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# Memorandum

TO Files

THRU: R. S. Boyd, Chief, Research & Power Reactor Safety Branch, DRL

FROM J. Telford, Research and Power Reactor Safety Branch, Division of Reactor Licensing

DATE: June 28, 1966

SUBJECT: MEETING WITH CONSOLIDATED EDISON TO DISCUSS REACTIVITY TRANSIENTS OF PRESSURE VESSEL INTEGRITY RELATING TO INDIAN POINT UNIT NO. 2

50-247

On May 19, 1966, a meeting was held in Bethesda to discuss Reactivity transients (rod ejection) and the IP II Pressure vessel integrity with respect to shock wave propagation. These analyses were performed in response to questions asked by the staff by letter dated May 11, 1966, and will be submitted as a supplement to their application on about June 1, 1966.

Westinghouse Atomic Power Division

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Rod ejection

James Moore of Westinghouse with the assistance of Bob French discussed the rod ejection accident. He detailed the effect of the doppler coefficient, the moderator coefficient and reactor scram as a function of time following the ejection of several different rod worths. The following is a summary of their results:

(Continued)

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| Rod Worth (%) | Condition | Moderator Worth (%) | Percent of Core Melting |
|---|---|---|---|
| .8 | Zero Power | 1.5 | 0 |
| 1.5 | Zero Power | 0 | 2 |
| 1.5 | Zero Power | 1.5 | 8 |
| 1.0 | Full Power | 0 | 3.5 |
| 1.0 | Full Power | 1.5 | 11 |
| 0.5 | Full Power | 0 | 0 |
| 0.5 | Full Power | 1.5 | 2* |

* For this case 2% reaches melting but is not fully melted.

Note that for the cases expected for the IP II core i.e., .8% rod at zero power and .5% rod at full power there will be no core melting.

Pressure Vessel integrity

Eric Beckjord of Westinghouse discussed the ability of the IP II pressure vessel to withstand the shock wave that could be generated with fuel melting. Their previous analysis on the vessel capability was based on the transfer of energy to the vessel wall by momentum exchange. Realizing that a great deal of the analysis was left to speculation they have now attempted to correlate the vessel capability with experimental data obtained with TNT. Their analysis shows that 2200 lbs. ($16 \times 10^8$ ft.lb.) of TNT would be required to violate the vessel integrity. From this result they have determined the equivalent fuel plus metal-water reaction from the clad for the IP II core that would produce the same results. Based on the model they have proposed they have shown that approximately 75% of the fuel would have to melt to rupture the vessel. However, in subsequent discussions held with the principals they have reduced the figure requiring now only 1/3 of the fuel to melt. They have also found that a quasi-static-pressure surge could cause failure with only 7-8% fuel melting. (See the answer to question 6 of the second supplement to the PSAR for Indian Pt.2).

Fuel Failure Criteria

J. M. Gallagher discussed the method they are using to determine whether a fuel pin undergoes any melting. This information was based on TREAT data which indicates the fuel melts in the range of 250-300 cal/gm and vaporizes above approximately 400 cal/gm.

cc: E. G. Case
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