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SUBJECT: Ginna Station Safety Injection and Undervoltage Schemes

An engineering review has been performed to evaluate the adequacy of the load sheding and sequencing circuits at Ginna Nuclear Plant considering the potential for relay reset drift. The engineered safety features include two SI accumulators, three safety injection pumps, two residual heat removal pumps, and two containment spray pumps along with other equipment. These components and their actuation circuits are divided between two redundant, independent "trains", A and B, each of which is designed to mitigate the consequences of accidents. Analyses of transients requiring ESF operation, including a spectrum of loss of coolant pipe breaks and main steam line breaks, has shown that a failure of any component, or even an entire train, does not result in unacceptable consequences. In fact, when analyzing these transients the worst single failure is assumed to have occurred. Thus complete failure of a relay does not disable the entire ESF system or cause the transient consequences to be more severe than previously analyzed and found acceptable.

If offsite power is available the undervoltage relays will not be required to function and a plant transient that generates a safety injection signal will sequence ESF pumps onto the 480 volt busses unaffected by undervoltage relay reset times. A potential problem could exist only when there is a safety injection signal concurrent with a loss of offsite power and a difference in certain undervoltage relay reset times exists which is large enough to cause both a close and trip signal to be present for ESF pumps. The difference in relay reset times must be greater than the sequence time delay in order to cause both a close and trip signal to be present. Except for safety injection pumps 1A and 1B and the containment spray pumps, ESF pumps are sequenced into operation with time delays of 5 to 32 seconds. These time delays are larger than the difference between reset times which have existed for calibrated relays with complete loss of offsite power. The containment spray pumps are not

tripped by undervoltage. Therefore, only safety injection pumps 1A and 1B could be affected under these circumstances; safety injection pump 1C would be unaffected. A full train of ESF equipment would remain even if pump 1A or 1B failed to start as a result of relay timing problems. The consequences of events requiring safety injection have been analyzed, and found acceptable assuming the failure of a safety injection pump to start.

The probability of the combination of events of ESF actuation, loss of offsite power and failure of a safety injection pump as the result of undervoltage relay timing failure is small. The probability of pipe breaks initiating loss of coolant events has been estimated to range from 10^{-3} to 10^{-7} per year. The probability of breaks in pipes 2 inches in diameter and larger which initiate loss of coolant events is estimated in WASH 1400* Table III 6-9 to be approximately 10^{-4} per year. The probability of breaks in main steam or feedwater lines should be comparable. The probability of loss of offsite power during the time immediately following the break is estimated to be 10^{-3}/yr (Reference: WASH 1400 Section 6.4). The probability of relay timing difficulties is unknown but is less than 1. Therefore, the probability of a large pipe break concurrent with loss of offsite power and relay timing difficulty resulting in loss of a safety injection pump is less than $(10^{-4})(10^{-3})$ or 10^{-7} per year. The loss of 2 or more safety injection pumps is even less likely. The NRC does not typically require analysis of events which have a probability of occurrence of 10^{-7} or less.

Modifications to existing equipment which can reduce the probability of failure of ESF components are being considered.

Our present system, however meets the design requirements of the Nuclear Regulatory Commission and the General Design Criteria of Appendix A to 10 CFR Part 50. A substantial safety hazard as defined by 10 CFR Part 21 does not exist.

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*The WASH 1400 report was prepared to represent "typical" nuclear power plants. It is therefore not specific to Ginna but is applicable to the types of systems used at Ginna.