19.0 Response to Severe Accident Policy Statement

19.1 Purpose and Summary

19.1.1 Purpose

This chapter documents the Advanced Boiling Water Reactor (ABWR) capability in response to the NRC Policy Statement on Severe Accidents (Reference 19.1-1) and in response to the ABWR Licensing Review Bases (Reference 19.1-2) which would be used for NRC review of the ABWR Standard Plant design. Response to the CP/ML (Construction Permit/Manufacturing License) Rule (Reference 19.1-3) is provided in Appendix 19A. Resolution of applicable unresolved safety issues and generic safety issues is contained in Appendix 19B. For the most part, the ABWR capability is documented by probabilistic risk assessment techniques in Appendix 19D as outlined by Reference 19.1-2. Appendices 19E and 19F support the probabilistic risk assessment and provide the deterministic assessment of the ABWR capability to withstand a severe accident.

Appendices 19H and 19I consider the ABWR response to very large seismic events. Appendix 19K identifies appropriate additional reliability and maintenance actions that are required throughout the life of the plant so that the PRA remains an adequate basis for quantifying plant safety. Shutdown risk is addressed in Appendix 19L and 19Q. A fire protection probabilistic risk assessment is given in Appendix 19M. Detailed information about common-cause failure of multiplex equipment is provided in Appendix 19N. Appendix 19P provides information about the consideration of additional design modifications to reduce the residual risk of severe accidents. Appendix 19R contains a screening analysis for the potential for flooding to lead to core damage. Finally, Appendix 19S provides the response to the aircraft impact assessment rule (Reference 19.1-4).

19.1.2 Summary

This analysis indicates that ABWR satisfies the severe accident related goals identified in Reference 19.1-2. The individual goals are listed in Section 19.6 where the specific manner in which the goals are satisfied is described. For the purposes of this subsection, this information is further summarized and is organized into three major areas: prevention of core damage, maintenance of containment integrity and minimizing off-site consequences.

Core damage is prevented by three divisions of the Emergency Core Cooling System (ECCS) including the Reactor Core Isolation Cooling System which can function for several hours without AC power. It also includes a reliable and proven reactor depressurization system. Feedwater and condensate pumps also provide protection against core damage. A gas turbine is also available as an alternate supply to key electrical loads. Although an AC-independent Firewater Addition System is incorporated in the design, no credit is taken for it in the calculation of core damage frequency. The calculated core damage frequency is extremely low.

Containment integrity is protected by inerting the containment volume with nitrogen and by providing a three-division heat removal system, many components of which are operated routinely and thus have very high reliability. In addition, the containment design incorporates a containment overpressure protection system. The probability of containment failure resulting from loss of heat removal is extremely small.

In response to the aircraft impact rulemaking in Reference 19.1-4, an analysis of the ABWR plant design was performed. This analysis addressed the ability of the ABWR to either cool the core or maintain primary containment intact and to either cool the spent fuel pool or provide spent fuel pool integrity. The analysis results, provided in Appendix 19S, demonstrate that the core cooling is maintained and spent fuel pool integrity is maintained.

19.1.3 References

19.1-1 50FR32138, "Policy Statement on Severe Reactor Accidents Regarding Future Designs and Existing Plants", August 8, 1985.

19.1-2 Thomas E. Murley (NRC) letter to Ricardo Artigas (GE), August 7, 1987, "Advanced Boiling Water Reactor Licensing Review Bases."

19.1-3 Title 10, Code of Federal Regulations, Part 50, Section 50.34(f).

19.1-4 Title 10, Code of Federal Regulations, Part 50, Section 50.150.