Q & A's Related to the Release of the
Technical Study on Spent Fuel Pool Accident Risk at
Decommissioning Nuclear Power Plants

1) *Q. Why was the report prepared?*

A. The report was prepared to provide a technical basis for decommissioning rulemaking. In March 1999, the NRC staff met with the Commission to discuss an ongoing effort to improve regulatory consistency and predictability in decommissioning activities. The staff proposed to undertake a technical study at that time. Preliminary versions of the study were issued for public comment and technical review in June 1999 and February 2000.

2) *Q. What are the principal findings of the report?*

A. The principal technical findings of the report are that:

(a) The risk from spent fuel pools at decommissioning nuclear power plants is low and well within the Commission's safety goals with fulfillment of the industry commitments and staff assumptions.

(b) The report concludes that there is only a low likelihood that an accident at a spent fuel pool full of water could lead to the used fuel becoming uncovered long enough to cause a significant off-site radiological release. However, the report notes, even many years after a plant permanently shuts down, there is still some chance that water could be drained from the spent fuel pool by a rare event such as an earthquake much larger than the plant has been designed to withstand. Under certain conditions, this might cause the zirconium metal alloy that surrounds the fuel to become hot enough to catch fire, leading to a significant off-site radiological release.

This finding is important because the elimination of the potential for a zirconium fire was the established basis for exemptions from Price-Anderson insurance requirements granted to some licensees and was a consideration in staff decisions related to emergency preparedness and physical security requirements.

3) *Q. What does this mean regarding risk to the public?*

A. The report demonstrates that spent fuel pools at nuclear power plants that have shut down and are being decommissioned pose a low risk to public health and safety. The NRC has always considered the risk from decommissioning plants to be low, however until the completion of this report, no definitive study had been done to quantify the level of risk posed by these facilities.

The report also indicates that even many years after a nuclear power plant has shut down, there is still some chance that if water drained from the spent fuel pool, under certain conditions, the zirconium metal alloy that surrounds the fuel could become hot enough to catch fire, leading to a significant off-site radiological release. Because the probability of this occurrence is so low, the resulting risk to the public is also low.

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4) *Q. What will be done with the report?*

A. When the report is released, it will be distributed to industry and public stakeholders to promote public awareness. This will include placing the report into ADAMS. Also, the Commission has scheduled a Commission meeting on February 20, 2001, to discuss the report and receive input from industry and members of the public.

The report will be one of several elements considered in determining if and how decommissioning regulations should be modified. However, because of policy implications of the report that must be considered, the staff has committed to provide a policy option paper based on the findings in this report to the Commission in May of 2001. Eventually, the staff expects to develop a decommissioning rulemaking plan based upon the report, input from a February 20, 2001, Commission meeting, and Commission direction in response to the May 2001 policy paper.

5) *Q. When does the staff plan to submit proposed decommissioning rulemaking based on the report?*

A. A schedule for a decommissioning rulemaking plan will be developed within 60 days of receipt of Commission direction from the May 2001 policy paper.

6) *Q. Are there any immediate safety concerns as a result of this report that could impact currently decommissioning plants?*

A. No. Based upon a review of current conditions at potentially affected decommissioning plants, the staff has concluded that there are no immediate safety concerns and therefore, no need for immediate regulatory actions. This is because of the low likelihood of a fuel uncovery event that could result in a significant off-site radiological release. Furthermore, for currently decommissioning plants, the heat-up calculation results of the study indicate that even in the worst case spent fuel pool drainage scenario, there will be at least 20 hours to implement protective and mitigative actions to preclude the spent fuel from reaching a temperature at which a zirconium fire might start. The amount of time available to take protective and mitigative actions provides additional assurances that no immediate safety concerns exist.

Since the staff could not determine a generic time when a zirconium fire would be precluded after permanent shutdown of a reactor, the staff has begun to re-examine exemptions given to currently decommissioning plants in the areas of emergency preparedness, insurance, or physical security which may have been based, in part, on an evaluation that a zirconium fire could no longer occur. This review will inform the policy options to be presented in May 2001.

7) *Q. What implications does this report have for physical safeguards at decommissioning nuclear power plants?*

A. As noted in the answer to question 6 above, the staff concluded that there are no immediate safety concerns and therefore, no need for immediate regulatory actions. This conclusion includes safeguards. While the study, like risk analyses in general, does not include events due to sabotage, the report does provide insights that can be used to determine what targets are important to protect against sabotage. Accordingly, the basis for issuing security program exemptions to decommissioning plants is under review. The staff will provide potential policy implications for safeguards exemptions and regulations to the Commission in the May 2001 policy options paper.

8) *Q. Are there any aspects of the report that could impact operating plants?*

A. The staff is preparing a policy paper for the Commission concerning various policy issues related to the insights provided in the study. After receipt of Commission direction from the policy paper, the staff will determine what impact, if any, there will be on operating plants. However, because the potential for radiological sabotage may have broader implications, not only is the staff reviewing previous exemptions for defueled facilities, but also examining the devitalization practices for spent fuel pools at operating reactors.

9) *Q. What other impacts are anticipated as a result of this report?*

A. Regulatory actions for decommissioning plants which could be affected by policy considerations in the anticipated May 2001 policy paper (e.g., the Millstone 1 insurance exemption request) will be held until Commission direction is received.

In addition, the staff has recently completed its review of Nuclear Energy Institute (NEI) 99-01, "Methodology for Development of Emergency Action Levels," and was preparing to issue a revision to Regulatory Guide 1.101, "Emergency Planning and Preparedness for Nuclear Power Reactors," endorsing NEI 99-01 as an acceptable method for developing emergency action levels. However, NEI 99-01 included guidance for declaration of emergencies at decommissioning plants only up to an Alert level. Based on the results of the final technical study on spent fuel pool accident risk at decommissioning nuclear power plants, the endorsement of NEI 99-01 decommissioning emergency action levels is being further reviewed.

10) *Q. What will be the industry's likely reaction to this report?*

A. Industry will agree that the risk is low and support relaxation of operating reactor regulations for decommissioning facilities and will probably indicate the assumptions in the report are conservative.

11) *Q. What will be the public stakeholders' likely reaction to this report?*

A. Some public stakeholders will likely agree with the finding that, generically, zirconium fire is a concern indefinitely. Some may expect stricter regulations or higher standards for relaxation of requirements at decommissioning plants.

Some members of the public may disagree that emergency preparedness does not greatly impact risk at decommissioning plants. Additionally, some members of the public may want to know what the NRC plans to do with the results of the study (see above). Some public stakeholders may also want to know about any safety concerns related to currently decommissioning plants that were granted exemptions on the bases that a zirconium fire was not possible. Some members of the public may also question security requirements at decommissioning plants. Several public stakeholders have pursued this line of questioning before.

12) *Q. Will there be any follow-up meetings with the public to discuss the report?*

A. The Commission has scheduled a Commission meeting on February 20, 2001, to discuss the report and receive input from industry and members of the public. The staff will consider requests from public or industry stakeholders for additional meetings to discuss specific technical questions or issues that stem from the report. The staff will determine the need for additional meetings with industry or public stakeholders concerning any of the policy options it is developing for the Commission as a result of this report.

13) *Q. How will the NRC address future comments which might be made on the report by stakeholders?*

A The staff plans to utilize the rulemaking process to provide opportunities for further stakeholder involvement. Throughout this project, the staff has sought out stakeholder involvement and has worked hard to address their comments and concerns. The report will be noticed in the *Federal Register*, directly mailed to stakeholders who have been interested in this project, and be the subject of a news release. As noted above, the report will be discussed during a Commission meeting scheduled for February 20, 2001. The staff will continue to work with all stakeholders throughout any subsequent rulemaking process.

14) There has already been publicity in advance of this report by Mr. David Lochbaum, Union of Concerned Scientists, concerning the report's content and conclusions.

Q1. How does NRC respond to David Lochbaum's assertion that the risks from spent fuel pools are higher than previously thought?

A. The report does conclude, on a generic basis, that the likelihood of a zirconium fire never goes to zero. However, the degree of change in risk posed by spent fuel pools is small. The NRC has always considered the risk from spent fuel pools at decommissioning plants to be low and this report has verified that the likelihood of an accident at a spent fuel pool in permanently shutdown nuclear plants that leads to a release of radioactive material offsite is very unlikely.

Q2. Does NRC agree with David Lochbaum's assertion that the risk from dry cask storage and transportation of spent fuel is higher than previously believed?

A. No. The NRC report does not address risk associated with storage or transport of spent nuclear fuel in dry casks. No correlation can be drawn from this report about the risk associated with transporting or storing of spent fuel in dry casks because the seismic and thermal designs for dry storage casks preclude the conditions which drive the risk in the fuel pool. Independent from this report, the NRC staff initiated a PRA study to assess the risk associated with the dry storage of spent nuclear fuel.

15) *Q. Provide a plain language explanation of the consequences of a spent fuel pool accident with a high or low Ruthenium source terms provided in Tables 3.7-1 and 3.7-2 of the report.*

A. Assuming that a zirconium fire (event frequency is less than 3×10^{-6} per year) has occurred, Tables 3.7-1 and 2 show the sensitivity of offsite consequences to different parameters which can vary considerably. These parameters include the amount of the fission product ruthenium (which is released during the zirconium fire); whether the evacuation occurs early or late in the event; and the length of time since final reactor shutdown. For example, for a large release of ruthenium along with other fission products, then Table 3.7-1 shows that the potential early fatalities could be as high as 192 deaths if the zirconium fire occurred at 30 days following final reactor shutdown and evacuation started during the release; if evacuation of 95% of the population was completed prior to the release (early evacuation case) the potential early fatalities decrease to seven. If the ruthenium is released as a less volatile fission product, then Table 3.7-2 shows that the potential early fatalities could be two deaths if the zirconium fire occurred at 30 days following final reactor shutdown and if evacuation started during the release; if evacuation of 95% of the population was completed prior to the release, no early fatalities would be expected. All cases show that after 5 years since final shutdown, a zirconium fire could result in a maximum of one potential early fatality.

Other values (societal dose, individual risk of early fatality, and individual risk of latent cancer fatality) in Tables 3.7-1 and 2, provide metrics to use in evaluating whether NRC safety goals are met. To do this, the consequence values in the tables would be multiplied by the frequency of the events. For all scenarios evaluated, the staff found that the safety goals were met. Note: NRC safety goals are based on the risk to an average individual in the vicinity of a nuclear power plant from a reactor accident should not exceed one tenth of 1 percent (0.1 percent) of the sum of risk from other accidents to which members of the U.S. population are generally exposed.

16) *Q. What is the impact of the report on the Shearon Harris spent fuel pool license amendment?*

A. The TWG report does not impact the Harris spent fuel pool license amendment. The report focuses on spent fuel pool risks at decommissioning plants, not operating reactors.