

received 2/15/2000

February 4, 2000

**NOTE TO:** Brian W. Sheron, Associate Director  
for Project Licensing & Technical Analysis  
Office of Nuclear Reactor Regulation

**FROM:** Gary M. Holahan, Director  
Division of Systems Safety and Analysis  
Office of Nuclear Reactor Regulation

**SUBJECT:** LESSONS LEARNED RELATIVE TO FAILURE TO MEET THE  
COMMISSION DUE DATE FOR THE SPENT FUEL POOL  
DECOMMISSIONING STUDY

Attached is the lessons learned study completed by R. Caruso relative to the failure to meet the Commission due date for the Spent Fuel Pool Decommissioning Study. DSSA management is reviewing the study and will forward you our conclusions and recommendations shortly.

**cc:** S. Collins  
R. Zimmerman  
T. Collins  
R. Caruso

**Attachment:**  
As stated

B1235

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February 4, 2000

Memorandum to: G. Holahan, Director  
Division of Systems Safety and Analysis

From: R. Caruso, Chief, BWR Systems and Nuclear Performance Section  
Reactor Systems Branch

Subject: Spent Fuel Pool Contracting Issues

On January 5, 2000, you requested that I investigate the history of a particular technical assistance contracting action associated with the activities of the Spent Fuel Pool Technical Working Group (TWG) and report on lessons learned.

I interviewed the individuals who were most knowledgeable of this contract, reviewed the electronic mail that they exchanged with one another, and reviewed the relevant documents associated with the contracting activity. From this information, I was able to develop a history of the contract, and identify the key events associated with it. I have identified several opportunities for improvement in the performance of technical assistance contracting, as well as several issues related to the management and resolution of complex technical issues, that I believe respond to your request.

#### TWG History

The TWG was established in March 1999, following a Commission meeting where the staff proposed to reexamine the risk associated with the storage of spent fuel in decommissioned reactors. The staff proposed to use this work to develop a risk-informed technical basis for regulatory decision-making and to determine whether other decommissioning rule-making activities could be consolidated into a single risk-informed decommissioning rule. The TWG was formed to perform the technical analysis needed to support the risk-informed decisions, including deterministic neutronic and thermal-hydraulic calculations, and the development of event and fault trees for various scenarios. The TWG was composed of staff members with expertise in several different disciplines, including PRA.

Early in the history of the TWG, it was decided that the staff members would perform the majority of the technical analyses in-house. However, because much of the work involved new issues that had not been previously been evaluated, the TWG decided that it would be prudent to have an outside organization review its results. For the risk aspects of the review, several contractors were available to perform this work, including one who had performed a similar review for an operating reactor several years earlier. However, because of problems that had arisen with the contractor during that review, the staff decided that a new contractor should be chosen.

Contracting history

At about the time of the March Commission meeting, therefore, the TWG member with the responsibility for the PRA aspects of the issue made an initial contact with the new contractor. The discussions that were held with the contractor were not very explicit, beyond stating that the staff would need "assistance in doing PRA work on spent fuel pools". The contractor responded positively to the request for support, and the staff member who made the initial contact received a positive recommendation about the quality of the contractor's work from another office within NRC. No further significant contact occurred between the staff and the contractor until the Request for Proposal (RFP) was issued on July 2, 1999.

The RFP which was issued on July 2, 1999 was unusual, in that it included an initial commitment of funds to allow the contractor to begin work before the contractor submitted a formal proposal. The staff took this action so that the contractor could attend a public meeting between the NRC and interested stakeholders concerning the SFP activities, on July 15-16, 1999. \$25000 was committed for this task on July 2, 1999.

The contractor attended the public meeting on July 15-16, 1999, and met with the staff member who would manage the contract. In an interview, the contractor stated that, as a result of the meeting, he had a slight sense of urgency with regard to the completion of the contract, but the urgency did not seem to be at a critical level. This is contrary to the recollections of the staff members who were involved. They had a very strong sense of urgency, from the very beginning of the TWG activities, and they believed that this had been communicated very clearly to all participants in TWG activities, including contractors.

On August 9, 1999, the contractor submitted a proposal in response to the RFP. The proposal was acceptable to the staff in all ways, except that it recommended that

"... the schedule in the [Statement of Work] SOW be extended by one month for each of the tasks, with the overall date of completion changing from November 30, 1999, to December 31, 1999."

Discussions with the contractor revealed that the contractor thought from the very beginning that the proposed schedule was too short, considering the amount and type of work to be done. Staff members who worked on the contract do not remember receiving any such protestations from the contractor. However, on August 17, 1999, the contractor submitted a new proposal, which stated

"We recommend that the overall schedule in the SOW be extended by one month for each of the tasks except Subtask 2, with the overall date of completion changing from November 30, 1999, to December 31, 1999. We understand and agree that Subtask No. 2 (Risk Assessment Revision) must be completed by Nov. 15, 1999."

None of the contractor staff that were interviewed and none of the staff members who were interviewed, remembered the circumstances surrounding this change to the contractor proposal. In fact, several of the contractor staff members were surprised to hear that it had occurred. They stated that they had thought all through the period of performance that the completion date for Subtask 2 was December 31, 1999. However, this recollection is contradicted by the monthly contractor status reports, which repeatedly stated that the completion date for this subtask was November 15.

It appears that someone on the NRC staff could not accept the contractor's proposal to delay

*Delayed start first*

*if we discussed this.*

the completion of Subtask 2 (which was the centerpiece of the PRA efforts), and the contractor responded to this reaction by accepting the shorter date for Subtask 2. All of the contractor staff members who performed the work insisted that they had no knowledge of this change, and were never told about it at any time during the performance of the work. However, they repeatedly reported that they were on schedule to complete the task by November 15.

*Handwritten note: This happened rather*

The NRC accepted the proposal on August 18, 1999, and the staff expected that the work would commence immediately. However, the contractor did not begin work immediately, because it claimed that it was not clear that the funding for the work had been transferred. The NRC staff thought that it had made it clear to the contractor that the work should begin, but communication of this fact evidently failed.

Once the work began in September, the contractor worked at a "normal pace", with plans to complete all of the work, including Subtask 2, by December 31, 1999. The technical monitor spoke with the contractor several times each week, and made one trip to the contractor site to observe the progress of the work first hand. All written reports from the contractor and the monthly contracting summary status reports from the NRC technical monitor indicate that the work was progressing satisfactorily, and would be completed "according to schedule." However, during interviews, the technical monitor stated that he had several reservations about the ability of the contractor to complete the work on time, and he expressed these reservations frequently to other members of the TWG and to his management.

The contractor issued several deliverables in October and November for other subtasks. On November 15, 1999, the contractor issued a draft of the spent fuel pool risk assessment, which the contractor stated "meets the milestone for Task Order 1, Subtask 2". The contractor stated that it was their understanding that the NRC staff would review this draft report and would provide the contractor with comments, so that the final report could be issued by December 31, 1999.

The staff reported that the November 15, 1999 deliverable contained several significant problems. The report was not well written, not well documented, and it contained significant problems with the Human Reliability Analysis (HRA), which was one of the crucial sections. The technical monitor brought these problems to the attention of his immediate management at this point, and it was decided that the staff would still be able to meet the January 14, 2000 date, with some additional in-house effort to "clean up" the contractor report. In hindsight, this was probably a critical decision, because it assumed that the staff could recover from the contractor's failure.

The staff provided comments back to the contractor on November 30, and the contractor continued to work on the final version of the report through December. The contractor reported that November 30 was the first time that it really understood the urgency of the task at hand, and they worked continuously to resolve the staff comments. Staff members remember that they had to work very hard to convince the contractor to make some of the modifications to the report.

On December 17, operational level staff members realized that they were not going to receive a useable report from the contractor in time to support the original schedule for the draft report. In addition, lower level management reviews of the draft staff report indicated that it would need substantial revision. As a result, on December 20, operational level management notified their supervision that the schedule for completion of the draft report was in jeopardy. Operational and leadership level management discussed several courses of action, including delay to the final report, and issuance of a partial report. Eventually, the issue was resolved on December

23 at the EDO level with the decision to request a delay in issuance of the report. This recommendation was presented to Commission technical assistants on December 23-24, and a delay until February 11, 2000 was granted. With continuing dialogue between the staff and the contractor, the contractor did not complete its work on Subtask 2 until the third week of January 2000

In early January, supervision of the writing of the report was redirected to an experienced PRA section chief, and the staff expects to issue the report on time.

It is my understanding that the draft report will include information from the final contractor report, but considerable staff effort has been expended to rework the results. The contractor has reported to me that the changes are so significant that they do not consider the final report to be their work product, but rather, a product of the NRC staff.

### Regulatory environment

From the time of the first contacts between the staff and the contractor, up to the completion of the period of performance, the work of the TWG continued at a rapid pace. The technical staff was surprised by the schedule which was established at the March Commission meeting, without input from the operational level of management. In spite of the compressed schedule, the staff developed PRA event and fault trees for various SFP scenarios, and the TWG produced a preliminary report of its results by early June 1999. These results were discussed in a public meeting with stakeholders on June 7, and after an executive-level meeting on June 8, a decision was made to release the draft version of the report for public comment.

Operational levels of the staff strongly opposed release of the document at this time, because it had not been reviewed by an independent entity, and many of its assumptions were vulnerable to question. During its preparation, the staff had visited several decommissioned reactor sites, and had discovered that the actual physical plant conditions were quite different from what had been assumed in previous SFP PRAs. In addition, there was considerable disagreement among PRA practitioners about the treatment of HRA for SFP scenarios that lasted many days. In spite of these concerns, the report was released to the public in late June, at about the same time that the staff issued SECY 99-168.

SECY 99-168 discussed improvements to the decommissioning regulations for nuclear power plants. It included a discussion of SFP risk, and presented a schedule for completing the SFP risk assessment. The review was expected to be complete in December 1999, and the final report was scheduled to be issued in March 2000. A draft version of the final report was scheduled to be issued in mid-January 2000.

Following issuance of the SECY, a public meeting and workshop was held on July 16, 1999, to discuss the draft technical report and the progress of the risk assessment. At this meeting, the staff draft report came under strong technical criticism, as had been expected by operational staff. One of the agreed actions from the workshop was that the industry would provide the staff with specific, detailed written comments, as soon as possible. These comments were eventually provided by NEI via letters on August 18, 26, and 30, and the staff continued to carry out a dialogue with the industry throughout this period. In fact, the staff recollection of this period is that it was one of intense pressure from the industry. In a rare role reversal, the staff found itself in the position where it was developing the necessary technical basis for regulatory action, and that basis was under fire by the industry.

The staff spent much of the summer refining and defending the positions described in the draft

technical report, and this activity continued into the fall, when a major staff effort was undertaken to develop valid HRA measures for SFP accident scenarios.

In parallel with the TWG efforts, the staff continued to negotiate with the Commission for approval of the recommendation in the SECY. Commission opinions on the SECY varied, with several Commissioners pressing to have the staff-recommended schedule shortened. Final agreement on the contents of a SRM for the SECY was achieved during the week of December 20, at the same time that the staff realized that the contractor report would not be provided on time, and the report needed significant modification. As a result, the Commission issued its SRM related to SECY 99-168 on December 21, 1999, with the understanding that the draft report would be issued on January 15, 2000.

Subsequently, the staff requested an extension to this date, and the current deadline for issuance of the draft report to the Commission is February 11, 2000.

### Observations and Recommendations

- Not true*
1. The TWG decided at an early stage to have its technical work reviewed by an outside organization. This was a good decision, given the "cutting-edge" aspects of the issues. However, the staff then decided to use a contractor with very limited experience in evaluating SFP PRAs, during a period when the issue was highly visible and there was strong stakeholder interest, and the completion date for the work allowed for very little margin of error. This combination of factors strongly increased the likelihood that the contractor would not produce a useable product on time. In the future, for similar situations, the staff should (1) choose a contractor with a proven record, and (2) allow for more margin to completion of the task. Schedules for the resolution of technical issues should not be established without careful, deliberate consideration of the difficulty or novelty of the tasks to be completed. The opinion of experienced staff members should be given more weight in making these scheduling decisions.
  2. In retrospect, the schedule for completion of the contracting activity was too optimistic. The fact that the staff was able to recover from the contractor's inexperience within a few weeks does not change the fact that insufficient margin was allowed for contractor performance.
  3. The contracting process is not conducive to rapid implementation of technical support contracts, even with the national laboratories. The review process is too long, response time by contractors is too slow, and overall, it takes too much time to get a contract in place. As a result, the contract was put into place too late in the risk-assessment process, and the staff did not have sufficient time to recover from the contractor's inexperience. Without the presence of a clearly visible and mutually acknowledged emergency, it is difficult to make the process move more quickly. The staff should investigate ways to streamline the process to allow contracts to be placed in a quick-reaction mode. Alternatively, the staff should establish on-call contracts with contractors who are known to have the requisite expertise readily available.
  4. The contractor in this case delayed the start of work by about 6 weeks, even though advance funding had been provided with the RFP. For contracting situations like this, the contracting officer and the technical monitor should hold a telephone conference with the contractor as soon as the RFP is issued, to make it clear to all contractor staff members that the work is fully funded and that work should commence immediately.

5. It is evident that the contractor modified its original proposal for this task to meet the schedule needs of the staff, even though the contractor (and some members of the staff) did not really believe that it could meet that schedule. Contracting officials should be alert to situations where contractors revise their proposals in this way, and they should bring them to the attention of the leadership level.
6. The staff could have written the SOW for the contract more clearly. However, in a case such as this, where the work is so "cutting edge", it is understandable that the results cannot be specified more precisely in advance. NRC should understand that these sort of cases will arise, and there is a risk that they will not be successful, because the outcome cannot necessarily be planned or predicted.
7. Staff members at the operational level are reluctant to present negative information that could impact schedules that are imposed from the executive level. Instead, they make heroic efforts to find a way to correct the problem to meet the schedules. They do not always succeed. Management at the executive level should improve the climate of communication so that staff members are not reluctant to express their reservations about overly optimistic schedules.
8. Operational level staff members should be encouraged to report reasonably foreseeable delays in the completion of significant tasks to higher management. This situation may be partly addressed by implementation of recommendation 7 above.
9. The final report that was produced by the contractor was not suitable for use in the draft report that was to be issued in mid-January. The staff had to perform a significant rewrite of the results, and the contractor was reluctant to incorporate many of the staff comments into the final contractor report. In spite of these differences, the staff seems to have been able to produce a report within a short time after the original due date. However, it is not clear that the contractor report was the most significant reason for the delay in completing the staff draft report.
10. Although the contractor did have some experience with PRA technique, it did not have current experience in analyzing the risk aspects of spent fuel pools at decommissioned nuclear power plants. This field of study was evolving rapidly, and the contractor did not seem to be "in touch" with the issue as it matured. If NRC decides to use an inexperienced contractor to address a rapidly evolving issue in the future, it will be important to have the contractor attend all of the meetings between the NRC staff and the industry, and participate much more intimately in the decision-making process as the issue evolves. I believe that this detachment of the contractor from the normal workings of the TWG was likely a strong contributor to the failure of the contractor to produce a useful report on time. In conjunction with recommendations 1 and 2, it is recommended that the NRC staff establish a continuing relationship with an outside organization/contractor/national laboratory that has the requisite expertise in developing new PRA analyses, so that a relationship of trust can be established, and so that organization can provide the independent "sanity check" function that was expected from the contractor in this case. Alternatively, the NRC could use some other internal organization that also uses PRA to provide such a check. I believe that this sort of relationship would be beneficial to the agency, as a whole, as we move toward risk-informed regulation. However, it should be recognized that this sort of duplication of effort may be expensive and difficult to justify.

*Not true*

11. Several staff members commented that this project may have been more successful if a more senior staff member had been appointed to lead the TWG. I believe that this opinion is mere speculation. The TWG membership included senior staff members, and they communicated frequently with senior NRC management. The problems with the draft contractor report were discovered when the report was issued, and the technical monitor's management (SES level) was notified quickly of the situation. It is not clear to me that the appointment of a senior staff member as leader of the TWG, or even the substitution of any of the individual participants would have changed the outcome. The problems described above do not stem from individual failings, but rather from legal restrictions, cultural artifacts, and externally imposed stress on the organization. Their resolution requires an understanding of why those restrictions and artifacts exist, and why the staff responds as it does to stress.

12. The realization that the staff draft report would not be completed on time, coming as it did at almost the exact moment that the Commission approved this schedule, appears to have been an unfortunate coincidence. Although hindsight might suggest that operational level management should have alerted higher management to the possibility of a delay in late November or early December, I believe that the decision to try to "fix" the contractor report deficiencies was not unreasonable, and is consistent with other staff practices in similar situations. Resolution of this issue will require changes to agency culture.