

An aerial photograph of a desert landscape with rolling hills and a small facility on a ridge. The text is overlaid on a semi-transparent white box.

**Yucca Mountain Project
Quality Assurance Program
Management Assessment Report**

Prepared by InfoZen, Inc.

For the

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

October 31, 2007

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Executive Summary

On April 27, 2007, The U.S. Department of Energy (DOE) awarded contract DE-AC28-07RW12383 (reference 1) to InfoZen Inc. to conduct an independent review of Yucca Mountain Project (YMP) QA plans and plan implementation by the DOE Office of Civilian Radioactive Waste Management (OCRWM) and its primary contractors, Bechtel SAIC Company (BSC LLC) and Sandia National Laboratory (SNL).

The team assembled to execute this contract comprised 14 independent experts from InfoZen, Polestar Applied Technology, Inc., and Technical and Professional Services, Inc. and represented over 400 years of experience in nuclear facility management and operations, NRC regulations and regulatory practice, DOE Orders, and commercial nuclear codes and standards. The review was conducted from May through September 2007, included document reviews, interviews, activity observations, and expended over 5000 staff hours of effort.

As part of the overall independent review, the contract called for a Quality Assurance Management Assessment (QAMA), to be performed in accordance with OCRWM procedures. The QAMA was conducted by seven members of the team and addressed a family of issues of significance to the overall quality of OCRWM work, including: corrective action program (CAP) effectiveness; technical adequacy and timeliness of the YMP license application (LA); effectiveness and compliance in the area of training, qualifications and proficiency; and various other management issues affecting quality.

This report details the results of the QAMA. A companion report, *Independent Quality Assurance Program Review and Implementation Assessment*, provides details of the other QA evaluations conducted under this contract.

QAMA Results, in Summary

Based on its evaluations, the QAMA Team drew conclusions and formulated associated recommendations. The following are particularly important:

- The OCRWM Director has provided strong leadership with sharp focus on nuclear quality. However, with the anticipated turnover of the OCRWM Director in early 2009, it is very important for the organization to take effective steps to secure the gains achieved in recent years and to ensure long term continuity in policy and practice.
- The current OCRWM organizational structure does not include single point leadership at the Nevada site and project office locations. The Team believes that assignment of a single, experienced nuclear industry executive level individual to that position would significantly enhance overall organization effectiveness.
- The Team notes that in the context of many years of issues and criticisms regarding QA effectiveness, the OCRWM Office of Quality Assurance (OQA) has taken

aggressive and effective steps to improve overall QA performance. However, one of the consequences of OQA's strong efforts in this respect has been that OQA is now, in effect, in a position of direct involvement in line management. In the team's view that this situation is inconsistent with and fundamentally different from the nuclear assurance and oversight role taken by QA organizations in successful commercial nuclear organizations. The Team recommends organizational clarification and communications to correct this misalignment.

- In the course of its review, the Team saw evidence of significant improvements and tangible successes in correcting historical quality-related problems. This positive progress contrasts starkly with the frequently negative tone of communications about OCRWM quality performance. A communications plan and strategy should be developed and implemented to provide balanced and accurate information on such improved performance to project staff, various state and local stakeholders, and the regulators.
- The numerous efforts to improve the Corrective Action Program (CAP) have yielded clear improvement; while more progress is needed, the Team concludes that the CAP is a maturing program and that it is today achieving its intended effect of identifying, tracking, and correcting conditions adverse to quality. Additional refinements are in progress, and this report offers several recommendations regarding condition report classification, process efficiency and issue closure.
- The Team concludes that OCRWM will very likely submit a comprehensive and technically adequate License Application by the summer of 2008. Nonetheless, there are several significant challenges, as discussed in the QAMA report, which must be successfully met to achieve this goal. The Team offers recommendations in this respect, but is generally confident that the goal will be achieved.
- Commercial nuclear industry experience in licensing activities shows that a trusting, open and mutually respectful relationship between licensee and NRC is an important factor in licensing success. Based on its observations and discussions, the Team considers that an improved communications protocol between OCRWM and NRC would be beneficial to both parties and would improve OCRWM readiness for license application interactions.
- As a related item, the Team notes that the role of NRC licensee – which OCRWM is slated to assume for the YMP - is highly unusual for DOE, and it carries with it numerous organizational requirements, capabilities and behaviors that are unfamiliar to DOE. The numerous actions currently underway to attain a strong nuclear culture at OCRWM are important in this respect, and the Team encourages continuing strong effort in those areas. Additional factors are important as well, and the Team has offered recommendations.
- OCRWM line management has not effectively utilized the self assessment process and some OCRWM organizational units have not complied with internal



commitments or schedules, in that previously committed actions to improve self assessment performance have not been completed. Effective self assessments are important contributors to overall quality performance and increased focus on this area is recommended.

- The OCRWM training and qualification program requires improvement. Some procedures implementing training requirements are out of date and key OCRWM directorates do not have Training Program Descriptions as required by OCRWM procedures.

This extensive assessment was completed on schedule due in large measure to the active support of OCRWM, BSC LLC, and SNL management and staff personnel. The QAMA Team notes and appreciates their willingness and receptivity to participate in this effort.

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1. Introduction and Background

This is a report of the Quality Assurance Management Assessment (QAMA) conducted during May-September 2007, by an independent team, at the Yucca Mountain Project (YMP) offices. This QAMA was part of a broader set of independent reviews performed under contract to the US Department of Energy (DOE), examining multiple aspects of quality of work performed by the Office of Civilian Radioactive Waste Management (OCRWM) and its major contractors. This report specifically addresses the QAMA evaluations, conclusions and recommendations, and is a companion to the report of the other reviews conducted under this contract.

1.1. Contractual Basis

On April 27, 2007, DOE awarded DOE Contract DE-AC28-07RW12383 (reference 1) to InfoZen Inc. to conduct an independent review of QA plans and plan implementation by OCRWM, BSC LLC and SNL. The team assembled to deliver this contract comprised independent experts from InfoZen, Polestar Applied Technology, Inc., and Technical and Professional Services, Inc.

As required by contract and by the OCRWM Quality Assurance Requirements and Description (QARD) document (reference 2), the OCRWM Director annually directs the performance of a management assessment of organizations supporting the YMP and principal contractors. That management assessment, the QAMA, is included in the scope of the InfoZen contract.

As called for in the contract Statement of Work, the QAMA is to evaluate (1) the adequacy and effectiveness of the OCRWM QA Program, (2) the adequacy of resources and personnel provided to achieve and ensure quality, and (3) potential quality problems that could affect mission success. The OCRWM QARD sets similar scope objectives for the annual QAMA.

In the project kickoff teleconference shortly after contract award, the OCRWM Director, Mr. Ward Sproat, provided additional guidance for the independent reviews. He expressed particular interest in obtaining a senior management perspective on aspects of YMP implementation that have the potential to highly influence the quality of the license application (LA) now in progress and on the long term (i.e., post LA submittal) effectiveness of the YMP organization in proceeding with this project.

With that guidance in mind, the QAMA Team formulated a plan for a relatively broad assessment, addressing quality (small “q”) in the context of overall adequacy of work products to meet program objectives and needs, as opposed to an assessment that would be more limited to specifically defined elements of the OCRWM QA (large “Q”) Program. In accordance with OCRWM procedures, the QAMA Plan (reference 3) was prepared, submitted to and approved by the OCRWM QA Director.



1.2. QAMA Team

The QAMA Team convened by InfoZen comprised seven members with a wide variety of executive, management, regulatory and technical professional experience in commercial nuclear, DOE complex applications and the U.S. Navy Nuclear Program. Team membership was as follows:

Jack DeVine (QAMA Team Leader)	Polestar Applied Technology, Inc.
Bruce Hinkley (InfoZen Project Manager)	InfoZen
A. Bill Beach	InfoZen
Tom Crimmins	Polestar Applied Technology, Inc.
John Grove	Polestar Applied Technology, Inc.
Jon Johnson	InfoZen
Tony McConnell	Polestar Applied Technology, Inc.

Curricula Vitae for the QAMA Team members are provided in Appendix A.

Also under the aegis of the InfoZen contract, a separate independent review team (termed the “Implementation Assessment Team”) was established to examine the structure, inter-relationship and implementation of the OCRWM and contractors’ QA planning documents. Mr. Dan Stover of Technical and Professional Services, Inc. (TAPS) led this separate team effort. These two parallel reviews – although conducted by separate teams, with different objectives, and during different periods on site – were nonetheless coordinated in overall planning and execution.

The Implementation Assessment Team issued a separate report of its work (reference 4). InfoZen then produced a Contractual Summary that summarized the conduct of the combined assessments, their interrelationships, and their compliance with contractual requirements.

1.3. QAMA Scope

Within the broad objectives called for by contract, by procedure and by request of the OCRWM Director, this QAMA examined YMP management effectiveness in problem identification and resolution (PI&R), with particular emphasis on organizational decision making - that is, the organization’s effectiveness in making decisions that are timely, technically sound, well documented and defensible.

This in turn, led to specific examinations in two areas:

- The YMP Corrective Action Program (CAP), how well it supports ongoing problem identification and the resultant effective and sustainable resolution of the identified problems, and
- OCRWM’s (including contractors’) management of the LA work, and its prospects for production of a technically sound, responsive and ultimately successful application, submitted on time.

The team's observations, conclusions and recommendations regarding CAP are presented in Section 3 of this report; those on the LA work are presented in Section 4.

In the course of its work, the Team also identified numerous issues broadly germane to overall YMP organizational effectiveness related to quality. The Team's assessment of these items is captured in Section 2 of this report.

The Team also identified specific issues with training, qualifications and proficiency of personnel. The Team's assessment of these items is presented in Section 5.

1.4. Process and Methods

The QAMA Team employed three primary methods in conducting its assessment:

1. Document and product reviews. These included:

- Audits/Surveillances
- Corrective Actions/Condition Reports
- Quality Improvement Plan
- Internal and External Assessments
- Flow of QA Requirements across organizations

2. Observations of ongoing work, including:

- Audits/Surveillances of opportunity
- Management meetings relevant to focus area
 - Management Review Committee
 - Condition Screening Team
 - Licensing Strategy Team

3. Interviews with individuals and small groups

- Line/functional managers regarding management processes
- Mid-level management input on management processes towards quality
- Group discussions on QA issues/management

1.5. YMP Perceived Issues

As a first step in this review, the QAMA Team visited the YMP offices, reviewed previous evaluations, interviewed several key personnel, and observed several meetings. From these activities, the Team developed a preliminary view of the major issues that appeared to be challenges to ultimate project success. Following subsequent review and discussion with YMP management, the Team then used this issue set as a starting point for selection of targets for the QAMA.

Six main issues/areas were identified:

- OCRWM credibility

Over the years, corporate commitments to take action have often not been met. As a result, new commitments in many cases are simply not believed, internally or externally. This in turn contributes to wheel spinning – problems that don't stay fixed and decisions that don't stay made. The situation can be exacerbated by an unnecessarily negative tone in internal and external communications, which reinforces skepticism regarding promised performance or improvements.

- Cross-country management

YMP top leadership and decision-making is in Washington, D.C. - 3000 miles away from the project office in Las Vegas. The local middle management, organizationally stove piped, seems to have difficulty solving problems that cross organizational responsibilities.

- Sense of urgency

Research and analyses have been going on for more than twenty years. For some individuals, the start of construction and subsequent transition to facility operations seem to be a very distant objective, and the day-to-day work is often problem-filled and seemingly disconnected from the long term objective. As such, a sense of urgency is not uniformly exhibited throughout the organization.

- Inter/Intra organizational issues

The OCRWM Organization does not currently exhibit a consistently professional “nuclear culture”, with the characteristics proven to be successful at high performing commercial nuclear plants. As examples:

- There seems to be incomplete organizational understanding and appreciation for the NRC's role in the licensing, regulation, and operation of Yucca Mountain and of DOE's impending role as an NRC applicant and licensee.
- There are indications that OCRWM organizational units are not sufficiently self-critical and that external reviews are sometimes looked at as a hindrance to progress rather than as actions central to improvement.
- There are real (or perceived) organizational and cultural barriers among BSC LLC, SNL and DOE.
- The role of QA in the OCRWM is distinctly different than that of the industry standard Nuclear Oversight at commercial plants. At YMP, OQA is perceived as “running” some of the line functions of the project.

- CAP structure and implementation

YMP current work is essentially conceptual engineering and science - but the YMP Corrective Action (CA) process is patterned after those used for operational facilities. The process is burdensome and slow. Classification of condition reports in some cases seems to be inconsistent with the true significance of the reported issues.

- License Application preparation

There is a very large body of work ahead, with obvious potential for serious resource shortfalls because the production process involves a great deal of complex parallel work with little time for integration, verification of quality, and discovery.

It is important to note that the Team did not attempt to validate the above list and does **not** present it as an assertion or an indictment of the organization. Nevertheless, based on discussions with YMP personnel, there was generally strong agreement that this list does serve as a fair synopsis of the broad issues facing the YMP. For that reason, the Team used this list as a framework and a starting point for its assessment, and it correlated its conclusions and recommendations with this starting-point list through the course of the QAMA..

2. Management Issues Affecting Quality

The QAMA Team represented over 200 years of nuclear management experience in the regulatory, commercial, and government sectors. During the course of the Team's assessment of specific QAMA target areas, several broader management issues affecting quality emerged. These issues are identified and discussed in this section, with the Team's conclusions and recommendations.

2.1. Review Topics and Assessment Methods

The review topics discussed in this section include:

- OCRWM Senior Management Leadership
- OQA Roles and Responsibilities
- Nuclear Culture / OCRWM as an NRC Licensee
- Communications - Internal and External
- Self Assessments

The observations, conclusions and recommendations in this section are based on:

- Review/analysis of documents including trend reports, performance metrics, root cause evaluations, and prior QA management assessments (internal, external and self assessments)
- Observation of management meetings and interactions between the Yucca Mountain Project (YMP) staff and OCRWM headquarters, YMP staff and OQA, YMP staff and BSC LLC/SNL, and YMP staff and the NRC
- Targeted interviews with selected YMP staff personnel (including BSC LLC and SNL)

2.2. Conclusions and Recommendations, re Management Issues Affecting Quality

2.2.1. OCRWM Senior Management Leadership

The OCRWM Director position, RW-1, is a politically appointed position. As such there is the likelihood that with the potential change in political administration at the start of 2009, a new OCRWM Director will be assigned.

Mr. Sproat's personal impact on the project has been significant and far reaching. Under his direction and leadership, clear objectives have been established and there has been increased emphasis and visible improvement in areas such as quality, project controls and management, and individual responsibility. Although this progress has been well grounded in improvements in training, qualification, procedures, and overall personnel selection, the Team is concerned that as a consequence of a change in leadership, the project may lose the positive momentum it has gained.

As a related matter, the organizational structure does not include single point leadership at the project office and site location in Nevada. Currently, lead managers from each of the main organizational elements report to the OCRWM Program Director in Washington

DC. There is no local day-to-day single authority to direct action, resolve conflicts or disagreements and coordinate all work. The QAMA Team considers this arrangement to be problematic today, and believes that it may be particularly impactful at some future time when there is a transition in OCRWM Directors.

Recommendations

- Appoint a single individual as the senior nuclear manager of Nevada operations, located at the OCRWM Las Vegas offices.
- Place high priority on making any needed changes in the OCRWM Director direct reporting positions, such that they are in place prior to expiration of Mr. Sproat's current term.
- Act now to solidify and institutionalize the changes Mr. Sproat has put in place. Assign high priority to implementation of *Strategic Objective 2 – Organizational Development*.

2.2.2. OQA Roles and Responsibilities

The QAMA Team's review of the QARD revealed that the roles and responsibilities of the OCRWM OQA organization are clear and meet the requirements of NQA-1 and the YMP Standard Review Plan (SRP), NUREG-1804. Further, the Team considers the recent addition of commercial nuclear experienced QA professionals to be a very positive action.

Nevertheless, in the course of its review in numerous areas, the Team noted that the OQA organization is directly involved in numerous line management activities – to a degree that is inconsistent with most commercial nuclear organizational structures and that can undermine the effectiveness of its oversight role. Presently, OCRWM OQA is intrusively involved in many of in-line management functions and responsibilities, such as the classification of Condition Report (CR) severity levels and selection of corrective actions (see Section 4 for more details).

The organization is in a transitional phase, rebuilding under a new management team after years of reported OCRWM quality issues - evidently, this current OQA role is intentional, having been deemed necessary to make step change improvements in the overall quality of YMP work. Such an approach is not dissimilar to that employed at commercial nuclear plants attempting to recover from degraded quality performance, and it serves as a mechanism for the nuclear assurance functions to demonstrate acceptable quality behaviors and standards to the line organizations. However it is not a suitable model for a QA organization that is to be successful and effective over the long term.

Fundamentally, quality performance must be owned by the responsible line organization. OQA's proper role is one of oversight, auditing, and surveillance, and to serve in that role effectively, it must be independent and organizationally detached from the execution of the work that it reviews.

Recommendation

Move the OQA organization back into a more independent oversight role with the line organizations taking full responsibility for the quality of their performance.

2.2.3. Communications - Internal and External

Over and over during its review, the Team saw evidence of significant improvements and tangible successes in correcting historical problems. This positive progress contrasts starkly with the usually negative tone of communications about OCRWM, not only from outside sources but also including internal and external communications originating from OCRWM management. As an example, the QAMA Team observed a DOE-NRC Technical Exchange on 6/26/07 (a public meeting) at which some of the presentation material and attendant discussion was excessively negative.

It is sometimes necessary and appropriate to present publicly the details of identified problems and corrective actions. But taken to an extreme, pervasively negative communications can convey a very misleading picture to employees and stakeholders. And ultimately, they can undermine progress by discouraging workers and by diminishing stakeholder trust and confidence in OCRWM deliverables.

The QAMA Team considers it imperative for OCRWM to present its improved quality performance in an accurate and balanced way, both internally and externally. Messages that inform the NRC and the public about the positive features of the project should be developed and used in appropriate venues.

For example, in the Team's view, the underlying message on the OCRWM Corrective Action Program should be that it reflects continuous improvement by a learning organization – and while not yet perfect, it is an important tool being used to methodically identify and correct deficiencies. This message is not “spin” – it is unquestionably true and should be conveyed, in context.

Recommendation

Create a comprehensive Communications/Message Strategy for addressing key project issues, near term actions and longer term goals of the project. Include development of communications materials, coaching in their use, identification of communications opportunities, etc.

2.2.4. Self Assessments

The QAMA Team found that self-assessments conducted by OCRWM directorates do not meet OCRWM procedural requirements and do not reflect the level of self-critical examination exhibited by excellent, continually improving nuclear organizations.

Inadequacies in YMP self-assessments have been documented on numerous occasions, including:

- In April of 2006, an effectiveness review of the OCRWM Self-Assessment Program identified significant shortfalls in the implementation of the program, including the conduct of only 20 self-assessments during 2005. This resulted in the generation of CR 8251, citing weaknesses in scheduling and completing self-assessments, significance of areas being assessed, low number of CRs being generated, recurrence of conditions identified in self-assessment CRs, weaknesses in planning and documenting of self-assessments, and trained personnel not leading self-assessments. The cause of the deficiency was contributed primarily to management and supervision methods.
- The Nuclear Energy Institute (NEI) Yucca Mountain Project Independent Quality Assurance Review conducted in December of 2006 declared the OCRWM Self-Assessment Program to be ineffective based on: inconsistencies in scheduling, planning, scope of self-assessments not focused on key/critical areas, completing assessments, use of the CAP for areas identified as needing improvements or enhancements, and measuring the effectiveness of the self-assessment products.
- At the recommendation of the NEI Report, Condition Report 10004 was written to address the Self-Assessment Program. Following a root cause analysis (*CR 10004: OCRWM Management of Self-Assessment*, May 9, 2007), eighteen corrective actions were assigned. None of these have been completed and eight are late.

The Team found no evidence that the organization has made any significant progress in addressing this long-standing problem. In 2006, a total of only 11 self-assessments were conducted within OCRWM – and five of the eleven OCRWM organizations did not perform any.

Evidently, the requirements of LP-PM-001-OCRWM, *OCRWM Self-Assessment Program*, are not being followed by line management, in that no self-assessment schedule for FY07 has been generated. In the fifteen months since the generation of CR 8251 and the nine months since the generation of CR 10004:

- No self-assessment schedule for FY07 has been generated.
- Of the 18 corrective actions assigned to CR 10004, none have been completed and eight are late.

This finding has strong relevance to the License Application in that section (q) of



reference 5 requires DOE to establish measures to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and non-conformances are promptly identified and corrected. NUREG-1804, Section 2.1.1.6, Review Method 2 requires confirmation that management systems and procedures are sufficient to ensure that administrative or procedural safety controls will function properly. Examples of management systems include audits and self-assessments.

The Self-Assessment Program is a key component of these requirements in that it should be the first programmatic effort that identifies deficiencies. Line management should be the enforcers of quality, leaving the OQA to act as internal regulation and oversight. The ineffectiveness of line management as self-assessors requires the OQA to act as the sole enforcers of quality through the mechanisms of audits and surveillances.

Recommendations

- The Director, OCRWM, needs to establish a clear expectation of line managers for their support of the Self-Assessment Program and hold them to that expectation.
- Provide training from OQA to line managers in the schedule and conduct of self-assessments.

3. Corrective Action Program

All three YMP organizations – OCRWM, SNL, and BSC LLC – use the Corrective Action Program (CAP) to identify, analyze, and correct conditions adverse to quality and other deficiencies. Further, the CAP is intended to prevent recurrence of failures and deficiencies that are adverse to quality and to assess the effectiveness of corrective actions for significant failures/deficiencies.

The YMP CAP has been the subject of numerous reviews and the target of much criticism. Because it is central to effective quality management, the QAMA Team included the CAP in its assessment. The Team's intent is not to re-plow old ground but rather to provide a supplementary perspective and guidance that may enhance ongoing organizational actions. This section provides that input.

3.1. QAMA Team Assessment of CAP

CAP Focus Areas and Assessment Methods

The QAMA Team examined the YMP CAP history, reviewed related procedures and processes, conducted interviews, observed meetings and related activities, and reviewed samples of selected documentation.

The QAMA Team reviewed the Procedure AP-16.1Q, *Condition Reporting and Resolution*. The procedure establishes the responsibilities and process to be used to ensure that conditions related to work activities are promptly identified, controlled, evaluated and corrected as soon as practical. It also describes the process flow and requirements for condition identification and resolution. According to the procedure, this includes adverse conditions as well as opportunities for improvements.

The QAMA Team reviewed the procedure and the process. The Team conducted a number of interviews to obtain perspectives of the users at all levels. The Team also attended several CR Screening Team Meetings and Management Review Committee meetings, and reviewed a sample of CRs, both in-process and completed.

Historical Perspective on CAP

The YMP CAP has been reviewed by several external organizations and internally by the OCRWM OQA and by DOE, BSC LLC and SNL self-assessments. Most of these reviews have been highly critical of CAP effectiveness. Important historical reviews include:

- When formulating its Management Improvement Initiatives (Initiatives) in 2002, OCRWM self-identified that multiple corrective action programs existed, processes were burdensome, and actions were not completed in a timely manner.
- In May 2003, at a congressional field hearing, the Government Accountability Office (GAO) provided preliminary observations on the Yucca Mountain QA

- program, noting DOE's poor track record in correcting recurring quality assurance problems.
- A 2004 GAO Report documented weaknesses in the identification of problems and criticized the manner in which low level problems were handled. It also noted that the DOE and Bechtel had not made effective resources available to determine the root causes of problems.
 - A GAO Report in April 2006 noted that after 20 years of work DOE still could not be certain that it had resolved past quality assurance problems.
 - An August 2006 DOE Office of Inspector General (OIG) Report criticized numerous aspects of the CAP implementation, documenting for example:
 - 102 issues that were not placed into the CAP process, but should have been.
 - Employee reluctance to identify issues
 - Poor timeliness in corrective action closure, noting that 6 of 8 Level A CRs and 57 of 96 Level B CRs not closed in accordance with CAP requirements
 - Failure to validate effectiveness of some corrective actions as required.
 - Management failure to fully utilize the trending capabilities of CAP.
 - A Nuclear Industry Institute (NEI) assessment in late 2006 identified similar weakness in the CAP, including *numerous* examples of overdue actions at all levels and examples where effectiveness reviews were not performed. The review team also observed that efforts to complete root cause evaluations generally take longer than in the commercial nuclear industry.
 - NRC Observation Reports consistently document CAP issues and routinely criticize the manner in which some CRs are processed. A number of open items in NRC's process for tracking items of interest evolve around the CAP¹.
 - Internal OQA audits routinely initiate CRs that directly involve the CAP and its processes. A recent CR (9774), dated March 20, 2007, documents that the CAP is currently "ineffective" and was classified as a level "A".
 - An August 2007 GAO Report documented improvements in the QA program, including the changing of the organizational culture and focusing management attention on improving quality by solving problems.

¹ Most of the items discussed are not NRC identified deficiencies, but rather deficiencies identified and processed in the CAP in a manner not consistent with the NRC Observer's expectations. The 2006 GAO Report indicated that an NRC on-site representative indicated that repetitive and uncorrected issues associated with the requirements management process could have direct implications for the quality of the DOE LA.

Until recently, the historical picture that is portrayed by these reports has not been good. The QAMA Team considered these and other critical reports in its assessment. However, the QAMA Team also considered the improvements made in the CAP, particularly in the recent past. While the CAP is modeled after similar programs used at commercial operating reactors, its programs are not particularly similar to those at a commercial operating reactor. At this point, the project is still in the design phase, an iterative process that continues now and will continue to change as the design matures and reaches finalization to support construction.

3.2. Conclusions and Recommendations, re CAP

3.2.1. CAP Effectiveness

Notwithstanding its long history of performance issues, the QAMA Team found that the numerous efforts to improve CAP have taken hold and that the CAP today is achieving its intended effect of identifying, tracking, and correcting conditions adverse to quality. Although there are a number of process elements that still need improvement, the process is maturing and is generally effective.

The QAMA Team found project-wide agreement on this point. Interviewees convey strong satisfaction with the CAP's effectiveness in the identifying problems. At the time of this assessment, since the beginning of the year, 1186 CRs had been initiated by the Project. In 2006, 2163 CRs were initiated. This high number of CRs and their relative significance indicate that the program is being used effectively to identify problems.

Recommendation

While management must continue with CAP refinement and improvement (see subsequent recommendations in this section), internal and external communications should reflect positive progress rather than just shortcomings.

3.2.2. Process Efficiency

Although the CAP process effectiveness has been improving over the last few months, the areas of screening CRs, closing CRs, management accountability and the role of OQA still require improvement.

The QAMA Team concluded that although Procedure AP-16.1Q, *Condition Reporting and Resolution*, is adequate, both the procedure and the CAP process are complex and cumbersome. Most interviewees expressed some frustration with the administrative burden of the process for the user. Some process steps seem unnecessary, and they reduce process efficiency and effectiveness. The net effects of process inefficiency include adverse impacts on both resource requirements and timeliness, and the attendant skewing of performance data.

The QAMA Team also saw anecdotal indications that some persons are disinclined to use the CAP to address issues. In addition, the QAMA Team noted that the closure of CRs requires confirmation of effectiveness by the OQA, a responsibility more appropriately held by line management.

Individuals interviewed discussed various challenges related to use of the CAP process. Many understood that it takes some time to develop a computerized process that is easy for everyone to use. The frustrations expressed by the staff usually involved the actual process and how to use it, not frustration with the computer interface.

Among the process efficiency aspects identified, several stand out. These are (1) the process of screening condition reports for purposes of classification (2) the process for CR closure and (3) the process of post-closure effectiveness reviews. These are addressed in the following sub-sections.

Screening of Condition Reports

The process of CR screening was a frequently cited frustration and was observed by the QAMA Team to be tedious. Note that there are two sub-issues here. One is the problem of “over-classification”, discussed in the next section, and the other is the screening/classification process itself, discussed here. While separate, these are linked. Many of those who expressed concern about over-classification also indicated that the decisions were less based on substance than on who raised the issue or spoke the loudest in screening meetings, including the on-site NRC Observers.

To obtain more information and insights, QAMA Team members attended daily CR Screening Team Meetings (4/25, 6/26, 7/25). At those meetings the Team observed inefficiency and ineffective communication. In both cases, ten to fifteen individuals were present to screen approximately ten CRs. On many topics, the meetings deteriorated to free-form discussion of collateral matters rather than focused discussion of salient facts. In many cases, the recommendation of the line manager - the one most knowledgeable about the issue and accountable for its resolution - was ignored. From the meetings observed, it appears that about 15 to 20% of the work week is spent by these key individuals screening CRs.

While it is not certain why these meetings are so ineffective, the QAMA Team judges that at least one key factor is the history of CAP and OQA criticism that causes individual leaders to be reluctant to show forceful leadership, and which also pre-disposes groups to accept a “least common denominator” position – usually resulting in over-classification.

Closing Condition Reports

The most significant concern to the staff appeared to be the excessive time it takes to close a CR. Individuals interviewed indicated that much of the effort expended to close a CR is unnecessary. Furthermore, in order to avoid the cumbersome closure process, many managers attempt instead to downgrade the CR. The 2007 NEI Report referenced above

noted that some of those interviewed stated, “We spend more time justifying downgrades than just fixing the problem.”

QAMA Team members attended three Management Review Committee (MRC) meetings to better understand this issue (4/25, 6/27, 7/25). These meetings are held weekly to review Root Cause Evaluations (RCEs) for adequacy, to assure that actions have been fully completed for those issues ready for closure, and that effectiveness reviews have been appropriately assigned and performed as required. In the QAMA Team’s view, these meetings are inefficient and unnecessarily resource intensive. In one meeting, thirty minutes of side conversation by OCRWM participants at DOE HQ continued while a staff of 20 at the site office sat quietly and observed.

At the meetings attended by the QAMA Team, the discussions and decisions were dominated by OQA, and it appeared that those present looked to OQA rather than the line for final decisions regarding RCE adequacy or CR closure. (One reason for this may be that the site RCE subject matter experts are in OQA). The process was also inconclusive in many cases, with actions being returned to the line for additional review, with frustration on the part of the line for having to do more work on something they considered to be adequate.

As noted above, the YMP has received considerable criticism over the years regarding its CAP and OQA programs. The MRC was most likely formed to resolve some of these past criticisms regarding improper closure of actions and poor RCEs. But in the Team’s view, the pendulum has swung too far, and the screening committee that was formed to address criticisms of the past has supplanted line management’s responsibility for problem resolution. OQA has, in this area, moved out of its oversight role. This is not a long term solution and is inconsistent with industry practice..

Effectiveness Reviews

The QAMA Team noted that the closure of CRs requires confirmation of effectiveness by OQA, a responsibility more appropriately held by line management, particularly for those issues that are low in significance. While it may be appropriate to have OQA perform or be party to effectiveness reviews for those very significant issues, for more routine ones, it appears to be a resource intensive effort with little added value. OQA’s role should be to perform an audit or a surveillance on the CR closure process, instead of being part of it.

Management Accountability and Responsibility

A common denominator in each of the above is the direct involvement of OQA in matters for which the line organizations must be accountable. (See the discussion on this point in Section 2, above).

In simplest terms, line management must ensure their organizations implement the CAP in accordance with established requirements. Committees and/or OQA cannot and will

not supplant this responsibility. OQA, committees, and other functions are there to assist the line in fulfilling its responsibility, not to take responsibility away from the line. OQA's role is to monitor line management implementation of the CAP. When line management does not implement management expectations as determined through an audit or surveillance, then OQA should get involved and raise the issues to the appropriate level of senior management.

Recommendations

- Clarify OQA's role in the CAP process, and revise as required.
- The OCRWM Director should reinforce expectations regarding line management accountability for problem identification and timely resolution.
- Discontinue 100% review by OQA of all CRs.
- Close CRs upon execution of the CAs as approved by the responsible line manager. Assign subsequent effectiveness assessments to the line organization.
- Eliminate QARD section 16.2.5 and the associated actions in AP-16.1Q that require verification of CAs.
- Limit action on "D" CRs to simple documentation and communication as appropriate.

3.2.3. Classification of Condition Reports

The QAMA Team's review of CRs indicated that many identified issues had been classified at a higher significance level than required either by OCRWM procedure or by realistic judgments regarding their implications on safety, operability or waste isolation. Concern on this point was expressed by many of the individuals interviewed. Over-classification wastes resources and dilutes attention on issues of true importance.

CRs, after being entered into the CAP, are classified according to significance. The current OCRWM CAP calls for classification of CRs in accordance with the impact on or importance to (1) the health and safety of the public, (2) waste isolation and (3) to the protection of workers from harm. Based on severity with respect to any of these three, CRs are classified as levels A, B, C, or D (in order of decreasing severity) and as defined in procedure AP-16.1Q, *Condition Reporting and Resolution*.

In general, Level A issues are termed *Significant Conditions Adverse to Quality* which if left uncorrected, could have a serious effect on safety, operability, or the ability to isolate waste. Level B issues are *Adverse Conditions* which include failures, malfunctions, deficiencies defective items, and non-conformances. Level C issues are *Minor Adverse Conditions* that have a minimal effect on the safe and reliable operation of the facility, personnel, or the ability to isolate waste. Level D issues are *Opportunities for*

Improvement that do not meet the definition of an Adverse Condition. As of September 6, 2007, the backlog was 8 Level A, 92 Level B, 366 Level C, and 107 Level D CRs.

By Attachment 4 of Procedure AP-16.1Q, a RCE is required for Level A issues, and an Apparent Cause Evaluation (ACE) is required for Level B issues. Appropriately, the higher level CRs require more time and resources to close. Conditions Adverse to Quality that are classified as A or B depending on their significance require classification approval by OQA. RCEs, ACEs, extent of condition reviews, extensive corrective actions and corrective action plan reviews may require effectiveness reviews and other OQA approvals. The amount of manpower required to accomplish this work is great and often involves several iterations of the process steps because of differences of opinion in committees charged with classification and closure discussed above.

The Team reviewed Attachment 4 of Procedure AP-16.1Q and concluded that the attachment to determine significance is difficult to use and (due probably to an attempt to eliminate subjective decisions) is overly prescriptive.

Implementation of the Process

The majority of staff and managers interviewed expressed concern that many issues were “over-characterized” (inflated), particularly Level A CRs. Most interviewees pointed to the high number of Level B actions generated that resulted in ACEs, noting that many of evaluations were unnecessary for a project still in the design phase.

This is a matter of frustration and some controversy. Many individuals interviewed by the QAMA Team disagreed with the classifications of CRs under their responsibility and/or lacked full understanding why the CR had been characterized at that level. Most believed their efforts could be better spent on matters of importance rather than spending time and resources on issues that were relatively minor. On the other hand, a few other individuals pointed proudly to the number of higher significance items, noting that the organization was conservative and doing the right thing by driving levels higher. These individuals believed that the organization was doing a very good job of being more self-critical than in the past, and the number of higher significance issues was proof that the organization was learning how to identify and correct important issues.

The QAMA Team reviewed over one-hundred selected Level A and B condition reports. The review substantiated that levels were inflated. In the view of the QAMA Team, for many Level A condition reports, there is not a clear nexus between the issue and its severity effect on safety, operability, or the ability to isolate waste. The QAMA Team notes that by procedure, Senior Management may decide to raise an issue to Level A, so in that respect an “A” classification may be legitimate regardless of severity. However, given the fact that there were eight open Level A CRs at the time of this review that had been assigned Level A on that basis, it appears that the use of that criterion at this phase of the project is overused.

The Team similarly concluded that the number of Level B CRs was inordinately high. The definition for an Adverse Condition (Level B) is very broad. Nevertheless, without disputing the definition, the QAMA Team's judgment based on review of the Level B condition reports indicates that few of these Level B issues truly warrant an ACE – and in that sense, they are over-classified.

Implications of Over-classification

The resources required to analyze ACEs and address higher level CRs constitute a significant fraction of the total resources available to the YMP - and therefore diminishes, perhaps significantly, the resources available to produce the LA and accomplish other near-term important work. Furthermore, the high number of officially-classified significant problems at this stage of the project would seem to reinforce the YMP reputation for poor quality work. Thus, the composite effect of inflated classifications and extraordinary time and effort it takes to close CRs is the perception the project is riddled with significant problems that it cannot fix. This, in fact, is not the case.

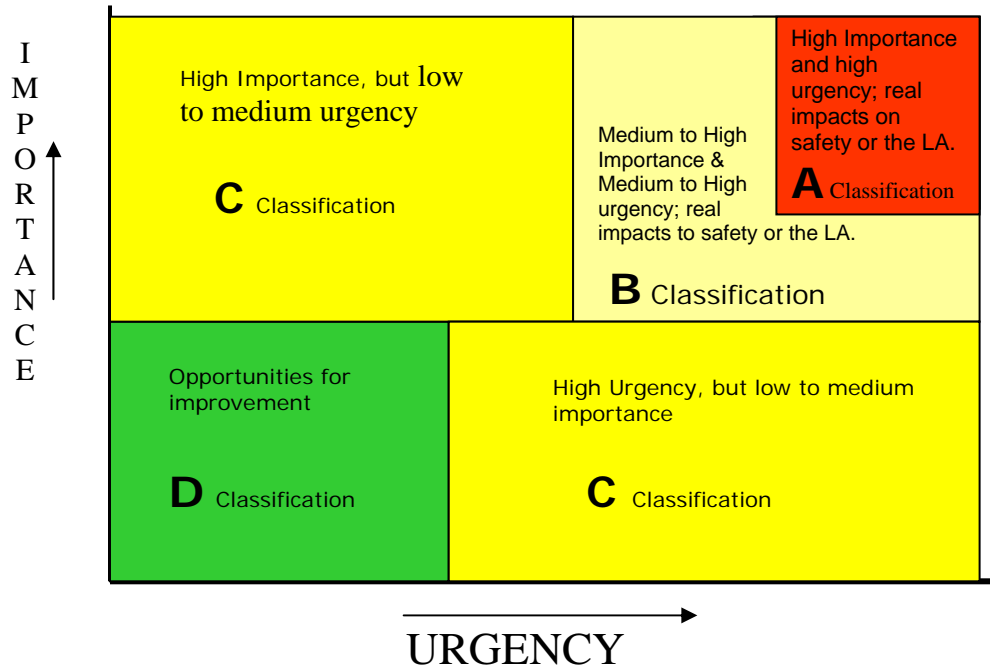
An Alternative Approach, for Consideration

The current process places little consideration on urgency. In the Team's view, classification categories "A" and "B" should be reserved for "conditions adverse to quality" that require **prompt** and **comprehensive** actions. Figure 1 shows an alternative classification logic that takes into account both urgency and long term importance.

For this phase of the project, in which there is not yet any waste to isolate and few operations that threaten worker or public safety, it would seem appropriate to limit the number of RCE, ACE and EoC reviews, thereby providing resources, sharp focus and timely attention to those issues that truly require them in the near term – primarily those that affect personal safety and the LA.

Under the alternative scheme, deficiencies identified as "important" and "urgent" because of near-term potential impact to personnel safety or the integrity of the LA (two current vital organizational objectives) would be classified as "A" or "B" and action taken as required by that classification. Similar but less urgent deficiencies, including deficiencies in safety and waste isolation, for which the impact will not materialize for years to come, would still be evaluated, only at a lower significance level (classified as "C") without an extent of condition review and no apparent cause evaluation. Including urgency in significance determination is not inconsistent with the commercial nuclear industry. For example, a packing leak on a safety injection valve that does not have to be fixed until the next outage is evaluated at a significantly lower level than one that has to be fixed to prevent a shutdown because of a higher leakage rate. Opportunities for improvement or minor deficiencies that would be tracked by trends will retain "D" classification.

Figure 1: Alternative CAP Classification Model



Recommendations

- Make significance determinations more realistic such that they reflect the true potential significance as it relates to safety, operability, or the ability to isolate waste.
- Revise procedures to clarify significance determination definitions and requirements, and clarify the procedure regarding the need for Apparent Cause Evaluations and Extent of Condition Assessments
- Develop and promulgate a clear statement of management expectations in this respect, and coach the organization on the refined approach.

3.2.4. CAP as a Management Process

The QAMA Team observed that in some instances CAP is used as a surrogate broad-based management process. As a case in point, CAP is currently the primary vehicle for tracking management initiatives related to nuclear culture change. Most of the open Level A CRs at the time of the assessment involved changes in behavior and culture. However, significant parts of this initiative are not so much corrective actions as elements of a



management-sponsored initiative necessary to ready the organization to be a successful licensee.

The open Level A CR that addresses the ineffective CAP (9774) is another example. Although this Level A CR purports to document that the CAP is ineffective, corrective actions are not scheduled to be completed until April 2008. In the QAMA Team's view, the CR-identified actions are sensible steps to improve the CAP process and therefore serve more as a list for work management than as essential corrective action that need to be managed under CAP.

The Team's view is that the CAP is currently adequate (albeit needing efficiency improvements) and that the actions being taken under this CR are in fact refinements and improvements, rather than essential steps needed to transform the CAP from an ineffective to an effective process. On that basis, it should not be a Level A CR. The CAP system in this case seems to be being used by management as a convenient way to manage organization and process change, rather than to correct deficiencies.

Another specific example is CR 6278 (Aug. '05). The deficiency documented in the report was that the Site Characterization Projects Requirements Document (YMD-RD) was not current. The corrective action could have been closed to the action of replacing the YMD-RD with Monitored Geologic Repository Requirements Document (MGR-RD). Instead the corrective actions have morphed into a series of process and procedure changes that are not directly tied to the original deficiency. At the time of the QAMA review, the CR was still active.

QAMA Team Post Script on CAP

The QAMA Team notes that CAP improvement is an ongoing process, receiving a great deal of management attention. In the course of discussions with YMP management subsequent to the QAMA review team, several team members were advised of improvements already in place, some along the lines recommended in this report. The QAMA Report obviously does not reflect those recent changes, but the Team notes that such progress is fully consistent with its view that CAP is an effective and continually improving process.

Recommendation

Limit CAP to corrective action management; track management initiatives and other actions via a separate action tracking system.

4. License Application

Preparation of the Yucca Mountain Repository Licensing Application (LA) for submittal to the Nuclear Regulatory Commission (NRC) is the major activity underway in the Yucca Mountain Project (YMP). OCRWM has committed to submit the LA to the NRC no later than June 30, 2008. This extensive document provides all of the information necessary for the NRC to make a determination that it is safe and appropriate to construct the repository. No other effort on the project is more important for the DOE and the YMP over the next year than production of a technically sound, complete and traceable LA.

The cost of the LA is expected to approach \$500 million and to consume the full time effort of more than 40% of the project personnel. Completing this effort on time and in a quality manner is a critical step in restoring public and regulatory confidence in OCRWM. It will serve as the single greatest demonstration of how the project has improved its ability to accomplish quality work. How OCRWM manages the interface with the NRC will also demonstrate its capacity to be a learning organization and a responsible design, construction and operating nuclear organization.

4.1. QAMA Evaluations re the LA

QAMA Focus Areas and Assessment Methods, re LA

A QAMA sub-team was formed for this area of review, comprising two experienced NRC senior managers and one former utility executive with extensive commercial NRC licensing experience. With this background, the sub-team was able to delve into the LA preparation activities and to assess the potential for the LA to satisfy NRC needs and the ability of the DOE organization to be a successful NRC licensee.

The sub-team explored the history of the development of the LA. The planning documents and the process for creating the LA sections and the process for reviews by BSC LLC, SNL and the DOE were reviewed. In order to gain a complete perspective of the LA preparation and review, the QAMA team spoke with executives in BSC LLC and SNL as well as the Heads of the OCRWM Offices, managers in BSC LLC, SNL and OCRWM, and a sample of engineers responsible for creating, reviewing and verifying the content of LA sections. Members also attended meetings where individual sections of the LA were being reviewed and decisions were being made about the content of the various LA sections.

OCRWM LA History and Overview

An earlier version of the OCRWM LA was completed several years ago, but was not submitted to the NRC at that time in the face of numerous contentious issues and assertions regarding the YMP.

The current effort is a complete re-write of the document, prepared by many different teams working in parallel on individual sub-sections. The sub-sections in turn roll up into



major sections, with the entire LA comprising 71 such sections. The production of the overall LA is managed through a four phase process, beginning with story board draft sections (now complete), Interim Draft (50% of the LA scheduled for completion by 5/31/2007), Final Draft (90% to be complete by 10/31/2007) and Validated Final Draft (100% scheduled to be completed by February 29, 2008).

During the QAMA Team's July visit to the YMP, we were informed that a number of the reviews and approvals due by May 31 were not as yet complete. Most of the incomplete reviews were the responsibility of DOE. Better performance in this area will be required if the overall production schedule is to be met.

While there is a good plan to control the preparation of the LA by the laboratories, managed by SNL, BSC LLC, and by DOE (the licensee) there are also a number of barriers that could threaten the LA completion and its ultimate approval by the Nuclear Regulatory Commission. The QAMA Team believes that all of the barriers can be overcome, but effective near term action is needed to do so.

The Team notes also that the unique role of DOE – as the NRC licensee - in this project presents significant challenges. Normally, the DOE operates as an oversight and contract interface organization. In this case, however, we believe that for DOE to succeed as the NRC licensee it must be totally involved in the work, and while directing the contractors must also be knowledgeable and take ownership of the details of the work products.

The DOE role and relationship with NRC is very analogous to that of a utility owner/licensee of a commercial nuclear power plant, one not familiar to most OCRWM personnel. In the Team's view, the DOE organization is not sufficiently developed as a NRC licensee capable of this level of involvement. The time to establish itself in this role is very short.

4.2. Conclusions and Recommendations, re LA

4.2.1. License Application Schedule and Quality

The QAMA Team concludes that a technically sound and complete LA can be prepared by February 2008, and that the primary challenge in meeting the committed summer 2008 submittal date will be the review and approval process planned to be conducted in the intervening period.

Observations and Recommendations, re LA Schedule

The QAMA Team believes that a process and plan to produce and compile the 71 sections of the LA by February 29th, while challenging, is sound and essentially on track. To date the performance of the laboratories and BSC LLC appears good. SNL has established a demanding deadline for the needed scientific information for the design. Some pieces have been delivered late, but the combination of SNL and BSC LLC management are well aware of the situation and contend that they will make this interface work well enough to meet the LA schedule.

Recommendations

- Establish a single, comprehensive LA schedule that accomplishes the review process “in line” with document production, and to the extent possible, in advance of the February 29 completion date.
- For any review and approval actions that must be conducted after February 29th, create a detailed plan and schedule to achieve that. Require all organizations, especially DOE, to commit to that schedule, and monitor it closely.

Observations and Recommendations, re LA Quality

The QAMA Team expects the LA to be of sufficient quality to be accepted and docketed by NRC. Plans and reviews currently in place appear to provide the needed completeness, quality and traceability to a sufficient level to secure NRC acceptance for docketing. Achieving full consistency, integration, and compatibility of the 71 individual (and separately prepared) LA sections is the most daunting quality-related task.

The parallel work in creating the 71 LA sections carries with it the inherent risk of inconsistency and/or inadequate integration among sections. In QAMA Team interviews with BSC LLC Engineering personnel they consistently expressed concern on this point. Processes are in place to accomplish cross section reviews (cross walks), but these necessarily must be done late in the LA preparation process. This review to ensure consistency and integration throughout the document is a daunting task. Management attention and careful execution will be needed.

Another challenging task will be to ensure traceability for all of the assertions in the LA to the base documents from which they are derived. The scientific experiments and reports as well as the base engineering calculations, analyses and design drawings must be easily accessed when questions arise about the basis for any and all statements in the LA. This characteristic of traceability is key to an efficient and successful licensing campaign. The project has established a rigorous process to accomplish this traceability that, if executed properly, will provide a strong asset to the project.

The safety analyses in the LA are required to be done on a probabilistic rather than a deterministic basis. This approach may dictate numerous iterations between the safety analysis and the design before satisfactory results are obtained. The ability of the engineers and analysts to specify the design based on their experience of what the analyses will show is the key to minimizing the iterations. The quality of the project team provides good reason to expect that this issue will not be a big barrier for the project, but careful monitoring is suggested.

Recommendation

Continue on the current course, with a high level of management oversight given to the chapter integration process.

4.2.2. OCRWM/NRC Working Relationship

The current OCRWM/NRC relationship is not conducive to a successful licensing interaction. Success in NRC licensing demands an open, mutually respectful and technically sound relationship between the licensee and the NRC staff. Based on observations and discussions, the QAMA Team believes that the OCRWM/NRC relationship currently does not meet that standard.

One potentially significant impediment to an open relationship is the contentious YMP legal environment.

Although some of the OCRWM management and staff are experienced in the commercial reactor licensing process, our QAMA Team interviews in most cases did not demonstrate complete understanding of the NRC expectations of the degree of detail and comprehensiveness of design descriptions, programs and safety analyses. Further, the public nature of many of the interactions between DOE and NRC restricts the open discussion of issues that typically take place in interactions between NRC and potential applicants, which normally are more informal and not open to continued public criticism. With less opportunity to discuss the details and technical bases of the submittal with the NRC staff reviewers, there is a risk of not satisfying the expectations in some sections in the LA. This could result in an overall lack of NRC confidence in the credibility of the LA, and ultimately a delay in NRC willingness to docket it.

Success in NRC licensing requires an open, efficient, mutually respectful and technically sound relationship between the licensee and the NRC staff. In our experience, the NRC trusts its applicants and licensees to do the right things, and relies on them to provide complete and accurate information and to keep them current on significant issues. Licensees that fail to do so quickly lose credibility.

In the QAMA Team's view, the DOE-NRC relationship requires improvement in that the barriers created by the conditions discussed above may preclude achievement of a satisfactory interface. Improvement is needed.

Recommendations

- OCRWM management and NRC should develop a communication protocol that provides suitable public involvement and at the same time permits healthy interaction between applicant and regulator.

- Similar attention needs to be applied to relationships among OCRWM and other regulators and stakeholders.

4.2.3. Post-submittal LA Support

Planning and preparation for the post-submittal phase is essential. It is vital that OCRWM be responsive to and timely in supporting the NRC, and that all interactions with the regulator and other involved parties be effectively coordinated by the Regulatory Authority Office (RAO). The first few months following submittal will be particularly important.

One risk or barrier is the ability of the OCRWM to support the review schedule. To date, review deadlines have been missed by some organizations, primarily DOE Offices within OCRWM. It is the QAMA Team's judgment that it is important for DOE, as the prospective NRC licensee and leader of the YMP, to set the pace in LA schedule performance. Much greater cohesion, quality performance and speed will be required after the LA is submitted if the NRC review schedule is to be maintained. It is to the DOE's benefit to establish the performance standards now while there is time to develop the organizational behaviors that will be essential to later success.

DOE, as an NRC licensee, must take meaningful and full "ownership" of the LA. Ownership implies the assumption of responsibility and solid familiarity with the LA contents so that meaningful discussions between the NRC and the prospective licensee (DOE) about all of the contents are possible.

While contractors may be used under the licensee's direction to answer NRC Requests for Additional Information (RAIs), to revise sections of the LA and as participants in discussions with the NRC, OCRWM personnel will be expected to take the lead in discussions, presentations and testimony on the contents of the LA and the details of the project. Furthermore, the licensee must be fully conversant with the NRC Licensing Process. This will require extensive training and/or the addition of staff resources with the requisite experience and knowledge.

The OCRWM Regulatory Authority Office (RAO) is, as we understand it, the counterpart to a commercial company's Licensing Group. In this Office the licensing strategy and communications with the regulator would be created and managed. An open dialogue between RAO and the NRC regulatory staff is essential. All communications with the regulators should be coordinated through RAO and it should be responsible for coordinating the content and timely delivery of the needed information. This will facilitate the NRC review schedule and increase the likelihood of an on-time approval of the license.

The broad issue is creating a full scope licensee organization with a nuclear culture; the near-term challenge is to create a RAO that can effectively represent OCRWM as a



licensee during the licensing defense and public hearing process. This will involve substantial training of the current federal employees, and/or recruiting of employees with commercial nuclear licensing experience so that all of the required skills to serve as an NRC licensee will be present in OCRWM.

The Team recognizes that plans have been put in place to create a DOE organization (a significant expansion of OCRWM) that will be a fully qualified nuclear operating organization. Furthermore the Director has established a Strategic Objective focused on organizational transformation to create the entity that will design, license and operate the Yucca Mountain Nuclear Waste Repository. While this will be a complex transformation for the whole organization, early emphasis on the RAO is recommended since its contribution will be so critical in the near-term.

Recommendation

The RAO must create a strategy and a comprehensive plan for the licensing defense phase of the project. The RAO must coordinate all activities and communications with the NRC necessary to obtain the license, including coordinating the content and delivery of all communications with the regulator and others involved in the licensing proceedings.

5. Training, Qualifications and Proficiency

The QAMA Team noted several specific deficiencies in the related areas of training, qualifications and proficiency. While initially these were not identified targets in the QAMA, their significance warrants, in the Team's view, particular attention.

5.1. QAMA Team Assessment re Training, Qualifications and Proficiency

Assessment Focus Areas and Methods

The Team reviewed OCRWM, BSC LLC, and SNL training, qualification and proficiency programs and procedures; conducted interviews with training coordinators; and reviewed select documentation of personnel training.

Overview of OCRWM Training, Qualifications and Proficiency

Section (c) of reference 5 specifies that "The [QA] program must provide for indoctrination and training of personnel performing activities affecting quality as necessary to assure that suitable proficiency is achieved and maintained." In support of this, NUREG-1804 Section 2.5.1.3, *Yucca Mountain Review Plan*, Acceptance Criterion 2 (16)(b) (for activities related to the QA program) states that "Personnel verifying activities affecting quality are trained and qualified in the principles, techniques, and requirements of the activity being performed."

In addition, Acceptance Criterion 2 (16)(d) (for activities related to the QA program) states that "Proficiency tests are given to personnel performing and verifying activities affecting quality, and acceptance criteria are developed to determine if individuals are properly trained and qualified". Acceptance Criterion 2 (16)(f) states that "Proficiency of personnel performing and verifying activities affecting quality is maintained by retraining, reexamining, and/or recertifying as determined by management or program commitment"

OCRWM training and qualification requirements flow from external requirements (10CFR63, NRC Regulations, etc) to DOE/RW-0522, *Training Management Plan*, to LP-2.19Q-OCRWM, *Personnel Training and Qualification*, then to the associated Training Program Descriptions.

The Team found that BSC LLC and SNL programs were comprehensive and well administered.

OCRWM has self-identified that they have challenges in their overall training and qualification programs as compared to the commercial nuclear industry. Strategic Objective # 2, Organization Transformation, states as its purpose to "design, staff, and train the OCRWM organization such that it has the skills and culture needed to design, license, and manage the construction and operation of the Yucca Mountain Project with safety, quality, and cost effectiveness". The Team concurs with the purpose of Strategic Objective # 2, and recommends that OCRWM aggressively pursue this objective to

improve readiness to become a licensee and continue improvement in overall quality performance and nuclear culture.

5.2. Conclusions and Recommendations

5.2.1. Procedural Compliance

The Team found that some OCRWM procedures associated with training and qualifications are either outdated or not followed. For example:

- DOE/RW-0522 assigns responsibilities to offices that do not exist in the current organization (Office of Strategy and Program Development, Office of Repository Development).
- A Training Advisory Group is not utilized as required by DOE/RW-0522.
- TPD-PI-RW-001 assigns responsibilities to an office that does not exist in the current organization (Office of Business Support).
- Training requirements of DOE/RW-0522, *Training Management Plan*, are not met in that several OCRWM directorates do not have approved training and qualification programs for positions in their organizations.

The lack of training and qualification programs in several directorates presents a high risk to the acceptability of the LA. These directorates, specifically the Offices of the Chief Scientist (OCS), Chief Engineer (OCE) and Regulatory Authority, currently utilize TPD-PI-RW-001, *OCRWM Program Indoctrination* for their training requirements. This does not provide for job-specific indoctrination training for personnel who review and sign for acceptance of documents supporting the LA, nor were any additional training topics added to the basic indoctrination training requirements.

Both the OCE and the OCS directorates utilize procedures for reviewing and accepting engineering design, preclosure safety analysis and OCRWM deliverables. While these seem to be thorough documents and are undoubtedly being effectively used by reviewers, no documented training and qualification could be demonstrated during interviews with training coordinators for these directorates or the RAO directorate that demonstrated they had been officially trained and qualified to review and accept their respective deliverables.

This lack of job-specific training and qualification could become a potential point of contention as it relates to OCRWM's role as a fully knowledgeable licensee and the associated potential impact to license application interactions after LA submittal. The potential risk being that personnel reviewing activities affecting quality (assuming LA inputs are broadly interpreted as such) may not be trained and qualified in the specific principles, techniques, and requirements of the activity being performed (i.e. not fully qualified to accept a specific technical analysis).

Recommendations

- Determine applicability of 10 CFR 63.142(c)(3) training and qualification requirements to OCRWM personnel who review and sign the license application.
- Conduct extent of condition determination for signatures with insufficient evidence of qualifications, if necessary.
- Determine and implement plan to ensure all personnel signing for acceptance of the license application are defensibly qualified to do so.
- Develop and implement Training Program Descriptions for RAO, OCE and OSC directorates.
- Revise DOE/RW-0522 and TPD-PI-RW-001 to reflect accurate responsibilities.

5.2.2. Proficiency

Training Program Documents other than the Office of Quality Assurance's do not meet the requirements of 10 CFR 63 or the guidance of NUREG-1804 in that they do not specify requirements towards maintaining proficiency, including any examining or certifying of proficiency of personnel. Instead they merely provide a blanket statement that "continuing training will ensure that personnel maintain proficiency and adapt to change in technology, methods and job responsibilities."

In reviewing the training programs and conducting interviews with the training coordinators for OCRWM/BSC LLC/SNL, no clear, specific and auditable requirements for maintenance of proficiency were observed in any training program guidance with the following exceptions: section 5.4 of LP-18.4Q-OCRWM, *Audit Personnel Qualification*; section 4.4 of BSC LLC QA-PRO-1045, *Audit Personnel Qualification*; and section 6.3 of SNL QA-PRO-007, *Audit Personnel Qualifications*. These contain clear proficiency requirements for lead auditors that meet the letter and intent of NRC requirements. No other training or qualifications documents reviewed contained specific guidance like these.

This finding relates to training and qualifications in that proficiency is intertwined with training and qualifications. Personnel must be appropriately trained to establish an initial qualification and proficiency, and qualification is maintained by ensuring proficiency at some pre-determined interval utilizing specific pre-determined requirements. Lack of proficiency implies lack of qualification, which may have implications on the License Application. If proficiency cannot be shown, then qualification comes into question, which has the potential to invalidate any work performed by the individual in question.

The effect on quality of this finding on OCRWM is solely dependent on whether OCRWM personnel involved with the license application are seen as "performing or



verifying activities affecting quality” by the NRC, as OCRWM considers their document reviews to be for acceptance purposes only. However, for BSC LLC and SNL personnel performing scientific activities and design work associated with quality, the risk of this finding affecting the veracity of the License Amendment is significantly higher.

Recommendations

- Revise Training Program Descriptions to clearly identify requirements that must be met to maintain proficiency for specific qualifications, and administrative controls to ensure that personnel maintain proficiency for their qualifications.
- Conduct extent of condition reviews on personnel associated with the license application to determine where proficiencies are not defensible.
- Develop and implement plan to restore defensible proficiencies to these personnel.

6. Bottom Lines

6.1. Recommendations, in Composite

The QAMA Team’s conclusions and recommendations are presented throughout this report. The following table is a compilation of all of these. Also included in this table is a cross-reference (under the heading “Issue(s) addressed” to the Apparent Issue List in Section 1 of this report.

Management Issues Affecting Quality (QAMA Report, Section 2)		
OCRWM Senior Management Leadership (Section 2.2.1)		
Topic/Conclusion	QAMA Recommendations	Issue(s) Addressed
Single point leadership at the OCRWM Las Vegas/Yucca Mountain Site operation is needed.	Appoint a single individual as the senior nuclear manager of Nevada operations, located at the OCRWM Las Vegas offices.	OCRWM management chain continuity
Continuity of leadership is important. Mr. Sproat’s tenure as OCRWM Director is expected to be completed in the next year; action is necessary to preserve the gains he has achieved.	Place high priority on making any needed changes in the OCRWM Director direct reporting positions, such that they are in place prior to expiration of Mr. Sproat’s term. Act now to solidify and institutionalize the changes Mr. Sproat has put in place. Assign high priority to implementation of <i>Strategic Objective 2 – Organizational Development</i> .	OCRWM management chain continuity

Office of Quality Assurance (OQA) Roles and Responsibilities (Section 2.2.2)		
Topic/Conclusion	Recommendations	Issue(s) Addressed
OQA is directly involved in numerous line management activities, to a degree that is inconsistent with most commercial nuclear organizational structures and that can undermine the effectiveness of its oversight role.	Move the OQA organization back into a more independent oversight role with the line organizations taking full responsibility for the quality of their performance.	Inter/Intra organizational issues
Communications - Internal and External (Section 2.2.3)		
Topic/Conclusion	Recommendations	Issue(s) Addressed
Communications, both internally and to the public and stakeholders, often convey an inordinately negative view of the project.	Create a comprehensive Communications/Message Strategy for addressing key project issues, near term actions and longer term goals of the project. Include development of communications materials, coaching in their use, identification of communications opportunities, etc.	Inter/Intra organizational issues OCRWM credibility
Self-Assessments (Section 2.2.4)		
Topic/Conclusion	Recommendations	Issue(s) addressed
The OCRWM Self-assessment Program does not meet requirements, is not effective, and there has been no apparent progress in improving program effectiveness.	The OCRWM Director needs to establish a clear expectation of line managers for their support of the Self-Assessment Program and hold them to that expectation. Provide training from OQA to line managers in the schedule and conduct of self-assessments.	OCRWM management chain continuity Inter/Intra organizational issues

Corrective Action Program (QAMA Section 3)		
CAP Effectiveness (Section 3.2.1)		
Topic/Conclusion	Recommendations	Issue(s) addressed
CAP is effective – it is achieving its intended effect of identifying, tracking and correcting conditions adverse to quality.	While management must continue with CAP refinement and improvement, internal and external communications should reflect positive progress rather than just shortcomings.	OCRWM credibility
Process Efficiency (Section 3.2.2)		
Topic/Conclusion	Recommendations	Issue(s) addressed
The CAP process is cumbersome and resource intensive. It is not user-friendly and it includes some process steps that are unnecessary.	<p>Clarify OQA’s role in the CAP process, and revise as required.</p> <p>The OCRWM Director should reinforce expectations regarding line management accountability for problem identification and timely resolution.</p> <p>Discontinue 100% review by OQA of all CRs.</p> <p>Close CRs upon execution of the CAs as approved by the responsible line manager. Assign subsequent effectiveness assessments to the line organization.</p> <p>Eliminate QARD section 16.2.5 and the associated actions in AP-16.1Q that require verification of CAs.</p> <p>Limit action on “D” CRs to simple documentation and communication as appropriate.</p>	<p>Inter/Intra organizational issues</p> <p>OCRWM management chain continuity</p> <p>Inter/Intra organizational issues</p> <p>Sense of urgency</p>

Classification of Condition Reports (Section 3.2.3)		
Topic/Conclusion	Recommendations	Main Area Addressed
<p>OCRWM condition reports are routinely over-classified. Many identified issues are characterized at a higher significance level than required either by OCRWM procedure or by realistic judgments regarding their implications on safety, operability or waste isolation.</p>	<p>Make significance determinations more realistic such that they reflect the true potential significance as it relates to safety, operability, or the ability to isolate waste.</p> <p>Revise procedures to clarify significance determination definitions and requirements, and clarify the procedure regarding the need for Apparent Cause Evaluations and Extent of Condition Assessments.</p> <p>Develop and promulgate a clear statement of management expectations in this respect, and coach the organization on the refined approach.</p>	<p>CAP structure and implementation</p> <p>OCRWM management chain continuity</p>
CAP as a Management Process (Section 3.2.4)		
Topic/Conclusion	Recommendations	Issue(s) Addressed
<p>In some instances, CAP is used as a surrogate broad-based management process.</p>	<p>Limit CAP to corrective action management; track management initiatives and other actions via a separate tracking system.</p>	<p>CAP structure and implementation</p>

License Application (QAMA Report, Section 4)		
License Amendment Schedule and Quality (Section 4.2.1)		
Topic/Conclusion	Recommendations	Main Area Addressed
A technically sound and responsive LA can be prepared by February 2008 – the primary schedule challenge is in the subsequent module integration and review process that must be completed by June 2008.	<p>Establish a single, comprehensive LA schedule that accomplishes the review process “in line” with document production, and to the extent possible, in advance of the February 29 completion date.</p> <p>For any review and approval actions that must be conducted after February 29th, create a detailed plan and schedule to achieve that. Require all organizations, especially DOE, to commit to that schedule, and monitor it closely.</p>	License Application preparation
The LA is likely to be of sufficient quality to be accepted and docketed by NRC.	Continue on the current course, with a high level of management oversight given to the chapter integration process.	License Application preparation
OCRWM/NRC Working Relationship (Section 4.2.2)		
Topic/Conclusion	Recommendations	Issue(s) addressed
Success in NRC licensing demands an open, mutually respectful and technically sound relationship between the licensee and the NRC staff. The OCRWM/NRC relationship currently does not meet that standard.	<p>OCRWM management and NRC need to collaborate in developing a communication protocol that provides suitable public participation and at the same time permits healthy interaction between applicant and regulator.</p> <p>Similar attention needs to be applied to relationships among OCRWM and other regulators and stakeholders.</p>	<p>Inter/Intra organizational issues</p> <p>License Application preparation</p> <p>OCRWM credibility</p>

Post-submittal LA Support (Section 4.2.3)		
Topic/Conclusion	Recommendations	Issue(s) addressed
<p>Planning and preparation for the post-submittal phase is essential. It is vital that OCRWM be responsive to and timely in supporting the NRC, and that all interactions with the regulator and other involved parties be effectively coordinated by the RAO. The first few months following submittal will be particularly important.</p>	<p>The RAO must create a strategy and a comprehensive plan for the licensing defense phase of the project. The RAO must coordinate all activities and communications with the NRC necessary to obtain the license, including coordinating the content and delivery of all communications with the regulator and others involved in the licensing proceedings.</p>	<p>License Application preparation</p>

Training, Qualifications and Proficiency (QAMA Report, Section 5)		
Procedural Compliance (Section 5.2.1)		
Topic/Conclusion	Recommendations	Issue(s) addressed
Some OCRWM procedures associated with training and qualifications are either outdated or not followed.	<p>Determine applicability of 10 CFR 63.142(c)(3) training and qualification requirements to OCRWM personnel who review and sign the license application.</p> <p>Conduct extent of condition determination for signatures with insufficient evidence of qualifications, if necessary.</p> <p>Determine and implement plan to ensure all personnel signing for acceptance of the license application are defensibly qualified to do so.</p> <p>Develop and implement Training Program Descriptions for RAO, OCE and OCS directorates.</p> <p>Revise DOE/RW-0522 and TPD-PI-RW-001 to reflect accurate responsibilities.</p>	<p>License Application preparation</p> <p>Training</p>

Proficiency (Section 5.2.2)		
Topic/Conclusion	Recommendations	Issue(s) addressed
Some OCRWM procedures associated with training and qualifications are either outdated or not followed.	<p>Revise Training Program Descriptions to clearly identify requirements that must be met to maintain proficiency for specific qualifications, and administrative controls to ensure that personnel maintain proficiency for their qualifications.</p> <p>Conduct extent of condition reviews on personnel associated with the license application to determine where proficiencies are not defensible.</p> <p>Develop and implement plan to restore defensible proficiencies to these personnel.</p>	<p>Training</p> <p>License Application Preparation</p>

6.2. Conclusions

This QAMA was particularly revealing in that it produced specific conclusions and an overall perspective that is somewhat different from those of previous evaluations. The QAMA Team saw many positives in the attitudes and performance of the OCRWM and contractors work. Certainly there is always room for continuing improvement, but the QAMA Team's view is that OCRWM is capable of producing a responsive, technically sound and complete YMP license application.

The QAMA Team's top tier conclusions cover several key areas:

- **CAP: Taking the Next Step**

An effective CAP is an essential tool for any high-performing nuclear organization.

The CAP was declared "ineffective" as recently as March 2007, via condition Report (CR) #9774. As did others before it, this Team found problems with the CAP, both in the process itself and in its implementation. But in the main, the YMP CAP does in fact serve as an effective vehicle to identify problems and to effect their resolution. And while inefficient, the process is getting better.

One particularly sharp distinction between the QAMA Team's findings and previous ones is that the QAMA Team concludes that one of the implementation issues is that findings are systemically *over*-classified rather than under-classified (see section 3). While over-classification may be the prudent choice in some circumstances, it can also have significant unintended negative consequences, as outlined in the QAMA Report. The QAMA Team has proposed for OCRWM consideration a practical revision to the classification process to address this issue.

- **LA: Built to Last**

Future success in the YMP hinges on the production of a License Application (LA) that meets NRC standards, can be docketed and can ultimately yield a license to build and operate the high level waste repository. Moreover, it is very important for OCRWM's organizational credibility with internal and external stakeholders that this be accomplished on the schedule (submittal by summer 2008) committed by the OCRWM Director.

The LA is a very large and complex document. In technical scope it is unprecedented (particularly with respect to the current requirement that adequate public protection be demonstrated for a period of one million years), and once delivered, it will face extraordinary examination, dissection and certain criticism from those firmly opposed to the project.

Ultimately, the OCRWM LA success may be as much a matter of public policy as science, but the Team’s view is that the OCRWM organization is on a path to produce a technically sound and responsive LA, on the prescribed schedule.

- **OCRWM OQA**

Following a long history of harsh criticism regarding ineffective QA, OCRWM has taken major strides in building an OQA that sets and maintains high standards for the entire project. It was very clear to the Team that the OCRWM OQA is had a positive influence on the entire YMP and that the OCRWM QA Program is effective.

In the QAMA Team’s view, the primary problem with OQA is that it has engaged in activities that are the proper purview of line management, in effect taking on a de facto management role. To some degree, this may be the unintended consequence of an aggressive rebuilding effort – but regardless of cause, it is the Team’s view that the current role is undesirable because it both undermines the accountability of the line organizations and it renders QA unable to serve its role as detached oversight – in both cases, undermining OCRWM organizational effectiveness.

The Team considers it very important that the organizational role of OQA be refined and re-communicated, as recommended in Section 2.

- **Readiness for the role of NRC Licensee**

Upon successful submittal and docketing of the LA, OCRWM will become an applicant – and if the licensing effort is successful, an NRC licensee. Both roles are unusual for DOE and will present significant challenges, and in many respects, the current OCRWM organization is not ready to take them on.

Significant effort is being applied to improve the “nuclear culture” within the OCRWM organization, and for the most part that initiative is one and the same as putting in place the features, characteristics, capabilities and organizational structure and characteristics needed to be an effective successful applicant and licensee. Many of the areas evaluated by the QAMA Team and discussed in this report and many of its recommendations relate to that effort.

In summary, it is the QAMA Team’s overall conclusion that YMP QA management is effective and that the YMP organization is developing a technically sound and compliant LA. The organization has a long history of problems related to QA effectiveness, and continued improvement in many areas is warranted. The QAMA Team developed numerous recommendations, as delineated in this report, and the Team strongly encourages YMP management to act on those recommendations.



References

1. DOE Contract DE-AC28-07RW12383, Independent Review of the Office of Civilian Radioactive Waste Management, Bechtel SAIC and National Laboratory Quality Assurance Plans
2. OCRWM Quality Assurance Requirements and Description, DOE/RW-0333P, Rev. 18
3. Quality Assurance Management Plan, Revision 0, June 13, 2007
4. Yucca Mountain Project Independent Quality Assurance Program Review and Implementation Assessment
5. 10 CFR 63.142, Quality Assurance Criteria for Geologic Repository at Yucca Mountain, Nevada

Appendix A: Assessment Team Curricula Vitae

John C. (Jack) DeVine, Team Leader

PROFESSIONAL SUMMARY

Jack DeVine is a co-founder of Polestar and remains actively engaged in guiding the company's operations and growth. He is a well-known and widely respected leader in the nuclear power industry. Since Polestar's inception in 1992, Jack has provided a wide range of professional services to private and public sector clients. His activities have included strategic and management consulting, ongoing periodic assessment of engineering and management effectiveness at several commercial U.S. nuclear stations (operations and assessment) and leadership of numerous independent assessment teams in support of DOE spent nuclear fuel management and facility deactivation and decommissioning work.

Prior to forming Polestar, Jack was with the General Public Utilities (GPU) system for 22 years. From 1970 through 1979, he held engineering and management positions involving design and construction of new nuclear plants and major plant modifications. Jack had a major role in the response and recovery from the March 1979 nuclear accident at the GPU Three Mile Island Unit 2, serving as part of the Emergency Response Team immediately following the accident, and in the following years as Recovery Engineering Manager and Technical Planning Director.

On special assignment to the Electric Power Research Institute (EPRI) in Palo Alto, California (1986-1989) Jack had responsibility for overall direction of the U.S. Advanced Light Water Reactor (ALWR) Program, coordinating U.S. and international utility industry efforts in developing advanced reactor design concepts for the next generation. (design, operation)

From 1989 through 1992, he served as the GPU Nuclear Corporation Vice President & Director - Technical Functions, with overall responsibility for all engineering work in support of the company's operating nuclear plants (operations), and as a member of the GPU Nuclear Board of Directors.

His work at GPU also included executive-level participation in utility industry activities, including Project Management Board of the Advanced Reactor Corporation, the EPRI Nuclear Power Division Advisory Committee, the Executive Board of the Edison Electric Institute (EEI) Utility Waste Management Group, and others.

Jack graduated from the U.S. Naval Academy in 1965, with a BS in Mathematics. He served as a commissioned officer aboard the fast attack nuclear submarine USS Sunfish (SSN-649).

DIRECT RELEVANT EXPERIENCE TO SOW:

- Over 30 years nuclear experience – DOE and commercial
- Independent Review Team Leader experience
- Engineering, operations, QA, and management assessments
- Spent Nuclear Fuel transportation and storage
- 10CFR50, 71 and 72 experience

EXPERIENCE

Polestar Applied Technology

1992 - Present

John C. (Jack) DeVine, Team Leader

Mr. DeVine is a co-founder of Polestar, a company which provides management and engineering services to U.S. and international electric utilities, the U.S. Department of Energy, and others. His activities at Polestar have included:

- Service as Chief Closure Officer for the performing entity at the Savannah River Site with management responsibilities and authorities for all WSRC projects pertaining to: 1) Nuclear materials processing, stabilizations and disposition, 2) Liquid waste storage, disposition, and solidification, 3) Analytical laboratory services throughout SRS, 4) Soil and groundwater closures, and 5) Excess facilities deactivation, decommissioning, and stewardship. (nuclear storage and disposal)
- Providing independent evaluations of nuclear plant management and engineering effectiveness at GPU Nuclear, Northeast utilities and Virginia Electric Power Co.
- Chairman of the Independent Technical Assessment Team for Dry Storage of N Reactor Fuel. This team established the technical feasibility and developed a conceptual engineering approach for packaging, transport, stabilization and dry storage of the spent nuclear fuel (SNF) at the Hanford K Basins; its recommendations were adopted by DOE and are being implemented. (spent fuel, disposal, packaging)
- Leader of the Hanford SNF Project Technical Assistance Group (TAG), providing technical and management support to the DOE and Westinghouse project organization.
- Leader of the Research Reactor SNF Task Team, developing a technical strategy for handling treatment storage and disposal of aluminum based SNF at the Savannah River site.
- Independent Technical Expert (ITE) providing review and assistance to DOE (EM-60) for the deactivation of PUREX and UO₃ at Hanford, and Rover at INEL. Key role in developing the end state criteria for deactivated facilities

General Public Utilities (GPU) System

1970-1992

In 22 years with GPU, Mr. DeVine held variety of engineering, management, and executive positions, including:

- Vice President & Director, Technical Functions for the GPU Nuclear Corp. (1989-1992), with overall responsibility for the work of 425 employees and an annual budget of over \$100 million.
- Member of the GPU Nuclear Board of Directors (1991-1992).

Executive-level participation in utility industry activities, including:

- Project Management Board of the Advanced Reactor Corporation.
- Electric Power Research Institute (EPRI) Nuclear Power Division Advisory Committee.
- Executive Board, Edison Electric Institute (EEI) Utility Waste Management Group.
- Utility Steering Committee of the Advanced Light Water Reactor (ALWR) Program.
- Vice Chairman, B&W Owner's Group Executive Committee.

On special assignment to EPRI in Palo Alto, California (1986-1989) as Senior Program Manager, with responsibility for overall direction of the ALWR Program, and coordination of the U.S. and international utility industry efforts in developing advanced reactor design concepts.

Major responsibilities at Three Mile Island Unit 2 (TMI-2) related to the recovery from the March 1979 nuclear accident:

- Member of the Emergency Response Team immediately following the accident.
- Recovery Engineering Manager (1979-1982), directing approximately 25 professionals in

John C. (Jack) DeVine, Team Leader

various tasks related to accident recovery, including design and installation of major recovery systems and facilities.

- Technical Planning Director (1982-1985), managing approximately 35 professionals in developing technical strategy, engineering concepts, and technical plans related to the analysis, decontamination, disassembly, and de-fueling of TMI-2.
- Lead role in the successful negotiation with Japanese nuclear industry for TMI-2 R&D funding and technical exchange.

Various project manager and project engineer assignments for the engineering, design, and construction of major nuclear plant modification and new construction work (1970-1979).

U.S. Navy

1965- 1970

- U.S. Navy service as a commissioned officer aboard the fast attack nuclear submarine USS Sunfish (SSN-649), involving new construction, reactor plant testing, sea trials, commissioning and fleet operation.
- Held various division officer and department head positions, and qualified as Engineering Officer of the Watch, Engineering and Ships Duty Officer, Officer of the Deck, and Submarine Officer.

EDUCATION

United States Naval Academy, Annapolis, Maryland: BS in Mathematics

U.S. Navy Nuclear Power Training Program: Theory and operation of Navy nuclear propulsion plants

Bruce E. Hinkley, Project Manager

PROFESSIONAL SUMMARY

Mr. Hinkley has over 28 years of nuclear industry experience as both a consultant and utility executive. He is presently the Vice President of the Energy Business Unit for InfoZen, Inc. providing technical and analytical support to the NRC and other government agencies. Previously, Mr. Hinkley served as an executive consultant to the US DOE in the areas of project management and engineering. Prior to the DOE project, he served as the president of the joint venture contracted to manage and direct the construction aspects of the restart of Pickering Units 1-4. He also functioned as the construction manager and project director while assigned to Pickering. He has managed/directed numerous technical and programmatic assessments including leading the industry expert team overseeing the missing fuel rod issue at Millstone. He has project managed the restart of several nuclear facilities as well as leading the development of the new Pebble Bed Modular Reactor Estimate and Schedule in South Africa. Mr. Hinkley has made presentations to utility Boards of Directors, the Nuclear Regulatory Commission, Advisory Committee on Nuclear Waste and other public forums.

Mr. Hinkley has a strong combination of direct utility and architect engineering services management experience. He is a hand-on manager with the ability to customize his approach to challenges from day to day involvement with the details to a more independent oversight and/or mentoring role as necessary.

DIRECT RELEVANT EXPERIENCE TO SOW:

- Over 25 years of commercial nuclear experience
- Extensive independent review experience – commercial nuclear and DOE in the areas of engineering, operations, QA, and management effectiveness
- Response Team manager for the Vermont Yankee Design Engineering and QA/Corrective Action Assessment conducted by the NRC
- Developed and implemented the QA improvement plan for the completion of construction on Pickering 4
- Performed QA effectiveness audit of fire protection program at PSE&G
- 10CFR50, 63, 71 and 72 experience

EXPERIENCE

InfoZen, Inc. (Rockville, MD)

February 2006 to Present

Vice President – Energy Business Unit

InfoZen is an innovative, technology-driven provider of mission critical solutions in both the government and public sectors. As Vice President, Energy Business Unit, responsibilities include profit and loss, recruiting, hiring, training and qualification, and growth of business unit in the government sector. Presently responsible for the oversight and direction of two high visibility contracts with the EDO's office at the NRC as well as performing individual consulting for the Westinghouse Savannah River Company as a member of the Independent Review Team evaluating disposition alternatives for tank cleanup and closure.

Shaw/Stone & Webster

February 2001 - February 2006

Executive Consultant – US DOE (Hanford)

October 2005 – January 2006

Selected as a member of the Industry Expert Review Team to review the Hanford Waste Treatment Project. The review included evaluation of the technical adequacy and scalability of the science, effective translation of the science to engineering and design, and the ability to operate and maintain the proposed facilities economically to meet the critical mission needs of the DOE.

Bruce E. Hinkley, Project Manager

Executive Consultant – US DOE (Yucca Mountain)

July 2004 – October 2005

Mr. Hinkley was assigned as an executive consultant to the DOE as part of the Management and Technical Support Contract at Yucca Mountain. In this role, he provided licensing and technical review support, project management program development, cost and schedule development and independent reviews, and design reviews of proposed spent fuel handling facilities and procedures. Mr. Hinkley also directed the independent review of the engineering and construction costs associated with the proposed designs. Support was also provided in the licensing and organizational development areas in developing and promulgating a cultural change from a long-term science project to a nuclear licensee construction and operations project.

President – Canadian Nuclear Engineers and Constructors (CANEC), Joint Venture of S&W Canada, Canatom NPM, AECON, and Comstock

December 2002- July 2004

Responsible for the leadership and direction of a \$350M joint venture company. CANEC was responsible for the construction management, quality implementation of the pressure boundary program, field engineering, and project/technical support for the restart of Ontario Power Generation's Pickering "A" Units 1-4. Peak staffing exceeded 1500 with over 400 non-craft management and support personnel. Exceeded all safety and environmental goals each year. Rework was less than 0.5% and Station Condition Reports (SCRs) attributed to construction and quality control were less than 1% of total SCRs. Developed a Continuous Improvement Plan to ensure continued positive trends.

Project Director – CANEC

May 2002 - December 2002

Responsible for directing the construction, field engineering, quality control, and related support services to restart Pickering Units 1-4. Brought in by Stone and Webster to turnaround a challenged project and increase productivity through strong management and improved communication with the client. Activities included streamlining and improving quality and talent of key individuals, established standard reporting mechanisms, and created report cards to monitor individual areas of performance. Improved training and development program and increased management and supervision direct observations and participation in the field. Developed and implemented a backlog reduction effort that closed out over 600 construction work packages in less than 3 months without impacting critical path.

Manager – Nuclear Engineering Services Projects

February 2001 - April 2002

Responsible for all domestic nuclear engineering services projects in multiple office locations. Annual budget of over \$50M. Responsible for engineering operational support to international projects. Scope of responsibilities includes: profit and loss, recruiting and staffing, training and personnel development, continuous improvement, budgeting, individual consulting assignments, and business development. Executive sponsor for Exelon and Entergy clients. Completed assignments as the Project Director for the PBMR estimate and schedule for the demonstration plant project in South Africa and assisting Exelon as part of a senior review team involved with plant restart assessments and evaluations. Other activities included employee concerns investigations and independent technical and management assessments.

Analytical Management Services

October 2000 - February 2001

President

Established and incorporated an independent consulting business to serve the nuclear industry in the areas of management and organizational transition, independent technical reviews, and business development. Independent Review Team (IRT) Leader for Northeast Utilities oversight of the Millstone Unit 1 Fuel Rod Accountability Project. Developed IRT process and procedures, managed a group of senior industry professionals from multiple companies, conducted NRC briefings and public meetings, and provided both technical and leadership direction. Provided business management consulting to Footbridge Staffing

Bruce E. Hinkley, Project Manager

Services and TRS Staffing Services.

Altran Corporation

March 2000 - October 2000

Vice President – Engineering and Operations:

Responsible for leadership and operational coordination of a \$20M engineering consulting company with multiple office locations across the United States and Canada. Responsibilities include business development and marketing, strategic planning, operational process improvements, individual consulting activities, recruiting, and training and development of personnel. Member of executive management team. Major industries served are nuclear and fossil power generation, DOE, petrochemical, biomedical, and other industrial. Individual consulting projects included website development, process re-engineering for the project management and control areas, and project manager for the Large and Small bore Piping Re-analysis Project for D. C. Cook Unit 1. Left company upon takeover by French entity and shift in business direction from engineering and project management services.

TRS Staffing Solutions – TEKTON Resources Division

May 1997 – March 2000

Division President

As President for Tekton, Mr. Hinkley was responsible for the management and direction of the engineering and design staffing division of TRS Staffing Solutions (a subsidiary of Fluor Corporation). This included recruiting and training of staff, marketing, business plan development, management of 16 regional offices, budgeting and forecasting, and overall profit and loss responsibility. Over 2,500 contractors in various projects throughout the US and Canada. Received “Master of Change” award from Fluor for the overall business improvements and increased revenue and profitability. Left TRS/Tekton to return to nuclear business sector.

Yankee Atomic Electric Company

April 1993 - May 1997

Vice President

1996-1997

Responsible for direction and oversight of engineering services to Maine Yankee, Vermont Yankee, Seabrook, Northeast Utilities, Boston Edison, and other affiliated companies. Individual assignments included:

- 10CFR50.54(f) Project Manager for Maine Yankee and Vermont Yankee
- NRC ISA Response Team Manager for successful Maine Yankee assessment. Responsible for management and direction of an integrated team of industry experts and utility personnel to respond to over 800 queries from the NRC. Reviewed all responses for technical adequacy, completeness, commitments, and programmatic concerns.
- Nuclear Safety Review Committee Member - Maine Yankee
- Vice President – Engineering for Maine Yankee, January – May 1997.

Director – Engineering Services

April 1993 – December 1995

Responsible for all Yankee service activities conducted with customers outside of New England. This includes client interface, project management, contract management, and quality review. Developed the business plan and model and increased revenue from \$600K in outside services to over \$10M annually. Staffed and organized commercial profit and loss business unit. Also responsible for personal consulting assignments. Individual consulting assignments included:

- Team leader and QA/Corrective Action Reviewer for the SWSOPI effort at V.C. Summer
- Team leader for the 10CFR50.59 assessment for Northern States Power
- Independent project oversight and surveillance/testing review in support of Millstone 2’s SWSOPI self-assessment
- Assessment team leader for the Prairie Island SWSOPI that included NRC presentations,

Bruce E. Hinkley, Project Manager

- briefings, and reports
- Team Leader and Testing reviewer on the Maine Yankee (MY), Vermont Yankee (VY), and Connecticut Yankee (CY) Service Water Self Assessments
- Response Team manager for the Vermont Yankee Design Engineering and QA/Corrective Action Assessment conducted by the NRC
- Member of VY Inservice Testing Audit as a technical specialist on program management and effectiveness
- Maintenance reviewer on the Seabrook Service Water System SSFA.

Quadrex Energy Services**1990-1993***Senior Vice President and General Manager*

Responsible for all engineering, operational, and administrative activities associated with the operation of the Quadrex Energy Services division. Member of the Quadrex Corporation Operating Committee responsible for review of business operations and development of recommendations to the CEO and Board of Directors. Individual consulting assignments included:

- Management consultant on the corporate improvement plan for a \$30M radwaste processing facility
- Expert testimony preparation for Westinghouse Electric Corporation's independent review of the readiness for plant operations for the Philippine Nuclear Power Plant. Included in the review and expert testimony preparation was the evaluation of the engineering design change process, maintenance program and work control process, drawing control, operational procedures adequacy, safety programs, training and qualification of personnel, and organization/manpower review.

CYGNA Energy Services**1986-1990***Vice President and Regional Manager*

Responsible for all engineering, technical, administrative, and business matters for the Boston, New Jersey, and Atlanta offices of Cygna Energy Services. Supervised over 50 professional employees as well as participated in several critical consulting projects. Key projects include:

- Safety System Functional Reviews, Project Manager/Lead Engineer
 - Indian Point 2 – Safety Injection - Maintenance & Testing Reviewer
 - Salem 1&2 – Component Cooling Water & Station Air/Compressed Air - Engineering Reviewer
 - Hope Creek – Service Water - Instrument Air/DG Air
 - R.E. Ginna – Auxiliary Feedwater - Maintenance Reviewer
- Instructor – Safety System Functional Inspection (SSFI) Methodology
- Instructed more than 30 PSE&G engineers/QA Inspection personnel in the methodology utilized in SSFIs. Course included historical basis for SSFI methodology, example NRC SSFIs, team selection criteria, system selection criteria, data gathering techniques, etc. Personnel represented were from the Safety Review, QA, System Engineering, Design Engineering, and Project Management Departments.
- EPRI “Assessment of Effectiveness of Current ASME XI Testing for Detecting Component Degradation”
- Project Manager for this EPRI sponsored effort. Activities included detailed analysis of several plants' ISI/IST programs, NPRDS reports, trending and post-maintenance testing. Additionally, alternate diagnostic systems/methods available for monitoring MOVs and pumps were evaluated. Draft Generic Letter 89-04 and 89-10 and associated IENs, Ins and IEBs (eg. 85-03) were also reviewed for impact to present IST programs.

Bruce E. Hinkley, Project Manager

- System Engineering Program
- Project manager for development of the V.C. Summer System Engineering Program. Responsible for evaluating the current V.C. Summer program vs. The INPO guidelines. Tasks included numerous interviews with affected personnel, procedure development, establishing performance goals/objectives, training and generation of a detailed system file on a pilot system. This effort received high praise from INPO on a subsequent inspection.
- Sacramento Municipal Utility District - Rancho Seco Management Review
- Senior evaluator on the team selected to review the last year of Rancho Seco's operations. Personally responsible for maintenance review support and primary responsibility for modification control assessment. Areas under review included training, organization and staffing, control room performance, and plant material condition.
- Senior Reviewer – Tech.Spec. Surveillance Testing Review - Boston Edison
- Project included FSAR and Tech Spec reviews to determine the required logic system functional tests. The complete logic path from sensor to activated device was then determined and existing station surveillance procedures were evaluated for their completeness and technical adequacy. Senior reviewer responsibilities included developing both short term and long term recommendations.
- Other consulting assignments were the PECO Audit and Surveillance Program Evaluation, Effectiveness Evaluation of the Salem Technical Audit Program, senior licensing and regulatory support for BECO as part of the Pilgrim Restart.

Carolina Power and Light Company

1981-1986

Senior Engineer to Manager of Technical Support: Assigned to the Brunswick Station. Responsibilities included outage management for all major engineering/construction projects (e.g., SW System Replacement, IGSCC Inspections and Repairs, MSIV and SRV Replacement), the ISI/IST program improvements, procurement engineering, ILRT/LLRT, development of work force management program, corporate modification and design commonality project, and regulatory projects. Developed the system engineering program including training and qualification, as part of the Brunswick Improvement Plan (BIP) for the restart of Units 1 & 2. Selected as an INPO Industry Observer in 1986 for the Millstone 1 & 2 Evaluation.

EDUCATION	<ul style="list-style-type: none"> ▪ Bachelor of Science, U.S. Naval Academy, 1976 ▪ Nuclear Engineering Graduate Courses – U. S. Navy, 1977
AFFILIATION, CERTIFICATIONS, HONORS	<ul style="list-style-type: none"> ▪ Certified Chief Nuclear Engineer – U. S. Navy ▪ American Nuclear Society (ANS) ▪ American Legion ▪ ANS Best Paper Award – 1985 and 1988 ▪ Master of Change Award – Fluor Daniel/TRS Staffing – 1998 ▪ <i>Executive Management Consultant to the US DOE – Yucca Mountain Project/Hanford WTP</i> ▪ <i>President and Project Director for CANEC (S&W JV) for the restart of Pickering Units 1-4</i> ▪ <i>Project managed over 20 System/Management Assessments</i> ▪ <i>Developed Systems Engineering Program – Brunswick Plant</i> ▪ <i>Team Leader of Independent Review Team on Millstone issue with missing fuel rods</i> ▪ <i>International experience in major nuclear project</i>

Bruce E. Hinkley, Project Manager

reviews/assessments –PBMR (South Africa) and Philippines Nuclear Power Plant - Philippines

- *Division Manager for all nuclear engineering services projects for Stone & Webster*
- *Senior Executive Management experience in the AE, consulting, and direct utility environments*

Involved in the restart of the Brunswick 1 & 2, Maine Yankee, Pickering Unit 4, and Dresden Units in both technical and senior management roles

- *Former Vice President of Engineering for Yankee Atomic (also member of BOD executive committee) and Maine Yankee*
- *Expert testimony support to Westinghouse for Philippines Nuclear Power Plant*

A. Bill Beach

PROFESSIONAL SUMMARY

Mr. Beach is a Senior Nuclear Consultant who has over 30 years of nuclear experience, including experience in senior level management positions at the U.S. Nuclear Regulatory Commission. Prior to working as an industry consultant, Mr. Beach was the Regional Administrator for the NRC Region III Office in Chicago. While in the NRC, he participated in a special investigation following the accident at Three Mile Island (Review activity), Unit 2; he led several major team inspections; he participated in several licensing hearings; he worked for a time on special assignment in the advanced reactor program; he directed the enforcement staff; he testified to congressional committees on several occasions; and as a senior manager, he participated in a high number of public meetings involving plant performance issues, performance assessments and industry conferences. (Nuclear Ops Exp)

As a consultant, he has served as Chairman and member of a number of off-site review committees throughout the commercial nuclear industry (review exp). He has performed a number of follow-up reviews to significant operating events to evaluate operational staff and equipment performance and the associated causal analysis, and subsequently provided recommendations for corrective action and performance improvement. He assisted in the establishment of the then new Nuclear Management Company and the implementation of its Quality Assurance and Self-Assessment programs. He has also performed risk assessments and risk evaluations of selected safety systems at several facilities, and assisted a number of utilities on matters involving corrective action program weaknesses, employee concerns, and other related program / performance issues.(Operation exp.) Mr. Beach has worked at several Department of Energy (DOE) facilities where he worked with the contractors and the DOE to improve operation efficiencies. He has served as a member of several Nuclear Safety Review Boards to provide technical oversight and assistance for various design-basis related and performance-related issues. He also worked with the DOE and its contractors to establish effective Quality Assurance and Self-Assessment processes to focus more on risk-significant and important safety issues.

DIRECT RELEVANT EXPERIENCE TO SOW:

- NRC Senior Executive Experience
- Nuclear Safety Review Boards
- Chairman Off site Review Committees
- Development of nuclear utility self assessment and quality assurance programs
- SSFIs and troubled plant restarts
- DOE self assessment and quality assurance processes

EXPERIENCE

Beach & Associates (1999-Present)

U S Nuclear Regulatory Commission (1978-1999)

- Regional Administrator, Region III
- Director of Reactor Projects, Region IV
- Team Leader, Quad Cities Diagnostic Team (Six Month Assignment)
- Chief, Advanced Reactor Program (Six-Month Assignment)
- Director, Division of Radiation Safety and Safeguards, Region IV, NRC
- Director, Enforcement Staff
- Team Leader, Safety System Functional Inspections
- Team Leader, Construction Appraisal Team
- Senior Resident Inspector
- Team Leader, Construction Appraisal Team

A. Bill Beach

- Senior Resident Inspector

Norfolk Naval Shipyard (1975-1978)

EDUCATION	<ul style="list-style-type: none"> ▪ Meritorious Senior Executive Award-1994 ▪ Mr. Beach is a graduate of Virginia Tech. ▪ He is currently a member of the Advisory Board in the School of Construction at Virginia Tech, where he is also working on his post-graduate degree.
AFFILIATIONS, CERTIFICATIONS, HONORS	<ul style="list-style-type: none"> ▪ Meritorious Senior Executive Award-1994 <p style="margin-left: 20px;">Clearances</p> <ul style="list-style-type: none"> ▪ NRC Q Clearance (Inactive) ▪ DOE L Clearance (Inactive)

Thomas M. Crimmins, Jr., P.E.

PROFESSIONAL SUMMARY

Mr. Crimmins is the former President and CEO of BNFL, Inc., which under his leadership experienced rapid growth in supporting the radioactive materials handling and cleanup needs of US DOE and utilities. In his 30-year career, Mr. Crimmins has had extensive experience in nuclear plant engineering, construction, startup, safety analysis, licensing, plant operations, decommissioning and decontamination. He served as plant manager at the two-unit Susquehanna Nuclear Station, and chief engineer during the construction and startup of Susquehanna. Mr. Crimmins was also VP Nuclear Engineering at Hope Creek Nuclear Station and Salem Units 1&2, and he also held electric utility executive positions in power production, marketing and customer service, including involvement in new ventures creation and corporate acquisitions.

Mr. Crimmins served as a member of the Board of Directors for Public Service Electric and Gas Company as well as the boards of several other subsidiaries, and he has served on numerous industry technical and management advisory bodies (review activity). Director, American Nuclear Society (elected for two terms) and won the prestigious Spirit of Leading Award at Public Service Electric and Gas Company, 1995. A commissioned officer in the U.S. Navy serving aboard two nuclear submarines, Mr. Crimmins was qualified as a submarine officer, as Engineering Officer of the Watch, and Office of the Deck. He participated in three patrol deployments and a complete overhaul/refueling of a nuclear submarine.

Currently, Mr. Crimmins is a senior Polestar consultant, providing technical assessment and management assistance to private and public sector clients in the safety, operations, and decommissioning and deactivation (D&D) of nuclear facilities, and in executive/manager coaching and change management initiatives. Much of his recent Independent Oversight of nuclear facilities (review exp) has been focused on Safety Conscious Work Environment (SCWE) and management effectiveness in creating and maintaining SCWE.

Mr. Crimmins is a Graduate of the US Navy Nuclear Power School and Submarine School, holds a B.S. in Physics from College of the Holy Cross in Worcester, Massachusetts, a M.S. in Engineering Management from the New Jersey Institute of Technology, and is a Graduate of Columbia University Advanced Program for Organizational Development and Human Resources Management.

DIRECT RELEVANT EXPERIENCE TO SOW:

- Commercial nuclear utility executive
- 10CFR50, 71 and 72 experience
- Decommissioning Project experience
- Nuclear Safety Review Board
- Independent Review experience – DOE and commercial nuclear
- Commercial nuclear design, construction, licensing, and operations

EXPERIENCE

Polestar Applied Technology, Inc., Los Altos CA

July 99 – Present

Associate, Commercial Services Division

Mr. Crimmins is a senior Polestar Associate, providing assessment and management assistance to private and public sector clients in the safety, operations, and decommissioning and deactivation (D&D) of nuclear facilities, and in executive/manager coaching and change management initiatives.

Thomas M. Crimmins, Jr., P.E.**BNFL Inc., Fairfax VA****1997 – 1998***President and Chief Executive Officer*

Served as Executive Vice President and Chief Operating Officer, and later as President and Chief executive Officer of BNFL, Inc., the wholly owned American subsidiary of British Nuclear Fuels Limited, a company registered in the United Kingdom. BNFL, Inc. was founded in 1990. It provides radioactive facility decontamination and decommissioning (D&D) services and it designs, installs and operates systems for the treatment, stabilization and packaging of radioactive waste (disposal). The company employs 400 people, has revenues of more than \$120 million and additional work under management of \$250 million per year, and work backlog of about \$9 billion. Accomplishments at BNFL include:

- Increased growth in the company from 150 employees to 400, winning projects and increasing productivity.
- Recruited high quality professionals for key project and subsidiary leadership roles.
- Earned a profit for the first time in the 7-year history of the company.
- Increased backlog from \$2 billion to \$9 billion and created the foundation for earnings growth that would be solid and consistent for many years to come.
- Won BNFL's first major commercial decommissioning project (Big Rock Point Nuclear Power Plant).
- Acquired firms with complementary capabilities and established tracks for profitability within two years.

Public Service Enterprise Group (PSEG), Newark NJ**1989 - 1996**

Held senior executive positions with Public Service Enterprise Group, the holding company for Enterprise Diversified Holdings and for the Public Service Electric and Gas Company (PSE&G). PSE&G is the nation's third largest combined electric and gas utility with annual sales exceeding \$6 billion.

*Senior Vice President, Customer Service & Marketing**1991-1996*

Led 2500 employees in the execution of marketing, sales, and customer services for 2.2 million customers. Activities and accomplishments include:

- Membership in the Executive Officer group (EOG), 1991-1995, which created the strategy and directed the operation of PSEG; and service on the Board of Directors of PSE&G from 1991 to 1995.
- Participated in the design and creation of a subsidiary, the Public Services Conservation Resources Company (PSCRC). Served as Chairman of the Board of PSCRC for its first three years.
- Served as a director on the Board of Community Energy Alternatives, a PSEG subsidiary and independent power producer.
- Created the vision, business focus and strategies to move the company's marketing and customer services functions into a competitive environment.
- Streamlined the Customer Service organization through process redesign, application of technology, and improved performance, with a resultant \$8.5 million annual expenditure reduction.
- Successfully negotiated a unique pricing structure with PSE&G's largest customer, retaining their business in NJ and for the company, while allowing them to improve their competitiveness.

*Vice President, Nuclear Engineering**1989 - 1991*

Directed this 400-person engineering and design organization engaged in the design, construction, engineering problem solving, and nuclear fuel procurement and licensing/safety analysis activities in support of three 1,100,000 kilowatt nuclear generating stations. (commercial Nuclear Power Exp) His

Thomas M. Crimmins, Jr., P.E.

budget responsibility exceeded \$130 million annually.

Overhauled and substantially improved the effectiveness of the division, through restructuring, realignment of resources, and personnel and management changes. His success was recognized by the independent judgment of the Nuclear Regulatory Commission and the Institute of Nuclear Power Operations.

He also led the PSE&G corporate-wide task force in the development of an ethical code of conduct. The task force produced the Standards of Integrity still in use as the guiding principles for all members of the corporate family.

Pennsylvania Power & Light Company (PP&L), Allentown PA 1981 – 1989

Vice President - Power Production (1987-89)

Planned and directed the operation of all PP&L fossil fueled, hydro and combustion turbine generating facilities (6,000,000 kilowatts). Served as an officer and/or director on several coal mining and exploration subsidiaries. Achieved superior operational results while changing the organization to be substantially more competitive.

Susquehanna Nuclear Station 1985 - 1987

Plant Superintendent

Directed all activities of a plant staff of 1200 in the production of electricity from two 1.1 million kilowatt nuclear generating stations. Achievements in this capacity included 5 million man-hours without a lost-time accident, capacity factors considerably above average for the nuclear industry, and evaluation results from the Nuclear Regulatory Commission and the Institute of Nuclear Power Operations that placed the station well within the top 10% of plants nationwide.(commercial nuclear operations exp)

Nuclear Plant Engineering 1981 - 1985

Manager

Planned and led the design and engineering of the Susquehanna Nuclear Station using a staff of 200 and contract engineering worth several hundred million dollars.(commercial nuclear design exp)

General Public Utilities Corporation (GPU) 1970 - 1981

Held a variety of technical and management positions at GPU subsidiaries, including the Jersey Central Power and Light Company, the GPU Service Company and the GPU Nuclear Company. These positions involved management of major nuclear plant backfit projects, engineering management, and safety and licensing management and engineering. Served as part of the emergency response team that provided evaluation, management and leadership immediately following the Three Mile Island accident (review activity).

US Navy Submarine Force 1965 – 1970

Commissioned officer in the U.S. Navy, serving aboard two nuclear submarines. Qualified as a submarine officer, as Engineering Officer of the Watch, and Office of the Deck. Participated in three patrol deployments and a complete overhaul/refueling of a nuclear submarine.

EDUCATION

- Graduate, Columbia University Advanced Program for Organizational Development and Human Resources Management
- M.S. Engineering Management, New Jersey Institute of Technology, Newark NJ
- Graduate, US Navy Nuclear Power School and Submarine School
- B.S. Physics, College of the Holy Cross, Worcester MA

Thomas M. Crimmins, Jr., P.E.**AFFILIATION,
CERTIFICATIONS,
HONORS**

- Director, American Nuclear Society (elected for two terms)
- Licensed Professional Engineer, Commonwealth of Pennsylvania
- Spirit of Leading Award, Public Service Electric and Gas Company, 1995

John C. Grove

SUMMARY OF EXPERIENCE

Mr. Grove served for 13 years as an Officer in the United States Submarine Force. He has significant experience in nuclear operations, engineering, and conducting operational and administrative inspections, audits and assessments.

DIRECT RELEVANT EXPERIENCE TO SOW:

- Conducted over 50 reactor safeguards examinations on aircraft carriers and submarines in the Pacific Fleet. Audited these ships to numerous administrative and operational standards and requirements and assessed the effectiveness of their engineering departments.
- Improved fleet readiness by tracking and promulgating best practices and methods for improvement.
- As Engineer of fast-attack submarine, was responsible for all aspects of quality assurance in the Engineering Department.

EXPERIENCE

Polestar Applied Technology **2007- Present**
Savannah River Site **2007**

Provide engineering and management support for high-level liquid waste tank closure projects, including conceptual development of a lag storage capacity for low level waste processing and oversight of all Polestar contract work.

United States Navy **1993- 2007**

Commander Pacific Fleet Nuclear Propulsion Examining Board **2004- 2007**
Junior Board Member

Successfully conducted over 50 reactor safeguards examinations on nuclear-powered submarines and aircraft carriers. Audited these ships to numerous administrative and operational standards and requirements and assessed the effectiveness of their engineering departments. Improved fleet readiness by tracking and promulgating best practices and methods for improvement.

- Streamlined several processes utilizing database management and information exchange, resulting in simplification of examination preparation and execution.
- Overhauled classified library holdings and inventory process, greatly reducing the man-hours required for administration and maintenance.

USS HARTFORD (SSN 768) **2000-2004**

Engineer Officer

Supervised a 55-man department responsible for a multi-million dollar nuclear propulsion plant. Coordinated the qualification and training of watchstanders as well as the administration, maintenance, operation, and repair of a naval nuclear propulsion plant.

- Led the Engineering Department to overwhelming success in reactor safeguards examinations and plant operations, including receipt of the Submarine Squadron Four Engineering “E” for Excellence three years in a row.
- Awarded two Navy Commendation Medals for leadership of the Engineering Department as well as skills in leading a watch team responsible for all submarine operations.
- Ranked number one of eighteen department heads in the squadron by the Squadron

John C. Grove

Commander.

Commander Submarine Group Eight 1998-2000

Submarine Operations and Scheduling Officer

Supervised nine officers in the scheduling and management of all submarine operations in the Mediterranean Sea. Acted as liaison with several foreign navies for submarine operations planning.

- Awarded the Navy Achievement Medal for leadership and performance during two major operational periods.
- Created operations web site to provide operational and reference support to assigned submarines.

USS OHIO (SSBN 726 GOLD) 1995-1998

Division Officer

Led several different divisions to success during operational and maintenance periods. Chosen to lead an eleven-man watch team in reactor plant operations during two reactor safeguards examinations.

- Awarded three Navy Achievement Medals while onboard for leadership as a Division Officer.
- As Quality Assurance Officer, successfully administrated over 150 controlled work packages with strict Quality Assurance controls.
- Qualified nuclear engineer four months ahead of schedule.

EDUCATION

- MS Engineering Management, 2006, Old Dominion University\
- BS Mechanical Engineering, 1993 (Magna Cum Laude), University of Washington
- BA Mathematics, 1993 (Honors), University of Puget Sound
- Navy Nuclear Power School
- Navy Nuclear Prototype Training Unit

Jon R. Johnson

PROFESSIONAL SUMMARY

Advise national and international nuclear utility and governmental executives regarding nuclear safety and regulatory policy. Received the Presidential Meritorious Rank Award from the President of the United States for sustained superior achievement in managing programs in the Senior Executive Service. Directed Nuclear Regulatory Commission licensing and inspection activities (Reactor Oversight Program) at all nuclear power reactor facilities in the United States. Responsible for leadership of NRC renewal of operating licenses, licensing of advanced nuclear reactors and risk-informed regulations. Registered Professional Engineer in the Commonwealth of Massachusetts. Qualified as Chief Engineer and Engineering Officer of the Watch on a US Navy nuclear power plant.

DIRECT RELEVANT EXPERIENCE TO SOW:

- Over 25 years with Nuclear Regulatory Commission (NRC) in positions of increasing responsibility responsible for review/evaluation of commercial nuclear power plants and research reactors
- Deputy Director – Office of Nuclear Reactor Regulation –managed inspection/evaluation of engineering, technical, and licensing; license renewal; risk informed regulation; augmented inspection activities in engineering, maintenance, and operations
- Extensive experience with 10CFR50, 63, 71, and 72 as a regulator and senior consultant. Detailed knowledge of implementation of 10CFR50, Appendix B (QA) requirements
- Nuclear Safety Oversight Committee
- Represented the NRC to the White House, Congress, state and local officials, the public, and the news media. Chaired public meetings and enforcement conferences

EXPERIENCE

Major U.S. Nuclear Utility 2003-present

Senior Nuclear Safety Consultant

Member of Off-Site Safety Committee for major US nuclear utility providing advice and guidance on reactor safety and engineering management. Senior safety and security advisor to the NRC’s Office of the Executive Director for Operations. Provide advice on risk-informed licensing approaches and inspection techniques for international regulators and utility managers. Chair of Executive Assessment Board for DOE M&O contractor. Member of Executive Team providing regulatory advice and licensing guidance for a geological spent fuel repository for the Department of Energy. Principal expert speaker at nuclear utility manager and regulatory agency workshops for the IAEA. Advise nuclear industry regarding advanced reactor engineering, design and safety policy.

US Nuclear Regulatory Commission 1978-2003

Senior Executive

Deputy Director, Office of Nuclear Reactor Regulation-assisted the Director in managing a staff of 600 highly skilled personnel in the engineering/ technical reviews, licensing, inspection, assessment, event response, security, and rulemaking activities at all nuclear reactor facilities in the US. Responsibilities included the technical review, certification, and licensing of advanced reactors and the renewal of current power reactor operating licenses. Joined the NRC in 1978 as a reactor inspector in the Philadelphia office. Held progressively more responsible supervisory positions including Senior Resident Inspector and Branch Chief in Philadelphia and Director, Division of Reactor Projects and Deputy Regional Administrator in the Atlanta office. Responsible for engineering, maintenance and operations inspection, enforcement, security, and emergency response functions. Qualified in boiling and pressurized water reactor technologies, nuclear criticality controls for nuclear fuel facilities, and various root cause analyses techniques.

Nuclear Trained Officer, United States Navy**1970-1978***Reactor Mechanical Assistant*

Reactor Mechanical Assistant on nuclear powered aircraft carrier in charge of dual-reactor operations and all nuclear mechanical systems as well as all chemistry and radiological controls. As Director, Division of Reactor Principles, US Naval Nuclear Power School, supervised 15 instructors and 800 students in course of instruction for the application of nuclear physics to a naval nuclear power plant. Directly supervised and operated a dual-reactor nuclear powered cruiser at sea and during a refueling overhaul. Graduated in top 15% of nuclear power school.

QUALIFICATIONS; AREAS OF EXPERTISE

Reactor Safety Licensing and Inspection Policy- Directly managed NRC's headquarters program office functions for all operating reactors and research reactors in the US including licensing, engineering/technical review, inspection and oversight programs (ROP), license renewal, maintenance rule implementation. development of risk-informed regulations, and operator licensing, advanced reactor licensing, and generic Technical Specification development. Provided advice on policy matters to the NRC Commissioners, the Congress, and the White House. Directly managed implementation of NRC's Reactor Oversight Process (ROP) including engineering/ technical review, inspection, assessment, enforcement, security, and emergency response functions for all NRC's operating reactors in the northeast (Region I) and southeast (Region II). As a senior nuclear safety and engineering consultant, provide advice to national and international nuclear utility and governmental managers regarding nuclear reactor licensing and inspection policy. Advise the nuclear industry regarding advanced reactor policy.

License Renewal – Served as the NRC's Chairman of the License Renewal Steering Committee. Provided NRC oversight of the technical staff's safety evaluation and environmental reviews as well as the budgeting and management of resources to implement Commission policy. Served as the NRC principle spokesman along with the Industry Steering Committee Chairman during periodic open public meetings to discuss high priority issues needing regulatory decisions. Supervised Regional inspections of aging management programs.

Engineering and Technical Reviews-As Deputy Director, NRR, responsible for NRC policy on engineering and technical reviews including regulations and industry standards endorsed for implementation, for NRC reviewer qualifications, and for the preparation of safety evaluations of LAs. As consultant to a major nuclear utility, review self assessments of engineering processes and design controls including safety design margins for critical components and systems. As Deputy Regional Administrator was responsible for oversight of all inspections of design and engineering activities at all power and research reactors and fuel facilities in the Southeastern US; as senior NRC executive in charge of the NRC MC 0350 process for oversight and performance improvement of the Brunswick and Browns Ferry stations, provided oversight of all regulatory reviews of engineering design and construction activities. As NRC Manager in Region I, led the Team which determined that Seabrook was constructed in substantial conformance with the engineering processes and design as described in the FSAR, a major factor in the operating license issuance.

Quality Assurance Programs- As Member of Safety Review Board for nuclear utility review all aspects of quality assurance activities and non-conformance reports as well as all self assessments of safety related activities. As an NRC inspector and Manager, reviewed detailed implementation of NRC requirements in 10 CFR 50, Appendix B, including design controls, procurement, testing, and corrective action programs. Led Team assessments of Corrective Action Programs at nuclear reactors

Jon R. Johnson

under close scrutiny of NRC due to performance issues.

Spent Fuel Repository Reviews-As the Chairman of the Executive Assessment Board and a Member of the Executive Team, evaluated major DOE effort to prepare a LA to the NRC for the world's first deep geological spent fuel repository. Provided regulatory advice and licensing guidance.

Administration.-As Deputy Regional Administrator, Region II, directly responsible for administering licensing, inspection, enforcement, budgeting, travel, human resource, legal, public affairs, state liaison, training, and emergency preparedness programs for one of NRC's largest regional offices. This included reactor safety as well as radioactive materials safety (medical and industrial) and fuel facility safety programs.

Security- Serve as special senior safety and security advisor to the NRC's Office of the Executive Director for Operations; managed twelve teams to assess safety and security strategy at all power plants in the U.S. As the Associate Director for Inspection and Programs, and Deputy Director, Office of Nuclear Reactor Regulation, responsible for physical security inspection and licensing programs as well as security regulation development at all civilian reactors in the US. Following 9-11, served on NRC's Executive Task Force to establish strategic plan for NRC's comprehensive re-evaluation of security effectiveness and establish interim requirements.

Diagnostic Evaluations and Self Assessments-As NRC manager and inspector, served on numerous inspection teams evaluating licensees self assessment program effectiveness. Served as NRC's SES manager and chairman of the Brunswick and Browns Ferry MC0350 oversight panels to monitor and lead the recovery actions from prior poor performance. Subsequently both facilities completed world records for safe operating periods.

Nuclear Oversight- Served as member and chairman of nuclear oversight boards for major US utility and major DOE contractor. Provided advice to CNO and President on matters involving nuclear safety, operations excellence, and licensing strategies.

Training and Qualification-As Associate Director and Deputy Director of NRR, was directly responsible for NRC's inspector training and qualification programs as well as oversight of civilian reactor operator licensing and training programs. Directly monitored revision of NRC's inspector training and qualification program and served as chairman of certification boards. In US Navy served as Division Director, responsible for course of instruction for 15 instructors and 800 students in course relating reactor physics to a naval nuclear power plant.

As nuclear safety consultant, developed and presented unique course on risk-informed regulatory approaches and inspection techniques to Eastern European regulators and utility managers. Principal expert speaker at workshops in Europe for the IAEA on nuclear regulatory strategies in a deregulated electricity market and use of technical support organizations by the regulator.

Research Effectiveness- As Associate Director for Inspection and Programs, served as NRC's representative to the NRC Research Effectiveness Review Board. Reviewed planning and budgeting priorities as well as evaluated the process for coordination between licensing and research for users of the results of nuclear safety research.

Public Communications-As Executive in NRC headquarters as well as two Regional offices represented the NRC to the White House, Congress, state and local officials, the public and news

Jon R. Johnson

media. Chaired NRC steering committees, public meetings, workshops, licensee performance reviews and enforcement conferences. Served as NRC’s chief spokesman during emergency exercises.

Reactor Operations – As a senior nuclear safety consultant, provide reactor operations and nuclear safety advice to nuclear utility managers. As NRC executive in two Regional offices as well as headquarters, was responsible for the safety oversight (ROP) of 103 operating power reactors and 36 research reactors in the US. As NRC Senior Resident Inspector, conducted daily reactor plant operations and maintenance inspections and regulatory oversight. As US Naval officer, qualified as Chief Engineer and Engineering Officer of the Watch. Directed dual-reactor plant operations at sea and during refueling overhaul. As an NRC inspector and Regional manager, directly responsible for construction completion and operational readiness inspections and regulatory oversight for power reactors in the licensing stage. As Region II executive, chaired NRC’s licensing and inspection MC 0350 panels to assess readiness of Progress Energy’s Brunswick site and TVA’s Browns Ferry reactor to restart following extended shutdown periods. As US Naval officer conducted readiness assessments prior to plant restarts.

Emergency Preparedness- Responsible for NRC’s Regional office and Headquarters reactor safety incident response functions. Served as member of NRC’s Executive Team in HQ incident Response Center during the Indian Point 2 steam generator tube rupture and response to the 9-11 attack on the World Trade Center. Participated on many exercises as well as directed NRC’s emergency response to reactor events. Completed training and qualification as NRC Team Leader for Incident Investigation Teams.

Strategic Planning- Served as NRC’s Office of Nuclear Reactor Regulation representative on NRC’s Strategic Planning Panel to update and reform the agency’s Strategic Plan. Recommended and developed key approaches to strategies, goals, and objectives as well as methods and means of measuring effectiveness or success. Presented the budget for NRC’s largest office to the agency’s Executive Resource Council.

EDUCATION	<ul style="list-style-type: none"> ▪ Master of Engineering-Nuclear Engineering, University of Virginia ▪ Bachelor of Science (Physics-with distinction), US Naval Academy
AFFILIATIONS, CERTIFICATIONS, HONORS	<ul style="list-style-type: none"> ▪ NRC Q Clearance; DOE Q clearance in process ▪ Presidential Rank Meritorious Executive Award ▪ NRC Performance and Special Achievement Awards ▪ NRC EEO Award for Outstanding Recruitment of Hispanic Engineers ▪ Chairman Executive Oversight Board for major DOE M&O contractor ▪ Member of Off Site Safety Review Committee for major US Nuclear Utility ▪ Principle speaker for IAEA workshops for European utility and regulatory managers ▪ Independent Member of Award Committee for private Technical and Scientific Co. ▪ Chairman NRC License Renewal Steering Committee ▪ Chairman NRC’s Oversight Panel for MC 0350 Reviews ▪ Member NRC’s SES Performance Review Board

Jon R. Johnson	
	<ul style="list-style-type: none">▪ Member NRC's Research Effectiveness Review Board▪ Certified NRC Inspector and Incident Investigation Team Leader▪ Registered Professional Engineer, Commonwealth of Massachusetts▪ Qualified as Chief Nuclear Engineer and Engineering Officer of the Watch, US Navy

Tony L. McConnell

PROFESSIONAL SUMMARY

Tony McConnell has extensive experience in all aspects of nuclear plant leadership, operation, engineering, maintenance, and regulatory compliance. This experience was developed during his 30 year career within the Duke Energy nuclear program.

Tony held key technical support and management positions in the areas of plant operations, startup testing/scheduling, fuel handling, and project management during Duke's startup and initial operations of the 5 reactors at Oconee and McGuire nuclear stations. He also obtained a Senior Reactor Operator license for Oconee and a Senior Reactor Operator Certification for McGuire.

Tony served ten of his eighteen years at McGuire as Technical Support Superintendent. In this role he developed a staff of 300 professionals to provide plant support in the areas of radiation protection, chemistry, reactor engineering, performance testing, regulatory compliance, radioactive waste processing, and project management.

From 1985 to 1993 Tony served as Station Manager at the dual unit, 2300 megawatt McGuire plant. For the majority of these 8 years, he was the senior manager on site, providing direction and oversight to the approximately 1800 personnel that supported the plant. In this role, the station was operated safely, with significant improvement in capacity factor, cost reduction, regulatory and community relations.

After serving at McGuire, he led the Babcock and Wilcox Owners Group generic plant license renewal initiative. This initiative played a key role in the development of the current License Renewal Rule which is being utilized to extend the operating license of commercial nuclear plants. He then moved to Duke's Corporate Office to serve as the Station Support Division Manager where he provided leadership and common services to all 3 of the Duke nuclear sites in the areas of plant operation, maintenance, chemistry, radiation protection, work control, QA, license renewal, and major projects such as Steam Generator Replacement.

In 1997 Tony moved in to the affiliate company, Duke Engineering and Services, to become President and CEO of DE&S Hanford, Inc. This company was responsible for the safe cleaning, packaging, and dry cask storage of approximately 80% of the spent fuel in the DOE complex, with an annual budget of approximately \$180M. After 2 years here he returned to the DE&S corporate office and served as Vice President of Special Projects and the Engineering Services Division in the Nuclear Services business unit. In this role, Tony provided review board services to a plant in a shutdown/restart process and directed significant QA improvement initiatives. He also co-chaired a DOE sponsored initiative to define the roadmap for deployment of the next US commercial nuclear plant while successfully leading the Engineering Services Division in providing valued engineering products and services to multiple US commercial nuclear clients.

Tony joined Polestar in April, 2002 and has provided executive level consultation, oversight, and assessment services for several nuclear clients.

DIRECT RELEVANT EXPERIENCE TO SOW:

- SRO
- Senior Utility Manger
- CEO of DOE contractor organization at Hanford
- Experience with spent fuel operation, shipping and dry cask storage



Appendix B: List of Interviewees

OCRWM Office of the Director	
Suzy Mellington	Special Projects
Gene Runkle	Manager, Project Controls Analysis Group
OCRWM Office of Quality Assurance	
Larry Newman	Director, Office of Quality Assurance
Marilyn Kavchak	Quality Assessments
Michael Ulshafer	Quality Systems Engineering
Lam Xuan	Quality Assessments
OCRWM Office of the Chief Scientist	
J. Russell Dyer	OCRWM Office of the Chief Scientist
Claudia Newbury	OCRWM Office of the Chief Scientist
Emily Cooper	OCRWM Office of the Chief Scientist
OCRWM Office of the Chief Engineer	
Paul Harrington	OCRWM Office of the Chief Engineer
Irma Ballestero	OCRWM Office of the Chief Engineer
OCRWM Regulatory Authority Office	
April Gil	OCRWM Regulatory Authority Office
Mark Williams	OCRWM Regulatory Authority Office
Bob Warther	Licensing Project Manager
Todd Shrader	OCRWM Regulatory Authority Office
William Boyle	OCRWM Regulatory Authority Office
OCRWM Infrastructure Management Office	
Scott Wade	OCRWM Infrastructure Management Office
Richard Craun	OCRWM Infrastructure Management Office
David Howell	OCRWM Infrastructure Management Office
Nora Gilbert	OCRWM Government Services, Human Resources
OCRWM Employee Concerns	
Julie Goeckner	OCRWM Employee Concerns
BSC LLC General Manager	
Ted Feigenbaum	BSC LLC General Manager
Tom McKinney	BSC LLC Deputy General Manager
BSC LLC Quality Assurance	
Mike Carmichael	BSC LLC Quality Assurance
James March	BSC LLC Quality Assurance
BSC LLC Engineering Manager/Design Authority	
Barbara Rusinko	BSC LLC Engineering Manager/Design Authority
Greg Gould	BSC LLC Engineering
BSC LLC Licensing & Nuclear Safety	
Richard Kacich	BSC LLC Licensing & Nuclear Safety
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Mark Krauss	BSC LLC Organizational Assurance, Corrective Action Program
Christine Drummond	BSC LLC Training Organization
Andrew Orrell	Sandia National Laboratory Senior Program Manager
Ron Stevens	Sandia National Laboratory Quality Assurance
James Maupin	Sandia National Laboratory Quality Assurance
Cheryl Seminara	Sandia National Laboratory Training
Pete Rail	BSC LLC Safety-Conscious Work Environment
Jack Parrot	NRC Senior OSLR
Bob Latta	NRC On-Site Representative
J. Vincent Everett	NRC
Joe Callan	Licensing Strategy Team Member



Appendix C: List of Meetings Observed

Condition Screening Team (6/26, 7/25)

Management Review Committee (4/25, 6/27, 7/25)

Licensing Strategy Team (6/27)



Appendix D: List of Documents Reviewed

Document ID	Title	Rev/ICN
AP-16.1Q	Condition Reporting and Resolution	Rev 10 ICN 1
AP-16.7Q	OCRWM Trend Program	Rev 0 ICN 0
AP-17.1Q	OCRWM Records Management	Rev 4, ICN 5
PGM-CRW-AD-000003	OCRWM Mission and Functions Statement	Rev 1
TPD-PI-RW-001	OCRWM Program Indoctrination	Rev 1
TPD-RW-QA-001	OCRWM QA Training Program Description	Rev 2
LP-2.19Q-OCRWM	OCRWM Personnel Training and Qualifications	Rev 0, ICN 2
LP-2.26Q-OCRWM	OCRWM QA Surveillance	Rev 2, ICN 0
LP-2.5Q-OCRWM	OCRWM Management Assessment	Rev 2, ICN 2
LP-6.1Q-OCRWM	Document Review	Rev 1 ICN 0
LP-7.21Q-OCRWM	Review and Acceptance of Engineering Design and Preclosure Safety Analysis Products	Rev 0 ICN 0
LP-7.5Q-OCRWM	Reviewing Deliverable Acceptance Criteria and Reviewing and Accepting or Rejecting Deliverables	Rev 0 ICN 1
LP-18.3Q-OCRWM	OCRWM Internal Audit Program	Rev 2, ICN 1
LP-18.4Q-OCRWM	OCRWM Audit Personnel Qualification	Rev 1, ICN 1
LP-PM-001-OCRWM	OCRWM Self-Assessment Program	Rev 2, ICN 0
DOE/RW-0333P	OCRWM QA Requirements/Description	Rev 18
DOE/RW-0522	OCRWM Training Management Plan	Rev 0 ICN 1
DOE/RW-0565	OCRWM Augmented QA Program	Rev 1
QA-DIR-10	BSC Quality Management Directive	Rev 1
QA-PRO-1041	BSC QA Surveillance	Rev 2
QA-PRO-1046	BSC QA Internal Audit Program	Rev 3
GM-DIR-40	BSC Integrated Assessment Program	Rev 1
GM-PRO-4000	BSC Management Self-Assessments and Organizational Self-Assessments	Rev 2
GM-DSK-4000	BSC Self-Assessment Desktop	Rev 1
TQ-DSK-1001-1001	BSC Personnel Training Assignment Guidance	Rev 0
QA-PRO-1045	BSC Audit Personnel Qualification	Rev 3
TQ-PRO-1001	BSC Personnel Training and Qualification	Rev 6
TQ-PRO-1008	BSC Training Program Descriptions	Rev 2
QA-PRG-001	SNL QA Program Description	Rev 1
PI-PRO-004	SNL Self-Assessments	Rev 1
QA-PRO-001	SNL Trend Evaluation, Analysis and Reporting	Rev 0
QA-PRO-003	SNL QA Surveillance	Rev 0
QA-PRO-007	SNL Audit Personnel and Quality Compliance Specialist Qualification	Rev 2
QA-PRO-008	SNL QA Internal Audit Program	Rev 2
TRN-PRO-001	SNL Personnel Training and Qualification	Rev 1
NUREG-1804	Yucca Mountain Review Plan	Rev 2
10 CFR 63.142	Yucca Mountain QA Criteria	-
10 CFR 830 Subpart A	Quality Assurance Requirements	-
DOE O 414.1	Quality Assurance	Rev C
DOE G 414.1-1	Management/Independent Assessment Guide	Rev A
NEI	YMP Independent QA Review	
CR 1222	National Spent Nuclear Fuel Project and YMP Interface Issues	
CR 5223	Potential Noncompliance with Qualification Requirements	

Document ID	Title	Rev/ICN
CR 6278	YM Site Characterization Project Requirements Document not current	
GAO-06-550T	YM DOE's Planned Nuclear Repository Faces QA and Management Challenges	4/25/06
GAO-04-460	Persistent QA Problems Could Delay Repository Licensing and Operation	4/04
GAO-03-826T	Preliminary Observations on the QA Program at the Yucca Mountain Repository	5/28/03
GAO-02-765T	Uncertainties About the Yucca Mountain Repository Project	5/23/02
DOE/IG-0736	OIG QAP Audit Report	8/06
DOE/IG-0708	OIG QA Weaknesses in the Review of YM E-mail for Relevancy to the Licensing Process	11/05
QAS-M-04-04	Report on Management Controls Over the Licensing Support Network for the YM Repository	4/04
OAR-06-04-CNWRA	NRC Staff Observation of FY2006 CNWRA Audit 2006-1	
OAR-06-09	NRC Audit Report of Observations of BSC Audit of Scientific Investigations for the Seismic Consequence Abstraction Model and Major Input Calculations	
OAR-06-05	NRC Observation Audit Report of the OCRWM OQA Audit of the Implementation of the QA Program at Las Vegas, NV and Washington, D.C.	
OAR-06-03	NRC Observation Audit Report of the OCRWM OQA Audit of the USGS	
OAR-06-02	NRC Observation Audit Report of the OCRWM OQA Audit of the BSC CAP	
OAR-05-05	NRC Observation Audit Report of BSC internal performance-based audit.	