

CORE BORE OPERATIONS

SAFETY EVALUATION

INTRODUCTION

General Public Utilities Nuclear Corporation (GPUN) submitted safety evaluation reports (SERs) to support the planned operation of a drilling rig, utilizing a hollow drill bit, to obtain samples of the TMI-2 reactor core (references 1, 2, 3, 4, and 5). These were reviewed and subsequently approved by the NRC staff (references 6, 7, 8, and 9). GPUN then submitted proposals to use the drilling rig as a defueling tool in the core region (references 10 and 11). These proposals included the use of solid faced drill bits. They were also reviewed and approved by the NRC staff (references 12 and 13). GPUN submitted a letter dated December 3, 1987, (reference 14) to use the drilling rig to drill portions of the Lower Core Support Assembly (LCSA) and a revision to the letter on December 28 revising the scope of activities (reference 15). This proposal would allow the use of the drilling rig to drill out the 52 incore instrument spiders, support posts, and up to 15 outer periphery incore guide tubes.

EVALUATION

Safety issues associated with pyrophoricity, criticality, and mechanical forces transmitted to the reactor vessel and internals, as approved in this safety evaluation, are bounded by the previous NRC safety evaluations in references 6 and 12. The staff previously evaluated the potential for transmission of forces from the drilling rig to both intact and damaged incore

instrument penetrations via the instrument string (reference 13). The staff found that neither additional damage to the incore instrument penetrations nor unacceptable leakage would occur.

In the revised scope of activities, the forces from the drilling rig could be transmitted to the incore instrument penetrations via the cut sections of incore guide tubes. Available evidence from video inspection demonstrates that the incore instrument penetrations are intact; however, the possibility exists that penetrations outside of camera range sustained damage during the March 1979 accident. Although very unlikely, it is possible that drill forces transmitted via a guide tube could bend or break an incore instrument penetration. However, this mechanism would result in only a small annular gap leakage pathway between the instrument string and the reactor vessel lower head. The staff has previously analyzed the results of the potential annular gap leakage and found it to be 0.4 gpm (reference 16). This is well within GPUN's capability to make up leakage which is in excess of 100 gpm. In addition, GPUN has installed an alarming water level instrument and will take hourly water level readings while drilling to detect any potential leakage.

The NRC staff also evaluated the potential for the drill bit reaching the reactor vessel lower head and causing a leak. The staff approval letter requires that the operating procedures incorporate the following:

- a. The elevation of the drill unit chuck shall be determined and independently verified within one-inch tolerance.

- b. The length of each section of drill string shall be measured, independently verified to be within 0.125 inch, and marked on the drill string.
- c. Full thread engagement at assembly joints be observed and independently verified within 0.125 inch.
- d. The top casing section (stop casing) be independently verified to have been correctly selected for the drilling location prior to drilling in each radius.

These limitations when coupled with the welded collar on the top casing section preclude the drill bit from reaching the incore instrument penetrations and provide a margin in excess of six inches to the reactor vessel lower head.

CONCLUSIONS

The staff has examined and evaluated the potential risks associated with using the core bore machine to aid in dismantling the LCSA. Safety issues associated with pyrophoricity, criticality, and mechanical forces regarding the reactor vessel and internals do not significantly differ from those previously reviewed and approved.

The staff has also concluded that the drilling operation will not cause significant risk of a failure of the incore instrument penetrations and that the licensee has the capability to detect and mitigate a failure if it did occur. Provisions to preclude the drill bit from contacting the reactor vessel lower head have been incorporated into the staff's approval letter. We, therefore, conclude that using the core bore machine to aid in dismantling the LCSA can be implemented without significant risk to the health and safety of the public.

REFERENCES

1. GPUN letter with attached SER from F. R. Standerfer, 4410-85-L-0147, to B. J. Snyder, dated August 30, 1985.
2. GPUN letter with attached SER from F. R. Standerfer, 4410-85-L-0248, to W. D. Travers, dated December 31, 1985.
3. GPUN letter with attached SER from F. D. Standerfer, 4410-86-L00101, to W. D. Travers, dated June 11, 1986.
4. GPUN letter with attached SER from F. R. Standerfer, 4410-86-L-0091, to W. D. Travers, dated June 23, 1986.
5. GPUN letter from F. R. Standerfer, 4410-86-L-0122, to W. D. Travers, dated July 11, 1986.
6. NRC letter with attached Safety Evaluation, NRC/TMI 86-041, W. D. Travers to F. R. Standerfer, dated May 5, 1986.
7. NRC letter with attached Safety Evaluation, NRC/TMI 86-052, W. D. Travers to F. R. Standerfer, dated May 28, 1986.
8. NRC letter with attached Safety Evaluation, NRC/TMI 86-058, W. D. Travers to F. R. Standerfer, dated June 19, 1986.
9. NRC letter with attached Safety Evaluation, NRC/TMI 86-070, W. D. Travers to F. R. Standerfer, dated July 16, 1986.
10. GPUN letter re "Use of Core Stratification Sample Acquisition Tool for Defueling" from F. R. Standerfer to W. D. Travers, dated July 23, 1986.
11. GPUN letter with attached evaluations from F. R. Standerfer, 4410-86-L-0162, to W. D. Travers, dated September 19, 1986.
12. NRC letter with attached Safety Evaluation NRC/TMI 86-072, W. D. Travers to F. R. Standerfer, dated July 24, 1986.
13. NRC letter with attached Safety Evaluation NRC/TMI 86-101, W. D. Travers to F. R. Standerfer, dated October 16, 1986.
14. GPUN letter re "Use of Core Bore Machine for Dismantling the Lower Core Support Assembly" from F. R. Standerfer to NRC, dated December 3, 1987.
15. GPUN letter re "Use of Core Bore Machine for Dismantling the Lower Core Support Assembly" from F. R. Standerfer to NRC, dated December 28, 1987.
16. NRC letter with attached Safety Evaluation, B. J. Snyder to F. R. Standerfer, dated May 2, 1985.

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