "supplanting" the traditional, later discovery.

DOE itself considered, and commented on, the tasks it would undertake during the period between initial LSN certification and LA submittal, tasks which might generate additional Documentary Material, tasks which *assumed* the prior completion of the basic LA-supporting technical documentation. DOE's John Arthur discussed with NRC (Ex. 54) the way in which DOE planned to use its time between initial LSN certification and LA submittal, specifically, in packaging the LA. He explained:

> DOE needs to refine the presentation of this technical work for licensing. Also, DOE needs to assure the transparency, traceability, and the self-sufficiency of the LA; and if necessary, clarify the presentation of technical, analytical, and compliance information; improve the readability of the document; provide more details, particularly in distinguishing structures, systems, and components that are important to safety or important to waste isolation; verify document-to-document consistency between the LA and underlying technical documents that were in revision during the development of the draft LA (principally analysis and model reports, system design description documents, facility description documents, and the Preclosure Safety Analysis;) and documents of additional preclosure and design detail, consistent with discussions between DOE and NRC.

Id. at 4.

Accordingly, the period between initial LSN certification and LA was to be used for packaging and fine tuning the LA into a final product. That period was definitely not intended to be devoted to the routine continuation of work on unfinished basic core technical documents and modeling basis supporting the LA. As DOE itself promised, "Documentation supporting the License Application will be 'frozen' at the time of LSN certification." This principle is consistent with DOE's original plan to have completed all the AMRs and other supporting technical documents, and, indeed, to have completed the TSPA-LA itself, *prior to* certifying the LSN. DOE's plan was clearly articulated in its LSN strategic approach (Ex. 10, *supra*, at 12): "Upon

the *initial implementation* of the OCRWM LSN, the following Documentary Material and associated first level reference material will be made available electronically:

- AMRs and associated first level references;
- PMRs and associated first level references;
- Site description documents;
- All correspondence and electronic mail relevant to the License Application;
- System design documents (SDDs) and associated first level references, etc."

Id. at 12 (emphasis added).

DOE emphasized this point with another 2001 strategy memorandum ("Technical Guidance for License Application Planning") (Ex. 55), which provided: "The technical basis for the LA, which will support LA preparation and any eventual NRC review, must be essentially complete eight months before LA submittal to support BSC's initial LSN certification process." *Id*. at 3. The same strategy document answered the question as to what would occupy DOE in the gap between LSN certification and LA submittal, explaining, "The review of draft [LA] sections must be sufficiently complete along with the essential supporting technical basis documents *before* the initial BSC LSN certification process begins, eight months before LA submittal. **DOE management review of and concurrence on the integrated LA, and production of the final document, will take place during the six months following initial LSN certification**." *Id*. at 5 (emphasis added).

DOE's novel new interpretation of its LSN requirements is unlawful and, in practice, wholly undisciplined. If DOE's new view were correct, it could have certified its database years ago, with only a thousand documents, or with only a single document. If the line is not drawn at the **completeness** of information (core technical documents and modeling basis) known to be

critical to the licensing proceeding and the formulation of contentions, then it cannot be drawn anywhere.

VII. THE CERTIFICATION OBLIGATIONS OF NEVADA AND OTHER PARTIES SHOULD BE POSTPONED UNTIL 90 DAYS AFTER DOE VALIDLY RECERTIFIES ITS LSN

There is no provision for an "automatic" postponement of the obligations of Nevada and the other parties under 10 C.F.R. 2.1003 simply because Nevada has raised a challenge to DOE's LSN. However, should the Board decide to strike DOE's LSN certification, the logical and necessary result would be a postponement of the obligations of Nevada and the other parties until DOE has validly certified.

VIII. CONCLUSION AND PRAYER FOR RELIEF

The PAPO Board should not permit DOE to (again) certify a knowingly incomplete LSN collection, eviscerating the entire purpose of LSN and trampling on the discovery rights of all the other parties due to its schedule-driven implementation of a premature LSN certification, itself predicated on a premature and equally arbitrary LA deadline.

The Board's action on this motion is critically important. Its primary charter is the resolution of disputes over the public availability of documents (i.e., on the LSN). The Board's mission is to ensure compliance by all the parties with their pre-LA obligations to make all their Documentary Material publicly available. The cornerstone of the parties' obligations, and of the Board's charter, is the Six-Month Rule. If DOE's interpretation were credited, and if DOE could certify its LSN as complete without regard to the character and content of the documents certified (*i.e.*, be permitted to "certify whatever it happened to have complete at the moment"), the letter and intent of the Six-Month Rule would be eviscerated. While DOE will predictably accumulate subsequent Documentary Material and will supplement its initial certification, a DOE certification update "at LA" containing the *"core technical documents and modeling basis*

documents to support the LA" would by definition render the entire concept of *pre-LA* discovery a sham.

Nevada respectfully requests the PAPO Board to issue an Order:

1) Striking DOE's October 19, 2007 certification; and

2) Postponing the obligations of Nevada and the other parties under 10 C.F.R. §2.1003 until 90 days after DOE validly recertifies its LSN database.

Respectfully submitted,

/s/
Charles J. Fitzpatrick
Joseph R. Egan
Martin G. Malsch
EGAN, FITZPATRICK & MALSCH, PLLC
12500 San Pedro Avenue, Suite 555
San Antonio, TX 78216
Telephone: 210.496.5001
Facsimile: 210.496.5011

Dated: October 29, 2007

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of	)	
	)	
U.S. DEPARTMENT OF ENERGY	)	Docket No. PAPO-00
	)	
(High-Level Waste Repository:	)	
Pre-Application Matters)	)	

CERTIFICATE OF SERVICE

I hereby certify that the foregoing Motion to Strike DOE's October 19, 2007 LSN Recertification and to Suspend Certification Obligations of Others Until DOE Validly Decertifies has been served upon the following persons either by Electronic Information Exchange or electronic mail (denoted by an asterisk (*)).

U.S. Nuclear Regulatory Commission
Atomic Safety and Licensing Board Panel
Mail Stop - T-3 F23
Washington, DC 20555-0001
Thomas S. Moore, Chair
Administrative Judge
Email: PAPO@nrc.gov
Alex S. Karlin
Administrative Judge
Email: PAPO@nrc.gov
Alan S. Rosenthal
Administrative Judge
Email: PAPO@nrc.gov & rsnthl@comcast.net
G. Paul Bollwerk, III
Administrative Judge
Email: PAPO@nrc.gov
Anthony C. Eitreim, Esq.
Chief Counsel
Email: PAPO@nrc.gov
James M. Cutchin
Email: PAPO@nrc.gov
Jered Lindsay
Email: PAPO@nrc.gov
Marcia Carpentier*
Email: PAPO@nrc.gov
Margaret Parish
Email: PAPO@nrc.gov
Debra Wolf
Email: PAPO@nrc.gov
Bradley S. Baxter*
Email: bxb@nrc.gov
Daniel J. Graser
LSN Administrator
Email: djg2@nrc.gov
ASLBP HLW Adjudication
Email: ASLBP_HLW_Adjudication@nrc.gov

U.S. Nuclear Regulatory Commission
Office of the Secretary of the Commission
Mail Stop - O-16 C1
Washington, DC 20555-0001
Hearing Docket
Email: hearingdocket@nrc.gov
Andrew L. Bates
Email: alb@nrc.gov
Adria T. Byrdsong
Email: atb1@nrc.gov
Emile L. Julian, Esq.
Email: elj@nrc.gov
Evangeline S. Ngbea
Email: esn@nrc.gov
Rebecca L. Giitter
Email: rll@nrc.gov

U.S. Nuclear Regulatory Commission
Office of Congressional Affairs
Mail Stop O-17A3

U.S. Nuclear Regulatory Commission
Office of Public Affairs
Mail Stop O-2A13
David McIntyre
Email: dtm@nrc.gov

U.S. Nuclear Regulatory Commission
Office of the General Counsel
Mail Stop - O-15 D21
Washington, DC 20555-0001
Karen D. Cyr, Esq.*
General Counsel
Email: kdc@nrc.gov
Gwendolyn D. Hawkins
Email: gxh2@nrc.gov

Janice E. Moore, Esq.
Email: jem@nrc.gov
Trip Rothschild, Esq.*
Email: tbr@nrc.gov
Mitzi A. Young, Esq.
Email: may@nrc.gov
Marian L. Zobler, Esq.
Email: mlz@nrc.gov
Andrea L. Silvia, Esq.
Email: alc1@nrc.gov
David Roth, Esq.
Email: der@nrc.gov
Margaret J. Bupp
Email: mjb5@nrc.gov
OGCMailCenter
Email: OGCMailCenter@nrc.gov

Hunton & Williams LLP
Counsel for the U.S. Department of Energy
Riverfront Plaza, East Tower
951 East Byrd Street
Richmond, VA 23219
W. Jeffery Edwards, Esq.
Email: jedwards@hunton.com
Kelly L. Faglioni, Esq.
Email: kfaglioni@hunton.com
Melissa Grier
Email: mgrier@hunton.com
Donald P. Irwin, Esq.
Email: dirwin@hunton.com
Stephanie Meharg
Email: smeharg@hunton.com
Edward P. Noonan, Esq.
Email: enoonan@hunton.com
Audrey B. Rusteau
Email: arusteau@hunton.com
Michael R. Shebelskie, Esq.
Email: mshebelskie@hunton.com
Pat Slayton
Email: pslayton@hunton.com
Belinda A. Wright
Email: bwright@hunton.com

U.S. Department Of Energy
Office of General Counsel
1551 Hillshire Drive
Las Vegas, NV 89134-6321
George W. Hellstrom
Email: george.hellstrom@ymp.gov

U.S. Department of Energy
Office of General Counsel
1000 Independence Avenue, S.W.
Washington, DC 20585
Martha S. Crosland, Esq.
Email: martha.crosland@hq.doe.gov
Angela M. Kordyak, Esq.
Email: angela.kordyak@hq.doe.gov
Mary B. Neumayr, Esq.*
Email: mary.neumayr@hq.doe.gov

Carter Ledyard & Milburn, LLP
Counsel for Lincoln County
1401 Eye Street, N.W., Suite 300
Washington, DC 20005
Barry S. Neuman, Esq.
Email: neuman@clm.com

U.S. Department of Energy
1000 Independence Avenue, S.W.
Washington, DC 20585
Eric Knox, Associate Director, Systems
Operations and External Relations, OCRWM*
Email: eric.knox@hq.doe.gov
Dong Kim, LSN Project Manager, OCRWM*
Email: dong.kim@rw.doe.gov

Churchill, Esmeralda, Eureka, Mineral
and Lander Counties
1705 Wildcat Lane
Ogden, UT 84403
Loreen Pitchford, LSN Coordinator
for Lander County
Email: lpitchford@comcast.net

U.S. Department of Energy
Office of Civilian Radioactive Waste Mgmt
Office of Repository Development
1551 Hillshire Drive
Las Vegas, NV 89134-6321
Timothy C. Gunter
Email: timothy_gunter@ymp.gov

City of Las Vegas
400 Stewart Ave.
Las Vegas, NV 89101
Margaret Plaster, Management Analyst
Email: mplaster@LasVegasNevada.gov

Clark County (NV) Nuclear Waste Division
500 S. Grand Central Parkway
Las Vegas, NV 89155
Irene Navis*
Email: iln@co.clark.nv.us
Engelbrecht von Tiesenhausen
Email: evt@co.clark.nv.us

Nuclear Waste Project Office
1761 East College Parkway, Suite 118
Carson City, NV 89706
Robert Loux
Email: bloux@nuc.state.nv.us
Steve Frishman, Tech. Policy Coordinator
Email: steve.frishman@gmail.com

Eureka County and Lander County, Nevada
Harmon, Curran, Speilberg & Eisenberg, LLP
1726 M. Street N.W., Suite 600
Washington, DC 20036
Diane Curran, Esq.
Email: dcurran@harmoncurran.com

Public Citizen
215 Pennsylvania Ave, SE
Washington, DC 20003
Michele Boyd, Legislative Director
Critical Mass Energy and Environment
Email: mboyd@citizen.org

Nevada Nuclear Waste Task Force
P.O. Box 26177
Las Vegas, NV 89126
Judy Treichel, Executive Director
Email: judynwtf@aol.com

Talisman International, LLC
1000 Potomac St., NW
Suite 300
Washington, D.C. 20007
Patricia Larimore
Email: plarimore@talisman-intl.com

Nuclear Energy Institute
1776 I Street, NW, Suite 400
Washington, DC 20006-3708
Michael A. Bauser, Esq.
Associate General Counsel
Email: mab@nei.org
Anne W. Cottingham, Esq.
Email: awc@nei.org
Ellen C. Ginsberg, Esq.
Email: ecg@nei.org
Rod McCullum*
Email: rxm@nei.org
Steven P. Kraft*
Email: spk@nei.org

White Pine County
City of Caliente
Lincoln County
P.O. Box 126
Caliente, NV 89008
Jason Pitts
Email: jayson@idtservices.com

Nuclear Information and Resource Service
6930 Carroll Avenue, Suite 340
Takoma Park, MD 20912
Kevin Kamps
Email: kevin@nirs.org

Yucca Mountain Project, Licensing Group,
DOE/BSC
Regulatory Programs
1180 North Town Center Drive
Las Vegal, NV 89144
Jeffrey Kriner
Email: jeffrey_kriner@ymp.gov

Abigail Johnson*
612 West Telegraph Street
Carson City, NV 89703
Email: abbyj@gbis.com

National Congress of American Indians
1301 Connecticut Ave. NW - Second floor
Washington, DC 20036
Robert I. Holden, Director*
Nuclear Waste Program
Email: robert_holden@ncai.org

Ross, Dixon & Bell
2001 K Street N.W.
Washington D.C. 20006-1040
William H. Briggs*
Email: wbriggs@rdblaw.com
Merril Hirsh, Esq.*
Email: mhirsh@rdblaw.com

Churchill County (NV)
155 North Taylor Street, Suite 182
Fallon, NV 89406
Alan Kall*
Email: comptroller@churchillcounty.org

Inyo County Water Department
Yucca Mtn Nuclear Waste
Repository Assessment Office
163 May St.
Bishop, CA 93514
Matt Gaffney, Project Associate*
Email: mgaffney@inyoyucca.org

Environmental Protection Agency
Ray Clark*
Email: clark.ray@epa.gov

Nuclear Waste Technical Review Board
Joyce Dory*
Email: dory@nwtrb.gov

Intertech Services Corporation
(for Lincoln County)
P.O. Box 2008
Carson City, NV 89702-2008
Dr. Mike Baughman*
Email: bigboff@aol.com

Nye County (NV) Department of Natural
Resources & Federal Facilities
1210 E. Basin Road, Suite 6
Pahrump, NV 89048
David Swanson*
Email: dswanson@nyecounty.net

Lincoln County (NV) Nuclear Oversight Prgm
100 Depot Ave., Suite 15; P.O. Box 1068
Caliente, NV 89008-1068
Lea Rasura-Alfano, Coordinator*
Email: jcciac@co.lincoln.nv.us

Nye County (NV) Regulatory/Licensing Adv.
18160 Cottonwood Rd. #265
Sunriver, OR 97707
Malachy Murphy*
Email: mrmurphy@cmc.net

Mineral County (NV) Board of County
Commissioners
P.O. Box 1600
Hawthorne, NV 89415
Linda Mathias, Administrator*
Office of Nuclear Projects
Email: yuccainfo@mineralcountynv.org

State of Nevada (NV)
100 N. Carson Street
Carson City, NV 89710
Marta Adams*
Email: maadams@ag.state.nv.us

White Pine County (NV) Nuclear
Waste Project Office
959 Campton Street
Ely, NV 89301
Mike Simon, Director*
(Heidi Williams, Adm. Assist.*)
Email: wpnucwst1@mwpower.net

Fredericks & Peebles, L.L.P.
1001 Second Street
Sacramento, CA 95814
916-441-2700
FAX 916-441-2067
Darcie L. Houck
Email: dhouck@ndnlaw.com
John M. Peebles
Email: jpeebles@ndnlaw.com

/s/
Susan Montesi

Declaration of Mike Thorne

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	Docket No. PAPO-00
	)	
U.S. DEPARTMENT OF ENERGY	)	ASLBP No. 04-829-01 PAPO
	)	
(High Level Waste Repository:	)	
Pre-Application Matters)	)	October 29, 2007

DECLARATION OF MIKE THORNE

My name is Mike Thorne. My *curriculum vitae* is attached as Exhibit A. I am over the age of 18 and have never been convicted of a crime. I am of sound mind and am fully qualified to make this Declaration. The facts stated herein are within my personal knowledge and true and correct.

1. I am one of the experts retained by the State of Nevada to review DOE's impending application to the NRC for a construction authorization for the proposed repository at Yucca Mountain in the State of Nevada, and to assist Nevada in the development and drafting of contentions. A statement of my qualifications and background is attached. I am qualified and experienced in performing risk assessments for nuclear waste disposal facilities. I have personal knowledge of the following facts, based on my education, experience, and my extensive review of documents relating to the Yucca Mountain project.

2. I have reviewed numerous documents placed by DOE on the LSN, and I am familiar with DOE's approach to developing its Total Systems Performance Assessment or "TSPA," which is its effort to assess quantitatively the combined performance of the natural and engineered systems at Yucca Mountain and compare the results with dose standards established or to be established by the EPA.

3. Analysis Model Reports or "AMRs," together with any necessary additional data files, are the basic building blocks of DOE's TSPA, and the TSPA cannot be fully evaluated without them. Several AMRs to be used in the TSPA, as of DOE's LSN certification on October 19, 2007, were not publicly available on the LSN, including the following especially important AMRs:

    a. An AMR, or similar document, that justifies the final exclusion of various possible features, events and processes (or FEPs") from the TSPA. The TSPA analyzes the effects of FEPs on repository performance, and the wrongful exclusion of one or more FEPs could affect the TSPA dramatically.

b. An AMR that supports the overall integration of models and analyses in the TSPA. This may be the most critical AMR because of its scope and obvious import for the validity of the entire TSPA.

4. In the absence of AMRs, the DOE is relying on identifying data for use in the TSPA using TDIPs. It is noted that these are not an adequate substitute for the AMRs, as they do not provide justification for the conceptual and mathematical models adopted, or for the specific parameter values or distributions used with those models. Rather, they are compilations of the information currently being used in calculations and are subject to revision.

5. An indication of the types of TSPA information that could be supplied in support of the TSPA in the license application (the "TSPA-LA") is that provided recently in support of the TSPA done specifically for DOE's Supplemental Environmental Impact Statement for Yucca or "TSPA-SEIS." This information has been provided directly to the State of Nevada on a hard drive including approximately 150 Gbytes of data. The type of information given on this hard drive will be fundamental to scrutinizing the adequacy of the TSPA-LA. However, it must be emphasized that the information given relates only to the TSPA-SEIS[1] and that it cannot be known the degree to which the information to be provided for the TSPA-LA will be the same as the TSPA-SEIS. Thus, for example, in the file 'README DOCUMENT FOR TSPA-SEIS file transmittal' (henceforth referred to as the README file), relating to the Input Database Software and Contents, it is stated that "[t]he TSPA_Input_DB Version 2.2 is not included in this submittal. The database has a check box that indicates that the values and the references have been confirmed. At this time, the parameters have not all officially completed this process." The admission that the parameter values and references have not all been officially confirmed shows that the input database is at an interim stage of development and changes can be anticipated in the database that will underpin the TSPA-LA.

6. Although extensive information has been provided, it is not comprehensive even in terms of the TSPA-SEIS. For example, in the README file a list is given of Source GoldSim Files used for GoldSim Files in this submission. GoldSim is a software tool that serves as the architecture for integrating the TSPA data and models and for performing the necessary multiple Monte Carlo simulations or calculations of dose (or runs). Under this heading, it is stated that Groundwater Model: v5.000_GS_9.60.100 is not included, whereas the corresponding Eruptive Model: vE1.004_GS_9.60.100 is included. No explanation is provided as to why the two models have been handled differently.

7. Also, the DLL (dynamic link library) files that are shared computational modules used in the calculations are not provided. The Groundwater Model cases/runs are stated to have used DLL_Set_34 and the Igneous Eruptive Model cases/runs used

[1] Section 6 of the README file states that the model is subject to the limitations documented in *Total System Performance Assessment Package for the Draft Supplemental Environmental Impact Statement* (TDR-WIS-PA-000014).

DLL_Set_35. The composition of these DLL Sets is listed in Section 7 of the README file. It is stated that this and other software listed as not included shall be obtained from the Software Configuration Management Organization in accordance with the current version of IM-PRO-003. This is an internal Sandia document that is available on the LSN. It does not appear to relate to the provision of software to third parties. As the DLL files are integral to the TSPA-SEIS, it is clear that the information package is incomplete, in that further actions would be required by the State of Nevada to acquire the additional material. Again, it is noted that these DLL files are subject to change. Thus, FAR_1-2.dll (official software name FAR) is listed as a prototype in DLL_Set_034, where it is stated not to be used by the Groundwater Model. However, it is also listed in DLL_Set_035 where it is not declared as a prototype and is stated to be used.

8. In summary, the information included on this hard disk demonstrates that comprehensive documentation on TSPA calculations can be generated and extensive information in support of the TSPA-SEIS can be provided on the LSN. However, the software required to access the documentation and perform calculations would need to be obtained separately and represented by a header on the LSN. The SEIS material that can be scrutinized includes the GoldSim case files and these provide both input data and a range of results. The cases provided relate only to the TSPA-SEIS and include preliminary information that will either be replaced or updated in the TSPA-LA. Furthermore, the model structures displayed in the GoldSim case files may also be modified for the TSPA-LA.

9. Currently, no GoldSim-based calculations have been provided that can be identified as being intended for use in support of the TSPA-LA. Thus, although the hard disk provides a great deal of information relevant to the TSPA-SEIS, it is not an appropriate basis for evaluating the adequacy, or otherwise, of the TSPA-LA. In order to provide a reasonably complete basis for evaluation, this material needs to be complemented with details of the changes that will be made to the models and data in the calculations to underpin the TSPA-LA. Mechanisms exist for recording such changes, e.g. in the change checklists associated with individual cases and provided for the TSPA-SEIS cases on the hard disk.

10. Millions of DOE documents are on the LSN. It is likely that some of these documents will be relied on in the TSPA-LA. However, using the LSN data base in its current form to predict what the TSPA-LA will look like, and to draft a reasonably complete set of TSPA contentions, would be analogous to trying to put a one thousand piece jigsaw puzzle together from a box of several million pieces, some from different puzzles or prior versions of the same puzzle, and with several important pieces known to be missing.

Mike Thorne

Mike Thorne

Exhibit A

Exhibit A

Mike Thorne and Associates Limited
(Director: Dr M C Thorne)

Abbotsleigh, Kebroyd Mount, Ripponden, Halifax, West Yorkshire, HX6 3JA
Telephone and Fax: 01422 825890; e-mail: MikeThorneLtd@aol.com

Michael Charles Thorne

Qualifications: PhD FSRP Year of birth: 1950 Nationality: British

PROFESSIONAL ACTIVITIES AND MEMBERSHIP

Visiting Fellow at the Climatic Research Unit, School of Environmental Sciences, University of East Anglia
Fellow of the Society for Radiological Protection and a Past President of the Society
Member of the Editorial Board of the Journal of Radiological Protection
Member of the National Dose Assessment Working Group (NDAWG) and Chairman of the Habits Subgroup
Member of the Eco-ethics International Union
Consultant to the Institute for Energy and Environmental Research, Washington DC.
Quintessa Associate
Director, Mike Thorne and Associates Limited

ACADEMIC RESPONSIBILITIES

Formal supervision of two PhD students at the University of East Anglia:
P Burgess, Future Climatic and Cryospheric Change on Millennial Timescales: An Assessment using Two-dimensional Climate Modelling Studies, PhD awarded 1998.
M Hoar, Reconstructing Climate Gradients across Europe for the Last Glacial-interglacial Cycle, PhD awarded 2004.
Informal supervision of PhD students at the University of Edinburgh (development and retreat of ice sheets) and at Imperial College of Science, Technology and Medicine (radionuclide transport in vegetated soil columns – experimental studies and modelling interpretations).
Teaching on the MSc course on Environmental Radioactivity at the University of Surrey.
Teaching on the MSc course in Environmental Technology at Imperial College of Science, Technology and Medicine.
Supervision of Post-doctoral research activities at the Universities of East Anglia; University of Newcastle and Imperial College of Science, Technology and Medicine on behalf of various commercial clients.

CAREER HISTORY (Selection of Projects)

Mike Thorne and Associates Limited, 2001 onward

Development of Climate and Landscape Change Scenarios, Biosphere Factors and Characteristics of Potentially Exposed Groups for the LLWR near Drigg, West Cumbria
Client - Nexia Solutions Ltd

Project building on previous work for BNFL relating to the LLWR and for the NDA relating to vulnerabilities of various sites.

Radiological Impact of NORM Discharges to the Marine Environment
Client - Scotoil Services Ltd

Support to an appeal against a SEPA decision to curtail such discharges from North Pier, Aberdeen.

Development of Proposals for Setting Radiation Protection Standards based on Consideration of More Sensitive Individuals in a Population
Client – Institute for Energy and Environmental Research, Washington DC

Overall project review and development of techniques for calculating radiation doses to the early embryo from internally incorporated radionuclides.

Review of Impacts of Coastal Erosion at Hunterston
Client – ERM Limited

Evaluation of the potential radiological implications of coastal erosion on the VLLW pits at Hunterston Nuclear Power Station.

Advice on Dose Reconstruction
Client – S A Cohen & Associates for NIOSH

Advice on dose reconstructions for workers at DOE facilities from 1941 onward.

Advice on Effects of Radionuclides on Organisms other than Man
Client – Nuclear Safety Solutions Limited, Canada

Provision of guidance on dosimetry, reference levels and effects relevant to selected protected species.

Participation in Safety Assessment Studies for the Baita Bihor Repository, Romania
Client – Quintessa/for the European Union

Compilation of inventory data, shielding studies and development of both operational and post-closure safety cases.

Review of the Yucca Mountain Project
Client – State of Nevada

Co-ordination of technical activities involved in a review of the proposed License Application by US DOE for disposal of radioactive wastes at Yucca Mountain.

Co-ordination of biosphere research and participation in BIOCLIM
Client – UK Nirex Ltd (NDA/RWMD)

Co-ordination of research on climate change, ice-sheet development, near-surface hydrology and radionuclide transport, as well as participation in an international programme on the implications of climate change for radioactive waste disposal. Also includes development of new models for radionuclide transport in the biosphere and for the gas pathway.

Development of a Handbook on Radionuclide Behaviour in the Environment
Client – Serco Assurance

Development of a handbook for Environment Agency staff outlining the behaviour of a wide variety of radionuclides in terrestrial and aquatic environments.

Development of a Simplified Dose Assessment Model
Client – Serco Assurance

Development of a simplified spreadsheet-based dose assessment tool for use by Environment Agency staff in determining Authorisations.

Provision of Biosphere Advice
Client – Ciemat, Spain

Provision of advice on models and data relevant to geological disposal of radioactive wastes

Provision of Advice on Safety
Client – NNC Ltd/Defra

Provision of expert advice to the UK Committee on Radioactive Waste Management (CoRWM).

Effects of Radiation on Organisms Other Than Man
Client – AEA Technology/Serco Assurance

Study for ANDRA to identify appropriate indicator organisms and develop appropriate dosimetry and effects models for those organisms.

Member of the Site Investigation Expert Review Group (SIERG)
Client – SKB

Oversight reviews of site investigation activities and the associated research and assessment programmes.

Advice on the Short-, Medium- and Long-term Effects of Climate Change on Nuclear Licensed Sites
Client – BNFL and Nexia Solutions Ltd

Interpretation of results from the international BIOCLIM project in relation to decommissioning and solid radioactive waste management, with particular emphasis on the potential significance of sea-level changes. Review of information on coastal vulnerabilities at NDA sites.

Advice on Submarine Reactor Accidents and the Development of Detailed Emergency Planning Zones
Client – Electrowatt-Ekono

Assistance to MoD in revising emergency planning criteria in the light of recent changes of views on Emergency Reference Levels and other technical developments. Also studies on tritium analyses and migration from transfer tanks.

Review of Continuing Operational Safety Cases
Client – Electrowatt-Ekono

Review of COSRs developed by BNFL for contaminated land.

Development of a New Soil-Plant Model for use in Radiological Assessments
Client – Food Standards Agency/Quintessa

Development of the specification for a new soil-plant model (PRISM) to replace that implemented in the SPADE suite of codes (implementation of the model has been by Quintessa) and extension of that work to new models for ^{3}H and ^{14}C.

Review of Probabilistic Safety Assessment and Criticality Issues relating to a Proposed Surface Storage Facility for Spent Nuclear Fuel
Client – State of Utah

Review of the potential for criticality in breached storage casks and of the probability of breaching by aircraft impacts. Also, supervision of various criticality and radiation shielding calculations.

Development of Models for Radionuclide Transfers to Sewage Sludge and for Evaluating the Radiological Impact of Sludge applied to Agricultural Land
Client – Food Standards Agency

Includes a review of literature and the development and implementation of probabilistic models for such transfers.

Development of Biokinetic Models for Radionuclides in Animals
Client – Serco Assurance

Development of updated biokinetic models for use by the Food Standards Agency in their SPADE and PRISM modelling systems.

Review Studies for the Proposed Australian National Radioactive Waste Repository
Client – RWE NUKEM

Reviews of reports on animal transfer factors and of the potential effects of climate change on the repository plus development of a model for the biokinetics of the ^{226}Ra decay chain in grazing animals.

Development and Application of a Model for Assessing the Radiological Impacts of ^{3}H and ^{14}C in Sewage Sludge
Client – NNC Ltd

Development of a model based on physical, chemical and biochemical principles for the uptake of ^{3}H and ^{14}C into sewage sludge and their subsequent distribution and transport after application of the sludge to agricultural land.

Support for development of the Drigg Post-closure Radiological Safety Assessment
Client - BNFL

Support in the areas of FEP analysis, biosphere characterisation, human intrusion assessment and the effects of natural disruptive events. In addition, provision of advice of future research initiatives that should be pursued by BNFL.

Review of Parameter Values
Client – AEA Technology/Serco Assurance

Review of biosphere parameter values for use in the ANDRA assessment model AQUABIOS.

Development of a Database related to Emergency Planning
Client – AEA Technology (Rail)

Identification of relevant international, overseas and national legislation, regulations and guidance, and production of brief summaries of the documents.

Dose Reconstruction for Workers on a Uranium Plant
Client - McMurry and Talbot

Dose reconstruction for the plaintiffs in a case relating to the Paducah Gaseous Diffusion Plant.

Dose Reconstruction for a Worker Exposed to Pu and Am
Client – Pattinson and Brewer

Dose reconstruction for a worker exposed by a puncture wound in the finger while working at a glove box.

AEA Technology, 1998-2001

Revision of Exemption Orders Made Under the Radioactive Substances Act
Client – DETR

Review of requirements for revision and preparation of a draft text for the purposes of consultation.

Assessment of Remediation Options for Uranium Liabilities in Eastern Europe
Client - European Commission

Studies of remediation requirements relating to mines, waste heaps and hydrometallurgical plant in Bulgaria, Slovakia and Albania.

Evaluation of Unusual Pathways for Radionuclide Transport from Nuclear Installations
Client – Environment Agency

Review of literature and conduct of formal elicitation meetings to determine potential pathways and evaluate their radiological significance.

Support Studies on the Drigg Post-closure Performance Assessment
Client - BNFL

Support in the areas of FEP analysis, biosphere characterisation, human intrusion assessment and the effects of natural disruptive events. In addition, provision of advice of future research initiatives that should be pursued by BNFL.

Development of Models for the Biokinetics of H-3, C-14 and S-35 in Farm Animals
Client - FSA

Review of relevant literature, development of appropriate biokinetic models and implementation in stand-alone software.

Integration of Aerial and Ground-based Monitoring in the Event of a Nuclear Accident
Client - FSA

Desk-based review and simulation study designed to determine optimum monitoring strategies for different types of accidents.

Elicitation of Parameter Values for use in Radiological Impact Assessment Models
Client - FSA

Expert elicitation study to provide distributions of parameter values for use in the suite of assessment models currently used by the FSA for routine and accidental releases.

Biosphere Research Co-ordination and Assessment Studies
Client - United Kingdom Nirex Ltd

Continuation of a programme of work originally undertaken at Electrowatt Engineering (UK) Ltd

Site Investigation and Risk Assessment - Hilsea Lines
Client - Portsmouth City Council

Radiological assessment of a radium-contaminated site.

Electrowatt Engineering (UK) Ltd, 1987-1998

Development of a Siting Policy for Nuclear Installations: Harbinger Project and Follow-up Study
Client - HSE/NSD

Review of existing policy and development of alternatives as a precursor to application to a wide range of installations, not restricted to commercial reactors.

Support to the Rock Characterisation Facility Public Enquiry
Client - UK Nirex Ltd

Preparation of position papers and rebuttals of evidence.

Rongelap Resettlement Project
Client - Marshall Islands Government

Participation in an oversight committee evaluating the radiological safety of Rongelap in the context of resettlement by its evacuated community.

Evaluation of Inhalation Doses from Uranium
Client - Baron & Budd

Provision of expert witness support in a class action relating to environmental exposure from a uranium plant.

Biosphere Studies Relating to Drigg
Client - BNFL

Provision of advice on time-dependent biosphere modelling for the Drigg low-level radioactive waste disposal facility.

Radiation Doses to an Individual as a Consequence of Working on the San Onofre Nuclear Power Plant
Client - Howarth & Smith

Interpretation of personal and area monitoring data for legal purposes.

Interpretation of Uranium in Urine Data for the Fernald, Ohio Feed Materials Processing Center
Client - Institute for Energy and Environmental Research

Interpretation of urinalysis and lung counting data, and appearance as an expert witness in the associated trial.

Determination of Failure Probabilities for use in PRA
Client - Nuclear Installations Inspectorate

Development of new approaches to the use of Bayes Theorem in defining component failure probabilities for use in PRA when statistics on actual failures are limited.

Review of Inventory Information
Client - UK Nirex Ltd

Review of uncertainties in inventories of individual radionuclides.

ALARP Study of Options for the Treatment, Packaging, Transport and Disposal of Plutonium Contaminated Material
Client - UK Nirex Ltd

Use of multi-attribute utility analysis to establish which option is preferred.

Expert Judgement Estimation of Intrusion Model Parameters
Client - British Nuclear Fuels plc

Project Manager of a study assessing the risks of human intrusion into Drigg radioactive disposal site using expert judgement techniques.

Brainstorming Study of Risks Associated with Building Structures
Client - Building Research Establishment

Participation in a classification study of the health risks associated with buildings including both injuries and disease.

Radiological Consequences of Deferred Decommissioning of Hunterston A
Client - Scottish Nuclear Ltd

Project Manager of a study of the radiological impacts of groundwater transport of radionuclides, releases to atmosphere and intrusion.

Reviews of Safety Documentation
Client - UK Nirex Ltd

Review of safety related documentation for Packaging and Transport Branch.

The Sheltering Effectiveness of Buildings in Hong Kong
Client - Ove Arup & Partners

Project Manager of a study evaluating the shielding effectiveness of all types of building in Hong Kong for volume sources of photons in air and surface deposition sources.

Assessment of the Radiological Impact of Releases of Radionuclides from Premises other than Licensed Nuclear Sites
Client - Ministry of Agriculture, Fisheries and Food

Project Manager of a study to identify representative premises, obtain data on their releases of radionuclides and assess radiological impacts using a new methodology developed for the project.

Assessment of the Radiological Implications of Uranium and its Radioactive Daughters in Foodstuffs
Client - Ministry of Agriculture, Fisheries and Food

Project Manager of a review study of concentrations of uranium and its daughters in foodstuffs, taking local and regional variations in uranium concentrations in soils, sediments and waters into account.

Radionuclides in Sewage
Client - Her Majesty's Inspectorate of Pollution

Project Manager of a study including a desk review on alternative methods of disposal of sewage sludges, interpretation of monitoring data relating to radionuclide discharges from Amersham International to the public sewer system, development of a model for radionuclide transport in sewers, and collection and analysis of effluent, foul water, sediment, sludge and other samples suitable for use in model validation studies.

Accident Consequence Calculations
Client - Nuclear Installations Inspectorate

Project Manager of a study to assess the radiological consequences of various atmospheric releases using the MARC code.

Definition of Threshold Recording Levels for Drums of ILW
Client - UK Nirex Ltd

Project Manager of a study of the implications of post-closure radiological impacts of radioactive waste disposal in defining Threshold Recording Levels for radionuclides in individual waste drums.

Definition of Expert Judgment Exercises Relating to Nuclear Safety
Client - Commission of the European Communities

Project Manager for a study defining expert judgment exercises relating to conceptualisation, representation and input data specification. Included a comprehensive review of available formal expert judgment procedures, and mathematical and behavioural aggregation techniques.

Definition of Research Requirements Relating to the Use of Expert Judgment in Parameter Value Elicitation for Reactor Safety Studies in a UK Context
Client - Nuclear Safety Research Management Unit, HSE

Development of proposals for using combined behavioural and mathematical aggregation procedures in formal elicitations of expert judgment.

Development Priorities for the Drigg Technical Development Programme
Client - British Nuclear Fuels plc

Provision of detailed advice to BNFL on future design options, and research and development priorities, in relation to radioactive waste disposal at Drigg.

Channel Tunnel Safety Studies
Client - Channel Tunnel Safety Authority

Provision of advice and guidance on safety criteria appropriate to the Fixed Link, on the classes of Dangerous Goods that may properly be carried and on the overall characteristics of the proposed Safety Case.

Development of Societal Risk Criteria
Client - Marathon Oil

Interpretation of F-N curves in the context of the offshore oil/gas industry, taking risk aversion into account.

Impacts of Salt Dispersal on Plant Communities
Client - Sir William Halcrow

Evaluation of salt dispersal from a major road in winter in relation to adjacent Sites of Special Scientific Interest.

Offsite Consequence Assessments
Client - Nuclear Electric

Studies of the offsite radiological impacts of atmospheric and liquid releases of radioactive materials from Magnox stations.

Dry Run 3
Client - Her Majesty's Inspectorate of Pollution

Uncertainty and bias studies involving formal expert judgment procedures to develop a conceptual model of those factors and interrelationships which are of significance in determining the post-closure radiological impact of a deep geological repository for radioactive wastes. This project also included advice on data and models to be used for post-closure radiological assessments.

Radiological Assessments of Drigg
Client - British Nuclear Fuels plc

Project Manager for post-closure radiological impact assessments of the Drigg LLW disposal site. Also included specification and development of computer codes relating to the radiological impact of fires, releases of radioactive gases produced by microbial action and metal corrosion, and human intrusion.

Biosphere Co-ordination
Client - UK Nirex Ltd

Co-ordination of the UK Nirex Ltd Biosphere Research Programme from its inception, including requirements definition, technical management of all projects and QA surveillance as the Client's Representative.

Biosphere Support for the Nirex Disposal Safety Assessment Team
Client - AEA Technology

Development of approaches for assessing the radiological impact of releases of radionuclides to the biosphere, plus advice on radiological protection criteria, definition of individual risk, implications of conventionally toxic chemicals in wastes and a variety of other matters.

Evaluation and Radiological Assessment of Liquid Effluent Releases from Various Premises
Client - Her Majesty's Inspectorate of Pollution

Reviews of monitoring data and evaluations of radiological impact, primarily related to Harwell, Aldermaston, Capenhurst and Amersham International.

Evaluation of the Radiological Impact of Overseas Nuclear Accidents
Client - Her Majesty's Inspectorate of Pollution

Studies of the impact of potential overseas nuclear accidents on the UK, with emphasis on survey and monitoring requirements, and the selection of appropriate radiation detection equipment for monitoring.

Bilsthorpe Power Station
Client - British Coal/East Midlands Electricity

Preparation of an Environmental Statement with emphasis on atmospheric dispersion of SO_2 and NO_x.

Gas Generation in Radioactive Waste Disposal Facilities
Client - AEA Technology

Development of a coupled microbial degradation and corrosion model for gas generation in repositories for LLW and ILW.

Effects of Chernobyl on Drinking Water Supplies
Client - Her Majesty's Inspectorate of Pollution

Evaluation of the radiological implications of enhanced concentrations of radionuclides in water supplies in England and Wales subsequent to the Chernobyl accident.

Sea Disposal of Radioactive Wastes
Client - UK Nirex Ltd

Participation in an Environmental Impact Assessment of the proposed resumption of sea-dumping of radioactive wastes.

UK Research Related to Radioactive Waste Management
Client - Her Majesty's Inspectorate of Pollution

Identification of gaps in the UK national research effort related to radioactive waste management.

Research Requirements for Repository Design and Site Investigations
Client - UK Nirex Ltd

Review of research requirements for repository design and site investigations in relation to LLW and ILW disposal in near-surface and deep repositories.

International Commission on Radiological Protection, Sutton, Surrey, England, 1985-1986

Scientific Secretary responsible for arranging and minuting meetings, administrative arrangements, technical review of reports, editing of the Commission's journal, liaison with other international organisations and public relations.

ANS Consultants Ltd, Epsom, Surrey, England, 1979-1985

Reviews of data on the distribution at transport of radionuclides in terrestrial and aquatic ecosystems (see publications list).

Development of a dynamic model for radionuclide transport in agricultural ecosystems and implementation of the model on various microcomputer systems.

Photon and neutron shielding studies of radiochemical plant, together with area classification and ALARA studies.

A review of UK use of the criticality code MONK and other approaches to criticality safety assessment.

Radiological and conventional safety aspects of Magnox reactor decommissioning.

Development of metabolic models for inclusion in ICRP Publication 30.

Development of pharmacodynamic models for toxic chemicals.

Review of neutron activation analysis in studies of radionuclide transport in soils and plants.

Experimental studies on radionuclide transport in soils and plants using various photon-emitting radionuclides.

Support for DoE work on probabilistic risk assessment of LLW and ILW disposal.

Review of UK research requirements for HLW disposal.

Post-closure radiological impact assessment of the proposed LLW and ILW facility at Elstow, Bedfordshire.

Development of a generalised biosphere model for use in probabilistic risk assessments of solid radioactive waste disposal.

Initial development of a mathematical model for use in assessing the radiological impact of contaminated groundwater.

Development, computer implementation and comprehensive documentation of a model to calculate the radiological impact of intrusion into radioactive waste repositories.

Development of a general-purpose computer code for solving first-order differential equations using a hybrid Predictor-Corrector/Runge-Kutta method.

Studies on the potential radiological consequences of Magnox reactor accidents.

Medical Research Council Radiobiology Unit, Chilton, Didcot, Oxon, England, 1974-1979

Development of dosimetric and metabolic models for use in ICRP Publication 30.

Studies on the metabolism of plutonium in bone and relationships to blood flow.

Theoretical studies on radionuclide metabolism and dosimetry.

Development of techniques in neutron-induced autoradiography and alpha imaging.

Image analysis studies of plutonium in bone, uranium in lungs, lysosomal inclusions in cells and heterochromatin.

Studies on the clearance of inhaled UO_2.

Alpha spectroscopy in support of toxicity studies with Ra-224.

Data analysis in connection with experimental animal studies on the potential efficacy of neutron therapy using 42 MeV neutrons.

University of Sheffield, 1971-1974

Experimental studies on the reaction $\gamma + p \rightarrow \pi^o + p$ at photon energies between 1 and 3 GeV, using a linearly polarised photon beam.

SELECTION OF PUBLICATIONS

A measurement of the beam asymmetry parameter for neutral pion photoproduction in the energy range 1.2 - 2.8 GeV. P.J.Bussey, C. Raine, J.G. Rutherglen, P.S.L. Booth, L. Carroll, G.R. Court, A.W. Edwards, R. Gamet, C.J. Hardwick, P.J. Hayman, J.R. Holt, J.N. Jackson, J. Norem, W.H. Range, F.H. Combley, W. Galbraith, V.H. Rajaratnam, C. Sutton and M.C. Thorne. London Conference (1974) Abstract 997.

The measurement of the polarisation parameters S, P and T for positive pion photoproduction between 500 and 1700 MeV. P.J. Bussey, C. Raine, J.G. Rutherglen, P.S.L. Booth, L.J. Carroll, P.R. Daniel, C.J. Hardwick, J.R. Holt, J.N. Jackson, J.H. Norem, W.H. Range, F.H. Combley, W. Galbraith, V.H. Rajaratnam, C. Sutton, M.C. Thorne and P. Waller. Nuclear Physics, B104, (1976) 253-276.

The polarised beam asymmetry in photoproduction of eta mesons from protons 2.5 GeV and 3.0 GeV. P.J. Bussey, C. Raine, J.G. Rutherglen, P.S.L. Booth, L.J. Carroll, P.R. Daniel, A.W. Edwards, C.J. Hardwick, J.R. Holt, J.N. Jackson, J. Norem, W.H. Range, W. Galbraith, V.H. Rajaratnam, C. Sutton, M.C. Thorne and P. Waller. Physics Letters, 61B, (1976) 479-482.

Aspects of the dosimetry of plutonium in bone. M.C. Thorne. Nature, 259, (1976) 539-541.

The toxicity of Sr-90, Ra-226 and Pu-239. M.C. Thorne and J. Vennart. Nature 263, (1976) 555-558.

Radiation dose to mouse testes from Pu-239. D. Green, G.R. Howells, E.H. Humphreys and J. Vennart with Appendix by M.C. Thorne. Published in "The Health Effects of Plutonium and Radium", Ed. W.S.S. Jee, (J.W. Press, Salt Lake City, Utah, 1976).

The distribution and clearance of inhaled uranium dioxide particles in the repository tract of the rat. Donna J. Gore and M.C. Thorne. In "Inhaled particles IV", Ed. W.H. Walton, (Pergamon Press, Oxford, 1977) pp. 275-284.

Theoretical aspects of the distribution and retention of radionuclides in biological systems. M.C. Thorne. J. Theor. Biol., 65, (1977) 743-754.

Aspects of the dosimetry of emitting radionuclides in bone with particular emphasis on Ra-226 and Pu-239. M.C. Thorne. Phys. Med. Biol., 22, (1977) 36-46.

A new method for the accurate localisation of Pu-239 in bone. D. Green, G. Howells and M.C. Thorne. Phys. Med. Biol., 22, (1977) 284-297.

The measurement of blood flow in mouse femur and its correlation with Pu-239 deposition. E.R. Humphreys, G. Fisher and M.C. Thorne. Calcif. Tiss. Res., 23, (1977) 141-145.

The distribution of plutonium-239 in the skeleton of the mouse. D. Green, G.R. Howells, M.C. Thorne and J. Vennart. In "Proceedings of the IVth International Congress of the International Radiation Protection Association Vol. 2 (Paris 1977).

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Exhibit 1

Exhibit 1

WELCOME to the Near-Field Environment (NFE) Group of the OCRWM Lead Laboratory for Repository Systems. On Tuesday, October 3 an all hands meeting was held in Las Vegas to present some Lead Lab kickoff information to Las Vegas-based employees. This e-mail summarizes that general information, primarily for the benefit of non-Las Vegas-based personnel, and provides some kickoff information regarding the NFE Group. In the next week or two I hope to be able to visit in person with all of the non-Las Vegas personnel.

Our mandate as a part of the Lead Lab organization is to produce a credible (i.e., technically competent) and defensible (i.e., compliant with 10 CFR 63 and traceable) License Application on or before June 30, 2008 (i.e., on schedule). This translates to a NFE scope of work that consists of (a) producing AMRs, (b) interfacing with and providing feeds to TSPA, and (c) supporting SAR Section development. The priorities, as emphasized by OCRWM Director Ward Sproat during his visit to SNL on September 21-22, are as follows:

Schedule – If we do not meet the June 30 deadline, "we are all out of a job". Therefore, the short term focus for NFE is on the AMR schedules. All AMRs that feed TSPA must meet the following milestone dates:

December 15, 2006 – Form and Function to TSPA. This coincides with completion of the draft revision of the AMR (check copy).

March 29, 2007 – Preliminary DTN to TSPA. This coincides with completion of the checking phase of the AMR.

May 31, 2007 – Final DTN to TSPA. This coincides with completion and approval of the AMR.

Any slips in schedule will be recovered by cutting scope. There is no allowance for not meeting schedule.

Regulatory Compliance – All of our AMRs will be traceable. Given a choice between a complex, state-of-the-art technical approach that is difficult to validate and/or defend and a simple approach that can be validated and defended with greater traceability. The simpler approach is preferred.

"There may be holes in our workscope, but there cannot be holes in our QA"

Technical Competency – The technical basis will be consistent with the Annual Work Plans (AWPs) as supported by the TWPs. No work, not already identified in TWPs, is necessary. Our mandate is to produce competent, defensible, and traceable work, not unnecessarily complex state-of-the-art analyses. Where greater complexity causes schedule slips, scope will be cut and/or alternative approaches will be considered.

Where greater complexity becomes necessary (i.e., if NRC thinks there are holes in our workscope), it can be introduced during License Defense.

Attached is an organizational chart for NFE. This organization is responsible for 20 Work Packages (i.e., about 20 AMRs), several TSPA feeds, and 3 SAR Sections. This org chart shows all personnel expected to contribute, at various locations, some full-time, some part-time. Those of you currently working on AMRs know who you are, others, who may not be contributing to an NFE AMR right now, will be contacted in the next few days to discuss your role (e.g., assistant author, checker, etc.).

My responsibility, as NFE Manager, is to ensure that the 3 priorities – schedule, defensibility, credibility – in that order, are satisfied. I will get involved in a technical sense only enough to be able to balance those priorities. Given the past successes of the NFE workforce, my main objective is simply to not ruin a good thing.

Detailed technical direction, integration, and decisions about necessary work scope will be provided by the two Technical Leads, Pat Brady (Chemistry) and Ernie Hardin (Thermal Hydrology). The technical areas in parentheses are just for general guidance, there will be several areas/AMRs where they overlap.

Administrative Support (listed as TBD on the org chart) will be provided by Arlene Nery and Patti Weigand.

ACTION ITEMS FOR EACH OF YOU

- Take Annual GET Training (through BSC) by October 31. This training introduces 8 new Lead Lab science procedures (SCI-PRO-xxx).
- Read the 8 SCI-PRO procedures (available on CDIS). They are not significantly changed from the previous BSC procedures.
- Use Lotus Notes for e-mail communication wherever possible. This helps to satisfy LSN requirements. If you must use a different system, you must cc "Lead_Lab@notes.ymp.gov.

That's all for now. Looking forward to working with you all

Geoff Freeze

Exhibit 2

Exhibit 2

United States Government Accountability Office

GAO

Report to the Honorable Jon C. Porter, House of Representatives

August 2007

YUCCA MOUNTAIN

DOE Has Improved Its Quality Assurance Program, but Whether Its Application for a NRC License Will Be High Quality Is Unclear

GAO-07-1010

officials. However, these officials noted that the NRC review process includes extensive public hearings on the application, which will provide stakeholders with an opportunity to comment on and challenge the substance of the application. In addition, regarding other aspects of the program, senior OCRWM officials noted that they have often consulted with external stakeholders, including city and county governments near the proposed repository site, NRC, USGS, and nuclear power companies. OCRWM has also consulted with Nevada, the U.S. Department of the Navy, and other DOE offices. For example, in developing its standards for the canisters that will be used to store, transport, and place the waste in the repository, DOE consulted with the Navy and the nuclear power plant operators that generate the nuclear waste and will use the proposed canisters. In addition, DOE has worked with the local city and county governments near the repository to develop the plans for transporting the waste to the proposed repository.

OCRWM's director has made the submission of the license application by June 30, 2008, the project's top strategic objective and management priority. Accordingly, each OCWRM office has created business plans detailing how its work will support this objective. Furthermore, DOE has developed a license application management plan that incorporates the lessons learned from previous license application preparation efforts and works to ensure that the license application meets all DOE and NRC statutory, regulatory, and quality requirements. The plan establishes a process whereby teams assess the statutory and regulatory requirements for the license application, identify any gaps and inadequacies in the existing drafts of the license application, and draft or revise these sections. Since the license application is expected to be thousands of pages long, the plan divides the license application into 71 subsections, each with a team assigned specific roles and responsibilities, such as for drafting a particular subsection or approving a particular stage of the draft. Finally, the plan also creates new project management controls to provide oversight of this process and manage risks. For example, the plan details how issues that may pose risks to the schedule or quality of the license application should be noted, analyzed, and resolved, and how the remaining issues should be elevated to successively higher levels of management.

Exhibit 3

Exhibit 3

PRIVILEGED AND CONFIDENTIAL – LITIGATION WORK PRODUCT

Department of Energy
Washington, DC 20585

QA: QA

AUG 21 2007

MEMORANDUM FOR: Edward F. Sproat, III, Director
Office of Civilian Radioactive
Waste Management

FROM: Larry Newman, Director LN
Office of Quality Assurance

SUBJECT: July 2007 License Application (LA) Oversight Report

Initial oversight surveillances (LA-01 and LA-02) have been completed and four additional assessments are scheduled for August. An executive summary of the LA oversight activities performed by the Office of Quality Assurance for the July 2007 timeframe is enclosed.

If you have any questions, please contact me at (702) 821-8410, or Michael L. Ulshafer at (702) 821-8412.

OQA:MLU-1381

Enclosure:
July 2007 LA Oversight Report

cc w/encl:
A. B. Benson, DOE (RW-14) NV
D. W. Crawford, DOE (RW-15) FORS
J. R. Dyer, DOE (RW-4) NV
A. V. Gil, DOE (RW-6) NV
P. G. Harrington, DOE (RW-5) NV
J. W. Hollrith, DOE (RW-7/8) NV
C. A. Kouts, DOE (RW-9) FORS
J. G. Lanthrum, DOE (RW-10) FORS
K. W. Powers, DOE (RW-11) NV
M. L. Ulshafer, DOE (RW-3) NV
Kay Hopkins, PEC, Las Vegas, NV
M. L. Horseman, PEC, Las Vegas, NV
J. F. McMahon, PEC, Las Vegas, NV
OQA Records Coordinator, NV

QA: QA

Monthly Status Report – LA Oversight Activities and Issues

Summary License Application Oversight Executive Summary (July 2007)

During this period the following activities were conducted:

- Team members attended status meetings and interfaced with personnel from OCRWM, BSC, and SNL, involved with the development and issuance of the License Application (LA).
- Oversight team member training was developed and delivered for 15 OQA, BSC QA, and SNL QA individuals that will be involved with future LA surveillances to help promote consistency.
- **Surveillance LA-01** provided a review of LA processes to determine content and future oversight activities and was issued in July. Two CRs (10803 and 10804) were issued as recommendations.
  - Additional conclusions of the surveillance include: CDRs are not being kept up-to-date and the Action Tracking Report is not consistently being used to track open action items.
- **Surveillance LA-02,** was completed and covered the LA Management Plan (LAMP) processes and implementation. Two CRs (10887 and 10900) were written relative to a lack of technical resources and a lack of consistent compliance with the LAMP.
- **Surveillance LA-03,** initial meetings were held and SEIS staff meetings were attended to evaluate the development status of the SEIS submittal. The SEIS will receive a page by page review August 13-17. The oversight report will be issued after the August review has been completed.
- **Surveillance LA-04,** to evaluate the status and processes for the LSN submittal was **cancelled,** due to LSN time constraints to complete the LSN submittal on schedule.
- **Surveillance LA-05,** the surveillance to evaluate the development status of the Emergency, Safeguards and Security plans was initiated; interviews were conducted; and the results are being documented. No CR conditions were identified during the surveillance.
- **Surveillance LA-06,** to evaluate the adequacy, implementation, and effectiveness of the process used to incorporate the requirements of supporting documents (e.g., NQA-1, NUREG 1297, etc) into the appropriate sections of the SAR, has been initiated.
- **Surveillance LA-07,** initial meetings were held to discuss the evaluation of activities related to the status and any issues concerning the NNPP SAR sections.
- **Surveillance LA-14,** was initiated to determine if a common definition and understanding of various terms used in the LAMP (accurate, complete, credible, quality, defensible, etc.) is documented with a common understanding throughout the LA project. This was a question that arose during the June NRC/DOE Technical Exchange meeting related to quality assurance.

Future Lines of Inquiry

- Instances were reported of inconsistent implementation of the LAMP. (CR 10900)
  - **Update** – this was emphasized during the LA Half-Time Briefings held on July 25-26, 2007.

- It appears that there may be a lack of resources needed to support BSC and Lead Lab technical activities to meet the February 29, 2008 milestones. (CR 10887) – the scheduled completion of the corrective action plan is targeted for August 8, 2007.
  - **Update** – During LA Oversight interviews, specific resource availability will be queried and any impact on the LA will be identified.
- It is not apparent that those CRs designated as having an impact on LA are receiving a further follow-up review to assure that the corrective actions have mitigated the LA impact (the self-identified CR 10842 has resolved this issue).

Planned LA Oversight Activities (August, 2007)

- Issue reports for the following LA Surveillances:
  - **LA-05,** *Emergency and Security Plans*
  - **LA-14,** *Definition of Terms*
  - **LA-03,** *SEIS*
  - **LA-06,** *Documents included by Reference*
- Conduct the following new LA Surveillance:
  - **Surveillance LA-07,** August 3-8, 2007, evaluate the status and any issues related to the NNPP products and LA sections
  - **Surveillance LA-08**, August 20-24, 2007, evaluate the status and any issues with Decision Papers and the Risk Register

Status of Open Oversight LA CRs

- **CR 10803** *LAMP Consolidated Action Item List should have due dates and current status*
  - In "Oversee Implementation step" with two open action items. Completion due date is scheduled for 9/7/2007.
- **CR 10804** *CDRs not staying current with LA Sections*
  - In "Oversee Implementation step" with one open action item and one closed action item (CDRs have been revised). CR completion due date is scheduled for 9/7/2007
- **CR 10887** *Evaluate BSC recruiting methods to support LA*
  - In "Plan CR" step with a scheduled plan due date of 8/8/2007
- **CR 10900** *Consistent Implementation of the LA Management Plan*
  - In "Plan CR" step with a scheduled plan due date of 8/10/2007

Exhibit 4

Exhibit 4

Department of Energy
Washington, DC 20585

October 6, 2000

A. L. Vietti-Cook
Secretary
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Attention: Rulemakings and Adjudications Staff

COMMENTS ON NOTICE OF PROPOSED RULEMAKING FOR LICENSING PROCEEDINGS FOR THE RECEIPT OF HIGH-LEVEL RADIOACTIVE WASTE AT A GEOLOGIC REPOSITORY: LICENSING SUPPORT NETWORK, DESIGN STANDARDS FOR PARTICIPATING WEBSITES (10 CFR PART 2)

Dear Ms. Vietti-Cook:

The U.S. Department of Energy (DOE) is pleased to submit comments on the U.S. Nuclear Regulatory Commission's (NRC) August 22, 2000, "Notice of Proposed Rulemaking for Amendments to 10 CFR 2, Subpart J, Procedures Applicable to Proceedings for the Issuance of Licenses for the Receipt of High-Level Radioactive Waste at a Geologic Repository."

The proposed revisions would establish basic design standards for participant websites in the Licensing Support Network (LSN), clarify the authority of the LSN Administrator to establish guidance for and review compliance with the design standards, and clarify the timing of participant compliance certifications.

The Department fully supports the underlying objective of the LSN system to ensure that interested parties will have an opportunity to review documentary material in preparation for NRC's License Application review. Indeed, we have been a strong proponent of NRC's efforts to streamline the document discovery process, and are committed to taking the steps necessary to ensure that the LSN system achieves its objectives. Additionally, the Department is highly supportive of the rule's use of new information management technologies to make information available to interested parties. The Department has used and will continue to use web-based technology to make its publications and supporting documents promptly available.

Our principal concern with the proposed rule relates to the approach that is being proposed for the timing of our certification of compliance. The proposed rule would require that all of the Department's documentary material be made available beginning in the pre-license application phase, which is defined to begin thirty days after a site recommendation by the Department. While we support early access to information, we believe that there is a more effective way to facilitate preparation of focused contentions and ensure an efficient licensing process than by tying the Department's certification of its documentary material to the Site Recommendation process. We recommend that the initial certification of compliance by the Department be linked to submission of the License Application. This could be accomplished by requiring the

certification to be submitted no later than six months in advance of submission of the License Application. Importantly, in recommending this approach, the Department is committed to ensuring that interested members of the public have a full six months in advance of submission of the License Application to review the Department's documentary material. To accomplish this, the Department would recommend that the following language be included as part of the rule: "In no event shall DOE's License Application be docketed prior to six months from the date of DOE's certification." Our more detailed comments on this issue are set forth in the enclosure.

Also included in the enclosure are more detailed comments on other issues and proposed clarifications related to the supplementary information in the notice of proposed rulemaking. If you have questions on these comments, please contact Monica Michewicz at (202) 586-9738 or April V. Gil at (702) 794-5578.

Sincerely,

Ivan Itkin, Director
Office of Civilian Radioactive
Waste Management

Enclosure: Comments on Proposed Revisions to the 10 CFR Part 2 Rule

cc:
R. A. Meserve, NRC
E. McGaffigan, NRC
N. J. Diaz, NRC
G. J. Dicus, NRC
J. S. Merrifield, NRC
K.D. Cyr, NRC
M. Madden, RW-1
L. Barrett, RW-2
R. Milner, RW-2
S. Hanauer, RW-2
J. Williams, RW-40
R. Minning, RW-50
A. Brownstein, RW-52
N. Slater, RW-52
C. Einberg, RW-52
M. Michewicz, RW-52
B. Wells, RW-60
K. Ford, RW-60

Exhibit 5

Exhibit 5

Official Transcript of Proceedings

NUCLEAR REGULATORY COMMISSION

ORIGINAL

Title:	Public Meeting to Discuss the Hearing Process for Judging the Safety of a Potential High-Level Waste Repository
Docket Number:	(not applicable)
Location:	Las Vegas, Nevada
Date:	Wednesday, May 23, 2001
Work Order No.:	NRC-221 Pages 1-139

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1 UNITED STATES OF AMERICA
2
3 NUCLEAR REGULATORY COMMISSION
4
5 PUBLIC MEETING TO DISCUSS THE HEARING
6 PROCESS FOR JUDGING THE SAFETY OF A
7 POTENTIAL HIGH-LEVEL WASTE REPOSITORY
8
9 WEDNESDAY,
10 MAY 23, 2001
11
12 LAS VEGAS, NEVADA
13
14 The Public Meeting convened at the
15 Regional TransportationCommission Building, 600 South
16 Grand Central Parkway,Las Vegas, Nevada, at
17 1:00 p.m., F.X. "Chip?! Cameron, Facilitato
18 presiding.
19 PRESENT:
20 F.X. "CHIP" CAMERON
21 C. WILLIAM REAMER
22 LAWRENCE J. CHANDLER
23 DENNIS C. DAMBLY
24
25

1 INDEX
2 AGENDA ITEM PAGE

8 But going now back to the notice of
9 receipt of an application. The important thing there
10 is you've got 30 days to file from the date that
11 that's published if you want to intervene and be a
12 party in the proceeding. If you miss the 30 days,
13 then you've got additional hurdles to get admitted
14 late, and it's possible you might n6t get in.
15 But the thing to remember, 30 days is a
16 short time. It's also - the 30 days wilt be before
17 the staff is done. So if you have issues you want
18 raised you have to base those on DOE's appliqation.
19. You don't base your issues on NRC's review. That
20 won't be done in~that 30-day period.
21 And while 30 days is short, remember what
22 we talked about a little while ago, DOE has to have
23. all of their documents online six months before they
24 submit theapplication, and that would be three mQnths
25 before --there would be an additional three months

1 before it's docketed.
2 So really nine months before this notice
3 would come out DOE's material should be online and
4 available to anybody.
5 So you can start, if you're seriously
6 interested in intervening in a proceeding, that's the
7 time to start preparing the issues you want resolved,
8 start looking in the licensing support network. The
9 NRC documents will be on there I guess eight months
10 before, and other people are interested. I'm sure the

Exhibit 6

Exhibit 6

USE OF THE REGULATORY GUIDE

The regulatory guide is consistent with requirements for the content of a license application in 10 CFR 63.21 and with licensing information specified in the Yucca Mountain Review Plan (NUREG–1804). It is also consistent with Environmental Review Guidance for Licensing Actions Associated with NMSS Programs (NUREG–1748). The actual format of the documents submitted is not specified in this regulatory guide. Requirements regarding electronic formats of LSN documents are defined in 10 CFR 2.1011.

Section C of this regulatory guide lists the topics of documents to be identified in or made available via the LSN. Appendix A to this guide contains a nonexhaustive list of the types of documents to which the topical guidelines in Section C should be applied. Types of documents not included in Appendix A should also be identified in or made available via the LSN if they are relevant to a topic in Section C of this regulatory guide.

Because the topical guidelines of Section C have been kept broad and at a fairly high level of detail, the user should consider each topic to be inclusive rather than exclusive with regard to documents germane to that topic for the site. For example, much of the information that supports the licensing proceeding will be based on the use of methodologies, computer codes, and models. Such information should be made available via the LSN. The Yucca Mountain Review Plan (NUREG–1804), provides guidelines on, and 10 CFR 63.21 sets the requirements for, information that should be submitted in the license application. Section C of this regulatory guide is based, in part, on these provisions.

The topical guidelines also include subcategories for the "Information for a Geologic Repository Environmental Impact Statement." This information should be made available via the LSN pursuant to 10 CFR 2.1003(b).

C. TOPICAL GUIDELINES

1. GENERAL INFORMATION
    - 1.1 General Description
    - 1.2 Proposed Schedules for Construction, Receipt, and Emplacement of Waste
    - 1.3 Physical Protection Plan
    - 1.4 Material Control and Accounting Program
    - 1.5 Description of Site Characterization Work

2. SAFETY ANALYSIS REPORT
    - 2.1 Repository Safety Before Permanent Closure
        - 2.1.1 Preclosure Safety Analysis
            - 2.1.1.1 Site Description as it Pertains to Preclosure Safety Analysis
            - 2.1.1.2 Description of Structures, Systems, Components, Equipment, and Operational Process Activities
            - 2.1.1.3 Identification of Hazards and Initiating Events
            - 2.1.1.4 Identification of Event Sequences
            - 2.1.1.5 Consequence Analyses
                - 2.1.1.5.1 Consequence Analysis Methodology and Demonstration that the Design Meets 10 CFR Parts 20 and 63 Numerical

Radiation Protection Requirements for Normal Operations and Category 1 Event Sequences

2.1.1.5.2 Demonstration that the Design Meets 10 CFR Part 63 Numerical Radiation Protection Requirements for Category 2 Event Sequences

2.1.1.6 Identification of Structures, Systems, and Components Important to Safety; Safety Controls; and Measures to Ensure Availability of the Safety Systems

2.1.1.7 Design of Structures, Systems, and Components Important to Safety and Safety Controls

2.1.1.7.1 Design Criteria and Design Bases

2.1.1.7.2 Design Methodologies

2.1.1.7.3 Repository Design and Design Analyses

2.1.1.8 Meeting the 10 CFR Part 20 As Low As Is Reasonably Achievable Requirements for Normal Operations and Category 1 Event Sequences

2.1.2 Plans for Retrieval and Alternative Storage of Radioactive Wastes

2.1.3 Plans for Permanent Closure and Decontamination, or Decontamination and Dismantlement of Surface Facilities

2.2 Repository Safety After Permanent Closure

2.2.1 Performance Assessment

2.2.1.1 System Description and Demonstration of Multiple Barriers

2.2.1.2 Scenario Analysis and Event Probability

2.2.1.2.1 Scenario Analysis

2.2.1.2.2 Identification of Events with Probabilities Greater Than 10^{-8} Per Year

2.2.1.3 Model Abstraction

2.2.1.3.1 Degradation of Engineered Barriers

2.2.1.3.2 Mechanical Disruption of Engineered Barriers

2.2.1.3.3 Quantity and Chemistry of Water Contacting Waste Packages and Waste Forms

2.2.1.3.4 Radionuclide Release Rates and Solubility Limits

2.2.1.3.5 Climate and Infiltration

2.2.1.3.6 Flow Paths in the Unsaturated Zone

2.2.1.3.7 Radionuclide Transport in the Unsaturated Zone

2.2.1.3.8 Flow Paths in the Saturated Zone

2.2.1.3.9 Radionuclide Transport in the Saturated Zone

2.2.1.3.10 Volcanic Disruption of Waste Packages

2.2.1.3.11 Airborne Transport of Radionuclides

2.2.1.3.12 Concentration of Radionuclides in Ground Water

2.2.1.3.13 Redistribution of Radionuclides in Soil

2.2.1.3.14 Biosphere Characteristics

2.2.1.4 Demonstration of Compliance with the Postclosure Public Health and Environmental Standards

2.2.1.4.1 Demonstration of Compliance with the Postclosure Individual Protection Standard

2.2.1.4.2 Demonstration of Compliance with the Human Intrusion Standard

APPENDIX A
TYPES OF DOCUMENTS TO AVAILABLE VIA THE LICENSING SUPPORT NETWORK

This appendix contains examples of the types of documents that should be identified in or made available via the Licensing Support Network (LSN) by participants. See 10 CFR 2.1003 and the exclusions in 10 CFR 2.1005.

1. Technical reports and analyses by all participants (including those developed by contractors). Note that this applies only to final technical reports and does not include preliminary drafts (including predecisional and other internal review drafts) other than "circulated drafts," as defined in 10 CFR Part 2, Subpart J (Item 6 below). See 10 CFR 2.1019(i)(2), which states that preliminary drafts, although subject to derivative discovery, are excluded from entry in the LSN.

2. Quality assurance records

3. External correspondence

4. Internal memoranda

5. Meeting minutes/transcripts

6. Draft documents circulated for supervisor concurrence or signature on which a nonconcurrence has been registered

7. Other documents (for 7.1 and 7.9, include references to other databases)

    7.1 Draft and final environmental evaluations or assessments
    7.2 Site characterization plan
    7.3 Site characterization study plans
    7.4 Site characterization progress reports
    7.5 Issue-resolution reports
    7.6 License application
    7.7 DOE environmental report
    7.8 Topical reports, data, and data analyses
    7.9 Draft, supplemental, and final environmental impact statements
    7.10 NRC preliminary comments on the sufficiency of DOE information for inclusion in a license application for a possible geologic repository at Yucca Mountain, Nevada
    7.11 The DOE site recommendation to the President of the United States (e.g., transmittal letter, statutory materials supporting the recommendation)
    7.12 Publicly available information on rulemakings
    7.13 Public and agency comments on documents
    7.14 Responses to comments
    7.15 NRC technical positions
    7.16 NRC regulatory guides
    7.17 The DOE project-decision schedules
    7.18 DOE program-management documents

Exhibit 7

Exhibit 7

Office of Civilian Radioactive Waste Management (OCRWM)

Licensing Support Network (LSN) Strategic Approach

OCRWM's opportunity to address and resolve the issues associated with meeting the Nuclear Regulatory Commission's (NRC's) requirements for the Licensing Support Network (LSN).

By April Gil (OLRC) and Dee W. Jensen (OIM)
October 2000

Approved by: _____ _____
ROBERT N. WELLS **Date**

Approved by: _____ _____
STEPHAN J. BROCOUM **Date**

Licensing Support Network (LSN) Strategic Approach

OCRWM's opportunity to address and resolve the issues associated with meeting the NRC's requirements for the Licensing Support Network

1.0 INTRODUCTION

The Licensing Support Network (LSN) is governed by the Nuclear Regulatory Commission's (NRC's) 10 Code of Federal Regulations (CFR) Part 2, "Rules of Practice for Domestic Licensing Proceedings and Issuance of Orders," and represents the Department of Energy's (DOE's) first major activity as a potential licensee. Development and operation of the LSN involves activities that must be integrated and accomplished by multiple Office of Civilian Radioactive Waste Management (OCRWM) organizations. These organizations are the Yucca Mountain Site Characterization Office's (YMSCO's) Office of Licensing and Regulatory Compliance (OLRC) and the Office of Information Management (OIM), each with unique functional areas of responsibility.

1.1 PURPOSE and SCOPE

The purpose of this Strategic Approach to the LSN is to:

1. Identify and define the Roles and Responsibilities of those directly involved in the definition, development, and implementation of, the LSN;
2. Identify the major issues associated with successfully meeting the LSN requirements;
3. Specifically state OCRWM's LSN Planning Assumptions;
4. Identify those options available to the OCRWM that will meet the needs of the LSN;
5. Identify a selected ideal option;
6. Specify what has been done in the past; and,
7. Define a specific Path Forward to successful implementation of the LSN;
8. Provide specific Goals and Objectives to be achieved through implementation and the Performance Metrics associated with successful implementation;
9. Provide a strategic implementation schedule for completion of LSN activities.

Detailed planning efforts for each of the individual operational activities will evolve from this strategic document. Activities associated with the successful completion of the OCRWM LSN Strategic Approach will provide real-time Lessons Learned that can be integrated into the activities currently being planned and conducted by the OCRWM Integrated Information Infrastructure (I^3) Team.

1.2 BACKGROUND

In 1989, in response to requirements from the NWPA in 114 (d) (2) requiring the NRC to issue a final decision approving or disapproving issuance of a construction authorization for a repository, within three years of the submission of the Department of Energy's (DOE's) License Application (LA), the NRC created the concept of the LSN, originally called the Licensing Support System (LSS).

The NRC expected the licensing procedure would involve substantial numbers of documents, and believed the LSN could facilitate timely NRC technical review, timely petitioner "discovery-type" review, and supplant the need for traditional discovery process after the LA is submitted. Additionally, the NRC believed that early provision of these documents in an easily searchable form would allow for a thorough

and comprehensive technical review of the LA by all parties/potential parties to the licensing proceeding, resulting in better-focused contentions.

The three primary functions of the LSN are:

1. To provide full text search and retrieval access to the relevant documents of all parties/potential parties to the licensing proceeding prior to DOE submittal of the LA;

2. To provide for electronic submission of filings by the parties, as well as orders/decisions of the Atomic Safety and Licensing Board Panel during the licensing proceeding; and,

3. To provide access to an electronic version of the repository licensing proceeding docket.

In 1998, potential parties to the NRC LSN Administrator that "documentary material" had been identified and made electronically available amended the rule to move away from the centralized system envisioned before the evolution of web-based technologies, and to require certification.

On October 6, 2000 revisions were proposed to the Rule to clarify the timing of DOE's required Certification, as well as clarify the roles and responsibilities of the NRC's LSN Administrator. On October 6, 2000, DOE submitted comments on the LSN proposed rule to the NRC. The major comments are as follows:

1. De-link the LSN from the Site Recommendation (SR), and to have DOE Certify it's LSN contents not later than six (6) months before submittal of the LA to the NRC;

2. Clarify that the LSN Administrator is responsible for the 'fidelity" of the electronic images, rather than the "integrity" of them; and,

3. The NRC Regulation Guide 3.69, Topical Guidelines for the Licensing Support System, which is based on 10 CFR 60, needs to be revised when 10 CFR 63 is finalized.

1.3 BOUNDARIES

The stated purposes of the LSN are to facilitate timely NRC technical review of licensing documents, suppport timely petitioner "discovery-type" review, and supplant the need for traditional discovery process after the LA is submitted. Additionally, the NRC believed that early provision of LA supporting documents in an easily searchable form would allow for a thorough and comprehensive technical review of the LA by all parties/potential parties to the licensing proceeding, resulting in better focused contentions. As such, the LSN will provide electronic access to:

1. Electronic files, including bibliographic header, for all documentary material generated by or at the direction of, or acquired by DOE;

2. Graphic oriented documentary material that includes...(calibration logs, photos, field notes, graphs, plots, etc.);

3. Basic licensing documents generated by DOE, such as the Site Characterization Plan (SCP), the Environmental Impact Study (EIS, and the License Application (LA).

For the purposes of the LSN and the OCRWM LSN Strategic Approach, Documentary Material has been defined as consisting of only the following:

- AMRs and associated first level references;
- PMRs and associated first level references;

Strategic Apporoach

If the Nuclear Regulatory Commission (NRC) accepts DOE's October 6, 2000 comments, the OCRWM LSN would need to be operational by August, 2001 and certified by July, 2002, six months piror to the submission of the Licensing Application (LA). Submission of the LA is currently scheduled for January 2003. The amount of information initially provided to the LSN will be limited to only those documents that are known to directly support the LA. This scenario means that OCRWM will have just over two years to resolve remaining issues concerning the identification of the document set that meets the definition of "documentary material," ensure the procedures are developed and fully implemented, and to perform the Quality Assurance steps necessary to insure that the OCRWM LSN is complete and accurate.

In the interim, the DOE will proceed as if Certification that the documentary material provided to the LSN must take place in August, 2001, the date currently defined in the Rule. Processes, procedures, and staffing will be allocated to that end. The DOE will determine who will be the Responsible Official for certification of the contents of the OCRWM LSN by July 1, 2001.

The DOE will insure that the Contractor identifies the processes and develops the procedures that will specify how the OCRWM LSN site will be populated with the required information, in searcheable full text, images, and headers. The Regulatory Team Lead will develop and execute a certification process (to be recommended by the YMSCO AM OLRC to and approved by, the Plant Operational Review Board [PORB]), and appropriate procedures. The OIM Team Lead will provide an operational OCRWM LSN system and make all relevant information available to the Regulatory Team to insure the proper execution of the Certification process.

5.2 INFORMATION MANAGEMENT ISSUES

The information provided by the NRC in the LSN Functional Requirements document is sufficient to prepare cost and scope documentation, and identify the essential hardware and software that will be required to implement the OCRWM LSN. It is expected that further OCRWM LSN requirements will be discussed and agreed upon between the DOE, Contractor organizations, and the NRC through follow-up LSN Advisory Review Panel (LSN ARP) Technical Work Group (TWG) meetings to be held in the future. The LSN ARP is made up of eight different organizational entities directly involved in the full scope of the NRC's LSN. The TWG is a working subgroup of the LSN ARP responsible for addressing technical issues.

5.2.1 What about the 214,000 non-electronic records remaining to be reprocessed?

Resolution of Regulatory Issue 6.1.1 above, some or all of the non-electronic records, i.e., microfilm and hardcopy, may need to be reprocessed into electronic format and included in the OCRWM LSN.

Strategic Approach

Metadata has already been captured and entered into the Records Information System (RIS) for the entire 214,000 records remaining to be reprocessed. Indexing information will be available at the time LSN in implemented in August, 2001. However, indexing information of documents attached to other documents will not be in the RIS. As the records are reprocessed, hidden documents will be identified and indexed. Electronic versions of the documentary material identified during the reprocessing efforts will be posted to the LSN, with monthly updates provided to the NRC, to document the changes posted within each 30 day time frame. All documentary material and associated indexing information will be made available electronically 60 days prior to LA as required by the existing NRC Rule.

5.2.2 When will the entire suite of documentary material be available electronically?

As stated in Information Management Issue 6.2.1 above, the documentation will be made available and posted to the OCRWM LSN as it is processed and identified as documentary material. However,

Exhibit 8

Exhibit 8

Strategic Decision Support Team
Issues List and Description

Issues 1, 2, and 3

Accept/emplacement date of 2010 + Emplacement Plan/rate +Acceptance rate

Issue
The present operating concept envisions acceptance and emplacement of 400 MTU SNF in an underground repository by 2010 followed by a ramp-up to 3000 MTU per year by 2014. Should the program consider an initial operating strategy that is considerably less aggressive?

Background - Several issues identified by the team may be addressed in a related manner if an alternative operating concept is considered. The issues involved are: accept/emplacement date of 2010, emplacement plan/rate, acceptance rate, contingency planning, early receipt/funding profile, constructor constraints, transportation mode in Nevada, site utility services, stakeholder involvement, thermal strategy and maybe more. The program should consider whether there are benefits that outweigh the costs of implementing a "go slow" approach to emplacement underground. This approach would also be responsive to suggestions of step-wise development.

Three variations of the go-slow approach could be considered:

1. Receive and emplace a small amount of waste over the first 5 to 10 years following initiation of operations. For example, receive 1 truck shipment per week (50 trucks per year). This could be about 100 MTU of commercial fuel or 50 cans of defense high-level waste or some combination.
2. Receive and emplace as described above but enhance receipt by receiving existing dual purpose systems that are already packaged at reactor sites (assuming that they can be qualified for storage at the repository)
3. Receive and emplace as described above, but enhance waste acceptance at the current rate with deployment of significant quantities above ground storage.

Potential impacts
There will be increase in the Total System Life Cycle Costs; however, there may not be a negative impact of the fee adequacy since near term spending would be reduced (significantly for scenarios 1 &2). The hot vs. cold operating approaches could be evaluated using actual wastes.

Milestone need
Any decision to change to this type of operating concept would be needed prior to initiating LA and may be beneficial to announce with SR

Organizational Owner
Lots of organizations would be involved in the implementation

Status
Is not under active consideration by th4e program. There have been modular studies developed by RW-46 (with repository input) over the past several years. The National Academy of Sciences just recently kicked off a study on repository staging.

10. There will be timely support for the approval of preclosure technical baseline changes identified during subsequent engineering studies and advanced conceptual design.

Regulatory

11. 10 CFR 63 and 10 CFR 963 are issued by October 2001 for consideration by the SSE. The schedule assumes the final rules have no substantive deviations or changes from the draft versions.

12. The YMRP will be complete before drafting the LA chapters. No impacts to technical work are assumed as a result of issuing the YMRP. Impacts to the technical workscope, if any, will be address through the scope, cost, and schedule baseline control process.

13. The information required to support development of the LA is defined by the LA Products List, which is based on the LA Guidance (formerly TGD). The LA Guidance prescribes the current required level of detail to be included in the LA. The level of detail guidance that captures NRC expectations will be issued shortly to support this assumption, with subsequent incorporation into the LA Guidance and LA Products list. Sufficient draft versions of the LA Products List and LA Guidance are available to support this planning exercise. When the NRC issues 10 CFR 63 and the Yucca Mountain Review Plan, the LA Guidance and the LA Products list will be updated again.

14. The draft LA chapters will be complete within two months after the inputs to the chapters are complete.

15. The schedule will accommodate early and phased review by NRC of programmatic, design, and science and analysis topics between SR and LA. Documentation shall be complete to the point that meaningful discussions can be held with the NRC. A detailed interactions schedule will be developed to show the relationships of the supporting work to the interactions. During the six month period prior to LSN certification, the schedule will accommodate early and phased review by NRC of completed programmatic, design, and science & analysis documentation. Documentation completed earlier than this time frame will be provided to NRC as soon as it is available. Documentation supporting the license application will be "frozen" at the time of LSN certification. Continued evolution of material will be utilized to support post-docketing interactions with the NRC.

16. LSN certification will occur six months prior to the License Application submittal. There will be no substantive safety related changes between certification of the LSN and License Application submittal (documentation supporting the LSN will be "frozen"). The schedule will be adjusted to allow ISA and TSPA backcheck and adjustment prior to LSN certification.

Exhibit 9

Exhibit 9

Office of Civilian Radioactive Waste Management (OCRWM)

Licensing Support Network Strategic Approach (LSNSA)

DOE POLICY DOE/RW-0535
October 5, 2001
Job Control Number: 01-2939

The Office of Civilian Radioactive Waste Management's (OCRWM) opportunity to identify and define OCRWM's approach to the issues associated with meeting the Nuclear Regulatory Commission's (NRC) requirements for the OCRWM Licensing Support Network.

FINAL Rev. 2 – 09/17/01 - dwj

compliance with this NWPA mandate. The issues associated with definition, development, implementation, and maintenance of the OCRWM/LSN are especially challenging because of the immense amount of information that will be provided and the requirement that all interested parties have access to the information.

Section 114(d) of the NWPA requires the Commission to issue a final decision approving or disapproving issuance of the construction authorization for a geologic repository for high-level-waste (HLW) within three years of the "submission" (i.e., docketing) of the DOE license application. The Commission anticipated that the HLW proceeding would involve a substantial number of documents created by well-informed parties regarding numerous, complex issues. The Commission believed that the LSN could facilitate the timely NRC technical review, and the timely petitioner "discovery type" review, of DOE's license application by providing access to relevant documents before DOE submits its license application. Additionally the NRC believed the LSN could supplant the need for the traditional discovery process used in NRC proceedings involving the physical production of these documents after the license application is docketed. The NRC also believed that early provision of these documents would allow for a thorough, comprehensive technical review of the license application by all parties and potential parties to the HLW licensing proceeding, resulting in better-focused contentions in the proceeding. [4] The LSN could also facilitate agency response to other requests by providing the public with electronic access to documentary material. The rule requires DOE to certify the contents of the OCRWM/LSN six months prior to the submittal of the LA.

OCRWM has successfully completed publication of the Viability Assessment and its associated supporting documentation, publication of the Draft Environmental Impact Statement (DEIS), Supplement to the Draft Environmental Impact Statement (SDEIS), Science and Engineering Report (S&ER), Preliminary Site Suitability Evaluation (PSSE), and associated supporting documentation. Identification of other documentary material that will need to be reprocessed prior to screening for transmission of information to the OCRWM/LSN has been completed.

1.3 REQUIREMENTS

The LSN and associated electronic information systems are governed by NRC's 10 CFR 2, Subpart J, "Rules of Practice for Domestic Licensing Proceedings and Issuance of Orders." Additional guidance for the OCRWM/LSN functions are contained in the Statement of Considerations accompanying 10 CFR 2, Subpart J as well as staff memos to the Commission. For example, according to SECY-00-0135, June 23, 2000, the primary functions of such a system (as stated in 10 CFR 2, Subpart J) are:

1. To provide full text search and retrieval access to the relevant documents of all parties and potential parties to the HLW repository licensing

[4] Amendment to 10 CFR Part 2, Subpart J, Supplementary Information, May 31, 2001, 66 Fed. Reg. 29453

Exhibit 10

Exhibit 10

DRAFT

Office of Civilian Radioactive Waste Management (OCRWM)

Licensing Support Network (LSN) Strategic Approach

OCRWM's opportunity to address and resolve the issues associated with meeting the Nuclear Regulatory Commission's (NRC's) requirements for the Licensing Support Network (LSN).

§ Licensing Application (LA)

One level of reference will be included for documentary material identified as relevant to the OCRWM LSN. Additional reports or studies that are reviewed and are determined that the subject matter falls within the purview of Regulatory Guide 3.69 will be included as they are identified.

Strategic Approach

Resolution of these issues are key to the success of OCRWM's LSN. Resolution however, must be made without the benefit of:

§ The final Part 63;
§ Updated Regulation Guide 3.69, based on the final Part 63;
§ The LA Review Plan; and,
§ An outline for LA development that is responsive to the Review Plan.

Additionally, the Department of Energy has generated approximately 1,030,000 documents consisting of approximately 11,000,000 images. Any scheme for screening the documents against selection criteria for "relevant," "relied upon," and "reports and studies," etc., is a complex, labor intensive, time-consuming, and costly process. Therefore, the Department of Energy will:

§ Make available all documents that will be referenced by or supporting the LA;
§ Make available all documents relevant to the LA;
§ Make available all first level references directly associated with these documents; and,
§ Review all documents that are defined as "reports" or "studies" within the RIS and include those documents that fall within the purview of Regulation Guide 3.69.

If it is determined that the documentary material definition requires expansion, the Department of Energy will provide that guidance and additional resources will be required to review any documents that will be incorporated because of the expanded definition.

Upon the initial implementation (August, 2001unless formal direction is received from the NRC directing otherwise) of the OCRWM LSN, the following documentary material and associated first level reference material will be made available electronically:

- AMR's and associated first level references;
- PMR's and associated first level references;
- Site Description Document;
- All Correspondence and Electronic Mail Relevant to the License Application;
- System Description Documents (SDD's) and associated first level references;
- Viability Assessment (VA) and associated first level references;
- Draft Environmental Impact Study (DEIS) and associated first level references;
- Responses to the NRC's IRSR's;
- Site Characterization Plan (SCP) and associated first level references;
- Site Recommendation and associated first level references;
- Circulated Drafts for Documentary material;
- Procedures cited in the License Application;
- Environmental Impact Study (EIS) and associated first level references;
- All reports and studies relevant to both the LA and the issues in Regulatory Guide 3.69, regardless of whether they will be relied upon or cited,
- Once submitted to the NRC, the License Application (LA) and associated first level references.

Exhibit 11

Exhibit 11

TECHNICAL GUIDANCE FOR
LICENSE APPLICATION PLANNING
(Plan B: Compliance-Focused Program)

1. INTRODUCTION

The purpose of this document is to provide a consistent set of technical guidance to the organizations involved in the planning for the license application (LA) under the compliance-focused program (Plan B). Plan B focuses on identifying the minimum but sufficient scope of work required to ~~develop~~ submit an LA that is considered to be~~a~~ docketable ~~LA~~, should the Yucca Mountain site be recommended and approved. This work scope will be sharply focused using a risk-informed, performance-based ~~risk-informed~~ approach to define the work necessary to defend the preclosure and postclosure licensing arguments. This top~~s~~-down approach to ensure regulatory compliance differs from the bottom~~s~~-up approach used to develop the initial Detailed Work Plan (DWP). The approach is expected to result in a reduction in the amount of work necessary to prepare a docketable LA. ~~and to support closure of U.S. Nuclear Regulatory Commission (NRC) key technical issue (KTI) agreements. Work that is inconsistent with NRC's performance-based risk-informed basis in 10 CFR Part 63 could be eliminated altogether. Other work scope outlined by the DWP could be considered confirmatory in nature with completion after the LA submittal for construction authorization. Additionally, some of the KTI agreements that provide for prescriptive actions may need to be revisited as we learn more information in light of a tops-down performance-based risk-informed approach.~~ Therefore, Plan B ~~entails potentially increased risk in the ability to docket the LA and~~results will need to be communicated ~~with~~ to the NRC in planned follow-on KTI-related technical exchanges to ensure that NRC understands and accepts the basis for any proposed changes.

The area of greatest challenge in this planning effort is the area of performance assessment (PA), which includes the testing program as well as process model analyses and modeling. Recent organizational changes at Bechtel SAIC Company (BSC) will facilitate the planning in this area. The PA Strategy/Scope organization is currently developing a postclosure compliance strategy to be used in defining and conducting the total system performance assessment (TSPA) and identifying the information needs. This strategy will be reviewed by a new ~~advisory~~ TSPA Oversight ~~g~~Group that reports directly to the BSC Manager of Projects, and will be subsequently validated by the Postclosure Strategy Board recently formed. This strategy will drive the planning for the scope of work to be conducted to fulfill the needs of the TSPA.

The approach to planning has been broken into ~~seven~~ eight components. The first component is the overarching general guidance that must be considered in developing more detailed plans by all areas of the Project. The next ~~six~~ seven components consist of the individual guidance related to the different areas of the Project (License Application/Licensing; Design; Preclosure Safety Assessment; Performance Assessment; Special Projects; Site Operations~~Services and Field Support~~; and Business, Technical Support, and Programmatic Areas) that must work together to support development and submittal of a docketable LA.

Preparation and review of the LA, including the ~~G~~general ~~I~~information and the ~~Safety Analysis Report (~~SAR~~)~~, are not quality-affecting activities and are not subject to the requirements of the DOE Quality Assurance Requirements and Description (QARD). The LA, nevertheless, will be controlled and measures will be taken to ensure commitments are consistent with the underlying documents and appropriate change control will be exercised. ~~However,~~ ~~p~~Preparation and review of those portions of the technical basis for the LA related to items important to safety or waste isolation are classified as quality-affecting activities and are subject to the requirements of the QARD and applicable procedural controls.

Existing quality issues ~~and any new or recurring issues~~ must be resolved expeditiously and appropriate measures taken to prevent recurrence. Resolution of these issues will be conducted in accordance with the ~~Process~~ Performance Improvement Transition Plan, which will be incorporated into this planning effort.

The technical basis for the LA, which will support LA preparation and any eventual NRC review, must be essentially complete eight months prior to LA submittal to support ~~at the time of~~ BSC's initial LSN certification process. BSC will complete the initial certification of the ~~licensing support network (~~LSN~~)~~ to the DOE~~,~~ seven months prior to LA submittal so that DOE has one month to prepare their initial certification to the NRC six months prior to LA submittal as required by 10 CFR Part 2, Subpart J. Adequate time is provided for the certification processes to allow for implementation of corrective actions, if needed. It is expected that some development of technical information will continue through submittal of the LA and afterwards, and consequently there will be incremental certification coincident with amendments of the LA.

This technical basis will build on the final technical basis for a possible SR decision, to the extent possible. Doing this should provide both schedule and cost benefits for completion of the LA and its supporting technical basis. This approach should also facilitate NRC review and completion of the staff Safety Evaluation Report (SER) within the 18-month period ~~defined~~ described in the schedule for the LA proceedings in Appendix D of 10 CFR Part 2. This is because ~~since~~ the NRC reviewed the preliminary technical documents for a possible SR decision as one basis for developing its preliminary sufficiency comments. Any significant changes to the technical basis existing at the time of a possible SR decision must be justified in terms of their relevance to meeting the primary objective for submittal of a complete and defensible LA and any potential cost impacts. Since the NRC's preliminary sufficiency comments were largely based on the site characterization and design information supporting a possible SR decision, significant changes to this information may require additional NRC review.

Development of the technical documents that provide information needed to prepare the LA will take place in parallel only when that approach will not affect the quality of downstream products (e.g., development of Process Model Reports (PMRs) in parallel with the Total System Performance Assessment (TSPA), assuming that the TSPA is based on the Analysis and Model Reports (AMRs)). Adequate review time must be provided to ensure that the information incorporated in downstream products, including draft LA chapters, is consistent with the final source material. Version control of all documents must be maintained and a structured process adhered to for document development and review.

~~performance-based risk-informed approach must be taken for this evaluation to ensure that the focus is on providing information that is significant to the DOE's compliance case.~~

Non-NRC requirements that govern Project activities must be adequately addressed, including those imposed by DOE directives, external regulation and oversight ~~(e.g., permit terms and conditions)~~, and other Federal and State agencies (e.g., permit terms and conditions). Where a requirement conflicts with an NRC requirement, the NRC requirement governs. These requirements need to be captured in the set of Project requirements documents, including future revisions of such documents.

3. LICENSE APPLICATION/LICENSING

The licensing for the Yucca Mountain Project is fundamentally a two step process – Construction Authorization and License to Receive and Possess. The analog from the commercial reactor-licensing arena is Construction Permit and Operating License. There is an established licensing precedent for the submittal of preliminary information at the construction stage, with final information submitted at the operating stage. The overall licensing approach for this Project is to submit an LA for licensing the entire facility, rather than by modules. It is expected that updates to the implementing details of submitted information will be routinely accomplished by amendments to the Safety Analysis Report.

The content of the LA will be developed in accordance with the LA Guidance (formerly the Technical Guidance Document) and the LA Products List that are available on the Intranet as the LA Guidance and Products Database and is routinely maintained. The LA Guidance and Products Database will be updated based on evaluation of the final 10 CFR Part 63 and the YMRP, when it becomes available. Evaluation of the NRC requirements and guidance must be complete and appropriate changes made to the LA Guidance and Products Database as soon as possible. These changes ~~must~~ will be documented early in the process to facilitate completion of the LA technical basis and the LA. The scope of the performance confirmation plan must be carefully evaluated based on the final NRC requirements to ensure that the plan described in the LA is limited to what is adequate and necessary to satisfy these regulatory requirements. [illegible] Significant changes to the LA Guidance, LA Products List, and LA format and content due to the YMRP are not included in the plan. [illegible]

~~In order t~~To support the DOE goal of submitting the LA to the NRC by December 2004, inputs to the LA will be conducted in a phased manner. As illustrated in the strategic planning schedule, the first drafts of the programmatic sections of the LA need to be completed by December 2003. The draft sections on design, science, preclosure safety assessment, and total system performance assessment need to be completed by March 2004. The LA review schedule has been shortened to 38 weeks. Technical and regulatory reviews of draft LA sections by ~~all~~ the affected offices within the DOE, as well as Naval Reactors, must occur in parallel to make the

initial review process as efficient as possible. The review of draft sections must be sufficiently complete along with the essential supporting technical basis documents before the initial BSC LSN certification process begins, eight~~six~~ months prior to LA submittal. DOE management review of and concurrence on the integrated LA, and production of the final document, will take place during the six months following initial LSN certification. Changes and additional information developed during the DOE management review will be included in the LSN with a supplementary certification at the time of LA submittal.

In addition to having overall responsibility for LA development, the BSC License Application Project will also be the prime author for ~~LA Chapter 7 and~~ selected sections of LA Chapters 1 (Introduction), 2 (Conformance with Technical Criteria), ~~10,~~ and 11 (Conduct of Operations and Related Topics).

~~The preclosure safety assessment and its supporting analyses will build on the preliminary preclosure safety assessment developed as part of the technical basis for a possible SR decision. The preclosure safety assessment developed and documented as part of the technical basis for the LA will be based on a 100-year active operating period, and include additional analyses for extended monitoring for up to 300 years.~~

To help ensure docketing of the LA and completeness of the LSN for significant safety matters, plans will be developed for phased NRC review of project technical documentation that provide the basis for the safety case. Pre-licensing interactions with the NRC will be clearly linked to the completion of documentation to address the KTI agreement items~~, including revisiting the specific nature of the information to be provided and the timing for completion of selected items, if necessary~~. Additional meetings will be considered, as appropriate, to reach early agreement with the NRC on the LA format and content, resolution of preclosure safety and design-detail issues, and selected approaches and methodologies critical to the licensing case. Interactions will continue on the topical reports currently under NRC review or for which DOE has committed to provide additional information (e.g., seismic design basis, criticality).

With respect to the LSN, Appendix B discusses the approach to be used to streamline the identification and loading of the documentary material required by 10 CFR Part 2, Subpart J, as well as the timing for the different activities needed to ensure LSN certification by June 2004.

The License Application Project will develop a Licensing Strategy and a Regulatory Guidance Matrix to ensure consistent approaches to design and analysis. [illegible]

Commitments ~~and comments from~~to the NRC and ~~all~~ other external parties will be ~~managed~~ tracked using an appropriate database management system, with incremental modifications as necessary to improve its function.

In support of implementing a Safety Conscious Work Environment on the Project, the DOE (as the prospective applicant) must have in place a process that allows for all employees to raise issues and concerns without fear of adverse consequences. The Condition/Issue Identification and Reporting/Resolution System (CIRS) is the starting point for employees to raise concerns. It

granting the construction authorization. ~~The need for any early construction that would require an exemption from the NRC licensing requirements in 10 CFR Part 63 will be identified.~~

The strategic planning schedule identifies the key activities and milestones related to design. This general logic will be followed in laying out the work to establish facility design and establish the infrastructure to begin production engineering to support design and construction. As the logic shows, waste package design is needed earlier than surface and subsurface design as the waste package drives design concepts and details in those areas.

5. PRECLOSURE SAFETY ASSESSMENT

The preclosure safety assessment and its supporting analyses will build on the preliminary preclosure safety assessment developed as part of the technical basis for a possible SR decision. The preclosure safety assessment developed and documented as part of the technical basis for the LA will be based on a 100-year active operating period, and include additional analyses for extended monitoring for up to 300 years.

The preclosure safety assessment will support modular construction of surface and subsurface facilities, including concurrent construction and operation activities. It will be developed consistent with the level of design to be described in the LA. It will demonstrate compliance with the 10 CFR Part 63 preclosure performance objectives. It will be sufficient, along with other Project documentation, to address the 10 CFR 63.112 preclosure safety analysis requirements.

The preclosure safety analysis group has lead responsibility for the development of LA Chapter 7 (Preclosure Radiological Safety Assessment) and selected sections of Chapters 2 (Conformance with Technical Criteria), 3 (Site Characteristics), and 10 (Radiation Protection). The group also provides overall integration of preclosure safety requirements into the LA.

~~5.~~6. PERFORMANCE ASSESSMENT

There will be a single total system performance assessment (TSPA), developed and documented in accordance with applicable ~~QA requirements and~~ procedures, as part of the technical basis for the LA. The TSPA will be developed to be a defensible case that provides reasonable expectation that postclosure performance standards are met, considering the use of ~~base~~ best available science and ~~any~~ necessary simplifying assumptions ~~necessary~~ needed to obtain ~~positive~~ acceptance by the NRC ~~compliance findings~~. The TSPA is expected to reflect a combination of some models and parameters that represent a reasonably expected behavior of the system and other models and parameters that are more conservative. This will be determined on a ~~model-by-model~~ case by-case basis. Additional guidance will be developed to provide ~~some~~ criteria for determining the proper balance of conservatism and realism and to ensure that such criteria are applied consistently across the models and parameters. This guidance will be based on the postclosure compliance strategy being developed by the PA Strategy/Scope organization, as discussed in Section 1.

The TSPA that supports the LA will be developed from the TSPA-SR model as supplemented by Volume 2 of the FY01 Supplemental Science and Performance Analyses (SSPA). Analysis and Modeling Report (AMR) and Process Model Report (PMR) revisions will include ~~insights~~ additional technical understanding gained during the development of models and analyses documented in the SSPA. They will also include new information generated to address KTI agreements and NWTRB issues, to enhance confidence in the underlying scientific basis through validation exercises, or to capture results of ongoing testing. The TSPA-LA will be based on these AMR revisions; PMR revisions will support the development of Chapter 8 of the License Application. It is important to note that since part of the strategy for developing a defensible TSPA-LA relies on AMRs that are supported by testing, not all of the information that was considered for the SSPA will likely be carried through for the TSPA-LA. For example, consideration of the effects of the drift shadow zone and in-waste package diffusive transport will likely not be reflected in the TSPA in any detail. ~~The overall TSPA architechture and implementation will follow the same methodology that was used in the TSPA-SR and the SSPA.~~

With the new procedures that are being put in place effective December 21, 2001, the AMRs will now be developed under AP-SIII.9Q, Scientific Analyses (for those AMRs that are analyses), and under AP-SIII.10Q, Models (for those AMRs that are models). PMRs will continue to be developed under AP-3.11Q, Technical Reports.

As noted in Section 4, the design will reflect the flexible design concept as described in the YMS&ER, along with any required modifications to this concept resulting from ongoing design evaluations. The testing program and AMR, PMR, and TSPA revisions will reflect the current understanding required to support a flexible design. Specifically, models and analyses will appropriately reflect the larger repository footprints based on the model domains developed for Volume 1 of the SSPA. However, the AMRs, PMRs, and TSPA ~~revisions~~ will reflect only one operating mode (there will not be multiple calculations evaluating a range of thermal operating modes). In addition, the TSPA will be conducted only for a 70,000 MTHM inventory.

The Performance Assessment Project will be the prime author of LA Chapters 3 (Site Characteristics), 8 (Performance of the Repository After Permanent Closure), and 12 (Performance Confirmation Program), and selected sections of Chapters 2 (Conformance with Technical Criteria) and 11 (Conduct of Operations and Related Topics).

Bechtel SAIC Company (BSC) will continue to utilize a logic sequence involving test planning, data collection, AMR development and revisions (including abstractions), PMR revisions, TSPA ~~revision~~analyses, ~~and~~ sensitivity analyses, and eventually documenting the information in Chapter 8 of the LA. ~~The following general logic sequence is used to develop the path to the LA:~~

~~Test planning~~
~~Testing~~
~~Interpret test results~~
~~Prepare test report~~
~~Provide interpreted test information to model developer~~
~~Model development and analysis planning~~
~~Revise model using additional test information~~

- ~~Validate model using multiple lines of evidence (including additional test information)~~
- ~~Update AMR using additional test information~~
- ~~Revise analysis based on revised model~~
- ~~Update AMR based on revised analysis~~
- ~~Revise TSPA model using revised models and analyses; update PMRs~~
- ~~Conduct TSPA-LA calculations~~
- ~~Revise TSPA model document~~
- ~~Prepare TSPA-LA document~~
- ~~Prepare Chapter 8 of LA~~

The data and software used in support of model development and TSPA analyses will be qualified, and models will be validated (i.e., information presented to provide confidence that the models are valid for their intended use), consistent with ~~the Process Improvement Transition Plan~~applicable Project procedures.

Testing makes up the data collection portion of the logic sequence leading to a defensible TSPA-~~LA~~. Testing requirements are based on process model input parameter and validation needs, technical basis for design needs, KTI agreements, and NWTRB issues. Additional guidance will be developed to evaluate the additional testing required to fulfill these needs. This guidance will be consistent with the postclosure compliance strategy being developed by the PA Strategy/Scope organization, as indicated in Section 1. The guidance will also be used to systematically evaluate the extent of revisions needed to the AMRs.

The Yucca Mountain Site Description will be updated to document the current understanding of site conditions, including that resulting from new work relevant to licensing, as the basis for information presented in the LA and its supporting documents.

~~6.~~7.SPECIAL PROJECTS

The Project has developed a vision of requirements hierarchy and flow-down that is included in the planning activities. Special Projects will provide input to the Project Scoping Document being developed by the BSC Contract Administration group (see Section 9) to allocate requirements to appropriate owning organizations within BSC Projects from the top-level requirements documents (CRD, YMPRD, WASRD, TRD, BSC Contract).
~~As part of this process, alignment issues between the documents will be eliminated and the documents revised to include true requirements. The owning departments will decompose the base requirements (e.g.,10 CFR Part 63) and assign specific requirements (paragraphs of 10 CFR Part 63) to implementing organizations (e.g., Design or Performance Assessment) through the Project Scoping Document. Each of the implementing organizations will develop the architecture to flow down their applicable requirements to their work products.~~

The current planning for Transportation Support includes rail and site access road activities to support a draft NEPA Strategic Analysis Document. Also draft rail corridor selection/decision criteria will be developed for engineering and design. In addition, an annotated outline of a Project Management Plan for Nevada Transportation will be prepared. The document will be based on limited available information. Work to develop this document in more detail has been

product will include. Because the LA Products have already been identified at a high level, these additional details are not expected to significantly alter the scope of the product but rather to define it in further detail. Following NRC issuance of the Yucca Mountain Review Plan, the LA Guidance and LA Products will be readjusted to meet these requirements, or to justify an acceptable alternative. The level of detail of the license application for construction authorization is assumed to be consistent with that in Preliminary Safety Analysis Reports for similar facilities and designs.

~~25. The draft LA chapters will be complete within two months after the inputs to the chapters are complete.~~

~~26.~~29. The schedule will accommodate early and phased review by NRC of programmatic, design, ~~and~~ science, and analysis topics between SR and LA. Documentation shall be complete to the point that meaningful discussions can be held with the NRC. A detailed interactions schedule will be developed to show the relationships of the supporting work to the interactions. During the six month period prior to LSN certification, the schedule will accommodate early and phased review by NRC of completed programmatic, design, and science & analysis documentation. Documentation completed earlier than this time frame will be provided to NRC as soon as it is available. Documentation supporting the license application ~~will be "frozen" at the time of LSN certification~~should be completed in time to support the initial certification process for the LSN. LSN certification will occur six months prior to the License Application submittal. This means technical products should be completed eight months prior to the scheduled LA date. Changes to documentation can still be made after LSN certification and will be verified during LSN recertification at the time of LA submittal. Changes to documentation should be minimized and not incorporated in schedules unless deemed essential (e.g., resolves DOE or NRC review comments/issues, etc.). Input of information to the LSN is anticipated to require a minimum duration of 18 months, which may be extended depending upon resource allocations and timing availability. Continued evolution of material used to support the license application will be utilized to support post-docketing interactions with the NRC.

~~27. LSN certification will occur six months prior to the License Application submittal. There will be no substantive safety related changes between certification of the LSN and License Application submittal (documentation supporting the LSN will be "frozen").~~

~~28.~~30. ~~The preclosure safety strategy will continue as described in the last version of the RSS (Revision 4).~~The License Application Project will prepare a L~~l~~icensing S~~s~~trategy ~~document~~ that will include the characteristics of the preclosure safety assessment and the performance assessment. The performance assessment strategy will reflect a methodology for evaluating the attributes of the natural system and engineered system for determining significant contributors to performance~~build upon the general approach in RSS Revision 4, and~~. The strategy will also be guided by specific treatment of uncertainty.

~~29. The postclosure safety strategy will continue to focus on the principal factors contained in RSS Rev 4, augmented by work conducted to address KTIs. Continued testing and model development in support of compliance arguments will focus on these areas.~~

Exhibit 12

Exhibit 12

Licensing Support Network

A New Path Forward

4/22/02

Examples of Documents

- Prong 1
  - AMR/PMR, detailed data, models, computer codes, methodologies, QA pedigree
- Prong 2
  - All documents contrary to DOE's licensing position, including DRs, CARs, NCRs, minority reports
- Prong 3
  - All reports and studies, including circulated drafts, covering topics of Reg. Guide 3.69

Consequences

- NRC will not accept the LA for docketing until 6 months after LSN certification
- An incomplete LSN has the potential to draw the licensing proceedings beyond the 3-year window mandated in the NWPA

Exhibit 13

Exhibit 13

STRATEGIC BASIS FOR LICENSE APPLICATION PLANNING FOR A POTENTIAL YUCCA MOUNTAIN REPOSITORY

Claudia M. Newbury and Stephan J. Brocoum, U. S. Department of Energy, Yucca Mountain Site Characterization Office
Robert P. Gamble, Robert C. Murray, and K. Michael Cline, Booz Allen Hamilton, Inc.

ABSTRACT

If Yucca Mountain, Nevada is designated as the site for development of a geologic repository for disposal of spent nuclear fuel and high-level radioactive waste, the Department of Energy (DOE) must obtain Nuclear Regulatory Commission (NRC) approval first for repository construction, then for an operating license, and, eventually, for repository closure and decommissioning. The licensing criteria at 10 CFR Part 63 establish the basis for these NRC decisions. Submittal of a license application (LA) to the NRC for authorization to construct a repository at the Yucca Mountain site is, at this point, only a potential future action by the DOE. Given the policy process defined in the Nuclear Waste Policy Act, as amended (NWPA), there is no way to predict whether or when the necessary authorization to submit a LA might be obtained. In spite of this uncertainty, the DOE must take prudent and appropriate action now, and over the next several years, to prepare for development and timely submittal of a LA. This is particularly true given the need for the DOE to develop, load, and certify the operation of its electronic information system to provide access to its relevant records as part of the licensing support network (LSN) in compliance with NRC requirements six months prior to LA submittal. The DOE must also develop a LA, which is a substantially different document from those developed to support a Site Recommendation decision. The LA must satisfy NRC licensing criteria and content requirements, and address the acceptance criteria defined by the NRC in its forthcoming *Yucca Mountain Review Plan* (YMRP). The content of the LA must be adequate to facilitate NRC acceptance and docketing for review, and the LA and its supporting documents must provide the documented basis for the NRC findings required for a construction authorization. The LA must also support a licensing proceeding before an Atomic Safety and Licensing Board panel prior to Commission action on any decision to authorize construction. The DOE has established a strategic basis for planning that is intended to provide the framework for development of an integrated plan for activities leading to preparation and submittal of a LA.

INTRODUCTION

The DOE's overall objective is to ensure safe disposal of spent nuclear fuel and high-level radioactive waste consistent with applicable laws and safety standards. The primary and more immediate objective is submittal of a complete and defensible LA to the NRC as soon as possible following the potential designation of the Yucca Mountain site for development as a repository. This position paper defines the general path forward to achieve that objective, including a strategic planning basis and identification of selected decisions or actions that may be needed. Lower-level strategies and cost-effective implementation plans based on the strategic planning basis established here must be prepared to support the DOE's multi-year planning process.

GENERAL STRATEGIC BASIS FOR PLANNING

The LA submitted to the NRC must present sufficient information to demonstrate compliance with the requirements in the NRC's rule establishing the criteria for disposal of high-level radioactive wastes in a potential geological repository at Yucca Mountain, Nevada - 10 CFR Part 63 (1). The LA must be:

- Complete - Provide the information necessary to satisfy NRC content requirements in 10 CFR Part 63 and address the guidance in the forthcoming YMRP to facilitate docketing;
- Transparent and traceable – Provide sufficiently detailed information as to purpose, method, assumptions, inputs, conclusions, and references, so that an independent NRC reviewer technically qualified in the subject area can generally understand the essential information relied upon as the technical basis for the DOE licensing/compliance case without having to consult the supporting documents or the originator of the documents. It should be possible to assess the adequacy of the licensing/compliance case based on full traceability to the supporting documents and other information to permit further, more detailed examination of the technical basis relied upon for the licensing case at reviewer discretion;
- Defensible – The technical case presented for compliance with NRC requirements and performance objectives must be supported by the technical basis documents and the available information.

Preparation and review of the LA are not quality affecting activities and are not subject to the requirements of the DOE *Quality Assurance Requirements and Description* (QARD) (2). The Final Environmental Impact Statement (FEIS) will accompany any LA submitted to the NRC by the DOE. There is no current basis to conclude that a supplement to the FEIS will be needed at LA submittal. The design-basis eventually developed for licensing will be evaluated to ensure that appropriate documentation is prepared, consistent with the requirements of the National Environmental Policy Act, to support NRC adoption of the DOE's EIS.

The technical basis for the LA must build on the final technical basis for a possible site recommendation (SR) decision for several reasons:

- Site characterization must be complete prior to a decision by the Secretary to recommend the site; the expectation is that only a limited amount of confirmatory or design-specific testing will be needed after that decision to verify or otherwise enhance confidence in the technical basis for the LA;
- The technical basis for a SR decision must provide adequate confidence for that decision and, therefore, must be the foundation for development and refinement of the technical basis for the LA;
- The technical basis for the LA, which will support LA preparation and any eventual NRC review, must be essentially complete at the time of initial certification of the LSN, six months prior to LA submittal as required by 10 CFR Part 2, Subpart J (3).
- Use of the existing technical basis, including the SR design basis, as a starting point should provide both schedule and cost benefits for completion of the LA and its supporting technical basis; it should also facilitate NRC review of the LA and its supporting documents since the

in the schedule for the licensing proceeding in Appendix D of 10 CFR Part 2 (3). Consistent with this approach, there should be no specification of page counts for LA chapters.

Pre-licensing interactions with the NRC must be clearly linked to the completion of documentation to address the KTI agreement items. Additional meetings will be considered, as appropriate, to reach early agreement with the NRC on the LA format and content, resolution of preclosure safety and design-detail issues, and selected approaches and methodologies critical to the licensing case. Interactions will continue on the topical reports currently under NRC review or for which DOE has committed to provide additional information (e.g., reports covering methods for assessment of the seismic design basis and criticality).

Commitments and comments from the NRC and all other external parties will be managed using an appropriate database management system, with incremental modifications as necessary to improve its function. This system will also be used to manage and document decisions.

Technical and regulatory reviews of draft LA chapters by all affected offices within the DOE, as well as Naval Reactors, must occur in parallel to make the initial review process as efficient as possible. The review of draft chapters must be complete along with the essential supporting technical basis documents before initial LSN certification, six months prior to LA submittal. DOE management review of and concurrence on the integrated LA, and production of the final document, will take place during the six months following initial LSN certification. Opportunities to accelerate the LA development schedule should be considered, including early preparation and review of programmatic inputs (e.g., general descriptions of the QA program, emergency response plan, records maintenance program) at a level of detail appropriate for the LA for a construction authorization. Development of these inputs could begin following evaluation of NRC requirements in 10 CFR Part 63 and guidance in the YMRP.

TECHNICAL AND BUSINESS SUPPORT, INCLUDING INFRASTRUCTURE INVESTMENT

Support work must focus on achieving the primary objective of earliest possible submittal of a LA following a potential site designation, but must also adequately support a prioritized and phased infrastructure investment plan that anticipates infrastructure needs at the time of a possible construction authorization.

Information management and related administrative services must focus on defining the minimal work and staff requirements that are adequate and necessary to support elements critical to LA docketing and review, including records management activities and LSN development, loading, and monitoring to permit certification. Project computer hardware and software upgrades should be limited to what is adequate and necessary to support Project work and allow interoperability among users based on equipment that is supported by current technology. Adequate staff support for maintenance of current and new systems is essential. Specialized hardware and software needs must be evaluated and any acquisitions justified in terms of their support for work needed for the LA.

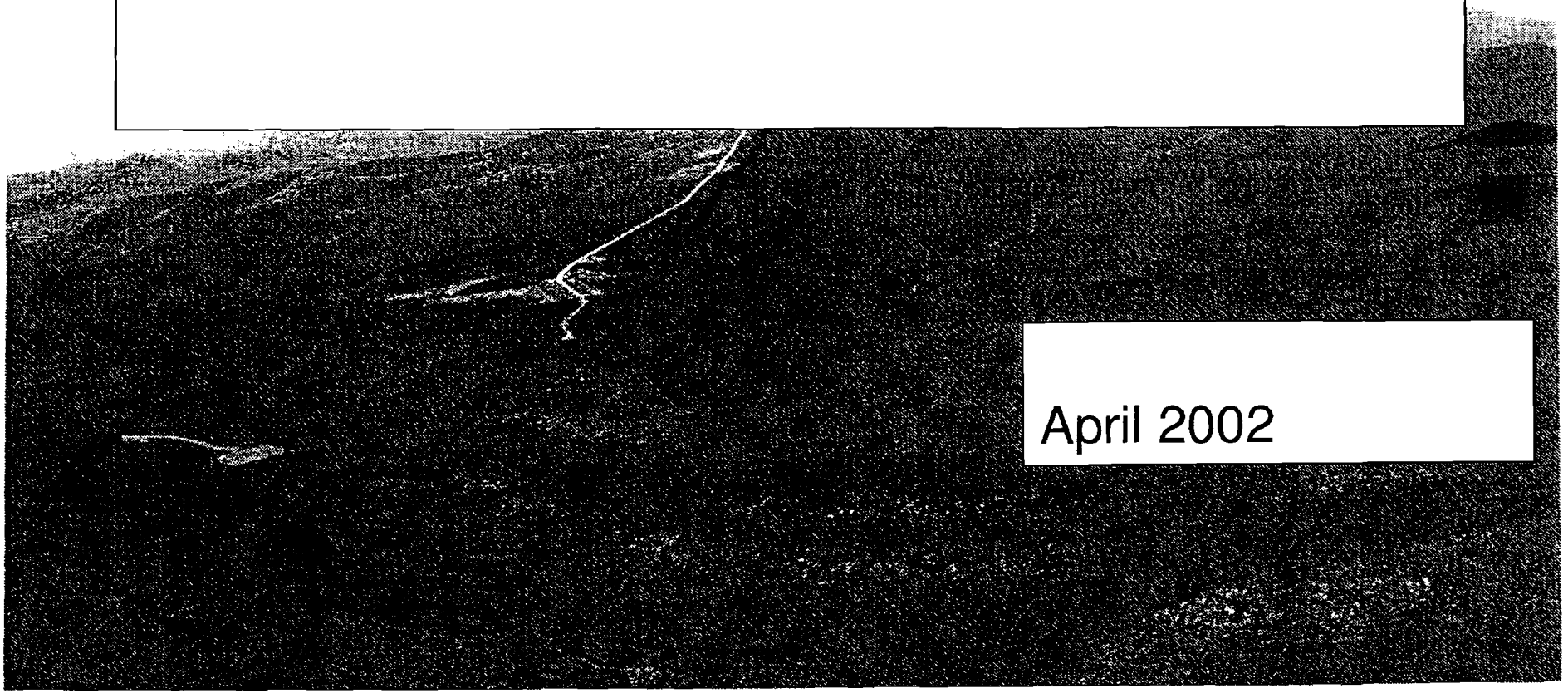
Exhibit 14

Exhibit 14

U.S. Department of Energy
Office of Civilian Radioactive Waste
Management

YUCCA MOUNTAIN PROJECT

LICENSE APPLICATION PLAN REVIEW



April 2002

LA Plan Key Milestones

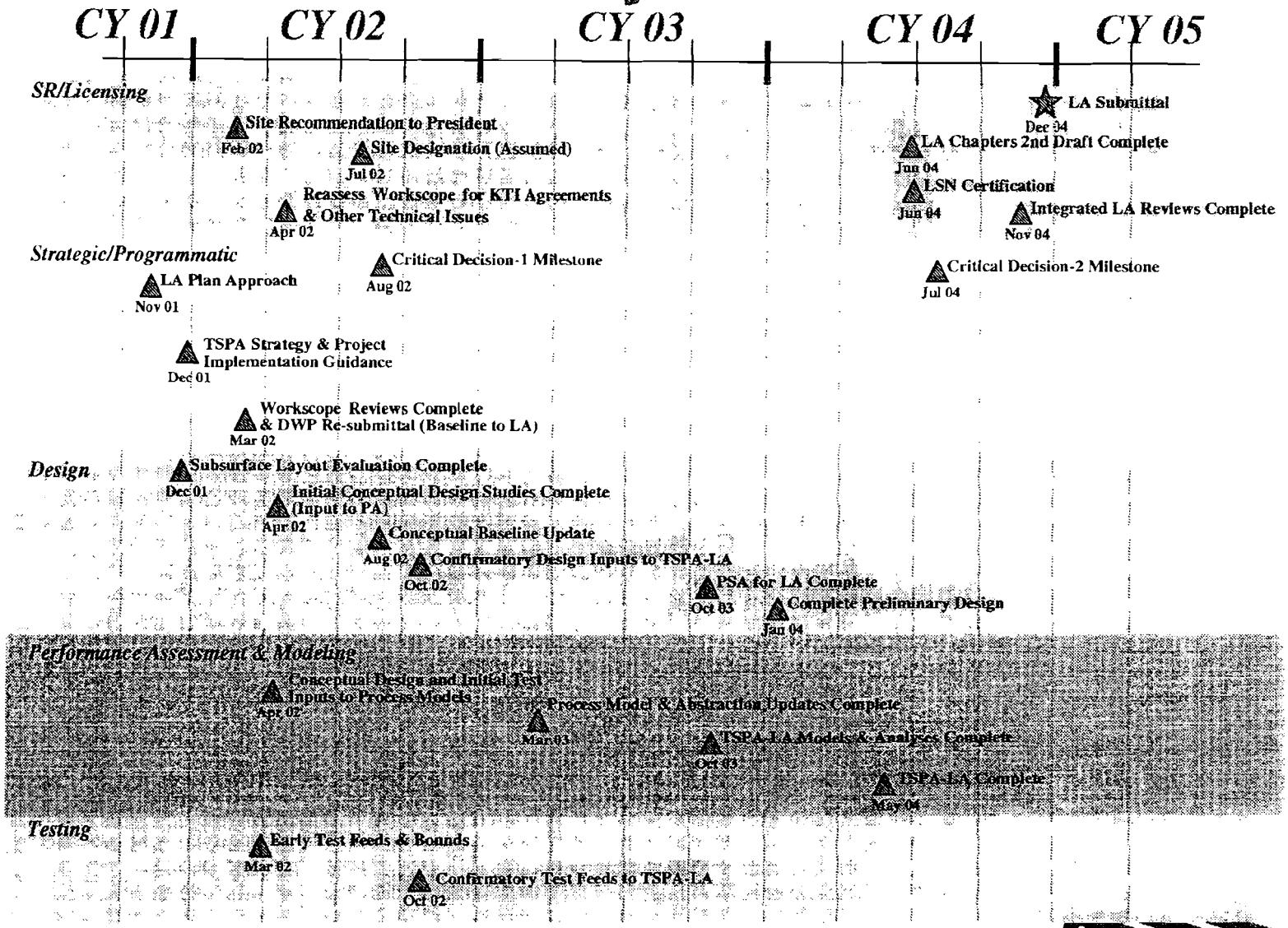


Exhibit 15

Exhibit 15

Repository Program Overview

Presented to:
Nuclear Waste Technical Review Board

Presented by:
Russel J. Dyer, Project Manager
Yucca Mountain Site Characterization Office
Office of Civilian Radioactive Waste Managment

May 7, 2002
Washington, DC

LA Plan Key Milestones

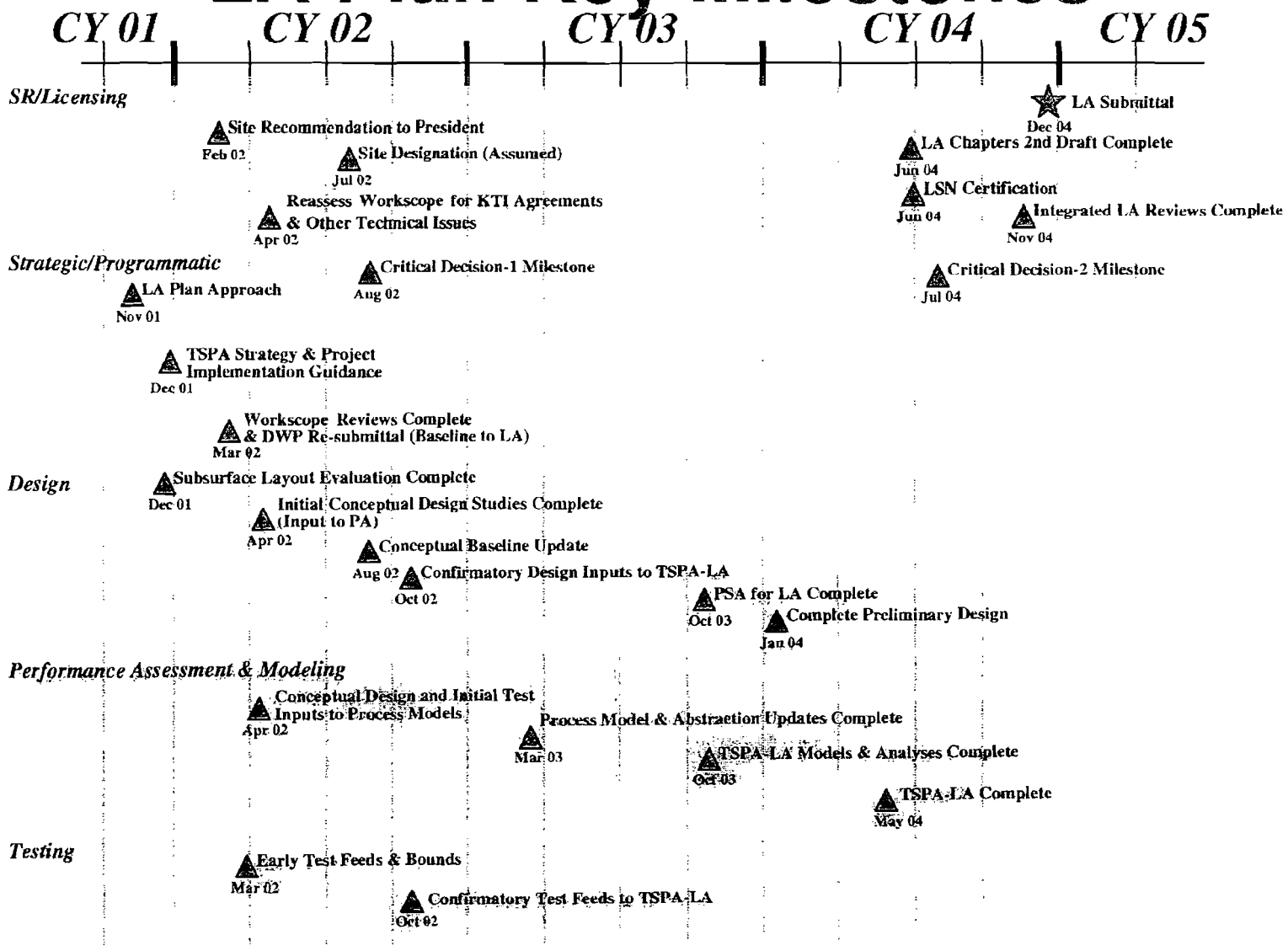


Exhibit 16

Exhibit 16

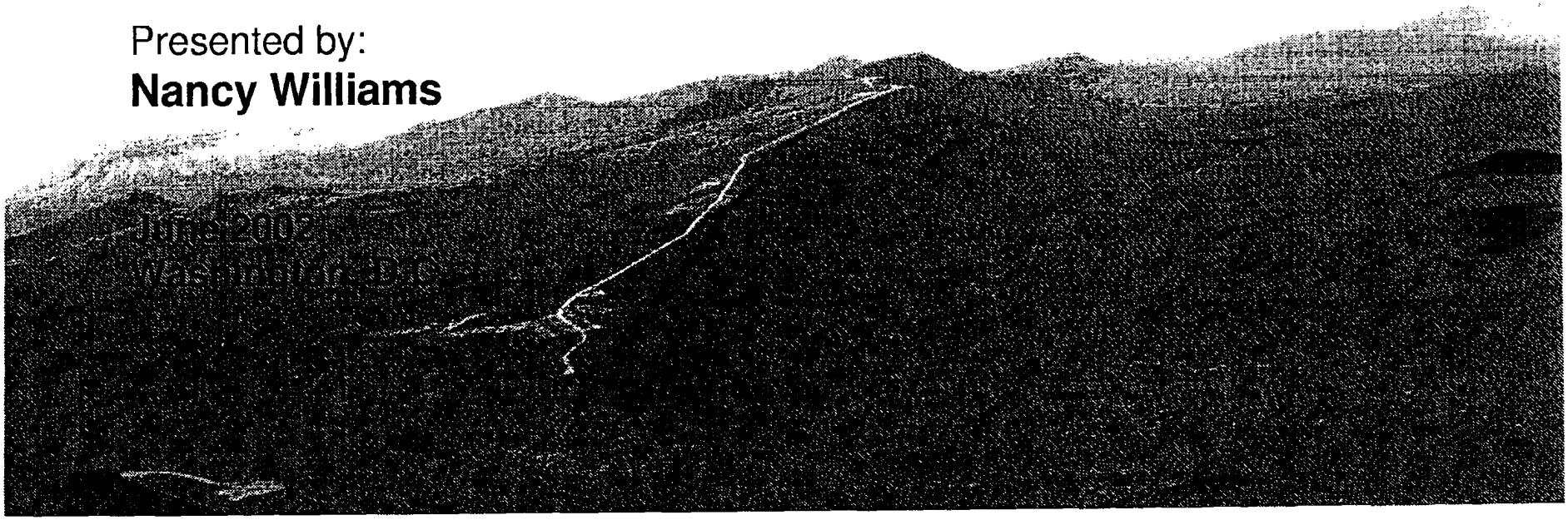
U.S. Department of Energy
Office of Civilian Radioactive Waste Management

YUCCA MOUNTAIN PROJECT

LA Development Approach

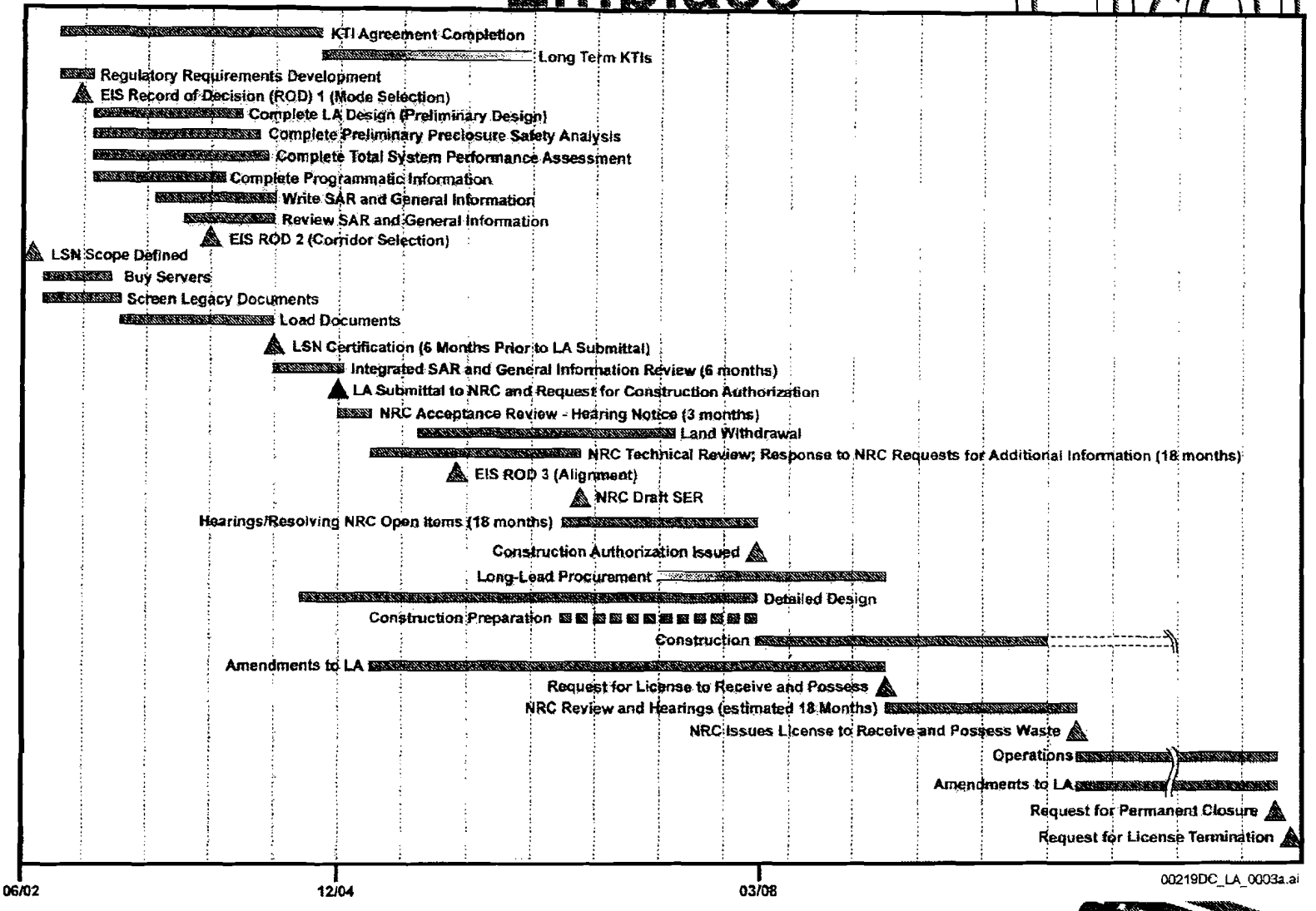
Presented to:
Robert Card

Presented by:
Nancy Williams



Licensing Approach to Receive and Emplace

Draft



YUCCA MOUNTAIN PROJECT

Exhibit 17

Exhibit 17

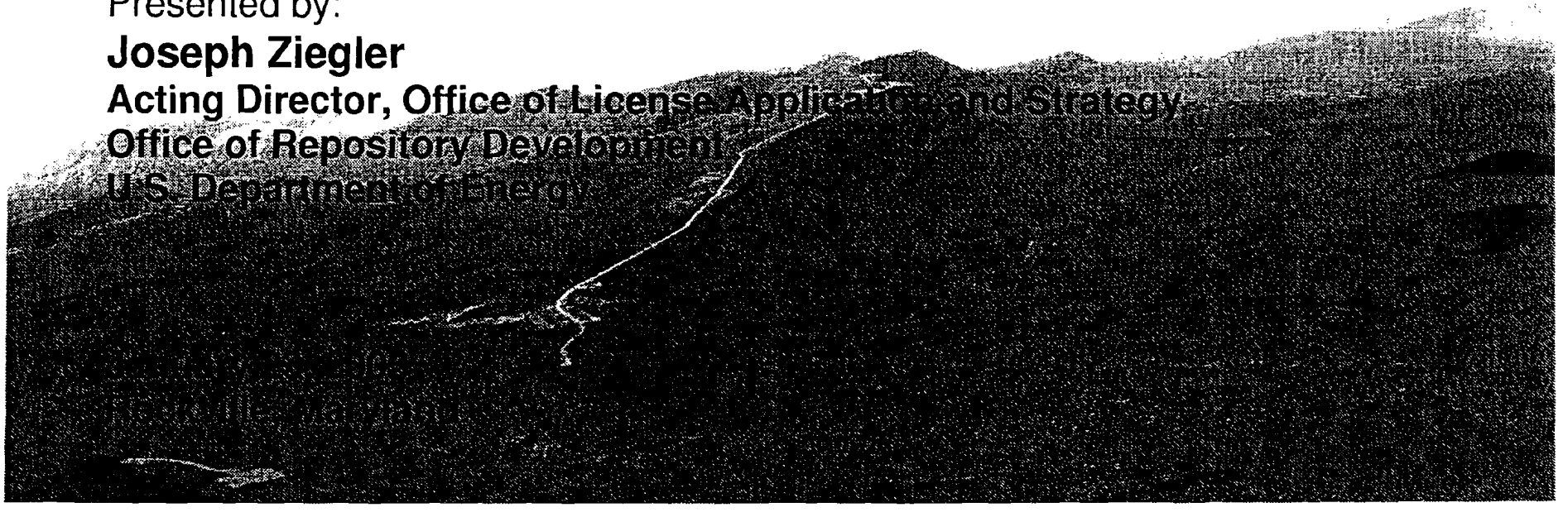
U.S. Department of Energy
Office of Civilian Radioactive Waste Management

YUCCA MOUNTAIN PROJECT

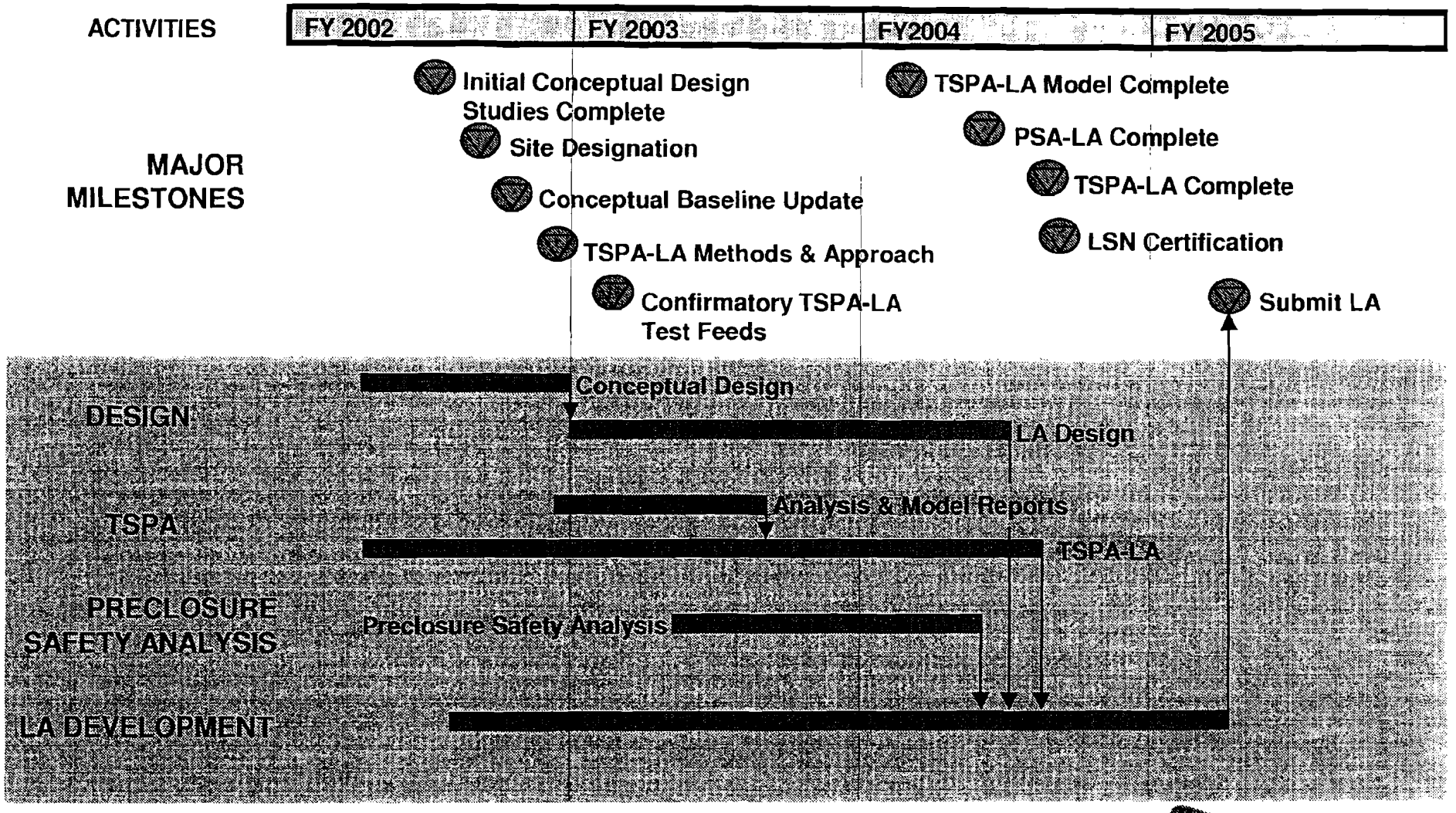
License Application Status

Presented to:
Nuclear Regulatory Commission

Presented by:
Joseph Ziegler
Acting Director, Office of License Application and Strategy
Office of Repository Development
U.S. Department of Energy



Summary Schedule to LA Submittal

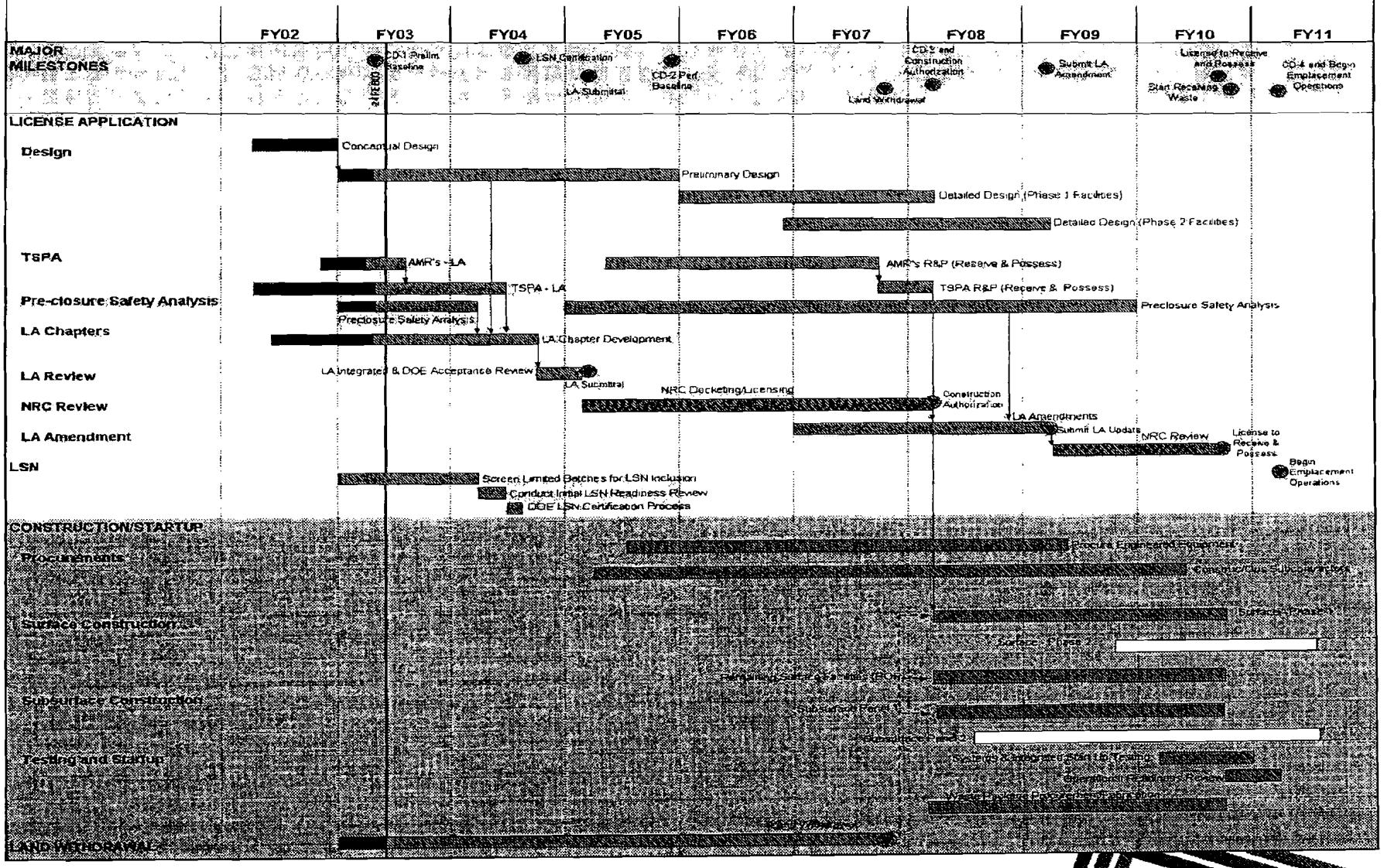


YUCCA MOUNTAIN PROJECT

Exhibit 18

Exhibit 18

YUCCA MOUNTAIN PROJECT SUMMARY PLAN TO WASTE EMPLACEMENT



YUCCA MOUNTAIN PROJECT

Yucca Mountain Project

Critical Path Float Values to LA

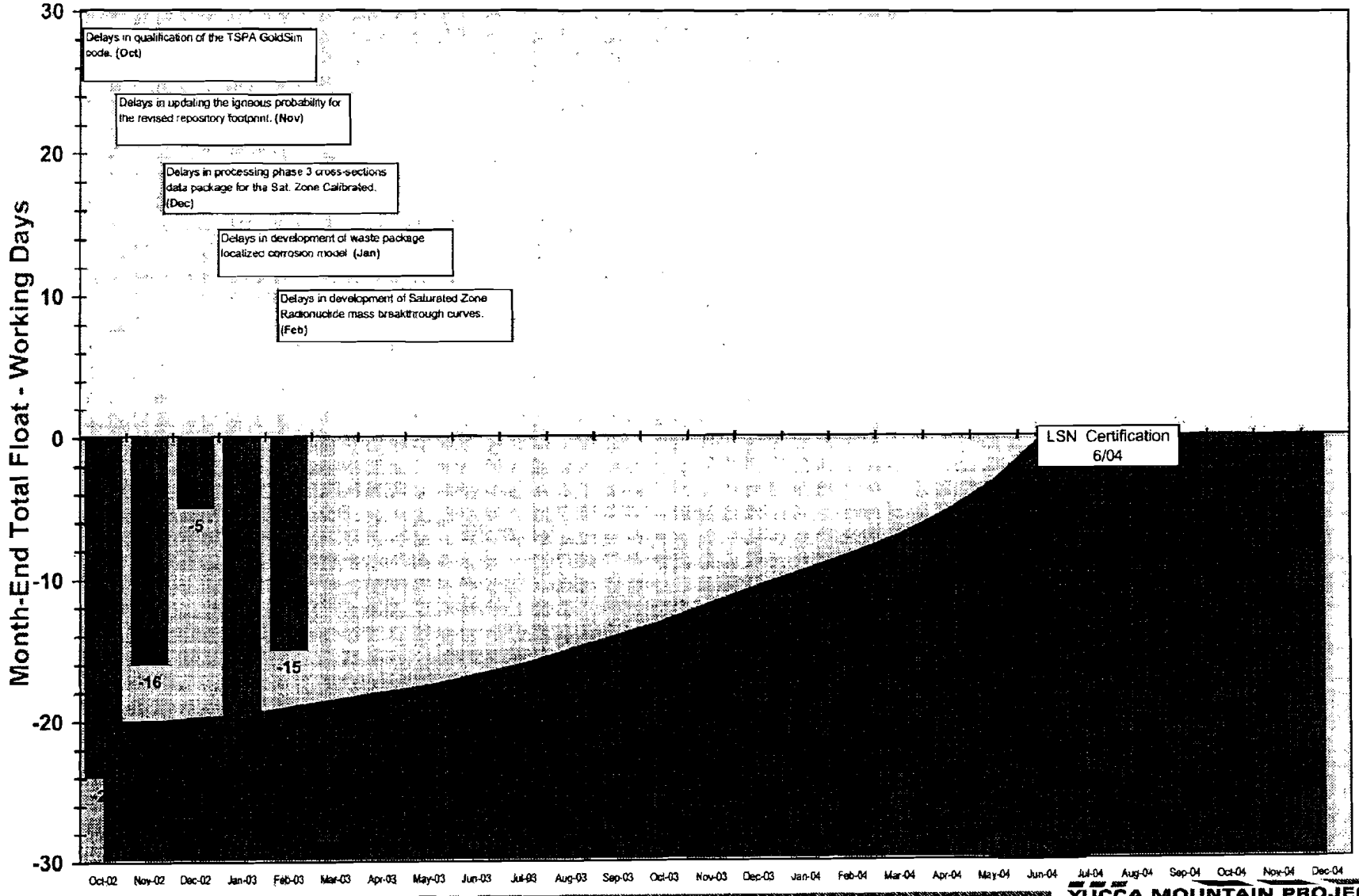


Exhibit 19

Exhibit 19

U.S. Department of Energy
Office of Civilian Radioactive Waste Management

Exhibits For Illustration

Presented to:
Nuclear Waste Technical Review Board

Presented by:
W. John Arthur, III
Deputy Director, Office of Repository Development
U.S. Department of Energy

May 13, 2003
Washington, DC

Preliminary Draft Yucca Mountain Decision Schedule

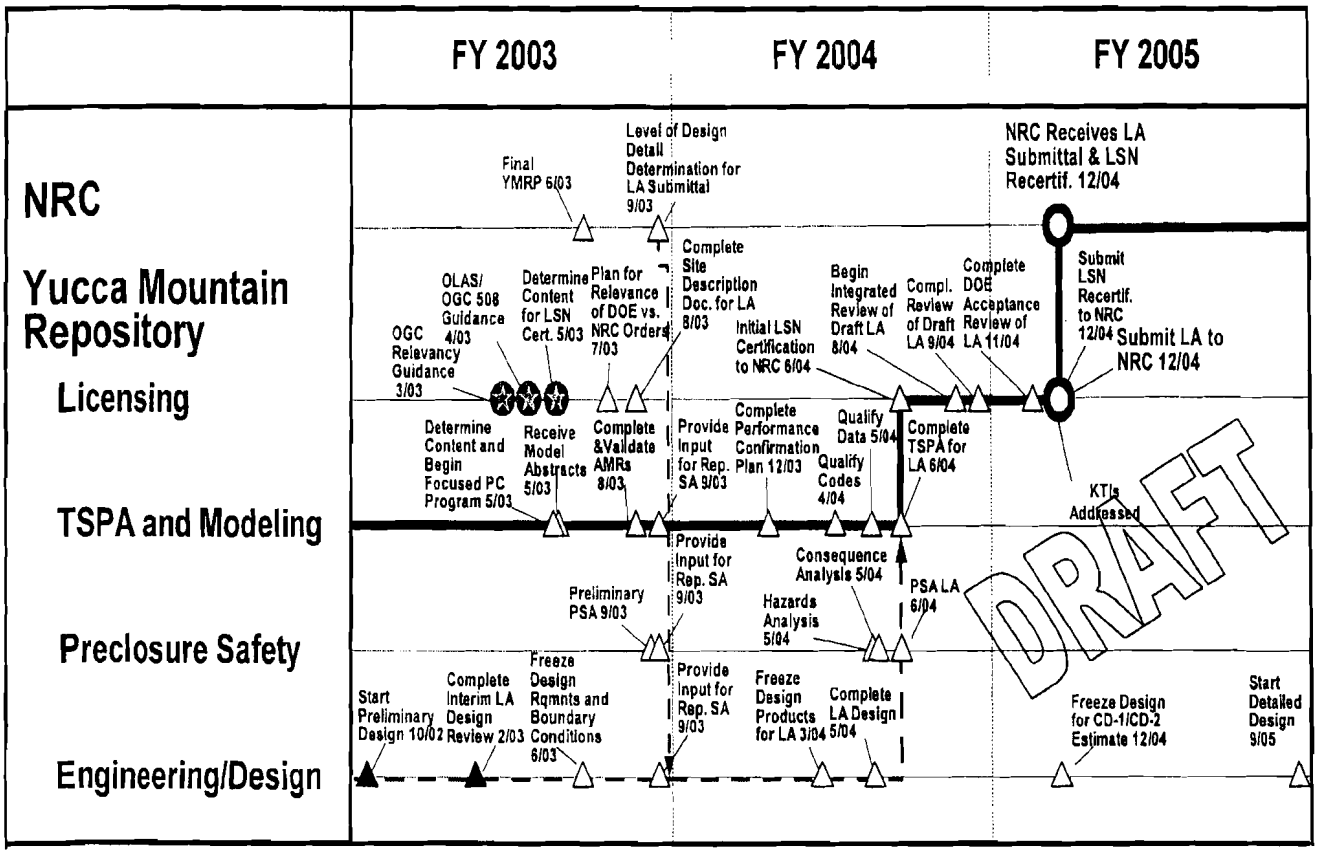


Exhibit 20

Exhibit 20

DRAFT

Performance Assessment & Modeling Assumptions and Work Sequence

39. TSPA used for the compliance case will continue to utilize a logic sequence involving data collection, AMR development revisions (process models & abstractions), PMR revisions, TSPA revision, and sensitivity evaluations. There will be one complete revised TSPA update prior to the LA submittal.

40. Process model development and TSPA analyses will utilize bounding and conservative arguments, and will incorporate margin in the development of material used to support compliance arguments. TSPAs performed in support of the compliance argument will utilize the AMR/PMR/TSPA documentation structure, the contents of which will not extend beyond bounding arguments defined by the RSS Rev 4 and by additional commitments to close KTI agreements, where such agreements center upon the TSPA representation of the process. "Best Estimate" predictions, realistic evaluations, and quantification of uncertainties will be performed to supplement the bounding evaluations to provide management and NRC insight into the bounding and conservative nature of the models and evaluations. The documentation form of these activities will be developed and implemented with sufficient time to consider implications of the "best estimate" results on the compliance arguments.

Regulatory Assumptions and Work Sequence

15. The draft LA chapters will be complete within two months after the inputs to the chapters are complete.

16. The schedule will accommodate early and phased review by NRC of programmatic, design, and science and analysis topics between SR and LA. Documentation shall be complete to the point that meaningful discussions can be held with the NRC. A detailed interactions schedule will be developed to show the relationships of the supporting work to the interactions. During the six month period prior to LSN certification, the schedule will accommodate early and phased review by NRC of completed programmatic, design, and science & analysis documentation. Documentation completed earlier than this time frame will be provided to NRC as soon as it is available. Documentation supporting the license application will be "frozen" at the time of LSN certification. Continued evolution of material will be utilized to support post-docketing interactions with the NRC.

Regulatory Assumptions and Work Sequence

17. LSN certification will occur six months prior to the License Application submittal. There will be no substantive safety related changes between certification of the LSN and License Application submittal (documentation supporting the LSN will be "frozen"). The schedule will be adjusted to allow ISA and TSPA backcheck and adjustment prior to LSN certification.

18. The preclosure safety strategy will continue as described in the last version of the RSS (Revision 4).

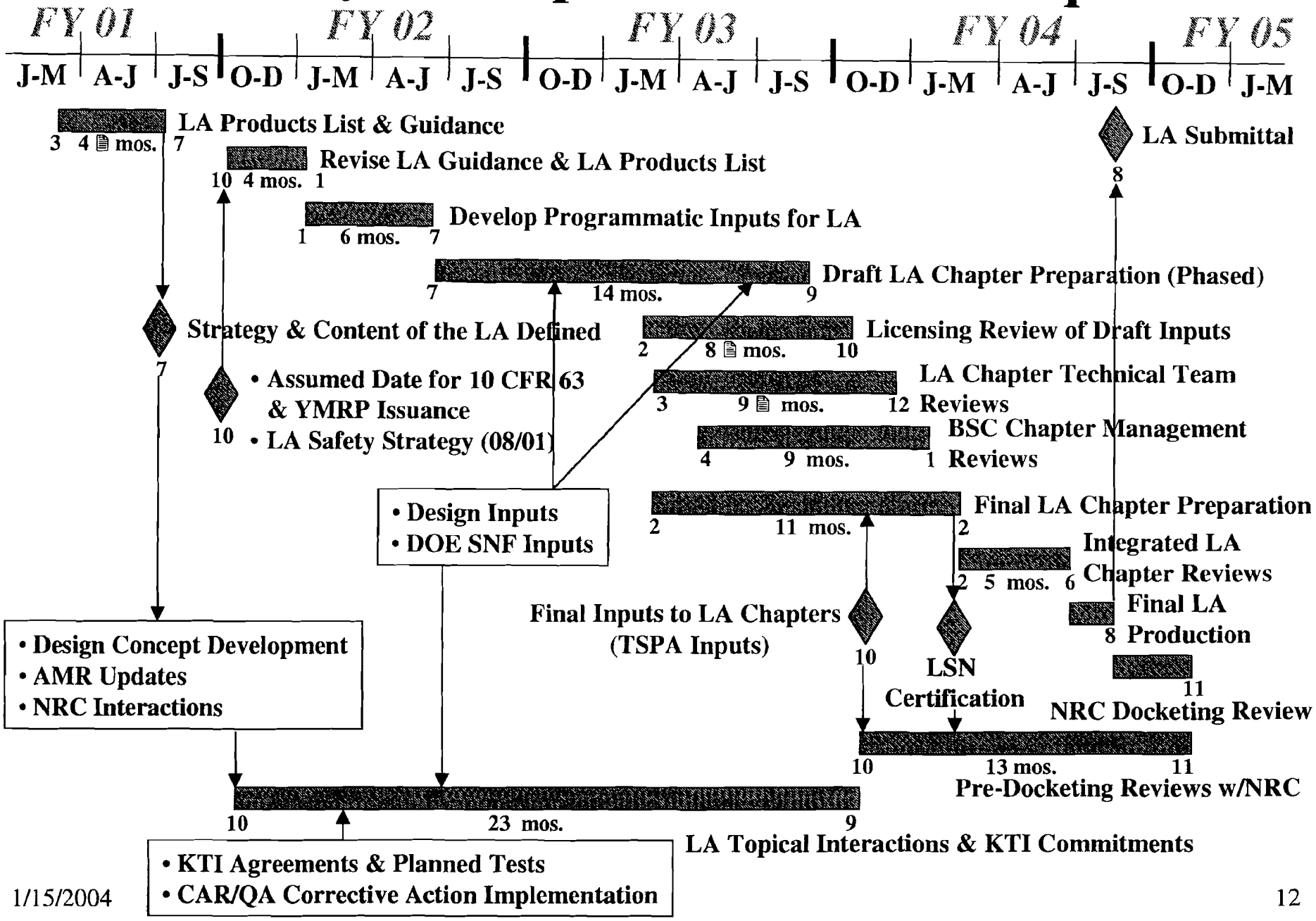
19. The postclosure safety strategy will continue to focus on the principal factors contained in RSS Rev 4, augmented by work conducted to resolve KTIs. Continued testing and model development in support of compliance arguments will focus on these areas.

20. The LA and LA Update review schedule will be streamlined such that technical reviews by BSC, DOE, General Council, and Naval Reactors will be held concurrently. Management reviews by BSC (including the NR review) and DOE will be held in series, but will serve only as a confirmatory review rather than another detailed technical review.

DRAFT

DRAFT

Regulatory Assumptions and Work Sequence



Regulatory Assumptions and Work Sequence

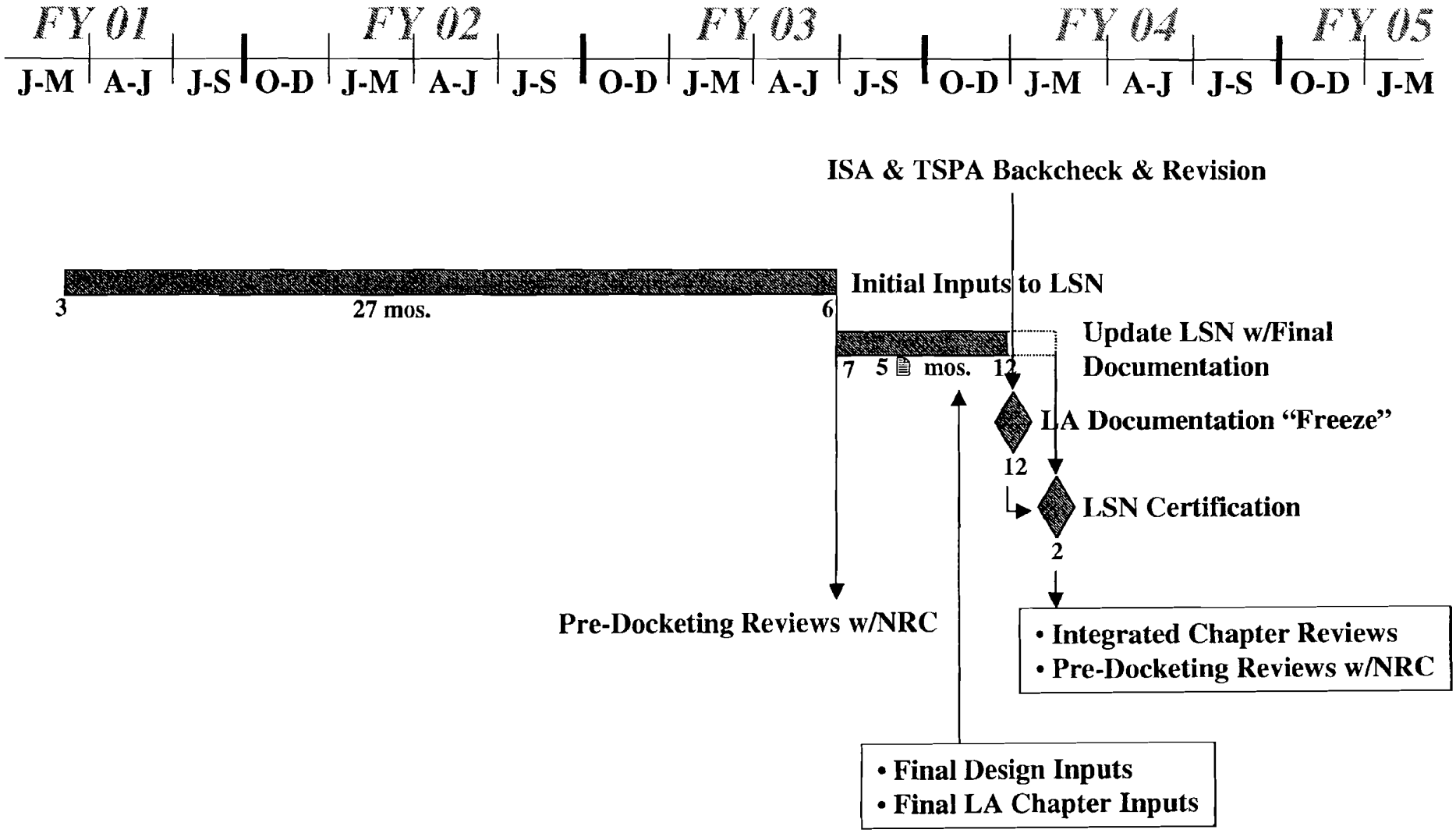


Exhibit 21

Exhibit 21

From: Dyer, YMP
To: Chu, OCRWM

Subject: Approach for LSN Certification

References: April and Jake's letter
Brocoum letter to Ben McGrae

Claudia, I incorporated your changes that still applied with this revision....

If the Yucca Mountain site is designated to become the nation's first geologic repository for High-Level Radioactive Waste, the Department's next major milestone is to submit a License Application to the Nuclear Regulatory Commission (NRC). In order to docket the License Application (LA), the NRC requires that the Licensing Support Network (LSN) be available to facilitate timely NRC technical review, and petitioner discovery-type review, of the Department's LA. LSN provides access to relevant documents before any LA is submitted, and is intended to to supplant the need for the traditional document discovery process after the LA is submitted. Additional information on the regulatory background can be found in Enclosure 1.

It is OCRWM's obligation to fulfill the LSN requirements in 10 CFR 2, Subpart J, and Topical Guidelines 3.69, and certify the LSN at least six months prior to any LA submission. Had steps not been taken years earlier, timely LSN certification would be near impossible.

Anticipating a possible need for LSN certification, YMP took several actions: aligning the records database to facilitate LSN certification; implementing procedures to capture any inclusionary records and trained personnel on these procedures. Without these early steps, manual screening for LSN relevancy would be a necessity for each record. A crosswalk of requirements in 10 CFR 2, Subpart J with RMS Document Types is available in Enclosure 2.

Our approach in certifying the LSN is to:

- Automatically include key documents (VA, SCP, EIS, SR, etc)
- Automatically include records designated as inclusionary in the RMS
- Screen remaining records either manually, or using software queries for:
    - Exclusionary material
    - Documentary material
    - Privileged material (header only)
        - legal
        - preliminary drafts
        - Homeland Security sensitivities
- Use appropriate personnel to screen for classified material (header only)
- Ensure header information for the records is accurate
- Place records onto LSN servers
- Three months prior to initial certification, DOE perform a readiness review

Additional detail on RMS Document Types, Numbers, and Relevancy Method can be found in Enclosure 3. Printed examples of some actual RMS documents are contained in Enclosure 4.

This approach is an attempt to balance the need to fulfill requirements for LSN certification and the NRC's technical review and discovery process; the desires of OGC for litigation support and preparation; and the anticipated time remaining. The first objective however is to ensure all information required to fulfill the criteria in the YM Review Plan (YMRP) is available within the LSN. Risk can be taken in areas where there is no direct connection in fulfilling YMRP criteria. The NRC is interested in a *"more focused set of materials most important to the licensing proceeding. It is not interested in the entire backlog of DOE and other parties' material, some of*

Exhibit 22

Exhibit 22

March 2004
Rev. 04

CACI

Requirements for Inclusion of DOE Documents In Licensing Support Network (LSN)

TALISMAN

Frequently Asked Questions

Introduction

The Department of Energy is responsible for implementation of the Nuclear Waste Policy Act (NWPA) P. L. 97-425, as amended. This Act provides for the siting, construction, and operation of repositories for the permanent disposal of high-level radioactive waste and spent nuclear fuel, in a manner that fully protects the health and safety of the public and the quality of the environment.

The President has designated Yucca Mountain, in Nevada, as the site for the first repository and the Congress has affirmed this designation. Under the provisions of the NWPA, construction and operation of the Yucca Mountain repository will require DOE to apply for and obtain a license from the U. S. Nuclear Regulatory Commission (NRC). The NRC has issued a regulation, Procedures Applicable to Proceedings for the Issuance of Licenses for the Receipt of High-level Radioactive Waste at a Geologic Repository, in 10 CFR 2, Subpart J, which defines the scope and process of discovery for the licensing proceeding. This regulation includes provisions that require DOE to provide the general public and parties to the licensing hearing with electronic access to all documentary material relevant to the licensing proceeding. These documents will be provided in the Licensing Support Network (LSN), which will take the place of the normal document discovery process used in an NRC licensing proceeding. The NRC also has issued regulatory guidance regarding the LSN. The NRC regulations require that the relevant documents be loaded in the LSN and be available electronically six months prior to DOE's submittal of the Yucca Mountain license application.

Support Network (LSN) at this time?

A. DOE needs to prepare now to meet the regulatory requirements for the LSN defined in 10 CFR Part 2, Subpart J, "Procedures Applicable to Proceedings for the Issuance of Licenses for the Receipt of High-Level Radioactive Waste at a Geologic Repository." The Nuclear Waste Policy Act directs the NRC to issue its licensing decision within 3 years after the DOE license application is submitted. Given this short period of time, the LSN will provide access to all documents that are relevant to the Yucca Mountain license proceeding in advance of the license application submittal and will be used instead of the traditional NRC document discovery process.

Q. Has the Department provided direction on which documents should be included in the LSN and through what process they should be provided?

A. Yes. On May 5, 2003, the DOE General Counsel, Lee Liberman Otis, issued a memorandum entitled "Screening and Processing of Licensing Support Network Documentary Material." The memo (sometimes referred to as the "call memo") provides guidance on identifying potentially relevant documents that must be submitted to CACI for processing into the LSN as well as those potentially relevant documents that must be segregated and retained in the event they must be produced at a later time. This memo also provides direction on the processes for providing the documents to CACI and certifying that all potentially relevant documents have been segregated and either submitted or retained.

Q. How is the NRC defining the term documents for purposes of satisfying the discovery requirements?

A. Document is defined in 10 CFR 2.1001 as " any written, printed, recorded, magnetic, graphic matter, or other documentary material, regardless of form or characteristic."

except those pertaining to the topics discussed in the Management and Organization section of the FAQs.

Modeling and Performance Assessment

Q. Are modeling and uncertainty and sensitivity analyses required to be included in the LSN?

A. Yes. DOE will be required to develop complex predictive models of repository performance. Models will be used to analyze natural features, events, and processes; to develop the design of engineered systems, to assess repository performance; to evaluate the expected impact of the repository on the reference biosphere; and to demonstrate compliance with performance objectives. DOE is required to consider alternative conceptual models of repository features and processes consistent with available data, and to evaluate the effects that different models have on predicted repository performance. DOE must also explain the technical bases for the models relied on to demonstrate compliance with performance objectives in accordance with 10 CFR 63.113. Documentation on modeling activities is required by 10 CFR 63.16, 10 CFR 63.21, and identified in Draft Regulatory Guide DG-3022.

Q. Are documents related to expert elicitation and peer review required to be included in the LSN?

A. Yes. DOE may elicit advice from the scientific community to ensure that the data, models, methods, and analysis used in the design of the repository are based on the latest available scientific understanding and the full range of expert opinion. Inclusion of documentation on the elicitation of expert opinion is required by 10 CFR 63.21 and listed

in DG-3022. Information related to the use of expert elicitation for the model abstractions that NRC anticipates reviewing during licensing is described in Section 2.2.1.3 of the Yucca Mountain Review Plan. Administrative and programmatic review requirements for the NRC staff for evaluating the control of expert elicitation are described in Section 2.5.4 of the Plan.

Q. Are pre-closure safety analysis and post-closure performance assessment, including accident analyses, probabilistic assessments, consequence analyses, and documents related to the demonstration of compliance with public health, groundwater protection, and human intrusion standards required to be included in the LSN?

A. Yes. The two main reports that DOE must produce to demonstrate compliance with NRC performance objectives are a pre-closure safety analysis and a post-closure performance assessment. Any document bearing on information contained in these reports – including description and technical basis of the repository design; identification of structures, systems and components, equipment, and process activities; description of the geologic setting and natural features, events, and processes; technical basis for including or excluding degradation, deterioration and alteration processes of engineered barriers; technical basis for the identification of hazards, event sequences, and consequences; and choice of supporting data, analytical methods, models, treatment of uncertainties, and assignment of probabilities – is required to show compliance with 10 CFR 63.21 and 10 CFR 63 Subpart E and must be included in the LSN. The detailed scope of information needed to support the Pre-closure Safety Analysis and Post-closure Performance Assessment are described in Sections 2.1 and 2.2 respectively of the Yucca Mountain Review Plan.

Q. Are documents related to validation and verification of software used in support of the Total System Performance Assessment required to be included in the LSN?

A. Yes. Such documents are part of DOE's Quality Assurance program and are required by 10 CFR 63, Subpart G--Quality Assurance. See also Supplement I to DOE's Quality Assurance Requirements and Description (QARD) DOE/RW-0333P.

Performance Confirmation

Q. Should ongoing activities, or plans for future activities, to confirm the adequacy of the design and of engineered or natural barriers be included in the LSN?

A. Yes. 10 CFR 63 Subpart F requires a continuing program, including in situ monitoring, laboratory and field testing, in situ experiments, surveillance, measurement, testing, and geologic mapping, during site characterization, repository construction and operation as part of a performance confirmation program. Section 2.4 of the Yucca Mountain Review Plan describes information NRC will review on the performance confirmation program. Documents related to this program should be included in the LSN.

Q. Are procedures, instructions and drawings, and document control documents required to be included in the LSN?

A. Guidance on the content of the performance confirmation program is contained in Sections 2.4 and 2.5.1.5 of the Yucca Mountain Review Plan. Documents related to the procedures and related documents to be used in the performance confirmation program should be included in the LSN.

Research and Development

Q. Should documents related to research and development to resolve safety questions be included in the LSN?

A. Yes. Section 2.3 of the Yucca Mountain Review Plan addresses the need for information on the research and development program to resolve safety questions related to the design and performance of structures, systems, and components important to safety and the engineered and natural barriers important to waste isolation.

Q. Should documents related to the OCRWM Science and Technology Program be included in the LSN?

A. Yes. Although the OCRWM Science and Technology Program is explicitly distinct from the license application, some of the topical areas addressed by that program are potentially relevant as described in the May 5, 2003, memorandum from the DOE General Counsel, Screening and Processing of Licensing Support Network Documentary Material.

Engineering and Engineered Barriers

Q. What types of Engineering documents must be included in the LSN?

A. Documents related to engineering activities, such as identification and resolution of safety questions, and the design, procurement, fabrication, manufacture and construction of barrier systems, surface facilities, underground facilities, monitoring equipment, post-closure monuments, and other structures, systems and components important to safety and to waste isolation must be included in the LSN.

Q. Are design analyses, including design methodology, design criteria, design bases, and codes and standards required to be included in the LSN?

A. Yes. All documents bearing on the design of structures, systems, components and equipment important to safety and to waste isolation are required to be included in the LSN. This includes information on materials of construction used during the building of the repository operations area; codes and standards used during design and construction; and the dimensions, material properties, specifications, analytical methods, design methods, design criteria, and design bases for structures, systems and components of both the repository operations area and the engineered barrier systems. Documents on the design of systems for physical protection of materials also are relevant. The general requirement for these documents is found in 10 CFR 63.21. The scope of information on design methods, design criteria, design bases and codes and standards that NRC may require in the license application are discussed in Section 2.1.1.7 of the Yucca Mountain Review Plan. The requirement to consider ALARA principles in the design is covered in Section 2.1.1.8 of the Plan.

Q. Are materials analyses required to be included in the LSN?

A. Yes. DOE is required to establish a program for the selection of materials important to safety and waste isolation and their review for suitability of application. A separate requirement calls for DOE to apply design control measures to the compatibility of materials used in the design. Records generated by the materials program are required to be maintained by 10 CFR 63.142. The scope of information on materials and material properties that NRC may require for licensing is described in Section 2.1.1.7 of the Yucca Mountain Review Plan.

Q. Are design control; engineering procedures, instructions and drawings; and document control documents required to be included in the LSN?

Exhibit 23

Exhibit 23

July 2006
FAQ Rev. 6

CACI
EVER VIGILANT

Requirements for Inclusion of DOE Documents In Licensing Support Network (LSN)

TALISMAN

Frequently Asked Questions

General Information

Click here to go to the top of the *General Information* section, or click below on the subcategory related to your question:

CACI
EVER VIGILANT

Requirements for Submittal of Documents for the Licensing Support Network (LSN)

TALISMAN

Frequently Asked Questions

Introduction

The Department of Energy is responsible for implementation of the Nuclear Waste Policy Act (NWPA) P. L. 97-425, as amended. This Act provides for the siting, construction, and operation of repositories for the permanent disposal of high-level radioactive waste and spent nuclear fuel, in a manner that fully protects the health and safety of the public and the quality of the environment.

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During August 2002, the General Counsel of DOE and the Director of OCRWM directed

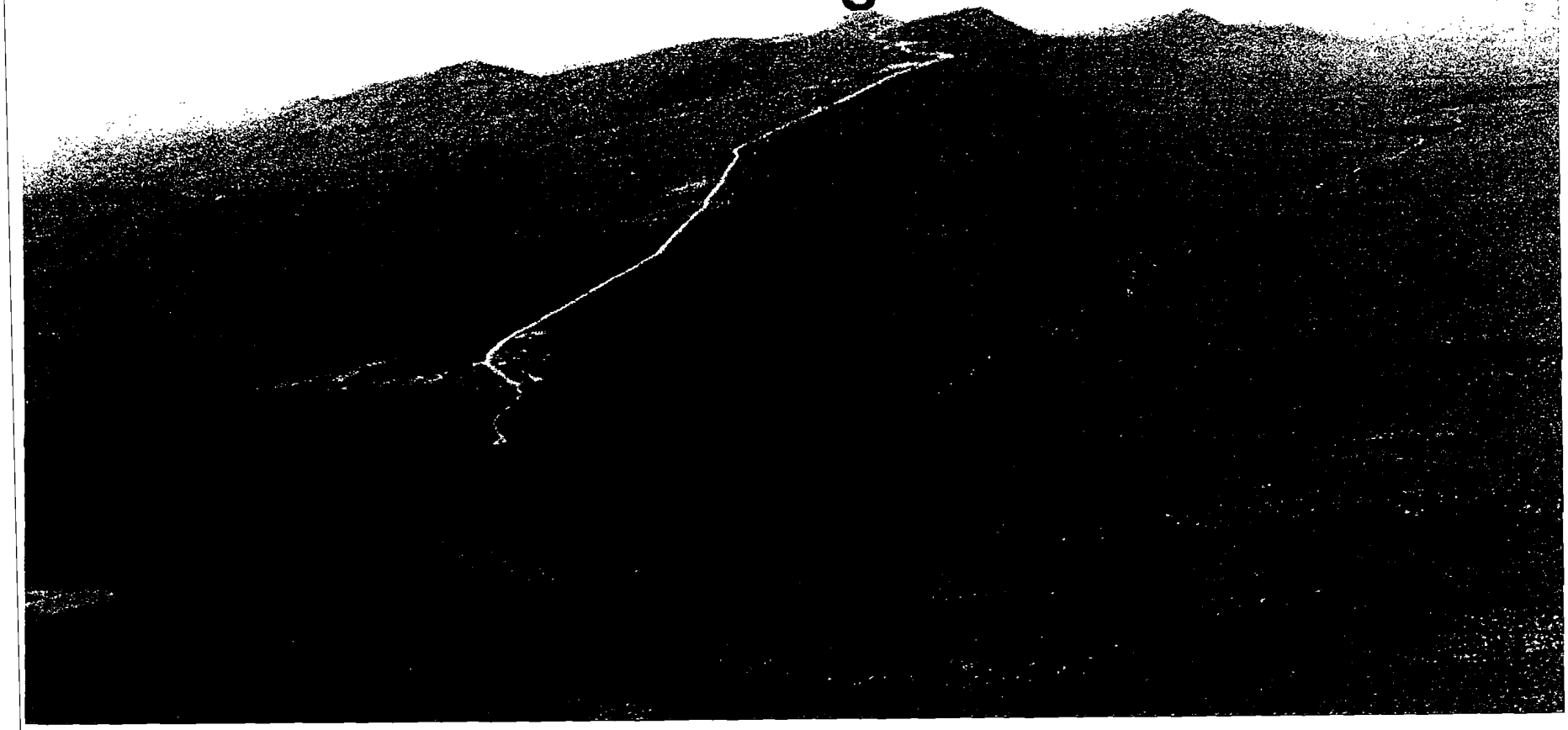
Exhibit 24

Exhibit 24

U.S. Department of Energy
Office of Civilian Radioactive Waste Management

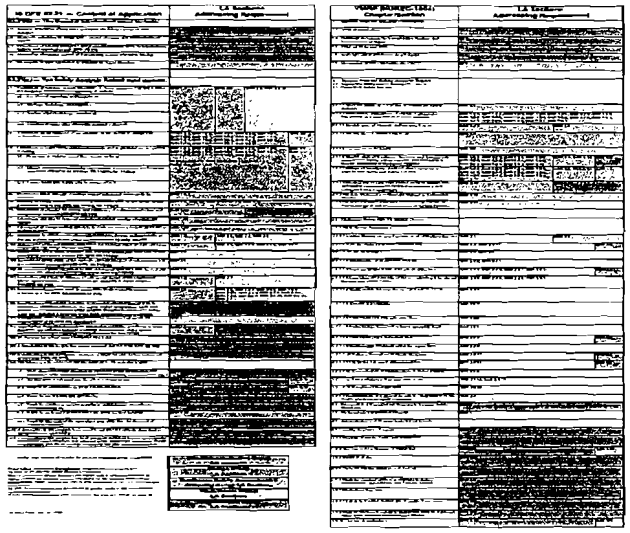
www.ocrwm.doe.gov

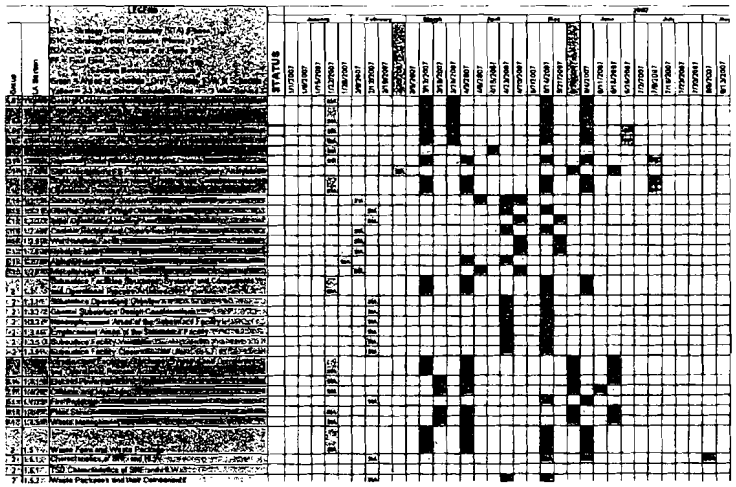
DOE/NRC Quality Assurance Technical Exchange



Management Plan Ensures Compliance with NRC Regulations, Guidance Documents and Expectations

- Regulation and NUREG 1804 compliance crosswalks
- Project Organization charts
- Schedule requirements
- LA development process





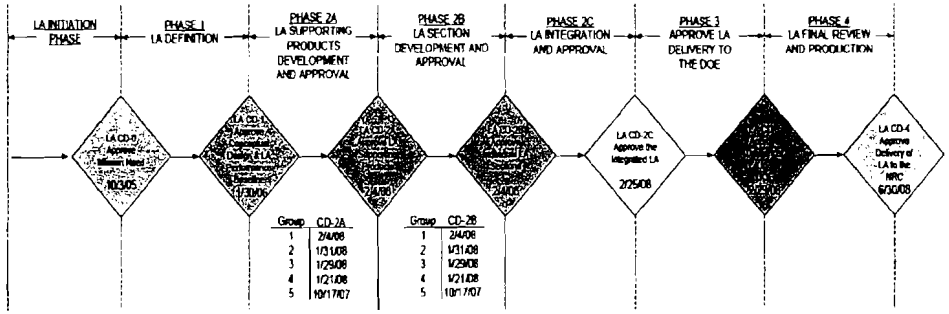


Exhibit 25

Exhibit 25

OCRWM	COMMENT SHEET	1. QA: NA

DELIBERATIVE PROCESS PRIVILEGED

3. Document Title:

RAO Comments and Resolutions for the CD-1 Packages

4. Document No.:

N/A

5. Date: 1/4/07

6. Manager of Reviewing Organization (Print Name):

RAO

7 Org./Discipline:

8. CODE	9. SECT./PARA.	10. COMMENT/SUGGESTED RESOLUTION	11. RESPONSE
1.	LA Performance Baseline – Critical Path Schedule (by key Area)	This section indicates the LSN is the overall critical path – Total Float = 0 – while the TSPA has 174 days of float. This does not seem reasonable for a Project which has only 15 months to go. Please check if these are correct. (vt) (RAO)	This will be resolved upon incorporation of the SNL baseline.
2.	Consolidated Cost Summary General	Why can't burdened rates be included? (rw) (RAO)	BSC burdened planned budgets are now available to be presented on schedule reports.
3.	LA Risk Register Item 3	This is not a risk. LSN is scheduled to be certified on time. (RAO)	Risk remains attached to adequacy of internal certification and the NRC ASLB acceptance and certification.
4.	LA Risk Register Item 5	Single approach for waste streams evaluation must be adopted by all SAR groups. This approach should be robust and broad to meet NRC expectations. (RAO)	A "single approach" for waste stream evaluations may not be feasible given the range of regulatory requirements and YMRP acceptance criteria that must be addressed with respect waste stream impacts and associated evaluations. For example a waste stream that may represent a bounding preclosure radionuclide inventory for release analyses or criticality analyses may not be representative for evaluating postclosure thermal constraints. Will revise the Risk Mitigation Approach to help clarify in the next revision to the Risk Register..
5.	LA Risk Register Item 8	For one-of-a-kind SSC's (material handling and transportation equipment etc) selective prototype testing by CA will be too late. It should be completed by LA submission to NRC to mitigate this risk. (RAO)	The Mitigation Approach reflects current scope and plans. Additional DOE direction needed. No change made to Risk Register.

OCRWM	COMMENT SHEET	1. QA: NA

DELIBERATIVE PROCESS PRIVILEGED

3. Document Title:

RAO Comments and Resolutions for the CD-1 Packages

4. Document No.:	5. Date: 1/4/07
N/A	

6. Manager of Reviewing Organization (Print Name):	7. Org./Discipline:
RAO	

8. CODE	9. SECT./PARA.	10. COMMENT/SUGGESTED RESOLUTION	11. RESPONSE
20.	LAMP Section 3. LA Project Architecture	Licensing Strategy was referenced but not provided in the package. Need to clarify exactly what should be included in, and purpose for, Licensing Strategy. Relationship to, and ownership of, Risk Register should be specified. (vt) (RAO)	Information related to Risk Register and licensing strategy document was deleted in Draft 31.
21.	P3 General	The critical path goes through "designs available for LA." This has several issues associated with it. i) This activity is not scheduled to finish until 4/17/08, which is after the 2/29/08 due to RW-1. ii) This has nearly 500 predecessor activities. Therefore, essentially the critical path goes through 500 activities. iii) Of the 500 activities, many are BOP activities. iv) Many of these activities are finish to finish logic, not finish to start logic. This logic is flawed. v) The seismic analysis study (1/500 activities) is scheduled to be completed by 9/28/06. Coupled with the FF logic, this means that this critical path item has 383 days of float. As of 12/10/06, there are 319 workdays remaining until 2/29/08. vi) Same comment as 1)a)v) for the event sequences. Event sequences are scheduled to be complete by 9/29/06 (rw) (RAO)	BSC has identified engineering products which are not included in the LA submittal but are required as supporting documents to be available at the time of submittal of the LA. These supporting products have been logically linked in the schedule through a milestone titled "designs available for the LA" with a date of 4/17/08. This milestone is then linked to the LA submittal only to hold the date and not because these products are required in the LA. This was explained to B. Warther on 12/19 by R. Tosetti. This milestone and all of its 500 predecessor activities can be excluded from any critical path analyses. If any of these supporting products goes critical with status and begins to drive the LA date, the logic will be reviewed and adjusted to not allow the late activity to drive the LA.
22.	P3 General	Need to modify the logic and ties for the modified approach to TSPA and AMRs (rw) (RAO)	Pending Sandia baseline schedule integration.

Exhibit 26

Exhibit 26

DN2002440331 3/12/07

Summary of the History and Status of TSPA for Yucca Mountain
March 12, 2007
Peter Swift

Brief history of TSPA for Yucca Mountain

Viability Assessment: Iterations of TSPA for Yucca Mountain began in the latest 1980s, and the first complete system analyses were in the early 1990s. These early TSPAs culminated in a large effort supporting the 1998 Viability Assessment (VA), which provided an assessment of the viability of the site that lead to a decision by the DOE to proceed with the site recommendation process.

The TSPA-VA (1998) received a detailed external review by an external panel chaired by Chris Whipple, completed in 1999. Copies of that review will be provided to the panel.

Site Recommendation and Environmental Impact Statement: In 2000 and 2001, the DOE prepared a TSPA to support the Site Recommendation, TSPA-SR. The origins of the current TSPA are readily visible in the TSPA-SR. TSPA-SR was reviewed by an International Review Team (IRT) in 2001. Mel Gascoyne was a member of that review panel. The IRT review is available on the internet at http://www.ocrwm.doe.gov/documents/ymipr_a/index2.htm and copies will be provided to the IPAR.

This TSPA was updated in 2001 with supplemental science and performance analyses (SSPA) to provide a more realistic treatment of uncertainty (with relaxed conservatism), and the TSPA-SSPA provided the basis for the 2002 Final Environmental Impact Statement (FEIS) that accompanied the 2002 Site Recommendation. TSPA-SR and TSPA-FEIS together form the last published version of the TSPA.

TSPA work since 2002: All TSPA work since 2002 is unpublished, and all is categorized by the DOE General Counsel as privileged, in anticipation of future litigation. No results have been presented in public since 2002, and all TSPA-related material provided to this panel that postdates the TSPA-FEIS must be treated as privileged.

Following the Site Recommendation in 2002, DOE began a schedule of work that would lead to submittal of a license application (LA) to the NRC in December 2004. Preparation of the LA included an update to the TSPA-FEIS to fully qualify models used in the SSPA (the 2001 SSPA used a more realistic treatment of uncertainty that included a relaxing of the model validation requirements believed necessary for licensing). This work led to completion of a draft TSPA-LA Rev 00 in December 2004: however, the DOE chose, for multiple reasons, to delay submittal of an application until the fall of 2005, and work continued on updates to the TSPA. This eventually became TSPA-LA Rev 01E, which was archived in May 2006 without publication and which will not be used to support a license application.

provided to the IPAR after the March 26-28 meeting, in the form of draft Model and Analysis Reports (AMRs) and TSPA Data Input Packages (TDIPs).

We anticipate beginning system-level calculations with the new model in early April, and we anticipate having preliminary results in late May, available for the IPAR to review at their second meeting. We anticipate having final results in August 2007, ready for IPAR review at their third meeting.

The current project schedule calls for TSPA results to be released for public comment as part of the Draft Supplement to the Environmental Impact Statement in October 2007. Final documentation of the TSPA-LA will occur in the fall of 2007, and text and results will be incorporated in the Safety Analysis Report (the primary component of the License Application) for delivery to DOE in January 2008. DOE anticipates delivering the License Application to NRC no later than June 30, 2008.

Exhibit 27

Exhibit 27

In conjunction with an upcoming audit of the TSPA, the Lead Lab has asked whether the Draft TSPA-LA AMR and technical input documents for the TSPA (such as TDIPs) are privileged. The following provides guidance on these questions.

- Drafts of documents are subject to withholding under Exemption 5 of the Freedom of Information Act (FOIA) as preliminary, predecisional documents. Additionally, the NRC regulations for the Licensing Support Network (LSN) expressly exclude all drafts from the LSN (with the exception of "circulated drafts" of reports and studies, which does not apply to this context as a practical matter). 10 CFR 2.1019 (i) (2). Therefore, the Draft TSPA-LA AMR and drafts of any technical input documents are not required to be released under FOIA. Nor are they required to be made available on the LSN. The withholding of these documents from non-Yucca Mountain personnel during the audit of the TSPA would be consistent with the protected status of these documents.

- Once a technical document such as an AMR or TDIP is finalized under project procedures, it is no longer a draft and therefore no longer exempt from disclosure under exemption 5. Similarly, if the document meets the criteria for documentary material in 10 CFR 2.1001, the final version of the document must be included on the LSN at the time of DOE's certification. However, this applies to the final version of the technical document only. The drafts of the document remain exempt from FOIA and the LSN even though the document has been finalized.

Exhibit 28

Exhibit 28

5

Environmental Impacts of Postclosure Repository Performance

from the repository to the surface and their downwind transport. DOE analyzed these possible airborne releases in the Yucca Mountain FEIS. Section 5.6 provides a summary of this analysis. Because DOE is not aware of significant new information or circumstances that bear on this analysis, DOE would not expect any change in the estimated impacts from the escape of gaseous radionuclides; therefore, DOE did not conduct a new analysis for this Repository SEIS.

10 CFR PART 63 and 40 CFR PART 197

In 2001, both EPA and NRC adopted public health and safety standards for any radioactive material to be disposed of in a Yucca Mountain repository. In 2004, in response to legal challenges, the U.S. Court of Appeals for the District of Columbia Circuit struck down the portions of those standards that addressed the period of time for which compliance must be demonstrated and remanded the provisions to the federal agencies for revision.

In 2005, EPA proposed new standards to address the court's decision. The proposed standards incorporate multiple compliance criteria applicable at different times for protection of individuals, the environment, and in circumstances involving human intrusion into the repository. The proposals also identify certain specific processes that must be considered in projecting repository performance. When finalized, these standards will be codified in 40 CFR Part 197, Subpart B.

Because Section 801 of the *Energy Policy Act of 1992* requires NRC to modify its technical requirements for licensing of a Yucca Mountain repository to be consistent with the standards promulgated by EPA, NRC also proposed new standards in 2005 to implement the proposed EPA standards for doses that could occur after 10,000 years but within the period of geologic stability. The proposed NRC standards also specify a value to be used to represent climate change after 10,000 years, as required by EPA, and specify that calculations of radiation doses for workers use the same weighting factors that EPA proposed for calculating individual doses to members of the public. When finalized, these standards will be codified in 10 CFR Part 63.

In developing the TSPA-SEIS model for the analysis in this Repository SEIS, DOE took into consideration the regulatory requirements in the proposed EPA and NRC standards to provide a perspective on potential radiological impacts during the postclosure period. The TSPA-SEIS model for the analyses in this Repository SEIS is in the process of being finalized for purposes of the compliance assessment to be included in the application DOE intends to file with NRC for construction authorization for a Yucca Mountain repository.

The analysis for this Repository SEIS estimated potential human health impacts from the groundwater and atmospheric transport pathways at the location of the *reasonably maximally exposed individual* (RMEI; 40 CFR 197.21), which is approximately 18 kilometers (11 miles) downgradient from the proposed repository. A hypothetical "reasonably maximally exposed individual (RMEI)" is defined with parameters that significantly affect exposure estimates set at high values so that the hypothetical individual is "reasonably maximally exposed" for the purpose of assessing potential doses that could result from releases of radioactivity from a repository. These impacts represent both radiological doses and probabilities of resultant *latent cancer fatalities*. A latent cancer fatality is a death that results from *cancer* from exposure to *ionizing radiation* or other *carcinogens*.

DOE has made modifications to the repository design and operational plans since the completion of the Yucca Mountain FEIS. DOE has modified the Total System Performance Assessment (TSPA) model to account for these changes, as well as additional data it has collected since the completion of the FEIS. Section 5.1 summarizes modifications that this Repository SEIS addresses in the TSPA model. For this

Exhibit 29

Exhibit 29

June 15, 2007

Robert R. Loux, Executive Director
Agency for Nuclear Projects
Office of the Governor
State of Nevada
1761 E. College Parkway, Suite 118
Carson City, NV 89706

SUBJECT: U.S. NUCLEAR REGULATORY COMMISSION'S PLANS FOR REVIEW OF THE U.S. DEPARTMENT OF ENERGY'S TOTAL SYSTEM PERFORMANCE ASSESSMENT

Dear Mr. Loux,

On behalf of the U.S. Nuclear Regulatory Commission (NRC), I am responding to your letter, dated May 16, 2007, to Chairman Dale E. Klein. In your letter, you state that our letter, of May 7, 2007, suggests that "NRC staff was preparing to abdicate its review responsibilities over the TSPA and accept the system simply as DOE's black box."

Nothing in our May 7, 2007, response to your earlier letters on this subject supports this assertion. NRC staff expects that U.S. Department of Energy (DOE) will provide full and complete access to any information that staff finds necessary for conducting its review. This includes access to the Total Systems Performance Assessment (TSPA) code and its supporting documentation. As stated in our previous letter, NRC's review will ensure that the models and data implemented in the TSPA credibly represent repository performance. Our evaluation of DOE's performance assessment (PA) will be based on regulations, at 10 CFR Part 63, that contain detailed requirements for the content of a PA, and on the guidance, in the Yucca Mountain Review Plan (YMRP), that is specific to NRC's review of DOE's TSPA. For example, the YMRP states that the staff will, among many other review activities related to the TSPA, "...confirm that the total system performance assessment code is properly verified, such that there is confidence that the code is modeling the physical processes in the repository system in the manner that was intended." (YMRP 2.2.1.4.1.2, Review Method 3) Although none of these methods necessarily requires independent execution of the TSPA, these methods do require that DOE supply extensive, high-quality documentation to support the licensing review. Simple duplication of DOE results is not a substitute for a detailed review of the TSPA.

Exhibit 30

Exhibit 30

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

CHAIRMAN

September 28, 2007

The Honorable Harry Reid
United States Senate
Washington, D.C. 20510

Dear Senator Reid:

On behalf of the U.S. Nuclear Regulatory Commission (NRC), I am responding to your letter of July 25, 2007, regarding the NRC staff's review of the U.S. Department of Energy's (DOE's) anticipated license application for a geologic repository at Yucca Mountain, Nevada. Specifically, you expressed the view that DOE's total system performance assessment (TSPA) and its underlying assumptions, including the computer modeling which supports the results of DOE's calculations, should be a major aspect of NRC's review and you are concerned that NRC may be planning to "abdicate this review responsibility." You also expressed a belief that all interested participants in the potential licensing proceeding should have full access to DOE's TSPA model and results so as to permit reproducibility, traceability, data verification, and accuracy.

I want to assure you that, if DOE submits a license application, the NRC has no intention of abdicating its review responsibility. The NRC staff will carry out a comprehensive, independent safety review of DOE's TSPA and will document the results of its review in a public Safety Evaluation Report. The staff's Yucca Mountain Review Plan describes the staff's approaches for conducting its comprehensive review, including evaluation of the capabilities of the barriers important to waste isolation and the thorough review and testing of the parameters and conceptual models in DOE's TSPA. With regard to examination of the computer modeling and assumptions, which form the basis for the results of DOE's calculations, NRC staff intends to review the TSPA to confirm that appropriate scenarios were evaluated in the TSPA, that the models and data credibly represent repository performance, and that the resulting dose estimates are statistically stable and consistent. The enclosure to this letter provides additional detail on NRC staff's plans to review DOE's TSPA and the availability of NRC staff's review information for examination by stakeholders. Conducting the literally hundreds of computer runs necessary to support the license application in a timely manner and being able to save intermediate data for NRC's licensing review requires the massive computer system being utilized by DOE. It is DOE's responsibility, as an applicant for an NRC license, to run these simulations on TSPA. It is NRC's responsibility to confirm the validity of these simulations.

During the execution of the TSPA, the results of the calculations are saved in computer files containing both the results of overall performance (e.g., estimates of dose) as well as intermediate results (e.g., infiltration rates, degradation rates of waste packages, timing and release rate of radionuclides from the waste package, timing and release rate of radionuclides from the saturated zone). The computer program and files of DOE's TSPA allow NRC to review and confirm the many calculations within the TSPA and to examine the parameters,

models and assumptions. This information is expected to be in the license application, which will be available to all stakeholders. Additionally, the Commission intends to ensure that the public, at a minimum, will have access to any TSPA codes and data that are accessible to the NRC staff or that impact safety determinations providing the data does not involve appropriately protected information.

The Commission is confident the NRC staff is prepared to review DOE's TSPA in support of the license application. This review process will be open to the public. In addition, the NRC staff will be briefing your staff on this topic as well as other issues in early October and will be able to directly address any additional questions you or your staff may have either on the enclosure or on other topics at that time. If you have further questions, please contact me.

Sincerely,

Dale E. Klein

Enclosure:
Key Elements of Staff Review of DOE's
TSPA Computer Program and Files

Similar letter sent to: (Congressman Porter & Heller - 2nd page different from others)

The Honorable Harry Reid
United States Senate
Washington, D.C. 20510

The Honorable John Ensign
United States Senate
Washington, D.C. 20510

The Honorable Shelley Berkley
United States House of Representatives
Washington, D.C. 20515

The Honorable Jon Porter
United States House of Representatives
Washington, D.C. 20515

The Honorable Dean Heller
United States House of Representatives
Washington, D.C. 20515

Key Elements of Staff Review of the Department of Energy's Total System Performance Assessment Computer Program and Files

The U.S. Department of Energy's (DOE) total system performance assessment (TSPA) comprises many parameters, models and assumptions that are represented mathematically in 'computer files' using the GOLDSIM computer software package, which is referred to collectively as the TSPA. The TSPA fulfills two primary functions. The first is to integrate many process-level models (e.g., infiltration, radionuclide transport, corrosion) in order to simulate overall system performance and produce estimates of expected dose. The second function is to iterate these performance simulations many times varying certain input parameters within ranges that capture natural variability and uncertainty; this is the stochastic[1] component. DOE uses this computer program to run hundreds of simulations, or "runs," to depict the different ways a potential repository could perform. The program saves these estimates of overall repository performance, expressed as dose estimates, in separate computer files. Still other files are created to preserve intermediate results (such as infiltration rates, degradation rates of waste packages, timing and release rate of radionuclides from the waste package, timing and release rate of radionuclides from the saturated zone). Careful review of the computer program itself, as well as review of the many files created when it runs, will allow the U.S. Nuclear Regulatory Commission (NRC) to follow and confirm the many calculations within the TSPA and to examine the component parameters, models and assumptions relied on in the license application. DOE must include all the information necessary to complete this examination in the license application, and make the application available to all parties. Examination, as used here, means that the input data, calculations, and linkages between processes can be followed in the DOE TSPA. The only requirement for an array of multiple computers of the scale DOE has developed is for running the hundreds or more individual simulations that capture the full range of uncertainty and variability in a relatively short time frame.

To gain insights into how the TSPA for the license application may be used, NRC has obtained published versions of the TSPA used for the Final Environmental Impact Statement (FEIS) and for the Site Recommendation (SR). NRC staff members are able to use commercially available, desktop computers to examine the computer program and files of the TSPA for the FEIS and SR. Specifically, the staff is able to examine the calculations, results, parameters, models and assumptions within the TSPA for the FEIS and SR.

Key elements of NRC's review of DOE's TSPA computer program and files include:

1) Adequacy of scenarios evaluated in the TSPA

NRC staff will examine the models, parameters, and assumptions in the computer program to verify that scenarios in the TSPA appropriately represent the potential evolution of the repository. For example, the TSPA must account properly for the timing and occurrence of disruptive events.

---

[1] Stochastic means developed in accordance with a probabilistic model.

Enclosure

2) Credibility of TSPA representation of performance

NRC staff will review the computer program and files of the TSPA to determine if the TSPA is properly verified. The goals of this review are to establish: (1) whether the code models the physical processes in the repository system in the manner that was intended; (2) that assumptions made within the TSPA are internally consistent; (3) that estimates of uncertainty in the results are consistent with the model and parameter uncertainty included in the TSPA; and (4) that repository performance and the performance of individual barriers, as represented by DOE, in the TSPA, are consistent and reasonable.

3) Statistical stability and consistency of resulting dose estimates

NRC staff will examine the overall dose estimates, and the intermediate results of the TSPA, to ensure that: (1) the results are statistically stable; (2) the estimated annual dose curves reflect contributions from all the scenarios evaluated; and (3) repository performance and the performance of individual components or subsystems are consistent and reasonable.

The NRC is prepared to perform single simulations of DOE's TSPA. The NRC experience with DOE's TSPA for the FEIS and SR is that single simulations can be performed on a high-performance desktop computer - DOE's computer cluster allows DOE to perform a large number of stochastic simulations in a short period of time that are not possible to perform on a desktop computer. The information required to perform this examination is expected to be in the license application, which will be available to all parties. The NRC staff is exploring the potential for linking several computers to improve efficiency of the licensing review by shortening the time required to perform simulations. However, if additional analyses are necessary, the NRC staff will require DOE to perform additional analyses and submit them for staff review. The staff does not intend to perform its own runs of the TSPA. Simple execution of the computer model is no substitute for the understanding developed through the comprehensive review described in items 1 through 3, above.

The NRC is also prepared to perform independent confirmatory calculations to assist its review of DOE's TSPA at a variety of levels. NRC has developed its own, independent performance assessment model, as well as its own, detailed hydrologic models that NRC will use to support its critique of DOE's TSPA. The NRC's independent total-system performance assessment model (TPA) is publicly available. Over the past 20 years, the NRC staff has published a number of reports documenting the development of TPA and the insights gained from its use. If these independent confirmatory calculations indicate the need for additional information, the staff will request the additional information from DOE. As appropriate, NRC independent confirmatory calculations would be documented in the NRC's Safety Evaluation Report.

Exhibit 31

Exhibit 31

Department of Energy
Washington, DC 20585

June 8, 2007

Robert R. Loux, Executive Director
Nevada Agency for Nuclear Projects
1761 E. College Parkway, Suite 118
Carson City, NV 89706

Dear Mr. Loux:

Thank you for your letter dated May 16, 2007 requesting assurance that the Department of Energy (DOE) will provide the State of Nevada with access to the Total System Performance Assessment (TSPA) that DOE is preparing for its Yucca Mountain license application. You specifically requested the computer code that will be used for the TSPA as well as access to the computer systems DOE will use for its TSPA calculations.

As a preliminary matter, we disagree with your assertion that the Licensing Support Network (LSN) regulations require DOE to make available the TSPA and its associated computer code at the time of DOE's initial certification. To the contrary, the LSN regulations provide for an initial certification by DOE and then a supplemental certification when DOE submits the license application. That two-part process clearly presupposes that all of DOE's analyses need not be completed at the time of DOE's initial certification, for otherwise there would be no need for a supplemental certification. The rulemaking history of the LSN regulations fully supports this result.

We additionally disagree with your assertion that the LSN regulations require DOE to provide access to its computer systems. The LSN regulations address the production of documentary material and in no way obligate DOE to provide access to its computer systems.

Morever, we agree with the Nuclear Regulatory Commission (NRC) that, as stated in its May 7, 2007 letter to you, the capability of a third party to indepently execute the TSPA computer code is not a prerequisite for developing an adequate understanding of the DOE performance assessment. DOE will support its TSPA in a traceable and transparent manner to allow NRC and others to review whether 1) adequate scenarios were evaluated in the TSPA; 2) models and data credibly represent repository performance; and 3) resulting dose estimates are statistically stable. DOE currently is working on completing the underlying Analysis Model Reports for the TSPA, developing and verifying the TSPA codes and performing the TSPA calculations. Subsequent to completion and verification of the TSPA supporting documentary materials, including the inputs, models, computer programs and computer runs for the final TSPA, we will make those materials available consistent with the LSN regulations.

All that said, and while not required for the licensing proceeding, we would like to discuss with the State of Nevada the possibility of making DOE personnel and resources available to assist them in understanding the TSPA methodology, assumptions, modeling, and calculations. Such assistance would be subject to funding, available resources and other constraints.

If you would like to discuss this matter further, please do not hesitate to contact me.

Sincerely,

Edward F. Sproat, III, Director
Office of Civilian Radioactive
Waste Management

Exhibit 32

Exhibit 32

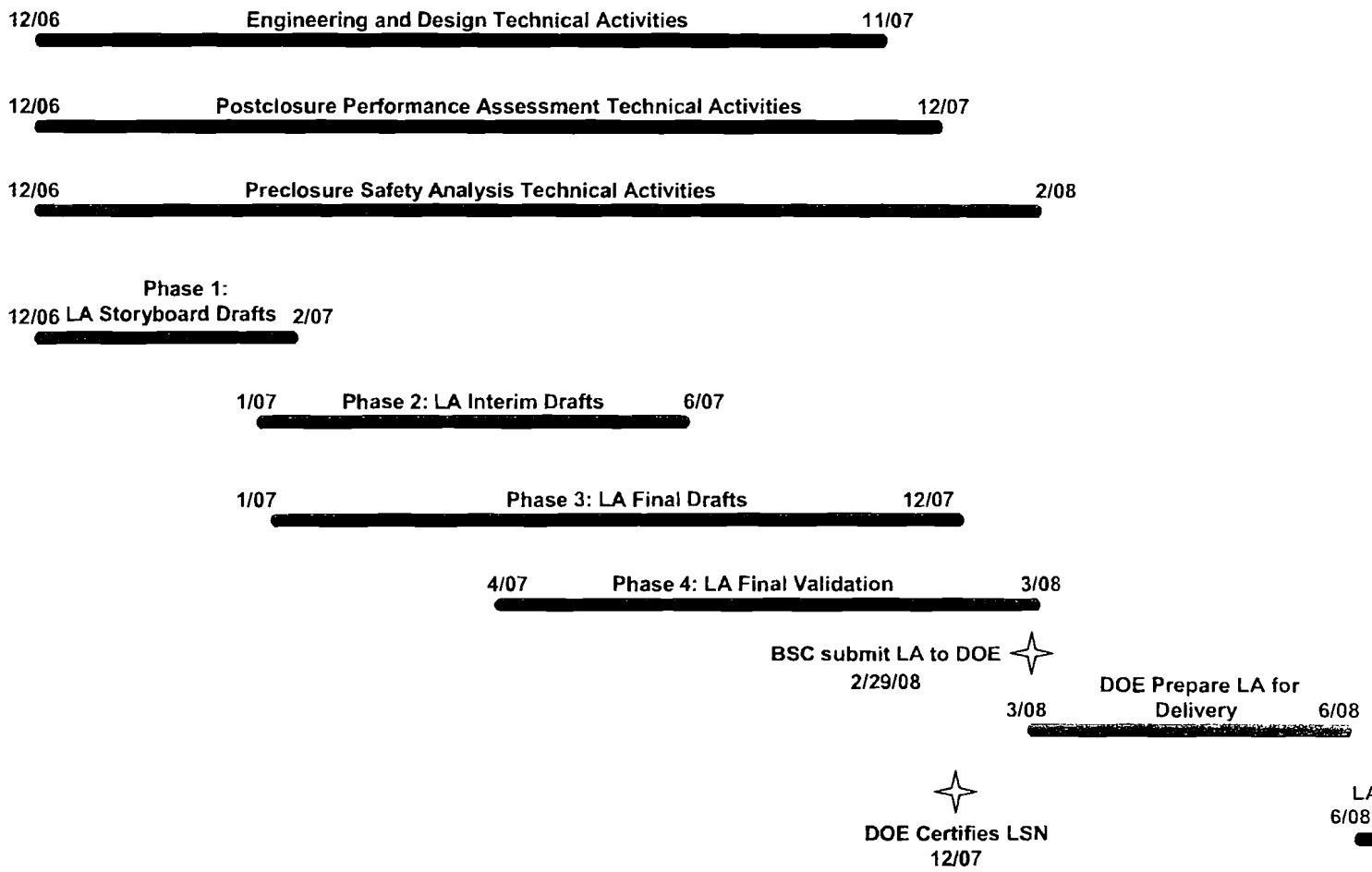
U.S. Department of Energy
Office of Civilian Radioactive Waste Management

www.ocrwm.doe.gov

DOE/NRC Quarterly Management Meeting

March 27, 2007
Rockville, MD

License Application Project Summary Schedule



Key Technical Issues

- DOE submitted responses to three Additional Information Needs (AINs) in December 2006, as scheduled
  - Radionuclide Transport 3.05, AIN-1 and Structural Deformation and Seismicity 3.01, AIN 2 – Documentation of Alcove 8 and Niche 3 tests
  - Total System Performance Assessment and Integration 2.02, Comment 59 – Transmittal of two Analysis and Model Reports: *In-Drift Natural Convection and Condensation*, and *Multiscale Thermohydrologic Model* (Corrected response transmitted 3/9/07)
    - This AIN was closed by NRC letter of 3/20/07
- Remaining Key Technical Agreement items will be addressed in the license application

Exhibit 33

Exhibit 33

UNITED STATES

NUCLEAR WASTE TECHNICAL REVIEW BOARD

FALL BOARD MEETING

September 19, 2007

Atrium Suites Hotel
4255 Paradise Road
Las Vegas, Nevada 89109

1 GARRICK: Okay. One other question. In the
2 conventional engineering world, they have metrics for
3 indicating where the design is from the standpoint of
4 nearness to completeness, metrics like preliminary design,
5 Title 1, Title 2, Title 3, whatever metric you want to use.
6 Can you tell us where we are now with respect to the design
7 and where you expect to be, say, at the time of the filing of
8 the license application?
9 SLOVIC: At the time of the completion of the license
10 application, we expect to be, and don't quote me these
11 numbers, 35 to 40 percent done on important to safety system
12 structures and components, and probably in the 25 to 30
13 percent on the supporting systems. So, we will have a
14 structural design. We will have designs of the important to
15 safety systems. We will have designs of the electrical
16 systems that we need. We will have designs for things like
17 hot water cooling systems for the buildings, but they won't
18 be to the level of detail that they will for the important to
19 safety structure systems and components.
20 ARNOLD: Henry?
21 PETROSKI: Petroski, Board.
22 So, in all these guidelines and drawings that
23 you're showing us, are these just conceptual, or have any
24 calculations gone into--
25 SLOVIC: No, these are reflective of the design as it's

1 the initiating event, which is this bubble, and these boxes
2 here represent pivotal events, which is how the system
3 responds, and the diamonds represent end states. And, so we
4 have--and, in this study, we're going to have probably a
5 couple hundred of these types of diagrams in order to capture
6 the array of initiating events, and system responses.
7 As I mentioned in the previous slide, we support
8 the quantification of these events, that is, the probability
9 of an event, by fault tree analysis, and that itself is
10 supported by historical records. And, we're using in this
11 study industry-wide, multiple industry-wide records of actual
12 equipment failures, field failures, and these are readily
13 available in actually published compilations.
14 At the end of this analysis, and all this stuff is
15 done using uncertainties and these little squiggly lines here
16 are supposed to represent probability distributions, which
17 represent uncertainties in the estimates of equipment
18 failures, failure probabilities. And, at the end, you get
19 results that are expressed also in uncertainties. In this
20 slide, for ease of, just ease of drawing, I depicted
21 uncertainties as a band. Mathematically, that's the
22 probability distribution as well.
23 Next slide? Okay, now a discussion about what the
24 appropriate level is at which one takes a look at event
25 sequences.

1 period, I no longer have to do a dose calculation.
2 MOSLEH: Not if your pinch point is the crane failure;
3 right?
4 FRANK: That is an initiating event, a successful crane
5 doesn't produce a drop, so I go off to the next initiating
6 event, yeah.
7 MOSLEH: So, if you base it on what matters, basically
8 the event of concern, you know, a malfunction that has a
9 consequence, then your choice of how far you go down in terms
10 of detail is a matter of, you know, a number of things,
11 including resources and modeling and things that are--you
12 know, data availability and other things, but not that
13 frequencies become smaller. I mean, you don't screen at that
14 level. You screen it at the level where the event has some
15 consequence; right?
16 FRANK: Agreed.
17 GARRICK: Okay, I have some questions, but I want to get
18 the whole Board in, so we're going to have to be reasonably
19 efficient here. I have Andy, Howard, David and Bill. Andy?
20 KADAK: Yes, thank you.
21 What you've described here is probably a four or
22 five year process. Now, is this going to be part of a
23 license application?
24 FRANK: Yes.
25 KADAK: Do you want to amplify?

1 the safety analysis?

2 FRANK: Let me reorient your paradigm here, because I

3 think we're doing something a bit different in this process.

4 It's really, the traditional way of thinking about

5 it is that you have a design and you evaluate the design.

6 Then, the next level of thinking about it is that you have a

7 design that takes you to--preliminary, evaluate that, you

8 give some feedback to the designers, and then you go to the

9 next level, tier two, or whatever it is, in design, and you

10 do that again. We're doing this almost continuously, where

11 at first, insights were given back to the design team based

12 on judgment. And, then, as the models developed a little

13 more, we could give them crude order of magnitude estimates,

14 and then as the models continued to evolve, those estimates

15 we hope get more accurate, or at least more down to the level

16 of detail that the design is at. And, yes, we hope at the

17 end, that it matches up right.

18 ARNOLD: And, the assumption is that when you find

19 something, it can be fixed by some tweaking of the design?

20 FRANK: Well, I think that's a big advantage of having a

21 risk assessment, going along right in parallel, in fact,

22 interwoven with the design. In the surface facilities, we

23 have that ability, it's just brick and mortar and steel and

24 we can change that. We know how to design things. So, it is

25 really just a question of time before it really does all come

1 together.

2 ARNOLD: Any idea of when that comes?

3 FRANK: Well, our stated due date for BSC delivery of a

4 licensing application, with all supporting analyses done, is

5 end of February 2008.

6 ARNOLD: Design and a supporting--

7 FRANK: Yes, Bob Slovic said roughly 35 percent of the

8 design for ITS components, that when the associated PCSA, at

9 that time.

10 GARRICK: David?

11 DUQUETTE: Duquette, Board.

12 I'm not sure I want to flog a dead horse, or a

13 dying one, but I'm going to do it anyway. I'm a little bit

14 concerned about the safety case itself. I'm going to follow

15 up on what my colleague, Mark Abkowitz, said. We heard this

16 morning that there would be a time when the facility is being

17 constructed that there could be almost an excess of material

18 arriving at the site before it can be properly handled as far

19 as disposal is concerned, probably would have to be put on

20 some kind of pads, and so on and so forth. It's during that

21 period that if anything goes wrong at the site, a crane

22 failing, some delivery problem, or something like that after

23 a year or two, that would expose workers at the utility who

24 may be loading casks for delivery, will all of a sudden, all

25 the systems will have to be stopped, including trains perhaps

Exhibit 34

Exhibit 34

QA: NA

TDR-MGR-RL-000002 REV 00

February 2002

Preclosure Safety Analysis Guide

Prepared for:
U.S. Department of Energy
Yucca Mountain Site Characterization Office
P.O. Box 30307
North Las Vegas, Nevada 89036-0307

Prepared by:
Bechtel SAIC Company, LLC
1180 Town Center Drive
Las Vegas, Nevada 89144

Under Contract Number
DE-AC08-01NV12101

4.4 DEVELOPING AND DOCUMENTING THE PRECLOSURE SAFETY ANALYSIS IN THE LICENSE APPLICATION

In support of the LA-CA, the PSA process begins with information on conceptual design and operations, including application of a preclosure safety strategy, application of good practices from similar operations, industry codes and standards, and NRC regulatory precedents. A structured hazards analysis is performed to identify potential hazards, external and internal to the repository facilities, that initiate event sequences that could result in releases of radioactivity. Information on the natural phenomena and man-made hazards at the site and region should be well characterized. SSCs important to safety are identified from the analyses of hazards and event sequences. Design requirements derived from 10 CFR 63.2, design bases, that prevent or mitigate potential accidents are defined for the SSCs important to safety and are incorporated into the YMP design criteria document. As the 10 CFR 63.2 design bases are incorporated into the design, the PSA is updated to reflect the design commitments. For example, if a design feature eliminates a hazard or reduces the likelihood of an accident sequence, the PSA is revised.

4.4.1 Level of Design Detail in the License Application for Construction Authorization

The purpose of the LA is to present the safety case for a repository, and it must demonstrate that a repository will meet the postclosure and preclosure performance objectives. To demonstrate that a repository can meet postclosure performance objectives, a total system performance analysis is performed that is independent of the PSA. To demonstrate that a repository can meet the preclosure safety objectives, a PSA is performed. The PSA for the LA-CA must be at sufficient depth, commensurate with the available design detail, that provides sufficient assurance that the preclosure performance objectives of 10 CFR 63.111 will be met in the final design of a repository. A principal role of the preliminary PSA is defining the design bases that ensure that preclosure performance objectives can be met in the final design, in accordance with 10 CFR 63.112.

The LA should include a description of the systems that are required to protect the health and safety of the public and workers from Category 1 and Category 2 event sequences as defined in 10 CFR 63.2 for the preclosure period. The SSCs important to safety are identified as those required to meet preclosure performance objectives of 10 CFR 63.111. The LA should also include a description of systems that process radioactive waste and protect important to safety SSCs from interactions from other SSCs. In addition, the LA should identify design features that protect the health and safety of the worker during normal operations, including the proposed program for ensuring ALARA in a repository design. Further, the LA should define the design and operational strategies for addressing the safety-specific disciplines of criticality and fire-protection. The strategies, criteria, standards, and associated analyses for criticality and fire protection should be incorporated into the PSA.

4.4.2 Information Base for Preclosure Safety Analysis in Support of License Application for Construction Authorization

The premise of the PSA process is that sufficient information exists to (1) define the kinds of event sequences (scenarios) that can credibly occur in the kinds of operations that are known or expected to be necessary for receiving, handling, processing, packaging, transporting, and storing

waste forms, (2) estimate their frequency (likelihood), and (3) estimate their consequences. Section 5 states the requirements for descriptions of operating facilities and the site. At the time of the LA-CA, the hazards and event sequence analyses should be based on the information available that will consist of the following:

- Regulatory requirements per 10 CFR Part 63
- Site information (location, geography, geology, seismicity, and meteorology) that is well characterized by Exploratory Studies Facility, Nevada Test Site, and generally available information
- Industry codes and standards
- Regulatory and industry precedents for similar facilities
- Knowledge of good practices employed in similar operations that will be, or expected to be, adopted in a repository
- Experience and knowledge of members of multi-disciplinary PSA team
- Conceptual designs and principals of construction and operation.

Information on conceptual designs, construction, and operation should be derived from the general system descriptions provided in the project description document and system description documents. The information listed below provides a large portion of the bases for hazards analysis and event sequence development, such as:

1. Characterization of waste forms (age, thermal output, enrichment, burnup, radionuclide inventories) and their vulnerabilities to damage (e.g., physical form, cladding, allowable drop height)
2. Rate of waste receipt for each year of operation
3. Subsurface layout of drifts, positions of waste packages within the emplacement drifts, and installation of drip shields as defined by post-closure performance assessment considerations
4. Ground support, ventilation, and fire-protection systems of the subsurface facilities
5. Concepts for rescue, recovery, and decontamination of disabled transport and emplacement equipment
6. Concepts for waste package transport and emplacement in subsurface, including control, instrumentation, communication, and power supply system
7. Waste package design bases for potential accidental conditions (i.e., allowable drop heights, impacts, thermal or fire loading); criticality control features

Exhibit 35

Exhibit 35

BSC

Study Cover Sheet

QA: N/A

YUCCA MOUNTAIN PROJECT

Preliminary Preclosure Nuclear Safety Design Bases

DOE Contract No.:
DE-AC28-01RW12101

Rev.	Date	Reason for Revision	By Print Name and Sign	EGS/Lead Print Name and Sign	PE/RM Print Name and Sign	DEM Print Name and Sign
000	8/08/07	Initial Issue	Robert Garrett	Michael Frank	Mark Wisenburg	N/A

Document No.:
000-PSA-MGR0-01000-000-~~000~~
12.56 8/8/07.

Rev.:
000

1. PURPOSE

The purpose of this document is to provide a preliminary identification of the structures, systems, and components (SSCs) that are important to safety (ITS) for the transportation, aging, and disposal (TAD) canister-based repository design during the Yucca Mountain Repository preclosure period and to identify and document the preliminary preclosure nuclear safety design bases associated with the ITS SSCs. This informal study was prepared in accordance with EG-PRO-3DP-G04B-00016, REV 4, *Engineering Studies*. The results of this study are subject to change as the preclosure safety analysis to support the license application is completed.

2. SCOPE

The *Q-List* documents the safety classification of repository SSCs (i.e. ITS or non-ITS) and identifies natural and engineered barriers important to waste isolation (ITWI). The structures, systems, and major components and their required preclosure safety functions are documented in *Preclosure Nuclear Safety Design Bases* in accordance with applicable quality assurance requirements. The process for the development of the *Q-List* and *Preclosure Nuclear Safety Design Bases* includes the identification of preclosure ITS SSCs and the development of the preclosure nuclear safety design bases required to meet the preclosure performance objectives of 10 CFR 63.111 [DIRS 173273] and the requirements of Sections 2.1.C.1.1.a and 2.1.C.1.2 of *Quality Management Directive* (BSC 2007 [DIRS 180474]).

Until such time as sufficient information for the TAD canister-based repository design can be developed to support the completion of a preclosure safety analysis in accordance with LS-PRO-0201, *Preclosure Safety Analyses Process*, that meets the requirements of 10 CFR 63.112 and demonstrates compliance with the 10 CFR 63.111 performance objectives, a preliminary identification of ITS SSCs and their nuclear safety design bases will be documented in this study in accordance with ENG-PRO-3DP-G04B-00016, *Engineering Studies*. The preliminary identification of ITS SSCs and their nuclear safety design bases is based on the analysis of previous designs, studies of the evolving TAD canister-based repository design, other hazard and nuclear safety analysis documentation prepared in support of the preclosure nuclear safety analysis, work in progress, and engineering judgment. Placeholders have been created for information that is not available at this time.

This study will be updated periodically to remain consistent with the evolving preclosure safety analysis. Following completion of the PSA in accordance with LS-PRO-0201, *Preclosure Safety Analyses Process*, the list of ITS SSCs will be documented in a revision to the *Q-List*. The final classification of SSCs will be based on risk-informed safety analyses completed in accordance with LS-PRO-0201. The nuclear safety bases will be documented in *Preclosure Nuclear Safety Design Bases*.

This study does not include the assignment of design requirements to SSCs or natural or engineered barriers that are ITWI. The preclosure nuclear safety design bases are used as input for design requirements found in *Basis of Design for the TAD Canister-Based Repository Design Concept* (BSC 2006a DIRS 177636]) and *Project Design Criteria Document* (BSC 2006d [DIRS 178308]). These documents define how the repository design will meet the nuclear safety design

Exhibit 36

Exhibit 36

November 13, 2001

Mr. Robert G. Card, Under Secretary
Energy, Science, and Environment
U.S. Department of Energy
1000 Independence Avenue, S.W.
Washington, D.C. 20585-0001

Dear Mr. Card :

As required by Section 114(a)(1)(E) of the Nuclear Waste Policy Act of 1982, as amended (42 U.S.C. 10134(a)(1)(E)), I am providing you with the preliminary comments of the U.S. Nuclear Regulatory Commission (NRC) regarding a possible geologic repository at Yucca Mountain, Nevada. These comments concern "...the extent to which the at-depth site characterization analysis and waste form proposal for such site seem to be sufficient for inclusion in any application to be submitted by the Secretary for licensing of such site as a repository." As described in more detail below and in the enclosures to this letter, the NRC believes that sufficient at-depth site characterization analysis and waste form proposal information, although not available now, will be available at the time of a potential license application such that development of an acceptable license application is achievable.

There are two important constraints related to NRC's preliminary comments. First, in making these comments, the NRC is making no conclusions concerning the actual site suitability of the Yucca Mountain site. Rather, the NRC comments address whether sufficient information will exist to begin a potential licensing review should DOE submit a license application. Second, NRC's licensing decisions, in terms of a potential repository at Yucca Mountain, will not occur until DOE submits a high-quality license application, the staff completes its independent safety review and issues a safety evaluation report, NRC provides an opportunity for a hearing, and NRC makes its final determination of whether the DOE license application meets NRC regulations. Any NRC licensing decision will be based on all the information available at the time of decision.

The NRC's preliminary comments reflect many years of extensive pre-licensing interaction among the NRC staff, DOE, and various stakeholders, including the State of Nevada, Indian Tribes, affected units of local government, representatives of the nuclear industry, and interested members of the public. NRC staff activities included: (1) engaging DOE in an issue resolution process on key technical issues including obtaining DOE's agreement to provide acceptable responses by the time of the submission of any license application; (2) issuing numerous publicly available technical and program status reports, over the last several years, that reviewed DOE's ongoing site characterization, waste package and waste form, and preliminary design work, and identified additional information that DOE would need to provide in any license application; and (3) interacting with representatives of the State

ALTERNATIVE REPOSITORY DESIGNS

DOE is exploring a flexible design concept to allow for the possibility of operating the repository over a range of thermal conditions. The DOE "Yucca Mountain Science and Engineering Report" describes the flexible design concept. The DOE "FY01 Supplemental Science and Performance Analyses" describes exploratory and scoping evaluations to support the proposed range of thermal operating modes. NRC has reviewed these evaluations and met with DOE to discuss a list of additional information needs. If the DOE were to adopt a lower temperature operating mode or the approach used in the FY01 Supplemental Science and Performance Analyses, then NRC will meet again with DOE to discuss specific additional information needs required for a potential license application. If additional information becomes available before any DOE site recommendation, NRC reserves the right to supplement these preliminary comments.

VIEWS OF THE ADVISORY COMMITTEE ON NUCLEAR WASTE

Finally, it is also worthwhile noting that the Commission's perspective on the adequacy of at-depth site characterization analysis and waste form proposal information is consistent with the NRC's Advisory Committee on Nuclear Waste. Specifically, in letters of September 18, 2001, and September 28, 2001, the Committee appears to agree with the NRC staff's approach to issue resolution and its use of analytical tools as a means to conduct the sufficiency review. The Committee did note, similar to the NRC staff, that substantial additional work by DOE is needed prior to the submission of a potential license application. However, it is our understanding that the issues raised in the Committee's letters are focused on the adequacy of a possible license application and that resolution of its concerns can be achieved in the intervening period between a possible site recommendation and a possible license application.

CONCLUSIONS

NRC's preliminary comments are that DOE has obtained or has agreed to obtain sufficient at-depth site characterization analysis and waste form proposal information required for a possible license application. DOE will continue to develop information needed for a license application. DOE and NRC have reached numerous agreements, representing a broad scope of additional work DOE will complete before any license application. NRC believes the plans and schedules to collect more information represent a reasonable approach. Based on the agreements with DOE, the NRC has reasonable confidence DOE could assemble the information needed for a possible license application.

Exhibit 37

Exhibit 37

Department of Energy
Office of Civilian Radioactive Waste Management
Office of Repository Development
1551 Hillshire Drive
Las Vegas, NV 89134-6321

QA: N/A
Project No. WM-00011

JUL 23 2004

OVERNIGHT MAIL

ATTN: Document Control Desk
Director, Division of High-Level Waste
Repository Safety
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, MD 20852-2738

DISPOSITION OF KEY TECHNICAL ISSUE (KTI) AGREEMENTS AND ASSOCIATED "ADDITIONAL INFORMATION NEED" (AIN)

Reference: Ltr, Ziegler to Reamer, dtd 4/2/04 (Key Technical Issue Agreement Response Schedule)

During the period from August 2000 to September 2001, 16 public meetings were held between the U.S. Department of Energy (DOE) and the U.S. Nuclear Regulatory Commission (NRC) specifically to address those issues most important to the performance of the geologic repository, or "Key Technical Issues." The purpose of these meetings was to resolve NRC staff questions and concerns related to the KTIs in the prelicensing period to the extent practical, and thus help assure that DOE has assembled a sufficient level of information to allow NRC to accept the License Application (LA) for review. As a result of these meetings, 293 "KTI Agreements" were established in which DOE agreed to provide additional information to address remaining NRC staff questions and concerns.

As of the date of this letter, DOE has submitted responses to 264 of the 293 agreements, and NRC has determined that 105 of the agreements are complete. By the end of August 2004, DOE plans to submit responses for the remaining agreements, along with supplemental responses for those 17 previously submitted agreement responses that were identified by the NRC staff prior to April 2, 2004, as AIN. This is consistent with our schedule provided to you by the referenced letter. We believe that the previously submitted and forthcoming responses to the agreements are responsive to your staff's questions and concerns.

NMSS07

During the prelicensing period, the KTI resolution process has served an important role in facilitating resolution of many of NRC staff questions and concerns. With the submission of information pertaining to the last remaining set of outstanding KTI agreements by the end of August 2004, DOE believes that the intended purpose of the KTI agreement process will be met and the process complete for DOE. The DOE would, however, appreciate NRC feedback on agreements that NRC has categorized as "high risk significance" as soon as possible. This will facilitate any necessary DOE actions as we proceed to the licensing process.

Once submitted, the LA and its supporting documentation will be the authoritative source of information upon which the NRC staff will base their review. Since the provision of information from DOE to the NRC in response to the KTI agreements is at a close, DOE expects that any questions or concerns of the NRC will be addressed within the context of the licensing process.

In the May 11, 2004, DOE/NRC Management Meeting, DOE proposed that any future questions or AINs related to KTI agreements that are not closed by the NRC by this summer be addressed after DOE submittal of the LA. Therefore, DOE does not intend to provide direct responses to any additional KTI agreement AINs received after the date of this letter. However, if the NRC staff has any remaining questions or concerns, DOE will evaluate those questions or concerns and determine an appropriate way to address the NRC staff's issue. For example, DOE may elect to address the issue directly in the LA, or in any future modifications to documents supporting the LA. In either case, the NRC staff will have the opportunity to review DOE's technical basis. We believe this approach is appropriate and necessary at this point in time, and in accord with our intent to continue open and productive interactions with the NRC staff during the prelicensing period on matters relating to DOE's LA.

This letter contains no new regulatory commitments. Please direct any questions concerning this letter to Timothy C. Gunter at (702) 794-1343 or e-mail timothy_gunter@ymp.gov.

Joseph D. Ziegler, Director
Office of License and Application Strategy

OLA&S:TCG-1613

cc:
D. D. Chamberlain, NRC, Arlington, TX
A. C. Campbell, NRC, Rockville, MD
L. L. Campbell, NRC, Rockville, MD
G. P. Hatchett, NRC, Rockville, MD
N. K. Stablein, NRC, Rockville, MD
R. M. Latta, NRC, Las Vegas, NV
J. D. Parrott, NRC, Las Vegas, NV
D. B. Spitzberg, NRC, Arlington, TX
B. J. Garrick, ACNW, Rockville, MD
H. J. Larson, ACNW, Rockville, MD
W. C. Patrick, CNWRA, San Antonio, TX
Budhi Sagar, CNWRA, San Antonio, TX
J. R. Egan, Egan & Associates, McLean, VA
J. H. Kessler, EPRI, Charlotte, NC
M. J. Apted, Monitor Scientific, LLC, Denver, CO
Rod McCullum, NEI, Washington, DC
W. D. Barnard, NWTRB, Arlington, VA
R. R. Loux, State of Nevada, Carson City, NV
Pat Guinan, State of Nevada, Carson City, NV
Alan Kalt, Churchill County, Fallon, NV
Irene Navis, Clark County, Las Vegas, NV
George McCorkell, Esmeralda County, Goldfield, NV
Ron Damele, Eureka County, Eureka, NV
Michael King, Inyo County, Edmonds, WA
Andrew Remus, Inyo County, Independence, CA
Mickey Yarbro, Lander County, Battle Mountain, NV
Spencer Hafen, Lincoln County, Pioche, NV
Linda Mathias, Mineral County, Hawthorne, NV
L. W. Bradshaw, Nye County, Pahrump, NV
Mike Simon, White Pine County, Ely, NV
R. I. Holden, National Congress of American Indians, Washington, DC

Exhibit 38

Exhibit 38

Description	Document Number	Baseline Complete
Simulation of Net Infiltration for Present-Day and Potential Future Climates	MDL-NBS-HS-000023	06/17/07
Data Analysis for Infiltration Modeling: Extracted Weather Station Data used to Represent Present and Potential Future Climate Conditions within the Vicinity of Yucca Mountain	ANL-MGR-MD-000015	12/22/06
Data Analysis for Infiltration Modeling: Development of Soil Units and Associated Hydraulic Parameter Values	ANL-NBS-HS-000055	12/21/06
UZ Flow Models and Submodels	MDL-NBS-HS-000006	09/08/07
Calibrated UZ Properties	ANL-NBS-HS-000058	06/04/07
Radionuclide Transport Models Under Ambient Conditions	MDL-NBS-HS-000008	09/23/07
Particle Tracking Model and Abstraction of Transport Processes	MDL-NBS-HS-000020	09/23/07
Alcove 8 - Niche 3 Seepage and Transport Models	ANL-NBS-HS-000056	12/01/06
Saturated Zone Flow and Transport Model Abstraction	MDL-NBS-HS-000021	Concurrent with TSPA AMR
Hydrogeologic Framework Model for the Saturated-Zone Site-Scale Flow and Transport Model	MDL-NBS-HS-000024	04/19/07
Saturated Zone Site Scale Flow Model	MDL-NBS-HS-000011	05/20/07
Site Scale Saturated Zone Transport	MDL-NBS-HS-000010	06/30/07
Saturated Zone In-Situ Testing	ANL-NBS-HS-000039	05/16/07
Biosphere Model Report	MDL-MGR-MD-000001	10/07/07
Soil-Related Input Parameters for the Biosphere Model	ANL-NBS-MD-000009	Completed 10/11/2006
THC Sensitivity Study of Repository Edge and Heterogeneous Permeability Effects	ANL-NBS-HS-000047	09/03/07
Abstraction of Drift Seepage	MDL-NBS-HS-000019	Concurrent with TSPA AMR
Pitzer Database Expansion to Include Actinides and Transition Metal Species (DATA0.YPF.R1)	ANL-WIS-GS-000001	9/30/2007
In-Drift Precipitates/Salts Model	ANL-EBS-MD-000045	04/02/07
Thermal Testing Measurements Report	TDR-MGR-HS-000002	03/23/07
Drift-Scale THC Seepage Model	MDL-NBS-HS-000001	07/08/07
Near Field Chemistry Model	TBD	9/30/2007
Engineered Barrier System: Physical and Chemical Environment	ANL-EBS-MD-000033	09/30/07
Thermal Management Flexibility Analysis	ANL-EBS-MD-000075	09/14/06
Post-Closure Thermal Envelope Study	ANL-NBS-HS-000057	10/27/07
Analysis of Invert Hydrologic Properties	ANL-NBS-HS-000053	9/30/2007
Multiscale Thermohydrologic Model	ANL-EBS-MD-000049	09/30/07
In-Drift Convection and Condensation	MDL-EBS-MD-000001	09/10/07
Qualification of Thermodynamic Data for Geochemical Modeling of Mineral-Water Interactions in Dilute Systems	ANL-WIS-GS-000003	05/30/07

Russ Dyer → Bob Lux
3/30/07

In-Package Chemistry Abstraction	ANL-EBS-MD-000037	8/1/2007
Dissolved Concentration Limits of Elements with Radioactive Isotopes	ANL-WIS-MD-000010	09/24/07
Waste Form and In-Drift Colloids-Associated Radionuclide Concentrations: Abstraction and Summary	MDL-EBS-PA-000004	09/24/07
MOX Spent Nuclear Fuel and LaBS Glass for TSPA-LA	ANL-WIS-MD-000022	03/16/07
Radionuclide Screening	ANL-WIS-MD-000006	03/23/07
Waste Package Inventory Allocation Analysis	ANL-WIS-MD-000025	Concurrent with TSPA AMR
Stress Corrosion Cracking of the Drip Shield, the Waste Package Outer Barrier, and the Stainless Steel Structural Material	ANL-EBS-MD-000005	04/19/07
General Corrosion and Localized Corrosion of Waste Package Outer Barrier	ANL-EBS-MD-000003	05/05/07
HIC of Drip Shield	ANL-EBS-MD-000006	06/23/07
Analysis of Mechanisms for Early Waste Package/Drip Shield Failure	ANL-EBS-MD-000076	05/12/07
Analysis of Dust Deliquescence for FEP Screening	ANL-EBS-MD-000074	10/28/07
Cladding Degradation Summary	ANL-WIS-MD-000021	07/12/07
Mechanical Assessment of the Waste Package Subject to Vibratory Ground Motion	MDL-WIS-AC-000001	08/24/07
Seismic Consequence Abstraction	MDL-WIS-PA-000003	08/30/07
Criticality Input To Canister Based System Performance Specification for Disposal	TDR-DS0-NU-000002	01/02/07
Evaluate Probability of Post-Closure Criticality	ANL-DS0-NU-000001	10/26/07
Drift Degradation Analysis	ANL-EBS-MD-000027	02/25/08
Dike/Drift Interactions	MDL-MGR-GS-000005	05/04/07
Atmospheric Dispersal and Deposition of Tephra from a Potential Volcanic Eruption at YM NV	MDL-MGR-GS-000002	11/27/07
Number of Waste Packages Hit by Igneous Intrusion (Rev. 3)	ANL-MGR-GS-000003	07/27/07
Magma Dynamics at YM, Nevada	ANL-MGR-GS-000005	05/23/07
Magma Dynamics at YM, Nevada	ANL-MGR-GS-000005	03/10/08
Characterize Eruptive Processes at YM, Nevada (EPPR)	ANL-MGR-GS-000002	02/26/07
The Development of the TSPA-LA FEPs - Criticality	TDR-WIS-MD-000003	11/01/07
The Development of the TSPA-LA Features, Events and Processes	TDR-WIS-MD-000003	07/20/07
Postclosure Nuclear Safety Design Bases Document	ANL-WIS-MD-000024	08/31/07
TSPA Model/Analysis for the LA	MDL-WIS-PA-000004	TBD
WAPDEG Analysis of Waste Package and Drip Shield Degradation	ANL-EBS-PA-000001	05/31/07
EBS Radionuclide Transport Abstraction	ANL-WIS-PA-000001	08/01/07

Exhibit 39

Exhibit 39

OCRWM - Home
Welcome
About OCRWM
Yucca Mountain Repository
Transporting Nuclear Waste
Receiving Nuclear Waste
Advanced Science Studies
Information Library
:: Document Library
:: Fact Sheets
:: OCRWM Calendar
:: Media Center
:: Audiovisual Gallery
:: Map Center
:: 2002 Site Recommendation and Approval
Youth Zone
Related Links

You are here: Home > Information Library > Document Library > OCRWM - Analysis & Model Reports

Analysis & Model Reports

Using data from our site characterization studies we have developed hundreds of computer models, called analysis models. These models simulate the different geologic, hydrologic, physical, and chemical processes of the repository. Our Analysis Model Reports are documents that describe the individual analysis models and how the respective parts of the repository work.

Sort by system:

Engineered Barrier | Natural Barrier | Monitored Geologic | Waste Isolation

Exhibit 40

Exhibit 40

AMR MAPPING TO LA CHAPTER 2

LA Chapter 2 Section	Section Title	Product Title	Product Control ID
2.1.1	Demonstration of Reliance on at Least One Engineered System and One Natural Barrier	TSPA-LA and various AMRs (see mapping of Barriers to AMR)	
2.1.2.1	Identification of Barriers	TSPA-LA	
2.1.2.2	Description of the Capability of Identified Barriers	TSPA-LA and various AMRs (see mapping of Barriers to AMR)	
2.1.2.3	Degree of Reliance on Each Barrier and Barrier Performance in TSPA	TSPA-LA	
2.1.2.4	Technical Basis for Barrier Capability	TSPA-LA and various AMRs (see mapping of Barriers to AMR)	
2.2.1.1	Initial Identification of FEPs	FEPs Database for LA	
2.2.1.2	Screening of Initial FEPS	FEPs Database for LA	
2.2.1.3	Formation of Scenario Classes Using the Reduced Set of FEPS	FEPs Database for LA	
2.2.1.4	Screening of Scenario Classes.	FEPs Database for LA	
2.2.2	Identification of Events with Probabilities Greater Than 10-8 Per Year	FEPs Database for LA	
2.2.2.1	Definitions of Events	FEPs Database for LA	
2.2.2.2	Probability and Technical Bases	FEPs Database for LA	
2.2.2.3	Conceptual Models for Determining the Probabilities	FEPs Database for LA	
2.2.2.4	Parameters Used to Calculate Probabilities	FEPs Database for LA	
2.2.2.5	Uncertainty in Models and Parameters	**need info**	
2.3.1	Degradation of Engineered Barriers	EBS FEPs and Degradation Modes Analysis	ANL-EBS-MD-000035
2.3.1		Longevity of Emplacement Drift Ground Support Materials	ANL-EBS-GE-000003
2.3.1		Abstraction of NFE Thermodynamic Env & Perc Flux	ANL-EBS-HS-000003
2.3.1		Environment on Surfaces of DS/WP Outer Barrier	ANL-EBS-MD-000001
2.3.1		Aging and Phase Stability of WP Outer Barrier	ANL-EBS-MD-000002
2.3.1		General and Localized Corrosion of WP Outer Barrier	ANL-EBS-MD-000003
2.3.1		Generalized & Localized Corrosion on Drip Shield	ANL-EBS-MD-000004
2.3.1		SCC of DS,WP Outer Barrier & SS Struct Material	ANL-EBS-MD-000005
2.3.1		Hydrogen Induced Cracking of Drip Shield	ANL-EBS-MD-000006
2.3.1		Degradation of Stainless Steel Structural Material	ANL-EBS-MD-000007
2.3.1		Hydride-Related Degradation of SNF Cladding	ANL-EBS-MD-000011
2.3.1		Clad Degradation- Local Corrosion Zirc and its Alloys	ANL-EBS-MD-000012
2.3.1		Clad Degradation - Dry Unzipping	ANL-EBS-MD-000013
2.3.1		Clad Degradation -Wet Unzipping	ANL-EBS-MD-000014
2.3.1		CSNF Waste Form Degradation: Summary Abstract	ANL-EBS-MD-000015
2.3.1		Defense HLW Glass Degradation	ANL-EBS-MD-000016
2.3.1		Pure Phase Solubility Limits -LANL	ANL-EBS-MD-000017
2.3.1		Secondary U2 - Paragenesis and Inc Rad 2nd Phases	ANL-EBS-MD-000019
2.3.1		Colloid-Associated Radionuclide Concentration Limits	ANL-EBS-MD-000020
2.3.1		Analysis of Mechanisms for Early WP Failures	ANL-EBS-MD-000023
2.3.1		Drift Degradation Analysis	ANL-EBS-MD-000027
2.3.1		Water Diversion Model	ANL-EBS-MD-000028
2.3.1		Water Drainage Model	ANL-EBS-MD-000029

AMR MAPPING TO LA CHAPTER 2

LA Chapter 2 Section	Section Title	Product Title	Product Control ID
2.3.1		Ventilation Model	ANL-EBS-MD-000030
2.3.1		Invert Diffusion Properties Model	ANL-EBS-MD-000031
2.3.1		Water Distribution and Removal Model	ANL-EBS-MD-000032
2.3.1		Incorp of Uncertainty & Variability of DS/WP Deg WAPDEG	ANL-EBS-MD-000036
2.3.1		In-Package Chemistry Abstraction	ANL-EBS-MD-000037
2.3.1		In Drift Corrosion Products	ANL-EBS-MD-000041
2.3.1		In-Drift Precipitates/Salts Analysis	ANL-EBS-MD-000045
2.3.1		Initial Cladding Condition	ANL-EBS-MD-000048
2.3.1		Multiscale Thermohydrologic Model	ANL-EBS-MD-000049
2.3.1		Summary of In-Package Chemistry Waste Forms	ANL-EBS-MD-000056
2.3.1		WAPDEG Analysis of WP and Drip Shield Degradation	ANL-EBS-PA-000001
2.3.1		FEPs Screening of Processes & Issues in DS&WP Degradation	ANL-EBS-PA-000002
2.3.1		Abst Mdls Pitting & Crevice Corrosion DripShield/WP	ANL-EBS-PA-000003
2.3.1		SCC of Drip Shield & WP Outer Barrier & H2 Induced	ANL-EBS-PA-000004
2.3.1		Abstraction of Models for SS Structural Material Degradation	ANL-EBS-PA-000005
2.3.1	Degradation of Engineered Barriers	DSNF and Other WF Degradation Abstraction	ANL-WIS-MD-000004
2.3.1		Inventory Abstraction	ANL-WIS-MD-000006
2.3.1		Clad Degradation - Summary and Abstraction	ANL-WIS-MD-000007
2.3.1		Clad Degradation-FEPs Screening Arguments	ANL-WIS-MD-000008
2.3.1		Misc WF FEPs	ANL-WIS-MD-000009
2.3.1		Summary of Dissolved Concentration Limits	ANL-WIS-MD-000010
2.3.1		WF Colloid-Assoc Concentration Limits : Abst & Sum	ANL-WIS-MD-000012
2.3.1		In Package Source Term Abstraction	ANL-WIS-MD-000018
2.3.1		WF Abstraction for TSPA	F0200 (AMR ID)
2.3.1		Intrinsic Drip Rates for WF Exposed to a HA Env	F0210 (AMR ID)
2.3.1		General & Localized Corrosion of WP Outer Barrier	W3001 (AMR ID)
2.3.1		Passive Film AMR	W3003 (AMR ID)
2.3.1		SCC AMR	W3004 (AMR ID)
2.3.1		Aging & Phase Stability of WP AMR	W3005 (AMR ID)
2.3.1		Environment on DS & WP AMR	W3007 (AMR ID)

AMR MAPPING TO LA CHAPTER 2

LA Chapter 2 Section	Section Title	Product Title	Product Control ID
2.3.1	Degradation of Engineered Barriers	WAPDEG Analysis of WP & DS Degradation	W3010 (AMR ID)
2.3.1		FEPS Screening of Processes & Issues	W3011 (AMR ID)
2.3.1		Incorporation of Uncertainty in WAPDEG	W3012 (AMR ID)
2.3.1		WP Materials PMR	W3015 (AMR ID)
2.3.1		In-Pkg Chem (Combined)	
2.3.1		WF Degradation (Combined)	
2.3.1		Clad Degradation	
2.3.1		Dissolved RN Conc (Combined)	
2.3.1		Colloidal RN Conc (Combined)	
2.3.2	Mechanical Disruption of Engineered Barriers		ANL-CRW-GS-000003
2.3.2			ANL-EBS-GE-000004
2.3.2			T0130 (AMR ID)
2.3.2			T0140 (AMR ID)
2.3.3	Quantity and Chemistry of Water Contacting Waste Packages and Waste forms	Environment on Surfaces of DS/WP Outer Barrier	ANL-EBS-MD-000001
2.3.3		General and Localized Corrosion of WP Outer Barrier	ANL-EBS-MD-000003
2.3.3		Generalized & Localized Corrosion on Drip Shield	ANL-EBS-MD-000004
2.3.3		Degradation of Stainless Steel Structural Material	ANL-EBS-MD-000007
2.3.3		In-Drift Thermal-Hydrological-Chemical Model	ANL-EBS-MD-000026
2.3.3		EBS: Physical & Chemical Environment Model	ANL-EBS-MD-000033
2.3.3		In-Package Chemistry Abstraction	ANL-EBS-MD-000037
2.3.3		In-Drift Microbial Communities	ANL-EBS-MD-000038
2.3.3		Seepage/Backfill Interactions	ANL-EBS-MD-000039
2.3.3		In-Drift Gas Flux and Composition	ANL-EBS-MD-000040
2.3.3		In-Drift Colloids and Concentration	ANL-EBS-MD-000042
2.3.3		Seepage/Cement Interactions	ANL-EBS-MD-000043
2.3.3		Seepage/Invert Interactions	ANL-EBS-MD-000044
2.3.3		Physical & Chemical Environmental Abstraction Model	ANL-EBS-MD-000046
2.3.3		Summary of In-Package Chemistry Waste Forms	ANL-EBS-MD-000056
2.3.3		WAPDEG Analysis of WP and Drip Shield Degradation	ANL-EBS-PA-000001
2.3.3		Abstraction of Models for SS Structural Material Degradation	ANL-EBS-PA-000005
2.3.3		Analysis of Hydrologic Properties Data	ANL-NBS-HS-000002
2.3.3		Abstraction of Drift Scale Coupled Processes	ANL-NBS-HS-000029
2.3.3		TH/THM Conceptual Model Analysis	ANL-NBS-HS-000037
2.3.3		FEPs in Thermal Hydrology & Coupled Processes	ANL-NBS-MD-000004
2.3.3		Abstraction of Drift Seepage	ANL-NBS-MD-000005
2.3.3		Thermal Tests Thermal-Hydrological Analysis/Model Report	ANL-NBS-TH-000001
2.3.3		Inventory Abstraction	ANL-WIS-MD-000006

AMR MAPPING TO LA CHAPTER 2

LA Chapter 2 Section	Section Title	Product Title	Product Control ID
2.3.3	Quantity and Chemistry of Water Contacting Waste Packages and Waste forms	Summary of Dissolved Concentration Limits	ANL-WIS-MD-000010
2.3.3		WF Colloid-Assoc Concentration Limits : Abst & Sum	ANL-WIS-MD-000012
2.3.3		EQ3/6 Data Qual Rev	F0190 (AMR ID)
2.3.3		Mineralogical Model	MDL-NBS-GS-000003
2.3.3		Drift Scale Coupled Processes (DST & THC Seepage) Models	MDL-NBS-HS-000001
2.3.3		Seepage Model for PA Including Drift Collapse	MDL-NBS-HS-000002
2.3.3		Seepage Calibration Model & Testing Data	MDL-NBS-HS-000004
2.3.3		Genesis of Water Movement in UZ	U0205
2.3.3		Coupled Processes Seepage	U0XXX (Becomes U0215)
2.3.3		Intrinsic Drip Rates for WF Exposed to a HA Env	
2.3.3		In-Pkg Chem (Combined)	
2.3.4	Radionuclide Release Rates and Solubility Limits	Clad Degradation -Wet Unzipping	ANL-EBS-MD-000014
2.3.4		EBS Radionuclide Transport Model	ANL-EBS-MD-000034
2.3.4		Inventory Abstraction	ANL-WIS-MD-000006
2.3.4		Summary of Dissolved Concentration Limits	ANL-WIS-MD-000010
2.3.4		EBS Radionuclide Transport Abstraction	ANL-WIS-PA-000001
2.3.5	Climate and Infiltration	Future Climate Analysis	ANL-NBS-GS-000008
2.3.5		Analysis of Infiltration Uncertainty	ANL-NBS-HS-000027

AMR MAPPING TO LA CHAPTER 2

LA Chapter 2 Section	Section Title	Product Title	Product Control ID
2.3.5	Climate and Infiltration	Simulation of Net Infiltration for M & P Climate	ANL-NBS-HS-000032
2.3.5		Future Climate Analysis	U00175 (Combine with U0005)
2.3.6	Flow Paths in the Unsaturated Zone	Future Climate Analysis	ANL-NBS-GS-000008
2.3.6		Analysis of Hydrologic Properties Data	ANL-NBS-HS-000002
2.3.6		Insitu Field Testing of Processes	ANL-NBS-HS-000005
2.3.6		Natural Analogs for UZ	ANL-NBS-HS-000007
2.3.6		Development of Numerical Grids for UZ F&T Modeling	ANL-NBS-HS-000015
2.3.6		Analysis of Geochemical Data for UZ	ANL-NBS-HS-000017
2.3.6		Abstraction of Flow Fields for RIP	ANL-NBS-HS-000023
2.3.6		Analysis of Base Case Particle Tracking of Base Case Flow	ANL-NBS-HS-000024
2.3.6		Analysis of Infiltration Uncertainty	ANL-NBS-HS-000027
2.3.6		Simulation of Net Infiltration for M & P Climate	ANL-NBS-HS-000032
2.3.6		FEPs in UZ F&T	ANL-NBS-MD-000001
2.3.6		Abstraction of Drift Seepage	ANL-NBS-MD-000005
2.3.6		Geologic Framework Model 3.1	MDL-NBS-GS-000002
2.3.6		Rock Properties Model	MDL-NBS-GS-000004
2.3.6		Seepage Model for PA Including Drift Collapse	MDL-NBS-HS-000002
2.3.6		Calibrated Properties Model	MDL-NBS-HS-000003
2.3.6		Seepage Calibration Model & Testing Data	MDL-NBS-HS-000004
2.3.6		Conceptual &Numerical Models for UZ F&T	MDL-NBS-HS-000005
2.3.6		UZ Flow Models and Submodels	MDL-NBS-HS-000006
2.3.6		Mtn-Scale Coupled Process (TH) Model	MDL-NBS-HS-000007
2.3.6		UZ Thermal Testing AMR	U00x1 (AMR ID) Becomes UO220
2.3.6		TH/THC/THM Effects on Drift-Scale Rn Tr	U00x3 (AMR ID) Becomes UO195
2.3.6		AMR Drift Scale Coupled Processes MDL	U0110 (AMR ID)
2.3.6		Abst Cpld Process Flow Field	U0115 (AMR ID)
2.3.6		Geostatistical Representation of the CHn Formation	U0145 (AMR ID)
2.3.6		Sens. Stdy UZ F&T Seepage	U0165 (AMR ID)
2.3.6		Future Climate Analysis	U0175 (AMR ID)
2.3.6		UZ Flow Patterns and Analysis (Realistic Case)	U0185 (AMR ID)
2.3.6		Drift Scale Coupled Processes TH	U0190 (AMR ID)
2.3.6		Drift Scale Coupled Processes	U0195 (AMR ID)
2.3.6		Abstraction of Drift-Scale Coupled Processes	U0200 (AMR ID)
2.3.6		Genesis of Water Movement in UZ	U0205 (AMR ID)
2.3.6		Shadow Zone AMR	U0210 (AMR ID)
2.3.6	Flow Paths in the Unsaturated Zone	Coupled Processes Seepage	U0XXX (AMR ID) Becomes UO215
2.3.6		Drift Scale Coupled Processes THM	UN0x1 (AMR ID) Becomes UO225
2.3.6		Volcanology AMR	VOLC (AMR ID)

AMR MAPPING TO LA CHAPTER 2

LA Chapter 2 Section	Section Title	Product Title	Product Control ID
2.3.7	Radionuclide Tranport in the Unsaturated Zone	Analysis Comparing Advective-Dispersive Trsnp Sol	ANL-NBS-HS-000001
2.3.7		Development of Numerical Grids for UZ F&T Modeling	ANL-NBS-HS-000015
2.3.7		UZ/SZ Rn Transport AMR	ANL-NBS-HS-000019
2.3.7		Fault Displacement Effects on Transport in the UZ	ANL-NBS-HS-000020
2.3.7		Particle Tracking Model/Abstr of Transport Process	ANL-NBS-HS-000026
2.3.7		UZ Colloid Transport Model	ANL-NBS-HS-000028
2.3.7		FEPs in UZ F&T	ANL-NBS-MD-000001
2.3.7		Geologic Framework Model 3.1	MDL-NBS-GS-000002
2.3.7		Rock Properties Model	MDL-NBS-GS-000004
2.3.7		Conceptual &Numerical Models for UZ F&T	MDL-NBS-HS-000005
2.3.7		Radionuclide Transport Models under Ambient Cond	MDL-NBS-HS-000008
2.3.7		Sens. Stdy UZ F&T Seepage	U0165 (AMR ID)
2.3.8	Flow Paths in the Saturated Zone	Geochemical & Isotopic Constraints on GW Flow	ANL-NBS-HS-000021
2.3.8		Modeling SubGridblock Scale Dispersion in 3D Hetero	ANL-NBS-HS-000022
2.3.8		Hydrogeologic Framework Model	ANL-NBS-HS-000033
2.3.8		Water-Level Data Anl for the SZ Site-Scale F&T Mdl	ANL-NBS-HS-000034
2.3.8		FEPs in SZ Flow and Transport	ANL-NBS-MD-000002
2.3.8		Probability Distribution for Flowing Interval Spacing	ANL-NBS-MD-000003
2.3.8		Recharge and Lateral GW Flow Boundary Conditions	ANL-NBS-MD-000010
2.3.8		Uncertainty Distribution for Stochastic Parameters	ANL-NBS-MD-000011
2.3.8		Calibration of the Site-Scale SZ Flow Model	MDL-NBS-HS-000011
2.3.8		AMR SZ Flow Patterns and Analyses Realistic Case	S0180 (AMR ID)
2.3.8	Flow Paths in the Saturated Zone	In Situ SZ Testing	S0185 (AMR ID)
2.3.8		Realistic Case (Expected)	S0190 (AMR ID)
2.3.9	Radionuclide Transport in the Saturated Zone	Input & Results Base Case SZ F&T Model TSPA	ANL-NBS-HS-000030
2.3.9		SZ Colloid-Facilitated Transport	ANL-NBS-HS-000031
2.3.9		Water-Level Data Anl for the SZ Site-Scale F&T Mdl	ANL-NBS-HS-000034
2.3.9		FEPs in SZ Flow and Transport	ANL-NBS-MD-000002
2.3.9		SZ Transport Method and Component Integration	MDL-NBS-HS-000010
2.3.9		Rn Transport AMR	S0195
2.3.9		UZ/SZ Rn transport AMR	U0100
2.3.10	Volcanic Disruption of Waste packages	Characterize Framework for Igneous Activity	ANL-MGR-GS-000001
2.3.10		Characterize Eruptive Process	ANL-MGR-GS-000002
2.3.10		Disruptive Events FEPs	ANL-WIS-MD-000005
2.3.10		Dike Propagation Near Drifts	ANL-WIS-MD-000015

AMR MAPPING TO LA CHAPTER 2

LA Chapter 2 Section	Section Title	Product Title	Product Control ID
2.3.10		Igneous Consequence Modeling for TSPA-SR	ANL-WIS-MD-000017
2.3.10		Physical Volcanology	T0120 (AMR ID)
2.3.10		Volcanology AMR	VOLC (AMR ID)
2.3.11	Airborne Transport of Radionuclides	Values for External Inhalation Rad Exposure Analysis	ANL-MGR-MD-000001
2.3.11		Environmental Transport Parameters Analysis	ANL-MGR-MD-000007
2.3.11		Physical Volcanology	T0120 (AMR ID)
2.3.11		Ashplume AMR	T0125 (AMR ID)
2.3.11		Volcanology AMR	VOLC (AMR ID)
2.3.12	Representative Volume*	Groundwater Usage by Proposed Farming Community	ANL-NBS-MD-000006

AMR MAPPING TO LA CHAPTER 2

LA Chapter 2 Section	Section Title	Product Title	Product Control ID
2.3.13	Redistribution of Radionuclides in Soil	Radionuclide Removal From Soil	B0005 (AMR ID)
2.3.13		Evaluate Soil/Radionuclide Removal by Erosion & Leaching	ANL-NBS-MD-000009
2.3.13		Environmental Transport Parameters Analysis	ANL-MGR-MD-000007
2.3.14	Biosphere Characteristics	Identification of Critical Group (Food and Tap Water)	ANL-MGR-MD-000005
2.3.14		Evaluation of Applicability of Biosphere-Related FEPs	ANL-MGR-MD-000011
2.3.14		Identification of Ingestion Exposure Parameters	ANL-MGR-MD-000006
2.3.14		Dose Conversion Factor Analysis GENII-S Ass Method	ANL-MGR-MD-000002
2.3.14		Disruptive Event Biosphere Dose Conversion Factor Analysis	ANL-MGR-MD-000003
2.3.14		Disruptive Event Biosphere-DCF Sensitivity Analysis	ANL-MGR-MD-000004
2.3.14		Non-Disruptive Biosphere DCF-Sensitivity Analysis	ANL-MGR-MD-000010
2.3.14		Abstraction of BDCF Distributions for Irrigation Periods	ANL-NBS-MD-000007
2.3.14		Non-Disruptive BDCF	ANL-MGR-MD-000009
2.3.14		Distribution Fitting to the Stochastic BDCF Data	ANL-NBS-MD-000008
2.3.14		Transfer Coefficient Analysis	ANL-MGR-MD-000008
2.4	Demonstration of Compliance with the Postclosure Public Health and Environmental Standards	TSPA-LA	
Unknown		Fracture AMR	I0050 (AMR ID)
Unknown		In-Drift Natural Convection and Condensation	E0125 (AMR ID)
Not on Schedule		Future Climate Analysis	ANL-NBS-GS-000008
Not on Schedule		Particle Tracking Model/Abstr of Transport Process	ANL-NBS-HS-000026
Not on Schedule		Abstraction of Flow Fields for RIP	ANL-NBS-HS-000023
Not on Schedule		Sens. Stdy. UZ F&T Seepage	U0165 (AMR ID)

Exhibit 41

Exhibit 41

AMR MAPPING TO YM REVIEW PLAN ACCEPTANCE CRITERIA

Acceptance Criteria from YMRP
System Description and Demonstration of Multiple Barriers (Section 4.2.1.1.3)
AC1: Identification of Barriers is Adequate
AC2: Description of the Capability of Identified Barriers is Acceptable
AC3: Technical Basis for Barrier Capability is Adequately Presented
Scenario Analysis and Event Probability (Section 4.2.1.2.1.3)
AC1: The Identification of the Initial List of Features, Events, and Processes is Adequate
AC2: Screening of the Initial List of FEPs is Appropriate
AC3: Formation of Scenario Classes Using the Reduced Set of Events is Adequate
AC4: Screening of Scenario Classes is Appropriate
Identification of Events with Probabilities Greater Than 10^{-8} Per Year (Section 4.2.1.2.2.3)
AC1: Events are Adequately Defined
AC2: Probability Estimates for Future Events are Supported by Appropriate Technical Bases
AC3: Probability Model Support is Adequate
AC4: Probability Model Parameters Have Been Adequately Established
AC5: Uncertainty in Event Probability is Adequately Evaluated
Degradation of Engineered Barriers (Section 4.2.1.3.1.3)
AC1: System Description and Model Integration are Adequate
Degradation of Engineered Barriers (Section 4.2.1.3.1.3) (continued)
AC1: System Description and Model Integration are Adequate

AMR MAPPING TO YM REVIEW PLAN ACCEPTANCE CRITERIA

Acceptance Criteria from YMRP
AC2: Data are Sufficient for Model Justification

AMR MAPPING TO YM REVIEW PLAN ACCEPTANCE CRITERIA

Acceptance Criteria from YMRP
Degradation of Engineered Barriers (Section 4.2.1.3.1.3) (continued)
AC3: Data Uncertainty is Characterized and Propagated Through the Model Abstraction
AC4: Model Uncertainty is Characterized and Propagated Through the Model Abstraction
AC5: Model Abstraction Output is Supported by Objective Comparisons
Mechanical Disruption of Engineered Barriers (Section 4.2.1.3.2.3)
AC1: System Description and Model Integration are Adequate
AC2: Data are Sufficient for Model Justification
AC3: Data Uncertainty is Characterized and Propagated Through the Model Abstraction
AC4: Model Uncertainty is Characterized and Propagated Through the Model Abstraction
AC5: Model Abstraction Output is Supported by Objective Comparisons
Quantity and Chemistry of Water Contacting Waste Packages and Waste Forms (Section 4.2.1.3.3.3)
AC1: System Description and Model Integration are Adequate
Quantity and Chemistry of Water Contacting Waste Packages and Waste Forms (Section 4.2.1.3.3.3) (continued)
AC1: System Description and Model Integration are Adequate
AC2: Data are Sufficient for Model Justification
AC3: Data Uncertainty is Characterized and Propagated Through the Model Abstraction
AC4: Model Uncertainty is Characterized and Propagated Through the Model Abstraction

AMR MAPPING TO YM REVIEW PLAN ACCEPTANCE CRITERIA

Acceptance Criteria from YMRP
AC5: Model Abstraction Output is Supported by Objective Comparisons
Radionuclide Release Rates and Solubility Limits (Section 4.2.1.3.4.3)
AC1: System Description and Model Integration are Adequate
AC2: Data are Sufficient for Model Justification
AC3: Data Uncertainty is Characterized and Propagated Through the Model Abstraction
AC4: Model Uncertainty is Characterized and Propagated Through the Model Abstraction
AC5: Model Abstraction Output is Supported by Objective Comparisons

AMR MAPPING TO YM REVIEW PLAN ACCEPTANCE CRITERIA

Acceptance Criteria from YMRP
Climate and Infiltration (Sectin 4.2.1.3.5.3)
AC1: System Description and Model Integration are Adequate
AC2: Data are Sufficient for Model Justification
AC3: Data Uncertainty is Characterized and Propagated Through the Model Abstraction
AC4: Model Uncertainty is Characterized and Propagated Through the Model Abstraction
AC5: Model Abstraction Output is Supported by Objective Comparisons
Flow Paths in the Unsaturated Zone (Section 4.2.1.3.6.3)
AC1. System Description and Model Integration are Adequate
AC2. Data are Sufficient for Model Justification

AMR MAPPING TO YM REVIEW PLAN ACCEPTANCE CRITERIA

Acceptance Criteria from YMRP
Flow Paths in the Unsaturated Zone (Section 4.2.1.3.6.3) (continued)
AC3: Data Uncertainty is Characterized and Propagated Through the Model Abstraction
AC4 Model Uncertainty is Characterized and Propagated Through the Model Abstraction
AC5 Model Abstraction Output is Supported by Objective Comparisons
Radionuclide Transport in the Unsaturated Zone (Section 4.2.1.3.7.3)
AC1 System Description and Model Integration are Adequate
AC2 Data are Sufficient for Model Justification
AC3. Data Uncertainty is Characterized and Propagated Through the Model Abstraction
AC4. Model Uncertainty is Characterized and Propagated Through the Model Abstraction
AC5 Model Abstraction Output is Supported by Objective Comparisons
Flow Paths in the Saturated Zone (Section 4.2.1.3.8.3)
AC1 System Description and Model Integration are Adequate
AC2. Data are Sufficient for Model Justification
AC3. Data Uncertainty is Characterized and Propagated Through the Model Abstraction
AC4: Model Uncertainty is Characterized and Propagated Through the Model Abstraction
AC5: Model Abstraction Output is Supported by Objective Comparisons
Radionuclide Transport in the Saturated Zone (Section 4.2.1.3.9.3)
AC1 System Description and Model Integration are Adequate
AC2. Data are Sufficient for Model Justification
AC3: Data Uncertainty is Characterized and Propagated Through the Model Abstraction
AC4: Model Uncertainty is Characterized and Propagated Through the Model Abstraction
AC5: Model Abstraction Output is Supported by Objective Comparisons

AMR MAPPING TO YM REVIEW PLAN ACCEPTANCE CRITERIA

Acceptance Criteria from YMRP
Volcanic Disruption of Waste Packages (Section 4.2.1.3.10.3)
AC1: System Description and Model Integration are Adequate
AC2: Data are Sufficient for Model Justification
AC3: Data Uncertainty is Characterized and Propagated Through the Model Abstraction
AC4: Model Uncertainty is Characterized and Propagated Through the Model Abstraction
AC5. Model Abstraction Output is Supported by Objective Comparisons
Airborne Transport of Radionuclides (Sectin 4.2.1.3.11.3)
AC1: System Description and Model Integration are Adequate
AC2: Data are Sufficient for Model Justification
AC3: Data Uncertainty is Characterized and Propagated Through the Model Abstraction
AC4: Model Uncertainty is Characterized and Propagated Through the Model Abstraction
AC5. Model Abstraction Output is Supported by Objective Comparisons
Representative Volume (Section 4.2.1.3.12.3)
AC1: System Description and Model Integration are Adequate
AC2. Data are Sufficient for Model Justification
AC3. Data Uncertainty is Characterized and Propagated Through the Model Abstraction
AC4 Model Uncertainty is Characterized and Propagated Through the Model Abstraction
AC5. Model Abstraction Output is Supported by Objective Comparisons
Redistribution of Radionuclides in Soil (Section 4.2.1.3.13.3)
AC1. System Description and Model Integration are Adequate AC2: Data are Sufficient for Model Justification
AC3. Data Uncertainty is Characterized and Propagated Through the Model Abstraction
AC4. Model Uncertainty is Characterized and Propagated Through the Model Abstraction
AC5 Model Abstraction Output is Supported by Objective Comparisons
Biosphere Characteristics (Section 4.2.1.3.14.3)
AC1. System Description and Model Integration are Adequate

AMR MAPPING TO YM REVIEW PLAN ACCEPTANCE CRITERIA

Acceptance Criteria from YMRP
AC2: Data are Sufficient for Model Justification
AC3: Data Uncertainty is Characterized and Propagated Through the Model Abstraction
AC4: Model Uncertainty is Characterized and Propagated Through the Model Abstraction
AC5: Model Abstraction Output is Supported by Objective Comparisons
Demonstration of Compliance with the Postclosure Individual Protection Standard (Section 4.2.1.4.1.3)
AC1: Scenarios Used in the Calculation of the Annual Dose as a Function of Time are Adequate
AC2: An Adequate Demonstration is Provided That the Annual Dose to the Reasonably Maximally Exposed Individual in Any Year During the Compliance Period Does not Exceed the Exposure Standard
AC3: The Total System Performance Assessment Code Provides a Credible Representation of Repository Performance
Demonstration of Compliance with the Human Intrusion Standard (Section 4.2.1.4.2.3)
AC1: Evaluation of the Time of an Intrusion Event
AC2: Evaluation of an Intrusion Event Demonstrates that the Annual Dose to the Reasonably Maximally Exposed Individual in Any Year During the Compliance Period is Acceptable
AC3: The Total System Performance Assessment Code Provides a Credible Representation of the Intrusion Event
Analysis of Repository Performance that Demonstrates Compliance with the Separate Ground-Water Protection Standards (Section 4.2.1.4.3.3)
AC1: An Adequate Demonstration is Provided that the Expected Concentration of Combined Radium-226 and Radium-228, Expected Concentration of Specified Alpha emitting Radionuclides, and Expected Whole Body or Organ0specific Doses from any Photon- or Beta-emitting Radionuclides at Any Year During the Compliance Period do not Exceed the Separate Ground-Water Protection Standards
AC2: The Methods and Assumptions Used to Determine the Position of the Representative Volume of Ground Water are Credible and Consistent, and the Representative Volume of Ground Water Includes the Highest Concentration Level in the Plume of Contamination in the Accessible Environment
AC3: The Methods and Assumptions Used to Calculate the Physical Dimensions of the Representative Volume of Ground Water are Credible and Consistent
Unknown
Unknown
Not on Schedule
Not on Schedule
Not on Schedule
Not on Schedule

AMR MAPPING TO YM REVIEW PLAN ACCEPTANCE CRITERIA

Product Title/Control ID
TSPA-LA and various AMRs (see mapping of Barriers to AMR)
(TDR-WIS-MD-000003) FEPs Database (ANL-NBS-MD-000002) FEPs in SZ Flow and Transport (ANL-NBS-MD-000001) FEPs in UZ Flow and Transport (ANL-WIS-MD-000005) Disruptive Events FEPS (ANL-MGR-MD-000011) Evaluation of Applicability of Biosphere-Related FEPs (ANL-WIS-PA-000002) EBS FEPs/Degradation Modes Abstraction (ANL-WIS-MD-000008) Cladding Degradation - FEPs Screening Arguments (ANL-WIS-MD-000009) Miscellaneous Waste Form FEPs (ANL-NBS-MD-000004) FEPs in Thermal Hydrology & Coupled Processes (ANL-WIS-MD-000019) FEPs: System-level and Criticality (ANL-EBS-PA-000002) FEPs Screening of Processes and Issues in Drip Shield and Waste Package Degradation (ANL-EBS-MD-000035) EBS FEPs and Degradation Modes Analysis (W3011 (AMR ID)) FEPs Screening of Processes and Issues
(TDR-NBS-MD-000002) Disruptive Events PMR
(ANL-WIS-MD-000005) Disruptive Events FEPs (ANL-MGR-GS-000001) Characterize Framework for Igneous Activity (ANL-MGR-GS-000002) Characterize Eruptive Process (ANL-CRW-GS-000093) Characterize Framework for Seismicity and Structural Deformation (TDR20 (AMR ID)) Physical Volcanology
(ANL-EBS-MD-000035) EBS FEPs and Degradation Modes Analysis (ANL-EBS-GE-000003) Longevity of Emplacement Drift Ground Support Materials (ANL-EBS-MD-000001) Environment on Surfaces of DS/WP Outer Barrier (ANL-EBS-MD-000002) Aging and Phase Stability of WP Outer Barrier (ANL-EBS-MD-000003) General and Localized Corrosion of WP Outer Barrier (ANL-EBS-MD-000004) Generalized & Localized Corrosion on Drip Shield (ANL-EBS-MD-000005) SCC of DS,WP Outer Barrier & SS Struct Material (ANL-EBS-MD-000006) Hydrogen Induced Cracking of Drip Shield (ANL-EBS-MD-000007) Degradation of Stainless Steel Structural Material (ANL-EBS-MD-000011) Hydride-Related Degradation of SNF Cladding (ANL-EBS-MD-000012) Clad Degradation-Local Corrosion Zirc and its Alloys (ANL-EBS-MD-000013) Clad Degradation - Dry Unzipping (ANL-EBS-MD-000014) Clad Degradation -Wet Unzipping (ANL-EBS-MD-000016) Defense HLW Glass Degradation (ANL-EBS-MD-000017) Pure Phase Solubility Limits -LANL (ANL-EBS-MD-000019) Secondary U2 - Paragenesis and Inc Rad 2nd Phases (ANL-EBS-MD-000020) Colloid-Associated Radionuclide Concentration Limits (ANL-EBS-MD-000023) Analysis of Mechanisms for Early WP Failures (ANL-EBS-MD-000027) Drift Degradation Analysis (ANL-EBS-MD-000028) Water Diversion Model (ANL-EBS-MD-000029) Water Drainage Model (ANL-EBS-MD-000030) Ventilation Model (ANL-EBS-MD-000031) Invert Diffusion Properties Model (ANL-EBS-MD-000032) Water Distribution and Removal Model (ANL-EBS-MD-000036) Incorp of Uncertainty & Variability of DS/WP Deg WAPDEG (ANL-EBS-MD-000041) In Drift Corrosion Products (ANL-EBS-MD-000045) In-Drift Precipitates/Salts Analysis (ANL-EBS-MD-000048) Initial Cladding Condition (ANL-EBS-MD-000049) Multiscale Thermohydrologic Model

AMR MAPPING TO YM REVIEW PLAN ACCEPTANCE CRITERIA

Product Title/Control ID
(ANL-EBS-MD-000056) Summary of In-Package Chemistry Waste Forms
(ANL-EBS-PA-000001) WAPDEG Analysis of WP and Drip Shield Degradation
(ANL-EBS-PA-000002) FEPs Screening of Processes & Issues in DS&WP Degradation
(ANL-EBS-PA-000004) SCC of Drip Shield & WP Outer Barrier & H2 Induced
(ANL-WIS-MD-000004) DSNF and Other WF Degradation Abstraction
(ANL-WIS-MD-000006) Inventory Abstraction
(ANL-WIS-MD-000008) Clad Degradation-FEPs Screening Arguments
(ANL-WIS-MD-000009) Misc WF FEPs
(ANL-WIS-MD-000010) Summary of Dissolved Concentration Limits
(F0210 (AMR ID)) Intrinsic Drip Rates for WF Exposed to a HA Env
(W3001 (AMR ID)) General & Localized Corrosion of WP Outer Barrier
(W3003 (AMR ID)) Passive Film AMR
(W3004 (AMR ID)) SCC AMR
(W3005 (AMR ID)) Aging & Phase Stability of WP AMR
(W3007 (AMR ID)) Environment on DS & WP AMR
(W3010 (AMR ID)) WAPDEG Analysis of WP & DS Degradation
(W3011 (AMR ID)) FEPS Screening of Processes & Issues
(W3015 (AMR ID)) WP Materials PMR
In-Pkg Chem (Combined)
WF Degradation (Combined)
Clad Degradation
Dissolved RN Conc (Combined)
Colloidal RN Conc (Combined)

AMR MAPPING TO YM REVIEW PLAN ACCEPTANCE CRITERIA

Product Title/Control ID
(TDR-EBS-MD-000006) Engineered Barrier System PMR
(ANL-EBS-HS-000003) Abstraction of NFE Thermodynamic Env & Perc Flux
(ANL-EBS-MD-000015) CSNF Waste Form Degradation: Summary Abstract
(ANL-EBS-MD-000037) In-Package Chemistry Abstraction
(ANL-EBS-PA-000003) Abst Mdls Pitting & Crevice Corrosion Drip Shield/WP
(ANL-EBS-PA-000005) Abstraction of Models for SS Structural Material Degradation
(ANL-WIS-MD-000007) Clad Degradation - Summary and Abstraction
(ANL-WIS-MD-000012) WF Colloid-Assoc Concentration Limits - Abst & Sum
(ANL-WIS-MD-000018) In Package Source Term Abstraction
(F0200 (AMR ID)) WF Abstraction for TSPA
(W3012 (AMR ID)) Incorporation of Uncertainty in WAPDEG
(ANL-CRW-GS-000003) Characterize Framework for Seis./Struc. Deform
(ANL-EBS-GE-000004) Effects of Fault Displacement on Emplacement Drifts
(T0130 (AMR ID)) Seismic Risk (Consequence) Analysis
(T0140 (AMR ID)) Seismic Design Inputs
(TDR-EBS-MD-000006) Engineered Barrier System PMR
(ANL-EBS-MD-000001) Environment on Surfaces of DS/WP Outer Barrier
(ANL-EBS-MD-000003) General and Localized Corrosion of WP Outer Barrier
(ANL-EBS-MD-000004) Generalized & Localized Corrosion on Drip Shield
(ANL-EBS-MD-000007) Degradation of Stainless Steel Structural Material
(ANL-EBS-MD-000026) In-Drift Thermal-Hydrological Chemical Model
(ANL-EBS-MD-000033) EBS Physical & Chemical Environment Model
(ANL-EBS-MD-000038) In-Drift Microbial Communities
(ANL-EBS-MD-000039) Seepage/Backfill Interactions
(ANL-EBS-MD-000040) In-Drift Gas Flux and Composition
(ANL-EBS-MD-000042) In-Drift Colloids and Concentration
(ANL-EBS-MD-000043) Seepage/Cement Interactions
(ANL-EBS-MD-000044) Seepage/Invert Interactions
(ANL-EBS-MD-000056) Summary of In-Package Chemistry Waste Forms
(ANL-EBS-PA-000001) WAPDEG Analysis of WP and Drip Shield Degradation
(ANL-NBS-HS-000002) Analysis of Hydrologic Properties Data
(ANL-NBS-HS-000029) Abstraction of Drift Scale Coupled Processes
(ANL-NBS-HS-000037) TH/THM Conceptual Model Analysis
(ANL-NBS-MD-000004) FEPs in Thermal Hydrology & Coupled Processes
(ANL-NBS-TH-000001) Thermal Tests Thermal-Hydrological Analysis/Model Report
(ANL-WIS-MD-000006) Inventory Abstraction
(ANL-WIS-MD-000010) Summary of Dissolved Concentration Limits
(ANL-WIS-MD-000012) WF Colloid-Assoc Concentration Limits - Abst & Sum
(F0190 (AMR ID)) EQ3/6 Data Qual Rev
(MDL-NBS-GS-000003) Mineralogical Model
(MDL-NBS-HS-000001) Drift Scale Coupled Processes (DST & THC Seepage) Models
(MDL-NBS-HS-000002) Seepage Model for PA Including Drift Collapse
(MDL-NBS-HS-000004) Seepage Calibration Model & Testing Data
(U0205) Genesis of Water Movement in UZ
(U0XXX (Becomes U0215)) Coupled Processes Seepage
(F210 (AMR ID)) Intrinsic Drip Rates for WP Exposed to a HA Envs
In-Pkg Chem (Combined)
(TDR-WIS-MD-000001) Waste Form Degradation AMR
(TDR-WIS-MD-000002) Waste Package Degradation AMR
(ANL-EBS-MD-000046) Physical & Chemical Environmental Abstraction Model
(ANL-EBS-PA-000005) Abstraction of Models for SS Structural Material Degradation

AMR MAPPING TO YM REVIEW PLAN ACCEPTANCE CRITERIA

Product Title/Control ID
(ANL-EBS-MD-000037) In-Package Chemistry Abstraction (ANL-NBS-MD-000005) Abstraction of Drift Seepage
(ANL-EBS-MD-000014) Clad Degradation -Wet Unzipping (ANL-EBS-MD-000034) EBS Radionuclide Transport Model (ANL-WIS-MD-000006) Inventory Abstraction (ANL-WIS-MD-000010) Summary of Dissolved Concentration Limits
(ANL-WIS-PA-000001) EBS Radionuclide Transport Abstraction

AMR MAPPING TO YM REVIEW PLAN ACCEPTANCE CRITERIA

Product Title/Control ID
(ANL-NBS-GS-000008) Future Climate Analysis
(ANL-NBS-HS-000027) Analysis of Infiltration Uncertainty
(ANL-NBS-HS-000032) Simulation of Net Infiltration for M & P Climate
(U00175 ((Combine with U0005)) Future Climate Analysis
(ANL-NBS-GS-000008) Future Climate Analysis
(ANL-NBS-HS-000002) Analysis of Hydrologic Properties Data
(ANL-NBS-HS-000007) Natural Analogs for UZ
(ANL-NBS-HS-000015) Development of Numerical Grids for UZ F&T Modeling
(ANL-NBS-HS-000005) Insitu Field Testing of Processes
(ANL-NBS-HS-000017) Analysis of Geochemical Data for UZ
(ANL-NBS-HS-000024) Analysis of Base Case Particle Tracking of Base Case Flow
(ANL-NBS-HS-000027) Analysis of Infiltration Uncertainty
(ANL-NBS-HS-000032) Simulation of Net Infiltration for M & P Climate
(ANL-NBS-MD-000001) FEPs in UZ F&T
(MDL-NBS-GS-000002) Geologic Framework Model 3.1
(MDL-NBS-GS-000004) Rock Properties Model
(MDL-NBS-HS-000002) Seepage Model for PA Including Drift Collapse
(MDL-NBS-HS-000003) Calibrated Properties Model
(MDL-NBS-HS-000004) Seepage Calibration Model & Testing Data
(MDL-NBS-HS-000005) Conceptual &Numerical Models for UZ F&T
(MDL-NBS-HS-000006) UZ Flow Models and Submodels
(MDL-NBS-HS-000007) Mtn-Scale Coupled Process (TH) Model
(U00x1 (AMR ID) Becomes U0220) UZ Thermal Testing AMR
(U0110 (AMR ID)) AMR Drift Scale Coupled Processes MDI
(U0145 (AMR ID)) Geostatistical Representation of the CHn Formation
(U0165 (AMR ID)) Sens. Stdy UZ F&T Seepage
(U0175 (AMR ID)) Future Climate Analysis
(U0185 (AMR ID)) UZ Flow Patterns and Analysis (Realistic Case)
(U0190 (AMR ID)) Drift Scale Coupled Processes TH
(U0195 (AMR ID)) Drift Scale Coupled Processes
(U0205 (AMR ID)) Genesis of Water Movement in UZ
(U0210 (AMR ID)) Shadow Zone AMR
(U0XXX (AMR ID) Becomes U0215) Coupled Processes Seepage
(UN0x1 (AMR ID) Becomes U0225) Drift Scale Coupled Processes THM
(VOLC (AMR ID)) Volcanology AMR

AMR MAPPING TO YM REVIEW PLAN ACCEPTANCE CRITERIA

Product Title/Control ID
(TDR-NBS-HS-000002) UZ F&T PMR (U0115 (AMR ID)) Abst Cpld Process Flow Field (U0200 (AMR ID)) Abstraction of Drift-Scale Coupled Processes (ANL-NBS-HS-000023) Abstraction of Flow Fields for RIP (ANL-NBS-MD-000005) Abstraction of Drift Seepage
(ANL-NBS-HS-000001) Analysis Comparing Advective-Dispersive Trsnp Sol (ANL-NBS-HS-000015) Development of Numerical Grids for UZ F&T Modeling (ANL-NBS-HS-000019) UZ/SZ Rn Transport AMR (ANL-NBS-HS-000020) Fault Displacement Effects on Transport in the UZ (ANL-NBS-HS-000026) Particle Tracking Model/Abstr of Transport Process (ANL-NBS-HS-000028) UZ Colloid Transport Model (ANL-NBS-MD-000001) FEPs in UZ F&T (MDL-NBS-GS-000002) Geologic Framework Model 3.1 (MDL-NBS-GS-000004) Rock Properties Model (MDL-NBS-HS-000005) Conceptual & Numerical Models for UZ F&T (MDL-NBS-HS-000008) Radionuclide Transport Models under Ambient Cond (U0165 (AMR ID)) Sens Stdy UZ F&T Seepage
(TDR-NBS-HS-000002) UZ F&T PMR
(ANL-NBS-HS-000021) Geochemical & Isotopic Constraints on GW Flow (ANL-NBS-HS-000033) Hydrogeologic Framework Model (MDL-NBS-HS-000011) Calibration of Site-Scale SZ Flow Model (ANL-NBS-HS-000022) Modeling SubGridblock Scale Dispersion in 3D Hetero (ANL-NBS-HS-000034) Water-Level Data Analysis for the SZ Site-Scale Flow and Transport Model (ANL-NBS-MD-000002) FEPs in SZ Flow and Transport (ANL-NBS-MD-000003) Probability Distribution for Flowing Interval Spacing (ANL-NBS-MD-000009) Recharge and Lateral GW Flow Boundary Conditions (ANL-NBS-MD-000011) Uncertainty Distribution for Stochastic Parameters (S0185 (AMR ID)) In Situ SZ Testing
(TDR-NBS-HS-000001) SZ F&T PMR (S0190 (AMR ID)) Realistic Case (Expected) (S0180 (AMR ID)) AMR SZ Flow Patterns and Analyses Realistic Case
(ANL-NBS-HS-000030) Input & Results Base Case SZ F&T Model TSPA (ANL-NBS-HS-000031) SZ Colloid-Facilitated Transport (ANL-NBS-HS-000034) Water-Level Data Anl for the SZ Site-Scale F&T Mdl (ANL-NBS-MD-000002) FEPs in SZ Flow and Transport (MDL-NBS-HS-000010) SZ Transport Method and Component Integration (S0195 (AMR ID)) Rn Transport AMR (U0100 (AMR ID)) UZ/SZ Rn transport AMR
(TDR-NBS-HS-000001) SZ F&T PMR

AMR MAPPING TO YM REVIEW PLAN ACCEPTANCE CRITERIA

Product Title/Control ID
(ANL-MGR-GS-000002) Characterize Eruptive Process (ANL-WIS-MD-000005) Disruptive Events FEPs (ANL-WIS-MD-000015) Dike Propagation Near Drifts (ANL-WIS-MD-000017) Igneous Consequence Modeling for TSPA-SR (T0120 (AMR ID)) Physical Volcanology (VOLC (AMR ID)) Volcanology AMR (ANL-MGR-GS-000001) Characterize Framework for Igneous Activity
(ANL-MGR-MD-000001) Values for External Inhalation Rad Exposure Analysis (ANL-MGR-MD-000007) Environmental Transport Parameters Analysis (T0120 (AMR ID)) Physical Volcanology (T0125 (AMR ID)) Ashplume AMR (VOLC (AMR ID)) Volcanology AMR
(ANL-NBS-MD-000006) Groundwater Usage by Proposed Farming Community
(ANL-NBS-MD-000009) Evaluate Soil/Radionuclide Removal by Erosion & Leaching (ANL-MGR-MD-000007) Environmental Transport Parameters Analysis (B0005 (AMR ID)) Radionuclide Removal From Soil
(ANL-MGR-MD-000005) Identification of Critical Group (Food and Tap Water) (ANL-MGR-MD-000011) Evaluation of Applicability of Biosphere-Related FEPs (ANL-MGR-MD-000006) Identification of Ingestion Exposure Parameters (ANL-MGR-MD-000002) Dose Conversion Factor Analysis GENII-S Ass Method (ANL-MGR-MD-000003) Disruptive Event Biosphere Dose Conversion Factor Analysis (ANL-MGR-MD-000004) Disruptive Event Biosphere-DCF Sensitivity Analysis

AMR MAPPING TO YM REVIEW PLAN ACCEPTANCE CRITERIA

Product Title/Control ID
(ANL-MGR-MD-000010) Non-Disruptive Biosphere DCF-Sensitivity Analysis
(ANL-MGR-MD-000009) Non-Disruptive BDCF
(ANL-NBS-MD-000008) Distribution Fitting to the Stochastic BDCF Data
(ANL-MGR-MD-000008) Transfer Coefficient Analysis
(TDR-MGR-MD-000002) Biosphere PMR
(ANL-NBS-MD-000007) Abstraction of BDCF Distributions for Irrigation Periods
TSPA-LA
TSPA-LA
TSPA-LA
I0050 (AMR ID) Fracture AMR
(B0125 (AMR ID)) In-Drift Natural Convection and Condensation
(ANL-NBS-GS-000008) Future Climate Analysis
(ANL-NBS-HS-000026) Particle Tracking Model/Abstr of Transport Process
(ANL-NBS-HS-000023) Abstraction of Flow Fields for RIP
(U0165 (AMR ID)) Sens. Stdy. UZ F&T Seepage

Exhibit 42

Exhibit 42

MOL.20070212.0039

QA: QA

TWP-MGR-PA-000044 REV 00

January 2007

Technical Work Plan for:

Total System Performance Assessment (TSPA) Parameter Selection and Documentation with TSPA Data Input Package (TDIP)

Prepared for:
U.S. Department of Energy
Office of Civilian Radioactive Waste Management
Office of Repository Development
1551 Hillshire Drive
Las Vegas, Nevada 89134-6321

Prepared by:
Sandia National Laboratories
OCRWM Lead Laboratory for Repository Systems
1180 Town Center Drive
Las Vegas, Nevada 89144

Under Contract Number
DE-AC04-94AL85000

2. SCIENTIFIC APPROACH OR TECHNICAL METHODS

2.1 WORK ACTIVITIES

TDIPs will be prepared to provide documentation of inputs for use in the TSPA. The TDIPs will include TSPA parameters, implementation approach, uncertainty, direct inputs, and justification of these inputs to TSPA. TDIPs will be prepared in accordance with LS-PRO-001, *Technical Reports*. TDIPs can be cancelled according to LS-PRO-001, Section 6.5, Cancellation of Technical Reports.

TDIPs, developed under LS-PRO-001, are not a scientific analysis or modeling study (although they may reference these studies), but rather contain information necessary to explain the use of parameters in the TSPA and their justification. As such, they are the starting point for traceability of the inputs to TSPA, back to their original source. The documentation will include references to or descriptions of the parameter, how the parameter is to be used in TSPA, and justification or reference to the justification for the value or values of the parameter, and justification for the distribution of values if the parameter is to be treated with uncertainty. If the parameter is used in an abstraction in TSPA, its relationship to that abstraction will be described in sufficient detail to permit independent reviewers to make a determination of its appropriateness. If the TSPA parameter is a result of a process model, information is either presented or referenced in the TDIP concerning the validation of that process model and supporting the appropriateness of using the process level model. TDIPs will be prepared by teams of PA Analysts, including both PIs and TSPA analysts. The teams will be supported by the Parameter Task Leader and statistical and normative experts in determining the uncertain parameter values. The TDIPs will be checked and reviewed according to LS-PRO-001.

2.2 ADDITIONAL STEPS FOR PERFORMANCE CONFIRMATION TEST PLANS

Not applicable. This TWP does not address any Performance Confirmation test plans.

2.3 ADDITIONAL STEPS FOR MODELING ACTIVITIES

Modeling activities done in support of TDIPs will be documented in model reports following SCI-PRO-006, *Models*.

3. INDUSTRY STANDARDS, FEDERAL REGULATIONS, DOE ORDERS, REQUIREMENTS, AND ACCEPTANCE/COMPLETION CRITERIA

The applicable federal regulations and technical requirements related to the work activities associated with this TWP are generally implemented through the appropriate implementing procedures identified in Section 4. In particular, the requirements identified in 10 CFR 63.113 (b) and 10 CFR 63.114 (a), (b), (c), and (g) are implemented primarily through LS-PRO-001. There are no U.S. Department of Energy (DOE) orders applicable to the scope of work identified in this TWP.

Acceptance criteria from Section 4.2.1, Performance Assessment, in *Yucca Mountain Review Plan, Final Report* (NRC 2003 [DIRS 163274]) are relevant to the planned work.

Exhibit 43

Exhibit 43

QA: QA

U.S. DEPARTMENT OF ENERGY
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT
OFFICE OF QUALITY ASSURANCE

REPORT FOR SURVEILLANCE OQA-SI-07-010 OF OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT LEAD LABORATORY STATUS AND PROCESSING TOTAL SYSTEM PERFORMANCE ASSESSMENT DATA INPUT PACKAGES

APRIL 20 – 25, 2007

Prepared by: _____ **Date:** 05-01-2007
Kenneth O. Gilkerson
Surveillance Team Leader
Office of Quality Assurance

Approved by: _____ **Date:** 5/1/07
Elver D. Robbins III
Acting Team Lead, Quality Assessments
Office of Quality Assurance

It should be noted that the Lead Lab's Quality Assurance (QA) group also performed a surveillance of the compliance and technical checking of TDIPs based on completed records packages available to them. At the time of the OCRWM surveillance, three TDIPs with record packages were reviewed by Lead Lab QA. CR 10377 was self identified by the Line during their surveillance regarding a checking issue. However, since the initiation of this surveillance, the Lead Lab has extended its surveillance as more record packages have become available. Their conclusions will be documented in Surveillance Report LL-QA-IS-07-18.

The following table lists the TDIPs that have been issued as of April 25, 2007, and those that have been reviewed by the surveillance team.

TDIP Number	AMR Number	OQA Review
TDR-TDIP-NS-000001	MDL-NBS-HS-000001	YES
TDR-TDIP-NS-000002	MDL-NBS-HS-000021	
TDR-TDIP-NS-000003	MDL-NBS-HS-000008	YES
TDR-TDIP-NS-000004	MDL-MGR-MD-000001	
TDR-TDIP-NS-000005	MDL-NBS-HS-000020	
TDR-TDIP-NF-000001	ANL-WIS-MD-000010	
TDR-TDIP-NF-000003	ANL-WIS-MD-000020	
TDR-TDIP-NF-000004	MDL-NBS-HS-000019	
TDR-TDIP-NF-000005	ANL-EBS-MD-000033	
TDR-TDIP-ES-000001	ANL-EBS-MD-000003	
TDR-TDIP-ES-000003	ANL-EBS-MD-000005	
TDR-TDIP-ES-000005	ANL-EBS-MD-000021	
TDR-TDIP-DE-000002	ANL-MGR-GS-000001	
TDR-TDIP-DE-000003	MDL-MGR-GS000002	
TDR-TDIP-DE-000004	ANL-MGR-GS-000003	YES
TDR-TDIP-TSPA-000001	ANL-WIS-PA-000001* see following discussion	YES
TDR-TDIP-ES-000007	ANL-WIS-MD-000021	YES
TDR-TDIP-ES-000008	ANL-EBS-MD-000006	YES

OQA identified two issues during this surveillance that resulted in a Condition Report 10513, which addresses conditions adverse to quality relative to requirements not met by the initiator nor found during the checking process.

TDR-TDIP-DE-000004, Revision 00, *Total System Performance Assessment Data Input Package for Number of Waste Packages Hit by Igneous Events*, issued and approved April 2007, depicts use of software DIRECT V4.0 for the data tracking numbers (DTN) discussed. Section 4.3 of this report indicated that this software was controlled by Software Configuration Management. This software was unqualified at the time and not controlled by Software Configuration Management. Additionally, Section 4.3 describes the codes cited in this TDIP being used in "this analysis." By definition, Technical Reports per LS-PRO-001 cannot be analyses or calculations. This approved TDIP reflects inaccurate information.

TDR-TDIP-NS-000003, Revision 00, *Total System Performance Assessment (TSPA) Data Input Package for Unsaturated Zone Radionuclide Transport Parameters Matrix Diffusion and Sorption*, issued and approved April 2007, lists DQP-MGR-HS-000001, *Data Qualification Report for Selenium and Tin Sorption Data Obtained by the Los Alamos National Laboratory*, as an input to the TDIP. The Document Input Reference System (DIRS) list this input as a direct input. The Data Qualification Report is a source to Selenium and Tin Sorption data described in this technical report. This input was to be verified (TBV) and a draft copy was assigned a Records Information System (RIS), accession number LLR.20070316.0138. The availability of this report during the review and checking process was questioned by the team during the surveillance since a copy could not be found electronically in the RIS or in CDIS. The technical checker indicated that a copy of this input was not available during the review. The QA program requires all inputs to be verified during the review. Direct inputs (even if TBV'd) have to be available to the technical checker and the compliance checker.

Another potential issue was investigated related to concerns that new (or revised) DTNs could be generated for updating information in AMRs that were not scheduled to be revised in support of TSPA. A draft work agreement between the Lead Lab and Lawrence Berkeley National Laboratory (LBNL) indicated that revision to certain data in the Radionuclide Transport Model Report could be performed in a TDIP and in the TSPA Model Report because the changes in the data were limited. This issue was identified by OCRWM in preparing for an audit of the Lead Lab at LBNL. DTNs and product output for TSPA are typically driven by AMRs developed to support TSPA through the analyses (SCI-PRO-005) or models (SCI-PRO-006) procedures. Some mechanism is needed to control the processes for revising data and the TDIP process cannot do that. However, it was determined that the TDIP-TSPA-001 issued April 13, 2007, does in fact address a revision to the Radionuclide Transport Model and does not use the TDIP process to change data as was proposed in the draft work agreement.

4.0 LEAD LAB CONTACTS

Charles Beach	Technical Support, Quality Compliance
Pam Dahl	Performance Assessment Integrations, External Support
Paul R. Dixon	Performance Assessment Integrations, Operations Manager
James E. Houseworth	Performance Assessment
Schon S. Levy	Performance Assessment, Technical Checker
Stephen F. Schuermann	QA
Ronald J. Stevens	QA Manager

5.0 OVERALL CONCLUSIONS

Although several minor issues were identified, the overall TDIP process is adequate. It is an interim process control to provide TSPA some confidence in using preliminary data until the AMRs being revised are finalized and the DTNs are qualified. From a process perspective, it is critical that the checking and review processes be followed to ensure the integrity of the information being used in TSPA computer runs. The schedule for the completion of the 26 TDIPs has slipped somewhat and the June 30 date for completion of the TSPA supporting AMRS is questionable. These revised AMRs are necessary to support completion of the TSPA Model Report, which is required for the License Application.

Exhibit 44

Exhibit 44

CCU.20071009.0009

QA: QA

SANDIA NATIONAL LABORATORIES – LEAD LABORATORY (SNL-LL)

REPORT FOR AUDIT LLQA-IA-07-008

WASTE PACKAGE DEGRADATION AND NEAR-FIELD ENVIRONMENT TECHNICAL PRODUCTS

LAS VEGAS, NEVADA
LIVERMORE, CALIFORNIA

AUGUST 13 – 29, 2007

Prepared by: Roxanna L. Scaglione
Roxanna L. Scaglione
Audit Team Leader
Lead Lab Quality Assurance

Date: 10/2/07

Reviewed by: James L. Maupin
James L. Maupin
Audits and Surveillances Manager
Lead Lab Quality Assurance

Date: 10/1/2007

desired, the investigator is free to dismiss adherence to a standard as inappropriate but then assumes the burden of specifying the conditions of the experimental work in adequate detail so as to be reproducible. In the present consideration, there is no need to explain why a standard practice was not invoked. The work performed is directly applicable to its intended use and is therefore adequate without invoking additional standards.

The stated use of ASTM G 1-90 is adequate in Section 6.1.

This CR was written to identify issues #32 and #33 from the audit.

CR 11114 - No Clear Disposition Path for TDIPs

The Total System Performance Assessment Data Input Package (TDIP) is an interim document that characterizes preliminary data and describes how it is to be used by TSPA. The TDIP allows TSPA to use this preliminary data with some level of confidence until the associated AMR providing the final data is approved. Interview results indicated that no path forward or disposition had been defined for TDIPs once the associated AMR was approved. It was unclear if TSPA would continue to use the TDIP as input after the associated AMR was issued. In the case where data values changed between the TDIP process and the final AMR, no formalized controls were identified to ensure that the correct values were used. It is recommended that the Lead Lab come to an agreement on the disposition of TDIPs when the associated AMR is completed and issued.

This CR was written to identify issue #1 from the audit.

CR 11116 - Corrective Action Program Database Access

During the audit personnel were interviewed regarding their knowledge and understanding of the Corrective Action Program (CAP). During those interviews it was noted that not all individuals initiating CRs have direct access (user name and password) to be able to electronically initiate a CR in the CAP Database, or run queries on existing CRs. It is recommended that those individuals initiating CRs obtain a user name and password.

This CR was written to identify issue #28 from the audit.

CR 11117 - Linking to Corrective Actions Captured in other CRs

Responses to open CR 7499, in particular an attachment to corrective action 7499-011 (see page 33 of CR 7499) where actions that are taken to correct perceived problems are documented in another CR (see CR 7424), should include a clear link between the response/interview responses (CA 7499-011) and the implemented actions (CR 7424).

This CR was written to identify issue #34 from the audit.

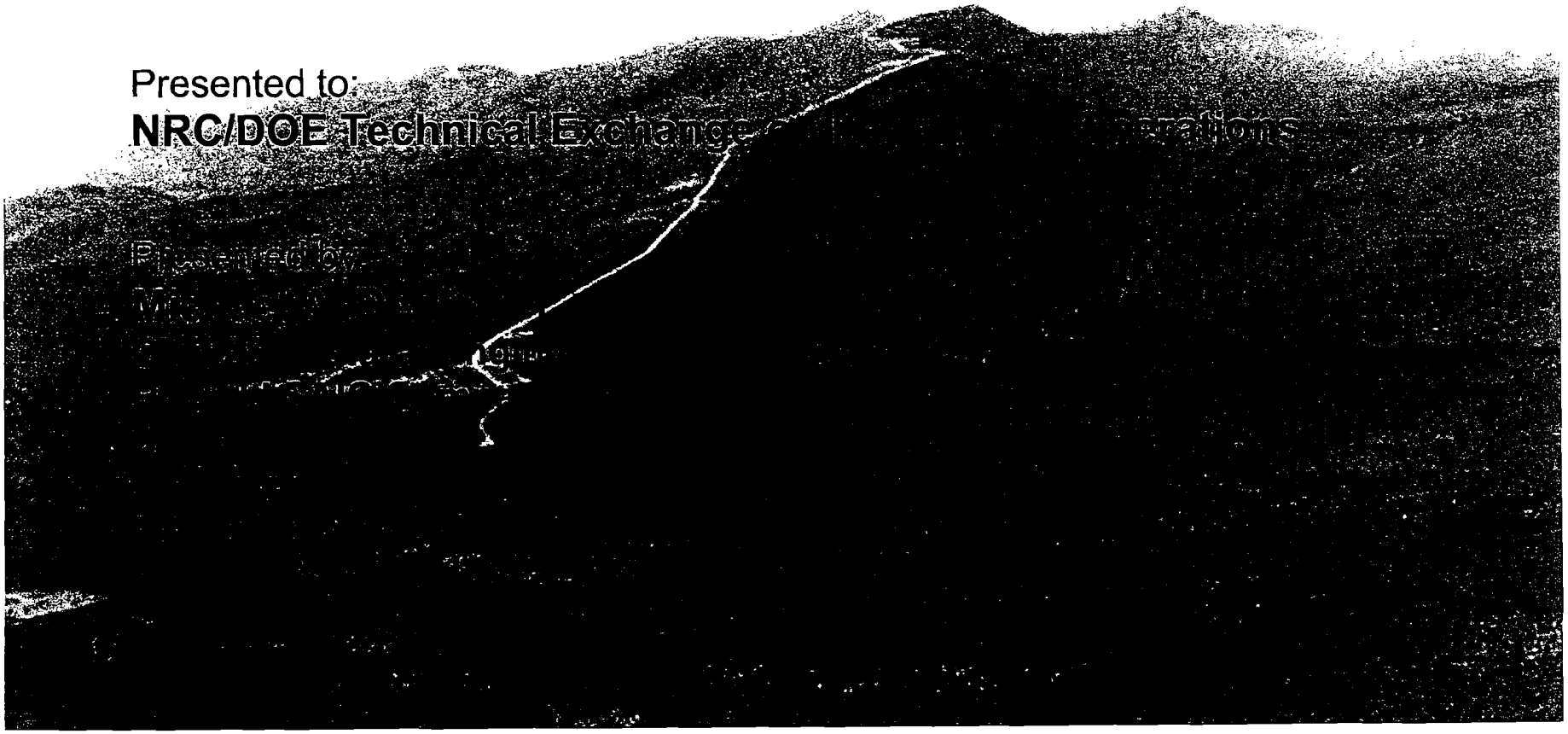
Exhibit 45

Exhibit 45

U.S. Department of Energy
Office of Civilian Radioactive Waste Management

www.ocrwm.doe.gov

Seismic Design Considerations



Presented to:
NRC/DOE Technical Exchange

Presented by:

Seismic Analysis Approach

- **Tier-1 Analysis**
  - Determine response of structures for seismic loads
  - Determine seismic forces and design structural members
  - Demonstrate Compliance with Nuclear Safety Design Bases in License Application
  - Development of In-Structure Response Spectra (ISRS) for component qualification
  - Demonstrate safety of ITS facilities
- **Tier-2 Analysis**
  - Basis of Detailed Design Calculations
  - Confirm Tier-1 Analysis Results
  - Available May 2008

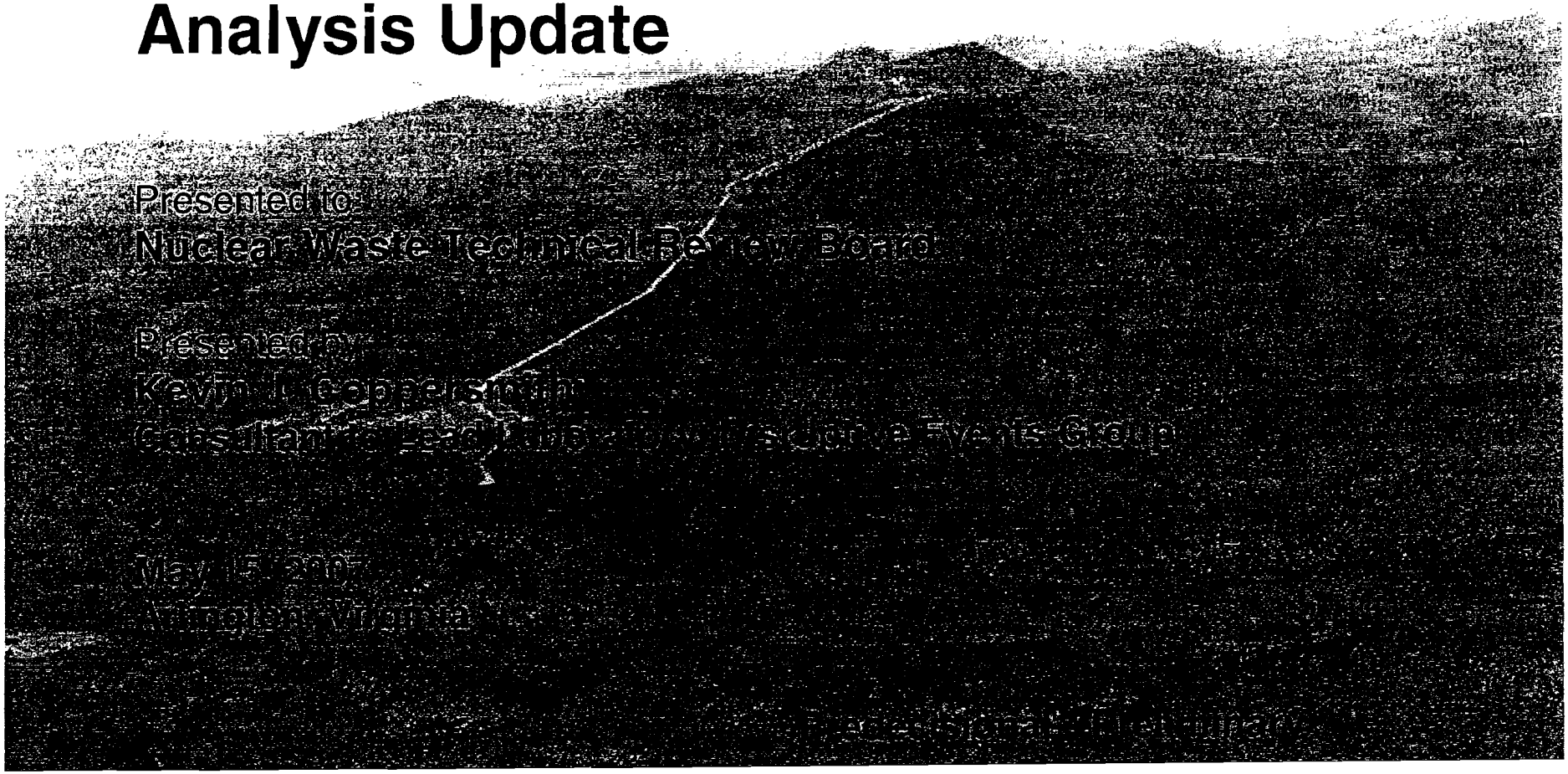
Exhibit 46

Exhibit 46

U.S. Department of Energy
Office of Civilian Radioactive Waste Management

www.ocrwm.doe.gov

Probabilistic Volcanic Hazard Analysis Update



Presented to:
Nuclear Waste Technical Review Board

Presented by:
Kevin M. Coppersmith
Consultant to Lead Author, Igneous Events Group

May 15, 2007
Arlington, Virginia

History Leading to PVHA-U

- Following completion of the PVHA, new aeromagnetic and ground magnetic data became available suggesting possible buried volcanic centers in Crater Flat
- DOE sensitivity study indicated a modest increase in the mean annual frequency of intersection of the repository; transmitted to NRC for review
- The NRC staff concluded DOE did not provide an adequate technical basis and that additional information was needed
- DOE made a regulatory commitment to complete a program of field studies (aeromagnetic survey, drilling, and sampling), data analysis, and to plan an update to the PVHA; final documentation is planned for Fiscal Year 2008 during License Application review

Schedule

Activity	Schedule
Planning	July to September 2004
Select and Retain Experts	August to September 2004
Distribute Information to Experts for Review	September 2004
Workshop 1 Key Issues and Available Data	October 11 to 15, 2004
Workshop 2 Alternative Models	February 15 to 18, 2005
Workshop 2A Approaches to Volcanic Hazard Modeling	August 30 to 31, 2005
Field trip to event-definition analogue sites	May 2 to 4, 2006
First Round of Elicitation Interviews	July to August 2006
Workshop 3 Preliminary Expert Assessments	September 26 to 27, 2006
Second Round of Elicitation Interviews	November to December 2006
Preliminary Hazard Calculations and Sensitivity Analyses	January to April 2007
Workshop 4 Feedback	May 10-11, 2007
Experts Finalize Elicitation Summaries	July 2007
Final Hazard Calculations and Aggregation of Expert Assessments	July 2007 to January 2008
Report Preparation/Finalization	November 2007 to June 2008

Complete

Summary

- PVHA-U methodology consistent with guidance for formal expert elicitation processes within regulated environment
- PVHA-U takes advantage of the lessons learned and opportunities for refinement
- Process structured around workshops and expert interactions
- PVHA-U results will be documented in Fiscal Year 2008 during the NRC's License Application review

Exhibit 47

Exhibit 47

SUPPLEMENTAL EVALUATION OF GEOPHYSICAL INFORMATION USED TO DETECT AND CHARACTERIZE BURIED VOLCANIC FEATURES IN THE YUCCA MOUNTAIN REGION

Prepared for

U.S. Nuclear Regulatory Commission
Contract NRC–02–02–012

Prepared by

John A. Stamatakos
Saurav Biswas
Mark Silver

Center for Nuclear Waste Regulatory Analyses
San Antonio, Texas

August 2007

EXECUTIVE SUMMARY

The probability of future igneous activity affecting the potential repository site at Yucca Mountain, Nevada, is addressed in models of the total system performance assessment. Uncertainties in igneous activity probability affect risk calculations linearly such that each order of magnitude increase in probability increases risk by an order of magnitude. In 2004, the U.S. Department of Energy (DOE) reconvened an expert elicitation panel to reassess the probability of an igneous event disrupting the potential repository for high-level nuclear waste at Yucca Mountain. The Probabilistic Volcanic Hazard Assessment-Update (PVHA-U)[1] supersedes the original DOE probabilistic Hazard Assessment (PVHA),[2] which was concluded in 1996. The goal of this PVHA-U is to characterize the spatial and temporal distributions of future igneous events and associated geometries and characteristics of intrusive and extrusive igneous activity at Yucca Mountain for both a 10,000- and 1-million-year period of performance. Results of the updated assessment will be probability distributions defining the annual frequency of intrusive and extrusive igneous events that can be combined with consequence studies in a performance assessment used to assess risk.

To support the expert elicitation, the DOE sponsored a high-resolution aeromagnetic survey of the Yucca Mountain region. The survey was conducted using a helicopter with an average sensor elevation of 40–50 m [131–164 ft] above terrain. Based on the resulting anomaly map, DOE identified a subset of seven anomalies for additional testing. The DOE drilled these seven anomalies to determine whether basaltic igneous features buried in the subsurface were the sources of the anomalies. The DOE encountered basalt in four of the seven boreholes. Basalt samples from those four boreholes were cored for additional analyses, including radiometric age determinations and mineral identification. Staff obtained basalt core samples from the DOE Sample Management Facility from which petrologic, magnetic, and paleomagnetic data were obtained. The magnetic data provided additional constraints for two-dimensional geophysical models of the anomalies.

These geophysical models help staff assess and rank identified anomalies in terms of how likely the anomalies represent basaltic features in the subsurface. This ranking will also be used by staff to evaluate uncertainties in probability models DOE developed in the PVHA-U. Analyses provided in this report supplement and update the initial evaluation of aeromagnetic data provided in the 2002 CNWRA report "Evaluation of Geophysical Information Used to Detect and Characterize Buried Volcanic Features in the Yucca Mountain Region" by Brittain Hill and John Stamatakos. In the 2002 report, Hill and Stamatakos concluded that there may be twice as many basaltic volcanoes in the Yucca Mountain region than considered in the original 1996 DOE hazard assessment. These additional buried volcanoes could potentially lead to a tenfold increase in probability estimates for igneous activity at Yucca Mountain.

The new DOE analyses have reduced the overall uncertainty in the number of past events. Specifically, many of the anomalies that were previously ranked as having a high or medium likelihood of being the result of buried basalt are now confirmed buried basaltic features while

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[1]The phrase "Probabilistic Volcanic Hazard Assessment-Update" (PVHA-U) is used repeatedly throughout this document; therefore, for ease of reading, the acronym PVHA-U has been used.

[2]The phrase "Probabilistic Volcanic Hazard Assessment" (PVHA) is used repeatedly throughout this document, therefore; for ease of reading, the acronym PVHA has been used.

several anomalies ranked as having a low likelihood of being buried basalt are now confirmed as being the result of faulted tuff. Moreover, the aeromagnetic data and drilling program have identified previously unknown Miocene basalt buried in Fortymile Wash.

The new DOE information and analyses also support the hypothesis that past volcanism in the Yucca Mountain region is temporally clustered. The most active of these temporal clusters was one that occurred between 3.6 and 4.7 million years ago, in which at least 12 to 17 volcanoes formed. This leads to an episodic recurrence rate of 11 to 16 volcanoes per million years, which is substantially greater than the longer term average rate of about 5 volcanoes per million years and an order of magnitude greater than the 1 to 3 volcanoes per million years in the original 1996 DOE assessment. Additional temporal clusters are recognized for the period between about 9 and 11.2 million years ago and one between 80,000 and 1 million years ago. Based on these data, it appears that temporal clustering is an important feature of the Yucca Mountain system that should be accounted for in volcanic probability models.

In addition to temporal clustering, new data and modeling results from the drill core at anomaly A reveal an accumulation of basalt that appears to be a very thick intrusion or sill rather than a buried volcanic lava flow or cone. This is the first documented evidence of a voluminous basaltic sill in the Crater Flat structural basin. The presence of a sill raises the possibility that, in addition to existing igneous activity scenarios in which a basaltic dike intersects repository drifts or a volcanic conduit forms thorough the repository, a basaltic sill could form within or beneath the potential Yucca Mountain repository.

Finally, the new DOE data coupled with the magnetic and petrologic studies documented in this report improve resolution of buried basaltic volcanic features and thereby reduce but do not eliminate uncertainties in spatial and temporal recurrence rates. Magnetic data alone cannot differentiate basalt from faulted tuff in areas with extensive tuff outcrops. Magnetic properties of the tuffs and basalts are comparable, and without additional information, magnetic anomalies arising from fault to tuff or basalt appear quite similar. This ambiguity was apparent in interpretations of anomaly Q, which the U.S. Geological Survey ranked as unlikely to be buried basalt. The DOE drill hole at anomaly Q encountered basalt at 140–163 m [459–535 ft]. Thus, areas with faulted tuff at or near the surface could contain additional, undetected basalt. This "present but undetected" designation adds uncertainty to volcano counts used in probability studies. The analyses provided in the 2002 Hill and Stamatakos report remain valid methods for staff to evaluate the potential for present but undetected volcanoes.

Exhibit 48

Exhibit 48

QA: NA

TWP-CRW-RL-000002 REV 01

April 2007

Technical Work Plan for:

Defensibility of Technical Products Supporting the License Application

Prepared for:
U.S. Department of Energy
Office of Civilian Radioactive Waste Management
Office of Repository Development
1551 Hillshire Drive
Las Vegas, Nevada 89134-6321

Prepared by:
Sandia National Laboratories
OCRWM Lead Laboratory for Repository Systems
1180 Town Center Drive
Las Vegas, Nevada 89144

Under Contract Number
DE-AC04-94AL85000

2. Perform a vulnerability assessment of the postclosure science technical products that the LL accepted from BSC, and implement mitigation plans to eliminate identified vulnerabilities associated with these products, or to mitigate any residual risk that may result from them. This activity will result in the development of a process for identifying, documenting, and remediating vulnerabilities in the core technical basis supporting the LA. The need for this process was identified after investigating potential vulnerabilities in technical products transitioned to the LL from BSC. CR #9815 identifies the need for such a process. The process described in this TWP is intended to satisfy that need. In conducting the vulnerability assessments planned in this TWP, emphasis will be placed on the timely discovery and resolution of issues relating to the core technical and modeling basis supporting submittal of an LA to the NRC on or before June 30, 2008. The vulnerability assessment process will continue to completion as part of license defense activities following LA submittal for technical products outside the core technical and modeling basis.

3. Reflect residual vulnerabilities for which resolution must be deferred for reasons of priority or time constraints in the project Risk Register, and address these vulnerabilities prior to the hearing(s) on the LA. This work will be performed by the License Defense Group within the Licensing Department, and the Performance Assessment System Integration Team (PASIT) within the Performance Assessment Systems Integration Group (PASIG).

4. Assist the DOE's Legal Team (DOE Office of General Counsel [OGC]) and its legal support contractor in identifying a witness pool that will be ready to defend the technical products supporting the LA. This work will be performed by the License Defense Group within the Licensing Department.

The work performed and products produced under this TWP are LSN Relevant. Some of this work and associated products may also be privileged under the categories of predecisional deliberative process and/or litigation work product, and shall be marked and handled accordingly. This includes the Vulnerability Assessment Database referred to in the Executive Summary, and in Subtask 2.4 of Section 2.1.2, as well as reports and information generated from the database and other work performed under this TWP. In addition, information provided by the U.S. Department of Energy's Office of General Counsel, or its legal support contractor, shall be marked "Attorney-Client Communication" and shall be handled accordingly. Communications involving such information and work products, whether in hard copy or electronic formats, shall likewise be marked and handled as relevant and privileged communications.

2. SCIENTIFIC APPROACH OR TECHNICAL METHODS

2.1 WORK ACTIVITIES

The overall technical and performance objectives of the scope of work described in this TWP are as follows:

- The current TSPA model architecture that provides a "wiring diagram" for the TSPA system model executed within the GoldSim software, including external feeds (e.g., external process models)

- The controlled TSPA database containing fixed-value and uncertain parameters used in the execution of the TSPA model, as well as the data that support the development of models embedded in the TSPA model.

In addition, the LL has acquired the following relevant background information:

- A list of pre-existing technical and quality assurance (QA) issues, as expressed in terms of key technical issues (KTIs) and associated Additional Information Needs (AINs), Regulatory Integration Team (RIT) comment records, CRs, and other internal and external review comments.

The following items will be obtained or developed in conjunction with the LL PA Department as a part of the work described in this TWP:

- Identification of the core technical and modeling basis supporting the LA, using a risk-informed approach consistent with the guidance of NUREG-1804

- A list of technical staff involved in the preparation of technical products (including information on their educational background, work experience, and technical expertise to support identification of a witness pool)

- A map of both direct and indirect TSPA inputs into the TSPA-LA system model architecture, using a top-down architecture of parameters, FEPs, submodels, and analysis and model reports (AMRs)

- A comprehensive list of primary software items and a ranking of software adequacy issues

- A ranking of each technical product, based upon importance to the quantitative regulatory requirements and barrier capability, and the potential for adversely impacting technical credibility, using a risk-informed approach (see page B-5 for a more detailed discussion of how this ranking will be determined).

2.1.1 Task 1 – Management of Future Technical Challenges

The primary subtasks associated with this work package include the following:

Subtask 1.1. Assessment of Critical Lessons Learned from Previous Events

Conduct a review of existing lessons learned to determine what could be done better to manage the issue resolution process.

Importance to the compliance decision is evaluated by determining which parameters/ processes account for most of the uncertainty in the performance metrics (e.g., dose). The dose is then compared to the applicable quantitative regulatory requirements in 10 CFR Part 63. Based on sensitivity analysis results, the parameters in the PA database will be prioritized in accordance with the discussion in the previous paragraph. Then, the most important parameters—those that are judged to account for the majority of uncertainty in the regulatory performance metrics—will be selected as the core set. The processes depicted in Figure B-3 (see Appendix B) will be implemented with this core set, starting from the core parameters in the PA database, and pulling the string to develop a trace through the technical work products to source data and information. Transparency, traceability, and qualification problems identified in this trace will be handled through the submittal of CRs into the Corrective Action Program (CAP). When the compliance analysis results are available and understood, this core set will be reevaluated and augmented, if necessary. The same processes will continue, as described in this TWP, for technical products outside the core technical and modeling basis in support of license defense.

The following technical areas will be evaluated as part of the vulnerability assessment of technical products supporting the LA:

- Data/parameter traceability and qualification
- Consistent treatment of parameter uncertainty
- Traceability and qualification of software
- FEPs screening
- Models and analyses
  - Model inputs
  - Model assumptions
  - Technical basis of model
  - Model confidence-building
  - Model conclusions
  - Consistency between models.

This subtask will be performed using the process shown in Figure B-3 (see Appendix B). Specific questions to ask in conducting this technical review are provided in Appendix B. This review will begin with previously discovered vulnerabilities (as documented in various comment/response databases), and will examine whether or not these were eliminated or mitigated during the associated AMR or TDIP revisions.

The portion of this subtask that involves evaluating whether uncertainty in parameters was treated consistently will be performed by the PASIT, within the PASIG.. In the same manner, the portion of this subtask that involves evaluating FEPs screening will be performed by the PASIT, within the PASIG.

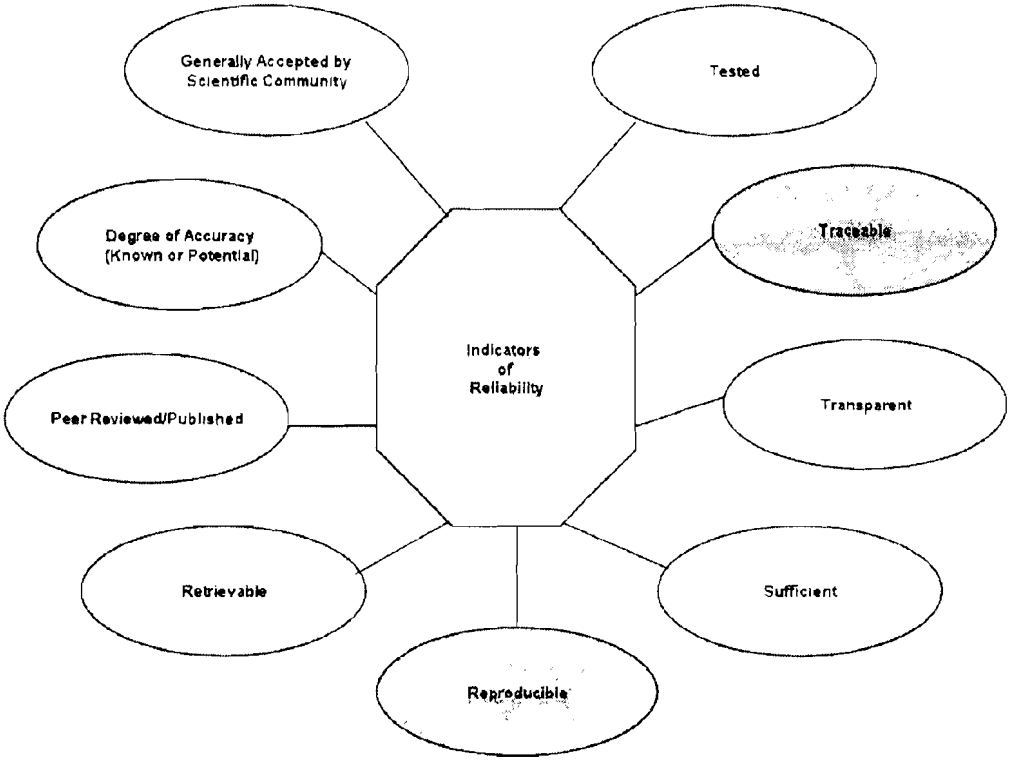

Figure B-1. Indicators of Reliability of Technical Evidence.

These attributes do not constitute a complete checklist for reliability and may not all apply.

In addition to being reliable, if the technical basis is to be defensible, it must also be technically credible and must meet applicable QA standards, 10 CFR Part 63 requirements, and YMRP acceptance criteria. Although it is recognized that some of the older technical products may not have been required to meet the YMRP acceptance criteria, the YMP Licensing Strategy Document that is currently under development states that the LA must adequately address all the guidance of the YMRP. Those instances discovered during the VA in which a technical product fails to meet YMRP criteria will be recorded as vulnerabilities and treated accordingly. The technical and modeling basis for the LA must adequately address the YMRP criteria independent of when the individual work products were developed. Specific criteria intended to determine whether a particular aspect of the technical basis of the postclosure safety case has these qualities have been developed. These are documented below.

For the purposes of this VA, "vulnerability" is defined as a condition in a particular part of the technical or QA basis for the postclosure safety case that weakens the defensibility of the LA and opens the LA to potentially damaging criticisms. Vulnerabilities will be treated as privileged information if they involve elements of legal strategy developed in anticipation of licensing litigation or non-finalized DOE policy. Privileged issues will be identified, addressed, and

Model vulnerabilities that are identified through this process, or that are identified by the PASIT, will be prioritized on the basis of importance to quantitative requirements and barrier capability, in coordination with the PASIT, and in terms of potential adverse impacts to technical credibility, as discussed previously. The highest priority vulnerabilities will be addressed first. If there is enough time for the particular vulnerability to be corrected in time for the compliance analysis, this option will be chosen. It is anticipated that there will be some vulnerabilities that will be addressed later, in coordination with the appropriate subject matter experts and PA analysts, by addressing in the NGPA the particular aspect of the model or analysis that represents a vulnerability.

For example, interactions of personnel between the PA System Integration Department and the Licensing Department as a part of the current work scope have identified a vulnerability: the technical basis for calculating the probability of a volcanic event is not the same as the technical basis for calculating the consequences of the same volcanic event. The probability calculation (i.e., the results of the Probabilistic Volcanic Hazard Assessment) is about 10 years old, while the consequence calculation relies, in part, on more recent data. The significance of this inconsistency will be examined and quantified for the compliance assessment. A possible approach for the mitigation plan would be to use the results of the current Probabilistic Volcanic Hazard Assessment (when they become available) in future iterations of PA analyses during license defense (i.e., the NGPA) so that it reflects consistent technical bases for both the probability calculations and the consequence calculations.

Performance indicators for model review, depending on the phase of the VA, include the following: (1) the number of AMRs and TDIPs reviewed, compared to the total number of AMRs and TDIPs to be reviewed; (2) the number of vulnerabilities identified, compared to the number of AMRs and TDIPs reviewed; and (3) the number of high priority vulnerabilities for which mitigation plans have been written, compared to the number of high priority vulnerabilities identified.

Like the FEP process above, success for this activity is measured by whether the compliance analysis is successful. For LA submittal, successful technical review of the PA implementation and, specifically, of the system model, by a multidisciplinary set of peers, will be the measure as currently proposed by the LL. When there are known vulnerabilities, the path forward to address the important vulnerabilities must also be reviewed, and success for this VA activity is measured by whether the review of the PA implementation, in addition to the mitigation plans for the important vulnerabilities, is successful.

B.4. Mitigation Decisions

When each mitigation plan for a vulnerability that is not appropriate for entry into the CAP system is completed, a Decision Package will be developed for the consideration of the LL Senior Management Team. The Decision Packages will contain information relevant to certain decision attributes, including but not necessarily limited to the following:

Exhibit 49

Exhibit 49

CONCEPT OF OPERATIONS for the YUCCA MOUNTAIN PROJECT TECHNICAL DATA MANAGEMENT SYSTEM

Version: 1.0

March 31, 2007

Prepared by:

Sunita Moonka, 04519, 284-3259, smoonka@sandia.gov

Jason Follingstad, 04538, 844-66623, jtfoll@sandia.gov

Sean Hendrickson, 04515, 284-7887, slhendr@sandia.gov

Brian Scott, 04531, 844-4762, bcscott@sandia.gov

Walter Walkow, 04538, 844-3750, wmwalko@sandia.gov

technical data, and search and access to the information by authorized users. The TDMS is organized around three main functionalities (i.e., data entry, data quality assurance, and data retrieval/usage). These involve five separate sets of roles and responsibilities (i.e., originator, reviewer, data coordinator, database administrator, and records coordinator) as depicted in Figure 3. (See Appendix A.)

DIRS, in conjunction with multiple applications, is primarily a reference management system that supports the formatting of bibliographies and cited works, and cross-references document inputs and products to allow tracking of these references. DIRS is organized around three main functionalities (i.e., reference entry, reference verification, and reference usage). These involve three separate sets of roles and responsibilities (i.e., originator, reference locator, and DIRS administrator) as depicted in Figure 6(see Appendix A). (See Section 4.0 for details of the current TDM Systems.)

We found, serious issues and gaps in the TDM (see Section 6.0) in our analysis. The TDM Systems do not automatically suppor,t and in some cases inhibit,t the flow of the work. By not automatically supporting the flow of work, humans must manually ensure the integrity, accountability, and traceability of the data. These issues and gaps include:

- Suboptimal business processes (e.g., no IRAN process for QSL data in TIC, no time limit on IRAN response, less than optimal quality control on USGS data submitted directly into RPC)
- Parts of the business processes are supported by TDMS, DIRS, and other peripheral systems while critical processes (e.g., impact review assessment notification, submission of technical products and product references, quality control, review of technical data, tracing developed data to source data) are accomplished manually.
- Most TDMS operating system software, middleware, database management system software, and programming languages are dated and are often unsupported technologies on the Bechtel SAIC Company (BSC) network.
- Extensive manual manipulations are necessary to accomplish many of the operational procedures, which is time consuming and labor intensive, especially if errors are to be avoided.
- Each of the functional areas has supporting applications operating in a legacy infrastructure environment consisting of "stovepipe" systems and data.
- There are security and maintenance issues. For example, by design of the system, it is necessary for TDMS administrators to have full access to the file server and production database so that they can publish the static web pages, upload datasets, and update the database when they receive new or changed datasets. Because of this, administrators have the ability to accidentally manipulate production data without going through the application, thus bypassing access controls.

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Recommendation for moving forward

We recommend that the current TDM System be replaced. The replacement system must automatically track data items through the system from end-to-end; conclusions developed and

Information Systems Center (4500) of Sandia, in its roll as YMP Lead Laboratories of the existing technical data management (TDM) process that supports the YMP PA. This analysis complied with the governing DOE regulations and orders[1] as well as Sandia Corporate requirements and guidelines[2]. (See Section 2.0 for details about the government and Sandia Corporate regulations, orders, requirements, and guidelines.)

1.2 Problem Statement

Currently, the TDM Systems is a collection of six major databases, user interface screens, and processes requiring extensive manual manipulation. Although current functions can guarantee that current processes are being followed, the TDM Systems cannot guarantee the "correctness" of the process nor the "correctness" or authenticity of the data, and consequently, accountability for license defensibility may fail in certain cases. Additionally, most of the TDM Systems hardware, operating system software, middleware, database management system software, and programming languages are outdated technologies. Furthermore, the requirements analysis of a replacement system must comply with both government and Sandia quality assurance requirements.

2.0 QUALITY ASSURANCE DRIVERS

2.1 DOE Office of Civilian Radioactive Waste Management

The TDM Systems must comply with the DOE Office of Civilian Radioactive Waste Management (OCRWM), Office of Science and Technology and International (OSTI) Program guidelines, standards, and requirements for research, development, test, and analysis materials and methods for use in enhancing applications. The governing documents are:

1. DOE/RW-0333P, "Quality Assurance Requirements Description" (QARD), and
2. Attachment 1 "Quality Assurance Requirements for Work Authorized by OCRWM Program and Funding Guidance Memorandum."

Sandia implemented the Sandia OSTI Quality Assurance Program to address OSTI requirements. The Sandia OSTI Quality Assurance Program is implemented via the Sandia Quality Assurance Program Plan (QAPP) to satisfy the requirements of the QARD for YMP. Of particular impact on the tasks discussed in this ConOps are Sandia guidelines for establishing processes, procedures, and responsibilities in the Sandia QAAP, *Supplement V, Control of Electronic Management of Data*. The following guidelines apply to this supplement:

- IM-PRO-002, Control of Electronic Management Information
- IM-PRO-003, Software Management
- IM-PRO-005, Software Independent Verification and Validation
- IM-PRO-006, Independent Verification and Validation
- SCI-PRO-002, Records Management
- SCI-PRO-004, Managing Technical Product Inputs
- TST-PRO-003, Scientific Notebooks

2.2 Sandia Corporate Process Requirements

Additionally, updates and replacements to the TDM Systems outdated processes and technologies must comply with corporate quality assurance drivers such as the Corporate Policy

Exhibit 50

Exhibit 50

Department of Energy
Office of Civilian Radioactive Waste Management
1551 Hillshire Drive
Las Vegas, NV 89134-6321

QA: N/A

SEP 13 2007

OVERNIGHT MAIL

Mr. Robert R. Loux, Executive Director
Nevada Agency for Nuclear Projects
1761 E. College Parkway, Suite 118
Carson City, NV 89706

Dear Mr. Loux:

This letter responds to your September 10, 2007, submittal to the Chairman of the U.S. Nuclear Regulatory Commission (NRC) regarding the U.S. Department of Energy's (DOE) licensing strategy for its Yucca Mountain License Application (LA). In that letter, you assert that:

- DOE intends to use a "next generation" performance assessment for license defense, rather than the Total System Performance Assessment (TSPA) modeling tool used to generate dose and release calculations for the LA.
- DOE is placing paramount importance on meeting the schedule for submittal of the LA, at the expense of consideration of safety and technical accuracy.
- The Technical Data Management System (TDMS) is "materially flawed."

None of those assertions are correct.

The LA that DOE will submit and defend will be based on the TSPA performed for the LA, and DOE believes that TSPA will be sufficient to support the grant of an authorization for construction. Your assertion that DOE will "[switch] midstream to its 'real' assessment" is simply wrong. DOE fully expects the TSPA to be examined thoroughly during the licensing process and, subject to any changes required as a result of that process, to be the basis for the NRC's decision on whether to grant construction authorization. DOE believes the state of Nevada will have ample opportunity to scrutinize this TSPA during the formal adjudicatory proceeding provided for in the Nuclear Waste Policy Act (NWPA).

DOE rejects the implication that adhering to a schedule and producing a quality application are mutually exclusive. After more than two decades of work, DOE does believe the time has come to submit the LA, recognizing that approval of an authorization to construct the repository must be based on the record developed during the licensing proceeding.

With respect to the assertion that the TDMS is "materially flawed," you cite a draft of a Technical Support self-assessment report. The state of Nevada's conclusion is premature.

The Executive Summary of the final version of that document states: "The TDM Systems do not automatically support and in some cases inhibit the flow of the work. By not automatically supporting the flow of work, **humans must manually ensure the integrity, accountability, and traceability of the data.**" [Emphasis added]

DOE has taken and continues to take the steps necessary with its federal and contractor personnel to ensure the integrity, accountability and traceability of the data and, as noted above, the extent to which we do so will be fully examined during the licensing proceeding. We strongly disagree with the statement of the state of Nevada that reliance on humans makes the system materially flawed.

Finally, DOE believes that all potential participants in the licensing proceeding should refrain from speculation based on incomplete information regarding the TSPA, and should await the LA submittal and the formal adjudicatory proceeding provided for in the NWPA.

If you have any questions, please contact me at (702) 794-1448.

Sincerely,

J. Russell Dyer, Ph.D.
Chief Scientist

cc:
Honorable Dale E. Klein, NRC, Rockville, MD
Commissioner Jazko, NRC, Rockville, MD
Commissioner Lyons, NRC, Rockville, MD
Honorable James A. Gibbons, State of Nevada, Carson City, NV
Nevada Congressional Delegation
NRC O/R Representative, Las Vegas, NV
J. D. Parrott, NRC, Las Vegas, NV
W. D. Barnard, NWTRB, Arlington, VA
M. P. Lee, ACNW, Rockville, MD
M. T. Ryan, ACNW, Rockville, MD
Catherine Cortez Masto, Nevada Attorney General, Carson City, NV

SEP 13 2007

bcc:
E. F. Sproat, III, DOE (RW-1) FORS
A. B. Benson, DOE (RW-14) NV
C. A. Kouts, DOE (RW-1) FORS
R. E. Lupton, DOE (RW-14) NV
C. M. Newbury, DOE (RW-4) NV
K. W. Powers, DOE (RW-11) NV
S. L. Rives, DOE (RW-11A) NV
S. A. Wade, DOE (RW-7) NV
OCS Records Coordinator, NV
Records Processing Center = "6"

MFR: OCS:JRD-1486

Exhibit 51

Exhibit 51

QA: NA

July 2007

Concept of Operations for the Yucca Mountain Project Technical Data Management System

Prepared for:
U.S. Department of Energy
Office of Civilian Radioactive Waste Management
Office of Repository Development
1551 Hillshire Drive
Las Vegas, Nevada 89134-6321

Prepared by:
Sandia National Laboratories
OCRWM Lead Laboratory for Repository Systems
1180 Town Center Drive
Las Vegas, Nevada 89144

Under Contract Number
DE-AC04-94AL85000

- Each of the functional areas has supporting applications operating in a legacy infrastructure environment consisting of "stovepipe" systems and data.
- There are security and maintenance issues. For example, by design of the system, it is necessary for Technical Data Management System administrators to have full access to the file server and production database so that they can publish the static web pages, upload datasets, and update the database when they receive new or changed datasets. Because of this, administrators have the ability to accidentally manipulate production data without going through the application, thus bypassing access controls.

Recommendation for Moving Forward

We recommend that the current Technical Data Management System be replaced. The replacement system must automatically track data items through the system from end-to-end; conclusions developed and published for the Licensing System must be able to automatically verify how data was developed throughout the analysis and modeling process; and referential integrity must be maintained by the database system to ensure the consistency and accuracy of the data.

The goal is to create a streamlined optimal exchange and common understanding among various organizations and agencies that implement specific areas and to rid the process of duplicated efforts and manual manipulations. Enterprise Business Modeling and Value Stream Analysis is recommended to identify business areas that are either not addressed or are weak. This approach will also help the Information Technology Integration team target and prioritize business areas that need automation. Individual projects can then be evaluated with an understanding of how their effort fits into the overall business.

Redevelopment of the Document Input Reference System and the Technical Data Management System would provide the following desired changes (see Section 5.0 for a complete analysis of desired changes and recommendations):

- Overhauled longstanding outdated technology
- Reduced manual procedures (e.g., checking the accuracy and validity of data and references, change history, access control, and trace development)
- Integrated corresponding systems supporting the scientific investigation process (e.g., Technical Data Management System, Controlled Document Information System, Record Information System, Technical Information Center, Software Configuration Management, and Curatorial Sample Inventory and Tracking System)
- Enhanced data quality and integrity
- Enhanced system security and maintainability (e.g., access control and backups)
- Enhanced reporting capability

1.2 PROBLEM STATEMENT

Currently, the TDM Systems are a collection of six major databases, user interface screens, and processes requiring extensive manual manipulation. Although current functions can guarantee that current processes are being followed, the TDM Systems cannot guarantee the "correctness" of the process nor the "correctness" or authenticity of the data, and, consequently, accountability for license defensibility may fail in certain cases. Additionally, most of the TDM Systems hardware, operating system (OS) software, middleware, database management system software, and programming languages are outdated technologies. Furthermore, the requirements analysis of a replacement system must comply with both government and SNL quality assurance (QA) requirements.

2. QUALITY ASSURANCE DRIVERS

2.1 DOE OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT

The TDM Systems must comply with the DOE Office of Civilian Radioactive Waste Management (OCRWM), Office of Science and Technology and International (OSTI) Program guidelines, standards, and requirements for research, development, test, and analysis materials and methods for use in enhancing applications. The governing documents are as follows:

1. *Quality Assurance Requirements Document* (QARD), DOE/RW-0333P
2. Attachment 1, Quality Assurance Requirements for Work Authorized by OCRWM Program and Funding Guidance Memorandum.

SNL implemented the SNL OSTI QA Program to address OSTI requirements. The SNL OSTI QA Program is implemented via the SNL Quality Assurance Program Plan (QAPP) to satisfy the requirements of the QARD for the YMP. Of particular impact on the tasks discussed in this concept of operations are SNL guidelines for establishing processes, procedures, and responsibilities in the SNL QAAP, Supplement V, Control of Electronic Management of Data. The following guidelines apply to this supplement:

- IM-PRO-002, *Control of Electronic Management Information*
- IM-PRO-003, *Software Management*
- IM-PRO-005, *Software Independent Verification and Validation*
- IM-PRO-006, *Independent Verification and Validation*
- SCI-PRO-002, *Records Management*
- SCI-PRO-004, *Managing Technical Product Inputs*
- TST-PRO-003, *Scientific Notebooks*.

Exhibit 52

Exhibit 52

DN2002 469200

Sandia National Laboratories
Operated for the U.S. Department of Energy by
Sandia Corporation

S. Andrew Orrell
Senior Manager, OCRWM Management Dept 6780

P.O. Box 5800
Albuquerque, NM 87185-

Phone: (702) 295-5549
Fax: (702) 295-3223
Internet: saorrell@sandia.gov

November 30, 2006

QA/NA

J. Russell Dyer
Director, Office of the Chief Scientist
U.S. Department of Energy
Office of Civilian Radioactive Waste Management
1551 Hillshire Drive
Las Vegas, NV 89134-6321

SUBJECT: CONTRACT NO. DE-AC04-94AL-85000 - SUBMITTAL OF DELIVERABLE: COMMITMENT 092206-D (LICENSE DEFENSIBILITY INITIATIVES)

Reference: Ltr, Orrell to Dyer, dtd 10/22/06

Enclosed for your review, in accordance with Sandia Contract No. DE-AC04-94AL-85000, is a response to the technical issue raised at the Office of Chief Scientist review in Albuquerque, September 21-22, 2006 regarding the Lead Lab License Defensibility Initiatives. The commitment was to *provide, and seek concurrence from the DOE Office of Civilian Radioactive Waste Management on a written description of the process and the strategy for the Lead Lab License Defensibility Initiatives.*

The enclosure provides the description of the process and strategy that the Lead Lab will implement to conduct a vulnerability assessment of the technical and modeling basis supporting the postclosure safety analysis that will be documented in Section 2 of the License Application.

If you have any questions on the enclosed material, please contact Tito Bonano at (702) 295-4641.

S. Andrew Orrell

SAO/cdg

Enclosure:
Vulnerability Assessment Process of Postclosure
Technical Products

Official Use Only *Deliberative Process - Privileged*

07_73_ymp_11-28-2006

1.0 Introduction

To be successful, the U.S. Department of Energy (DOE) Office of Civilian Radioactive Waste Management (OCRWM) must obtain a construction authorization (CA) for the Yucca Mountain repository and, subsequently, a license to receive and possess (R&P) radioactive waste from the U.S. Nuclear Regulatory Commission (NRC). The process for achieving this goal involves developing, submitting, and defending a License Application (LA) for CA and subsequent amending of the LA for the R&P license. The LA will contain a Safety Analysis Report that will include, among other things, a postclosure safety analysis. The technical basis supporting the postclosure safety analysis must be of a sufficiently high caliber to be defensible under the considerable scrutiny to which it will be subjected during the licensing process beginning with the submittal of the LA. That is, the technical basis must be technically credible, admissible in licensing hearings, and must meet applicable Quality Assurance (QA) standards, 10 CFR Part 63 requirements, and the *Yucca Mountain Review Plan* (YMRP) acceptance criteria.

However, at this time the technical basis for the postclosure safety analysis is not of the necessary caliber. Deficiencies in that technical basis have already been identified (e.g., Regulatory Integration Team and Independent Validation Review Team comments), and more deficiencies may be identified in the future by Yucca Mountain Project (YMP) participants and, perhaps more importantly, by other parties to the licensing process. These deficiencies represent vulnerabilities in the technical and modeling basis of the postclosure safety analysis contained in the LA, and their existence decreases the defensibility of the LA. To increase the defensibility of the LA and increase the likelihood of a successful LA, these vulnerabilities must be identified and eliminated as much as practically possible. Identifying and eliminating vulnerabilities will limit the occurrence and adverse effects of Requests for Additional Information (RAIs) and licensing contentions during adjudication, minimize the occurrence of licensing conditions and technical specifications that the NRC could place on the DOE, limit the burden placed on the performance confirmation program, minimize the occurrence of "surprise" issues during license defense, and improve witness credibility during licensing hearings. Documenting the identification and elimination of vulnerabilities will also provide an understanding of licensing risks that would assist OCRWM in developing appropriate licensing strategies.

The purpose of the vulnerability assessment (VA) of postclosure technical products supporting the LA being performed by the Lead Laboratory (LL) is to:

- Identify potential technical and QA-related vulnerabilities that could adversely impact the submission, docketing and/or defense of the LA;
- Evaluate these vulnerabilities from a risk-based perspective; and
- Address them in such a way as to eliminate or minimize their potentially adverse effects on the defensibility of LA.

2.0 Objectives and Approach of the Vulnerability Assessment

Licensing hearings will be held as a part of the licensing process for the Yucca Mountain repository. In these hearings, the DOE will need to defend the technical basis for the postclosure safety analysis in the LA, as it is anticipated that it will be challenged vigorously by those

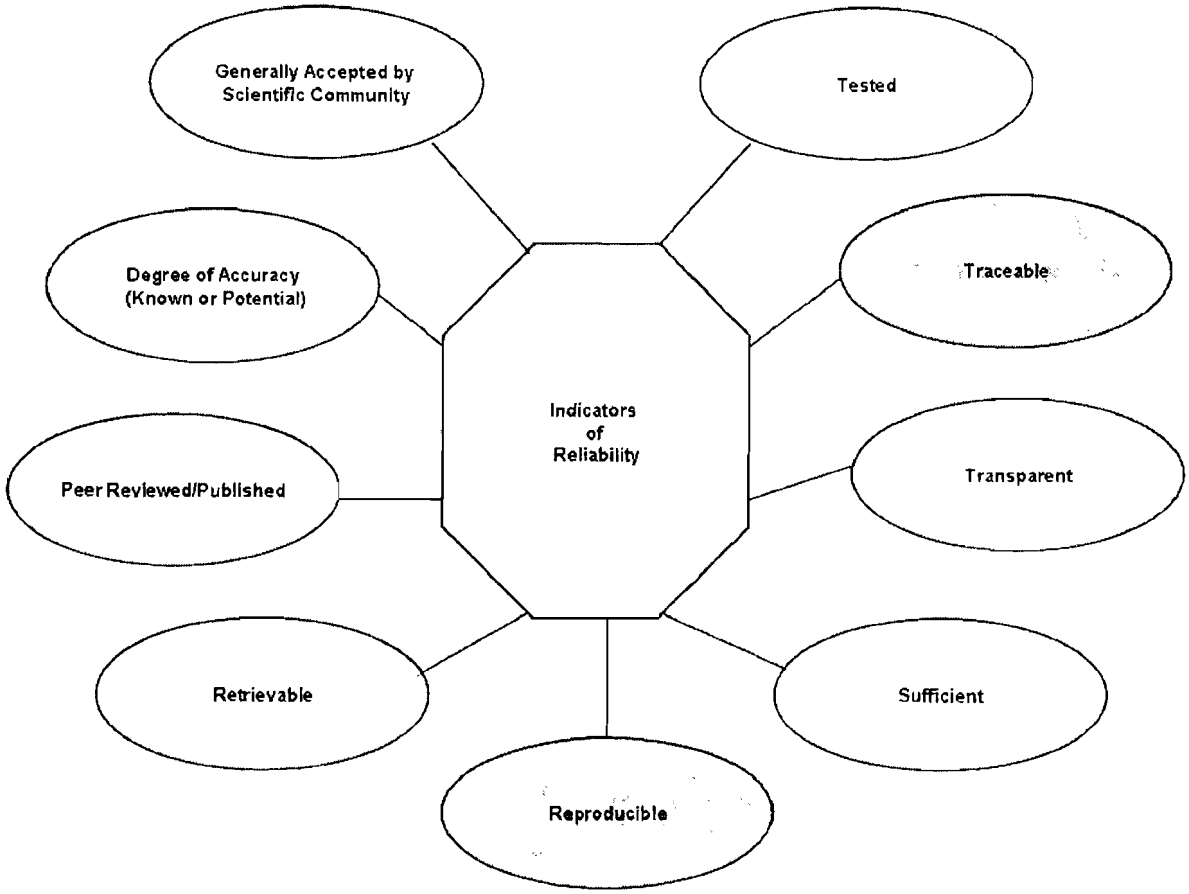

Figure 1. Indicators of Reliability of Technical Evidence

This VA will strengthen and qualify the core technical basis of the LA postclosure safety case by addressing known vulnerabilities, thus ensuring the legal admissibility of the technical basis. The "core technical basis" is the collection of components of, and inputs to, the compliance analysis that are determined to be most important, in principle, by analyzing the results of uncertainty and sensitivity analyses. The "core technical basis" must be defensible and qualified in time for LA submittal; the remainder of the technical basis can be dealt with during license defense.

Vulnerabilities will be identified and then prioritized using two main attributes: the importance to waste isolation (ITWI)[1] and potential adverse impact on technical credibility. The determination of ITWI will be based on uncertainty and sensitivity analysis results that are, by definition, conditioned on the system model assumptions, such as those found in Appendix M of

[1] In 10 CFR 63.2, the NRC defines "important to waste isolation" as follows: "*Important to waste isolation*, with reference to design of the engineered barrier system and characterization of natural barriers, means those engineered and natural barriers whose function is to provide a reasonable expectation that high-level waste can be disposed of without exceeding the requirements of § 63.113(b) and (c)."

identified vulnerabilities.[2] Other vulnerabilities are likely to be identified as a result of on-going work on the Total System Performance Assessment (TSPA), future reviews, etc. Issues affecting the reliability of the technical basis supporting the LA that emerge as a part of on-going work and that cannot be addressed successfully within the currently planned PA work scope will be addressed through the VA process.

As discussed in Section 3, the VA will be a closely coordinated effort between the LL's Performance Assessment System Integration and Licensing Departments. This close coordination will take advantage of synergisms between the two departments, will eliminate unnecessary duplication of efforts, and will ensure the most timely resolution of vulnerabilities affecting the core technical basis.

3.0 The Vulnerability Assessment Process

Based on experience with vulnerabilities that have already been identified, for the purpose of this VA, vulnerabilities are grouped into four categories: (1) data/parameters; (2) software; (3) features, events, and process (FEPs); and (4) models. Thus, the technical review aspect of the VA will be conducted by four teams, one associated with each of these categories. The Data/Parameter team will review data and parameters with two distinct objectives: (1) ensuring that uncertainty in data and parameters has been treated appropriately (performed within the Performance Assessment Systems Integration Group (PASIG) in the LL PA Department), and (2) ensuring that data are traceable to their source and have been properly qualified in accordance with QA standards (performed within the License Defense Group (LDG) in the LL Licensing Department). The Software Team will review software to determine if software is controlled, qualified, and adequately performs all necessary functions for its intended use. This software review will be performed within the LDG. Unqualified and/or inadequately qualified software will be qualified by the PASIG. The FEPs Team will review FEPs screening justifications to determine if FEPs have been screened appropriately, and if the screening basis has been adequately documented. This FEPs review will be performed within the PASIG. The LDG Component Model Team will examine models and analyses to determine whether a given model or analysis, as documented in its AMR, satisfies relevant regulatory requirements and YMRP acceptance criteria.

Each team's review will be augmented by a regulatory review. This regulatory part will focus on (1) whether the vulnerability statement and mitigation plan address the regulatory requirements and acceptance criteria adequately, and (2) whether implementation of the mitigation plan will improve the reliability aspect of admissibility of evidence at licensing hearings.

Vulnerabilities can be identified in one of three ways: (1) previous review comments and their responses, (2) review of transitioned technical products that support TSPA-LA (transitioned as of October 2, 2006), and (3) continuing development of the TSPA-LA. Previous review comments and responses will be reviewed by the appropriate team to identify those comments that represent a potential vulnerability and determine whether the vulnerability identified in the comment still

[2] The VA controlled database will be developed and implemented in a protected computer environment that will require access authentication through user identifications and passwords. The database will be classified in accordance with Licensing Support Network requirements regarding relevancy and privilege.

from the use of transportation, aging, and disposal (TAD) waste packages and from proposed regulatory requirements (e.g., peak dose).

If a particular FEP's screening justification or technical basis is found to be inconsistent with the screening criteria or is affected by the use of TADs or proposed regulatory requirements, then it will be revised. If the revision entails changing the status of the FEP from screened out (excluded) to screened in (included) (or *vice versa*), the affected inputs or models will be modified for the TSPA-LA (if possible) and/or for the PMA and the NG PA. If the revision does not entail changing the status of the FEP, then the justification will be updated, as needed, to be consistent with the existing design, proposed regulatory requirements, the current technical basis, and the screening criteria.

Once a particular FEP is determined to be either included or excluded consistent with the screening criteria, the process treats included FEPs differently than excluded ones. Included FEPs will be checked to confirm that they are traceable into the TSPA, and that their documentation is transparent. Inadequate documentation of how a particular FEP is included in the TSPA-LA will be revised as necessary. Excluded FEPs will be reviewed to determine whether their screening justifications are transparent. Screening justifications for excluded FEPs that are not transparent will be revised as necessary.

The process displayed in the "FEPs Team" column of Figure 2 is the approach successfully used for WIPP certification. It provided the EPA with a documented process (the FEP identification and screening methodology) that clearly demonstrated a transparent development of the system conceptual model and scenarios for the WIPP compliance analysis. The WIPP experience sets the precedent for the YMP. While this process was adopted by the YMP previously, the implementation of the FEP process needs to be reviewed, and any known or new vulnerabilities need to be mitigated.

For example, previous reviewers of the TSPA have identified the technical basis for screening out the occurrence of stress corrosion cracks in the drip shield as a potential vulnerability. As a result, the presence of stress corrosion cracks in the drip shield will now be included in the technical basis for the compliance analysis. However, models for describing how stress corrosion cracks might propagate over time and how water might be transmitted through them are still in their infancy; therefore; a possible approach for the mitigation plan would be to make bounding assumptions regarding the performance of the drip shield with stress corrosion cracks for the compliance analysis, while developing a more technically defensible model for the PMA and for the NG PA.

Performance indicators for FEPs review, depending on the phase of the VA, include (1) number of FEPs reviewed compared to the total number of FEPs; (2) number of vulnerabilities identified compared to the number of FEPs reviewed; and (3) number of vulnerabilities for which mitigation plans have been written compared to the number of vulnerabilities identified.

Success for this activity is measured by whether the compliance analysis is successful -- i.e., the entire PA implementation, not just the TSPA part as it is identified on this project, is determined to have been performed adequately for its intended purpose by satisfying the regulatory

requirements and YMRP acceptance criteria. For LA submittal, a technical review by a multidisciplinary set of peers that establishes the PA implementation as having satisfied the regulatory requirements and acceptance criteria will be the measure of success. Such a review has been proposed by the LL. A finding by the reviewers that the compliance analysis is satisfactory would attest to the success of the FEP part of the vulnerability assessment.

3.4 Component Model Team

The Component Model Team will begin by considering existing review comments and responses to identify those comments that pertain to potential model vulnerabilities, and continue by reviewing AMRs that document models/analyses that are direct feeds to TSPA-LA. The particular areas of models and analyses that will be examined are: (1) model inputs, (2) model selection, (3) model alternatives, (4) model assumptions, (4) technical basis of the model, (5) model confidence-building, (6) model conclusions, and (7) consistency between related models. Specific instructions and checklist questions to be used by the reviewers are given in the *Technical Work Plan for the Defensibility of Technical Products Supporting the License Application.*

Model vulnerabilities that are identified through this process or that are identified by the PASIG will be prioritized on the basis of ITWI, in coordination with the PASIG, and potential adverse impact to technical credibility, as discussed above. The highest priority vulnerabilities will be addressed first. If there is enough time for the particular vulnerability to be corrected in time for the compliance analysis, this option will be chosen. However, because of the aggressive schedule for the compliance analysis, it is anticipated that most vulnerabilities will be addressed in the PMA and/or in the NG PA, in coordination with the appropriate subject matter experts and PA analysts, by correcting the particular aspect of the model or analysis that represents a vulnerability.

For example, interactions of personnel between the Performance Assessment System Integration Department and the Licensing Department as a part of the current work scope have identified a vulnerability: the technical basis for calculating the probability of a volcanic event is not the same as the technical basis for calculating the consequences of the same volcanic event. The probability calculation (i.e., the results of the Probabilistic Volcanic Hazard Assessment) is about 10 years old, while the consequence calculation relies, in part, on more recent data. The significance of this inconsistency will need to be examined and quantified for the compliance assessment. A possible approach for the mitigation plan would be to use the results of the current PVHA (when they become available) in future iterations of PA analyses during license defense (i.e., the NG PA) so that it reflects consistent technical bases for both the probability calculations and the consequence calculations.

Performance indicators for model review, depending on the phase of the VA, include (1) the number of AMRs reviewed compared to the total number of AMRs to be reviewed; (2) the number of vulnerabilities identified compared to the number of AMRs reviewed; and (3) the number of vulnerabilities for which mitigation plans have been written compared to the number of vulnerabilities identified.

Data Traceability and Qualification: This effort is primarily funded under the License Defense WBS 1.5.02.06 WP S20603.

Software Traceability and Qualification: This effort is primarily funded under the Safety Analysis Integration WBS 1.5.03.01 and specifically the Requirements Management WP S30103 because it is important that remediation of software qualification issues be guided by and performed within the PA context. Traceability and mitigation plans are the responsibility of the License Defense WBS 1.5.02.06 WP S20603.

FEPs: This effort is primarily funded under the Safety Analysis Integration WBS 1.5.03.01 and specifically the FEPs WP S30104 because it is a required activity for TSPA-LA. Writing mitigation plans is the responsibility of the License Defense WBS 1.5.02.06 WP S20603.

Component Models: This effort is primarily funded under the License Defense WBS 1.5.02.06 WP S20603. Identification and communication to the Licensing Department of any new vulnerability during the implementation of the work activities under WBS 1.5.03 is an important part of the VA. This is accomplished through a member of the Licensing Department who acts as a liaison to the Performance Assessment Department.

The remainder of the VA work activity is funded under the License Defense WBS 1.5.02.06 WP S20603.

As the VA activity proceeds a "Cost of Quality;" i.e., the difference in cost between the current basis that includes a specific vulnerability and the future cost basis if the vulnerability is mitigated, will be tracked to provide a cost of the value added. This information will be tracked in the VA database, and the total costs accumulated as well so there will be, at any time, a cost of quality and a history of cost by vulnerability available to support future budget estimates and congressional testimony.

6.0 Summary

Vulnerabilities will be identified, prioritized by TTWI and potential adverse impact to credibility, and addressed by developing and implementing mitigation plans. The elimination or mitigation of potentially significant vulnerabilities will be completed before the issues are raised as NRC Requests for Additional Information (RAIs), or as potentially damaging legitimate challenges or "surprise issues" raised by external groups during the licensing process. A measure of success is that the DOE will already be prepared with reviewed and approved documented responses, and informed managers to facilitate rapid, focused, and appropriate responses that resolve these issues, limiting their potential negative effects and building credibility and confidence with the licensing boards and public.

Exhibit 53

Exhibit 53

From: LTSkoblar@aol.com
PostedDate: 07/14/2007 10:17:46 AM
SendTo: len_skoblar@ymp.gov
CopyTo:
ReplyTo:
BlindCopyTo:
Subject: DPO
Body:

Hi Don,

I enjoyed our one-on-one yesterday and I think it would do a lot of good to repeat it for the DPO; too much time is going by. I'll buy next time.

I think you need to digest Appel's report as a prerequiste. I believe he has missed the boat and I believe more then ever that the project has serious issues with its TSPA. This matter goes to the topic of LA Validation, LA Defense, value-engineering, Lead Lab transition, and so forth. There are solutions and I want to explore them with you before you make a decision on the Appel report.

I am encouraged from reading Rob Howard's SAR Section 2 Conceptual Development Report ..... really encouraged .....that the message is getting through. However, if Rob's writeup is the new path it is in conflict with the conclusions in the Appel report, so please be cautious here. Appel conflicts with the IVRT also. That's why I think this needs your attention sooner then later. Licensing can lead or follow on this. I think we should lead.

This is also an appropriate topic given the Lead Lab concept. BSC will need to review Sandia's work and we need a position, especially if it morphs from our traditional one. Plus it would be very important for us all to be on the same page prior to the actual transition. We can do this with a Licensing Position on "Reasonable Expectation." Another way to get everyone on the same page is for the YMP to adopt the recommendations in the DPO. That would be an attention getter and limit Sandia's options to do something other than expected value work. It also would have some SCWE cache.

As for conservatism, in some instances it would be OK (e.g., choosing to use 1% failed fuel instead of 0.1% that all the data support). But in other cases, it could be a real problem for us.

Ken Cyzsinski (sp?) used to work for me in the mid-80s when I was OCRWM's licensing support guy. He works for EPA now (along with John Bartlett) and wrote the SOC for EPA's 40 CFR 197. He tells me that "reasonable expectation" is all about expected value. Bartlett independently corroborates this. Thus, if NRC is obligated to implement the EPA standard, it too should interpret reasonable expectation in that manner in order to implement the EPA standard as intended.

This matter is timely. Let's wrap it up when you get a minute.

Len

PS - John Bartlett tells me that Egan has instructed his staff to write 3000 contentions. How cool would it be if they were all aimed at conservatism in TSPA and we come in with an expected value result. Their work would be wasted.

Len...we can meet on it. I'll share my disposition with you.

d

Exhibit 54

Exhibit 54

SUMMARY OF THE
U.S. NUCLEAR REGULATORY COMMISSION / U.S. DEPARTMENT OF ENERGY
QUARTERLY MANAGEMENT MEETING
IN ROCKVILLE, MARYLAND
NOVEMBER 22, 2004

Introduction

The U.S. Nuclear Regulatory Commission (NRC) and U.S. Department of Energy (DOE) held a public quarterly management meeting on November 22, 2004. The purpose of this meeting was to discuss the overall progress of the project at the proposed geologic repository site at Yucca Mountain (YM), Nevada. The meeting was hosted at the NRC Headquarters in Rockville, Maryland, with audio connections to the Center for Nuclear Waste Regulatory Analyses (CNWRA) in San Antonio, Texas, and to the DOE offices in Las Vegas, Nevada. Other participants included representatives from NRC Region IV, the State of Nevada, the Nevada Nuclear Waste Task Force, Public Citizen, the press, and interested members of the public.

The NRC issued the notice for this public meeting on November 4, 2004. The meeting notice is available in the NRC Agencywide Documents Access and Management System (ADAMS) at Accession No. ML043090582.

NRC Opening Remarks

Mr. Jack Strosnider, Director, Office of Nuclear Materials Safety and Safeguards, NRC started the meeting by welcoming DOE managers, members of the public, and all other stakeholders.

He acknowledged that DOE might not be able to submit a license application (LA) for a geologic repository at Yucca Mountain, Nevada, by December 2004. He said that EPA had not specifically stated when and how it would revise its YM standard. He also said NRC would amend 10 CFR Part 63 to be consistent with any EPA revisions to the YM standard and that interested parties would have the opportunity to submit public comments in any rulemaking.

Mr. Strosnider noted that in August 2004 the Pre-license Application Presiding Officer (PAPO) Board granted the State of Nevada's motion to strike DOE's licensing support network (LSN) certification, and in September 2004, DOE filed a Notice of Appeal with the Commission to overrule a portion of the PAPO Board's August 31, 2004 order. He said DOE had indicated it would comply with those portions of the order that it did not appeal. On November 10, 2004, the Commission issued an order holding DOE's appeal in abeyance. Mr. Strosnider reminded the audience that, according to NRC regulations in 10 CFR Part 2, the staff cannot docket the LA until at least 6 months have elapsed from the time of DOE certification. He said NRC is interested in hearing from DOE about DOE's schedule for completing activities leading up to a DOE LSN certification and for submitting an LA.

Mr. Strosnider concluded by noting that the President's budget request for FY 2005 includes significant increases for the NRC's LA review, for the high level waste information technology and information management (IT/IM) metasystem, and for the NRC public hearing. He stated

and the complete text of the ASLB decision. Since then, new internal requirements have been established, the budget has been realigned, and DOE is proceeding with additional work. DOE expects to recertify the LSN in the spring of 2005 timeframe.

Mr. Arthur noted that DOE would not submit the LA in 2004. In September 2004 DOE and Bechtel SAIC Company (BSC) completed a major management review of the draft LA. This review indicated that the science and design work completed in support of the LA was technically sound, was adequate for its intended purpose, and meets quality assurance requirements. This work supports robust safety analyses for the preclosure (operational) period through 10,000 years after permanent closure and was thoroughly cross-referenced against the requirements in 10 CFR Part 63 and the guidance in the YMRP.

Mr. Arthur said that DOE needs to refine the presentation of this technical work for licensing. Also, DOE needs to assure the transparency, traceability, and the self-sufficiency of the LA; and if necessary, clarify the presentation of technical, analytical, and compliance information; improve the readability of the document; provide more details, particularly in distinguishing structures, systems, and components that are important to safety or important to waste isolation; verify document-to-document consistency between the LA and underlying technical documents that were in revision during the development of the draft LA (principally Analysis and Modeling Reports, System Description Documents, Facility Description Documents, and the Preclosure Safety Analysis); and document some additional preclosure and design detail, consistent with discussions between DOE and NRC in the September 2004 technical exchange and based in part on DOE internal design reviews (in particular, important-to-safety Electrical Systems and the Aging Facility.)

Following the September management review, DOE and BSC produced an interim consolidated draft LA. This will form the basis for the final application. By the next NRC/DOE quarterly management meeting, DOE expects to discuss detailed plans and present a revised estimate for completing and submitting the LA to the NRC.

With respect to key technical issues, Mr. Arthur stated that on August 31, 2004, DOE submitted the remaining 17 of the 293 agreement item responses to the NRC. With this submission of information, the intended purpose of the KTI process has been met and the process completed for DOE. The KTI process has served an important role in facilitating resolution of many of the NRC staff's questions and concerns. Although the NRC has not yet evaluated and closed all of the agreements, DOE expects that any additional NRC staff questions or concerns regarding these agreement topics will be addressed during the licensing process.

With respect to Analysis and Model Reports (AMRs) supporting the LA, Mr. Arthur said that Phase II of the Regulatory Integration Team's (RIT) phase activities were almost complete. DOE has reviewed and is revising the AMRs to assure that they are suitable for the intended technical and regulatory audiences. To date, 87 of the 89 AMRs have been approved. The remaining two documents are scheduled for completion in November 2004. Quality metrics and quality assurance oversight indicate that this process has been effective based on the number of insignificant issues and unresolved items found during checking. Overall Mr. Arthur noted that the intent of DOE letter of May 28, 2004, to the NRC was being achieved.

Mr. Arthur then reported that for preclosure analyses, a Preclosure Design Integration Team was initiated to ensure that the preclosure safety basis is well defined, understandable,

Exhibit 55

Exhibit 55

TECHNICAL GUIDANCE FOR
LICENSE APPLICATION PLANNING
(Plan B: Compliance-Focused Program)

1. INTRODUCTION

The purpose of this document is to provide a consistent set of technical guidance to the organizations involved in the planning for the license application (LA) under the compliance-focused program (Plan B). Plan B focuses on identifying the minimum but sufficient scope of work required to submit an LA that is considered to be docketable, should the Yucca Mountain site be recommended and approved. This work scope will be sharply focused using a risk-informed, performance-based approach to define the work necessary to defend the preclosure and postclosure licensing arguments. This top-down approach to ensure regulatory compliance differs from the bottom-up approach used to develop the initial Detailed Work Plan (DWP). The approach is expected to result in a reduction in the amount of work necessary to prepare a docketable LA. Therefore, Plan B results will need to be communicated to the NRC in planned follow-on KTI-related technical exchanges to ensure that NRC understands and accepts the basis for any proposed changes.

The area of greatest challenge in this planning effort is the area of performance assessment (PA), which includes the testing program as well as process model analyses and modeling. Recent organizational changes at Bechtel SAIC Company (BSC) will facilitate the planning in this area. The PA Strategy/Scope organization is currently developing a postclosure compliance strategy to be used in defining and conducting the total system performance assessment (TSPA) and identifying the information needs. This strategy will be reviewed by a new TSPA Oversight Group that reports directly to the BSC Manager of Projects, and will be subsequently validated by the Postclosure Strategy Board recently formed. This strategy will drive the planning for the scope of work to be conducted to fulfill the needs of the TSPA.

The approach to planning has been broken into eight components. The first component is the overarching general guidance that must be considered in developing more detailed plans by all areas of the Project. The next seven components consist of the individual guidance related to the different areas of the Project (License Application/Licensing; Design; Preclosure Safety Assessment; Performance Assessment; Special Projects; Site Operations; and Business, Technical Support, and Programmatic Areas) that must work together to support development and submittal of a docketable LA.

This guidance also contains two appendices. Appendix A contains a listing of the key assumptions upon which the planning of this work is based. Appendix B discusses the strategic approach to be used in identifying the information to be contained in the Licensing Support Network (LSN) and activities required to support LSN certification. A strategic planning schedule is being issued separately as a companion to this technical guidance. That schedule is a top-down schedule that summarizes the key activities and milestones that serve as the overall framework for this planning, consistent with the DOE goal of an LA submittal in December 2004. The dates in the strategic planning schedule should not be interpreted as the definitive

Existing quality issues must be resolved expeditiously and appropriate measures taken to prevent recurrence. Resolution of these issues will be conducted in accordance with the Performance Improvement Transition Plan, which will be incorporated into this planning effort.

The technical basis for the LA, which will support LA preparation and any eventual NRC review, must be essentially complete eight months prior to LA submittal to support BSC's initial LSN certification process. BSC will complete the initial certification of the LSN to the DOE seven months prior to LA submittal so that DOE has one month to prepare their initial certification to the NRC six months prior to LA submittal as required by 10 CFR Part 2, Subpart J. Adequate time is provided for the certification processes to allow for implementation of corrective actions, if needed. It is expected that some development of technical information will continue through submittal of the LA and afterwards, and consequently there will be incremental certification coincident with amendments of the LA.

This technical basis will build on the final technical basis for a possible SR decision, to the extent possible. Doing this should provide both schedule and cost benefits for completion of the LA and its supporting technical basis. This approach should also facilitate NRC review and completion of the staff Safety Evaluation Report (SER) within the 18-month period described in the schedule for the LA proceedings in Appendix D of 10 CFR Part 2. This is because the NRC reviewed the preliminary technical documents for a possible SR decision as one basis for developing its preliminary sufficiency comments. Any significant changes to the technical basis existing at the time of a possible SR decision must be justified in terms of their relevance to meeting the primary objective for submittal of a complete and defensible LA and any potential cost impacts. Since the NRC's preliminary sufficiency comments were largely based on the site characterization and design information supporting a possible SR decision, significant changes to this information may require additional NRC review.

Development of the technical documents that provide information needed to prepare the LA will take place in parallel only when that approach will not affect the quality of downstream products (e.g., development of Process Model Reports (PMRs) in parallel with the Total System Performance Assessment (TSPA), assuming that the TSPA is based on the Analysis and Model Reports (AMRs)). Adequate review time must be provided to ensure that the information incorporated in downstream products, including draft LA chapters, is consistent with the final source material. Version control of all documents must be maintained and a structured process adhered to for document development and review.

The technical work conducted following a possible site recommendation and prior to completion of the technical basis for the LA must clearly focus on:

- Providing additional design-specific information needed as part of the technical basis for the LA that was not needed for a possible SR decision;
- Improving confidence in or refining models and other elements of the existing SR technical basis to develop the technical basis for the compliance case presented in the LA for NRC review.

carefully evaluated based on the final NRC requirements to ensure that the plan described in the LA is limited to what is adequate and necessary to satisfy these regulatory requirements. If the YMRP is issued by June 2002, an evaluation will be made as to the best method of presenting the information in the LA that takes into account the YMRP. This will be captured in the Management Plan for the Development of the Yucca Mountain License Application. Significant changes to the LA Guidance, LA Products List, and LA format and content due to the YMRP are not included in the plan.

To support the DOE goal of submitting the LA to the NRC by December 2004, inputs to the LA will be conducted in a phased manner. As illustrated in the strategic planning schedule, the first drafts of the programmatic sections of the LA need to be completed by December 2003. The draft sections on design, science, preclosure safety assessment, and total system performance assessment need to be completed by March 2004. The LA review schedule has been shortened to 38 weeks. Technical and regulatory reviews of draft LA sections by the affected offices within the DOE, as well as Naval Reactors, must occur in parallel to make the initial review process as efficient as possible. The review of draft sections must be sufficiently complete along with the essential supporting technical basis documents before the initial BSC LSN certification process begins, eight months prior to LA submittal. DOE management review of and concurrence on the integrated LA, and production of the final document, will take place during the six months following initial LSN certification. Changes and additional information developed during the DOE management review will be included in the LSN with a supplementary certification at the time of LA submittal.

In addition to having overall responsibility for LA development, the BSC License Application Project will also be the prime author for selected sections of LA Chapters 1 (Introduction), 2 (Conformance with Technical Criteria), and 11 (Conduct of Operations and Related Topics).

To help ensure docketing of the LA and completeness of the LSN for significant safety matters, plans will be developed for phased NRC review of project technical documentation that provide the basis for the safety case. Pre-licensing interactions with the NRC will be clearly linked to the completion of documentation to address the KTI agreement items. Additional meetings will be considered, as appropriate, to reach early agreement with the NRC on the LA format and content, resolution of preclosure safety and design-detail issues, and selected approaches and methodologies critical to the licensing case. Interactions will continue on the topical reports currently under NRC review or for which DOE has committed to provide additional information (e.g., seismic design basis, criticality).

With respect to the LSN, Appendix B discusses the approach to be used to streamline the identification and loading of the documentary material required by 10 CFR Part 2, Subpart J, as well as the timing for the different activities needed to ensure LSN certification by June 2004.

The License Application Project will develop a Licensing Strategy and a Regulatory Guidance Matrix to ensure consistent approaches to design and analysis. The Licensing Strategy will incorporate the postclosure compliance strategy discussed in Sections 1 and 6.