FEB 18 1982

MEMORANDUM FOR: H. R. Denton, Director, NRR

FROM: R. J. Mattson, Director, DSI

SUBJECT: TRANSMITTAL OF REPORT ON REDUCTION IN RISK ASSOCIATED WITH THE PROPOSED LOW POWER TESTING PROGRAM AT LASALLE

At your request we have prepared the enclosed report on low power risk reduction at LaSalle. The principal contributors were Norm Lauben, Tim Collins, Chuck Graves, Wayne Hodges, from RSB and Pat O'Reilly and Ashok Thadani from RRAB. The report concludes that the risk reduction for low power of this BWR is similar to the risk reduction previously estimated for various PWRs.

Original Signed by:
Roger J. Mattson

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ENCLOSURE

REDUCTION IN RISK ASSOCIATED WITH THE PROPOSED
LOW POWER TESTING PROGRAM AT LA SALLE

SUMMARY:

The applicant, Commonwealth Edison, has requested a license to operate the La Salle County Station Unit 1 up to 5% of rated power during its low power testing program. The applicant has stated that the planned period of time at or near 5% power would be about 14 days. We have examined the reduction in risk associated with this proposed testing program compared to long-term full power operation. The assessment was similar to that conducted for several PWR's during the past 2 years. There are three major factors which contribute to a substantial reduction in risk for low power testing as compared to equilibrium full power operation. First, there is additional time available for the operators to correct the loss of important safety systems needed to mitigate relatively high risk events, or to take alternate courses of action. Second, the fission product inventory during this time would be very much less than during full power operation. Third, there is a reduction in required capacity for mitigating systems at low power. From an examination of these factors we believe that the reduction in instantaneous risk to the public is on the order of 2,000 to 200,000 if La Salle is operated at 5% power from initial startup for 14 days compared to equilibrium full power operation.

DISCUSSION:

Since the publication of the Reactor Safety Study (WASH-1400), the NRC staff and the industry have continued to study the risk to the public from potential severe accidents at nuclear power plants. This effort has confirmed that the event scenarios dominating accident risks are generally the same for different classes of BWRs. Although a risk assessment study has not been performed for a BWR-5 (the

La Salle class of plants), studies do exist for a BWR-4 (Limerick) and a BWR-6 (Grand Gulf). The appropriate similarities and differences were considered in evaluating the relative low power risk for La Salle.

It was determined for this assessment that theevents which dominate risk for a BWR could be placed in four categories:

1. Events (both LOCA and non-LOCA) which include reactor scram but failure to remove heat from the containment.
2. Non-LOCA events which include reactor scram but failure to inject water into the reactor vessel.
3. LOCA's with failure of the required ECCS.
4. ATWS events.

The events in these 4 categories were examined to estimate the reduction in the probability of the event because of the additional time available during low power operation for the reactor operators to correct the loss of important safety systems or to take alternate courses of action. Similarly, we have calculated the reduced fission product inventory for operation of an initially unirradiated core at 5% power for 14 days and have determined the reduction in potential public exposure via reduction in potential release magnitudes. Risk is roughly proportional to the probability of severe accidents (in which the heat sink is lost) and to the fission product inventory in the core. From these factors we believe that the overall reduction in instantaneous risk to the public is on the order of 2,000 - 200,000 if LaSalle is operated at 5% power from initial startup for 14 days compared to continuous full power operation.

It is very important to recognize that this report is based on some very rough estimates. A detailed review of each event tree was not possible in the time alloted. Also computer analyses of the important events (ATWS and LOCA) were not possible. Therefore only estimates and inferences from previous work were used. For these reasons the risk reduction numbers have larger uncertainites than they otherwise might.

Category 1 Events

Following operation at full power, category 1 events will result in suppression pool heatup and boiling. Suppression pool boiling can overpressurize the containment or result in a reduction in pool level such that net positive suction head (NPSH) to the ECCS pumps is lost. Either containment overpressurization or loss of NPSH defeats the role of the suppression pool as the medium for post accident heat removal.

Following operation at 5% power for two weeks, failure to remove heat from the suppression pool results in a very slow increase in pool temperature due to decay heat. The capacity of the suppression pool is very large ($\sim$1 million gallons) and is considered to have an allowable temperature rise of about 110°F. For those events resulting in transfer of primary system stored energy to the pool, the initial increase in pool temperature is about 50°F. The decay heat load for the next three days would increase the pool temperature by about another 20°F. A 70°F increase in pool temperature poses no threat to containment or the ECCS pump NPSH requirements. Because of the time available, there is a high probability that the operator can take corrective actions to restore pool cooling. For this reason and the low fission product inventory, we believe that the risk due to events in category 1 is reduced by at least a factor of 40,000.

Category 2 Events

Following full power operation, category two events would result in reactor coolant boiloff, fuel heatup, and finally fuel melting. Following 5% power operation for two weeks, the decay heat rate is so low that, even if passive systems heat losses are neglected, several days would be needed to reduce vessel water level to the top of the active fuel region. At this time, decay heat rate is far below normal passive heat losses to the drywell. Hence, drywell cooler operation could stop boiloff. Because of time available, there is a high probability that the operator can take action to correct ECCS malfunctions or use other systems to restore vessel inventory. For these reasons, we believe that the risk due to category 2 events that result in excessive fuel damage and significant radiological release is reduced by at least a factor of 40,000.

Category 3 Events

The most significant events in this category are the transient induced LOCAs in which a safety relief valve sticks open. Because of the reduced system pressure and temperature in this class of events, passive system heat losses are substantially less than categories 1 and 2. Therefore boiloff could continue to eventual core melt at 5% power if some minimal core cooling is not established. For these events, several hours would elapse before core uncovery would begin and several more hours before uncovery of higher powered center core regions would uncover and core damage would occur. Because of the time available, the operator has a high probability of correcting ECCS malfunctions or cooling with alternate systems. For LaSalle only one control rod drive pump would be more than sufficient to remove decay heat. The RCIC system would be available for a while. BWR emergency procedures instruct the operator to use other backup systems as well. For these reasons we believe that the risk due to events in category 3 resulting in excessive fuel damage and significant radiological release is reduced by factors on the order of 1000 to 100,000.

Category 4 Events

For ATWS events, the low initial power results in a slower rate of heatup of the suppression pool and a large decrease in the amount of sodium pentaborate required to take the reactor to a subcritical condition relative to the full power case. It is estimated that about 2 hours operation at 5 percent power would be required to raise the suppression pool bulk temperature to 200°F assuming operation of both RHR heat exchangers. However, less than about 15 minutes operation of the Standby Liquid Control System (SBLCS) would be needed to reach a subcritical, hot standby condition. Because of the additional time available to the operators to act to mitigate ATWS events, and the lower fission product inventory resulting from low power operation, we believe that the risk reduction from category four events is on the order of 1,000 - 100,000.

CONCLUSIONS:

The above discussion indicates a significant risk reduction during low power testing for each event category. Combining the factors for each category, we estimate that the overall reduction in instantaneous risk to the public should be on the order of 2,000 to 200,000, if La Salle is operated at 5% power from initial startup for 14 days compared to equilibrium full power operation. This reduction is similar to that previously estimated for several PWRs.

ISSUANCE OF ORDER RESTRICTING CONDITIONS FOR OPERATION (EFFECTIVE IMMEDIATELY) - GRAND GULF UNIT 1

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