

APPENDIX 1B SEVERE ACCIDENT MITIGATION DESIGN ALTERNATIVES

An evaluation of candidate severe accident mitigation design alternatives (SAMDA) was conducted to evaluate the potential for such modifications to provide significant and practical improvements in the radiological risk profile of the AP600 design.

The process used for identifying and selecting candidate design alternatives included a review of SAMDAs evaluated for other plant designs. Several SAMDA designs evaluated previously for other plants were excluded from the present evaluation because they have already been incorporated or otherwise addressed in the AP600 design. These include:

- Hydrogen ignition system
- Reactor cavity flooding system
- Reactor coolant pump seal cooling
- Reactor coolant system depressurization
- Reactor vessel exterior cooling.

Additional design alternatives were identified based upon the results of the AP600 Probabilistic Risk Assessment. Fifteen candidate design alternatives were selected for further evaluation.

An evaluation of each of these alternatives was performed using a bounding methodology such that the potential benefit of each alternative is conservatively maximized. As part of this process, it was assumed that each SAMDA performs beyond expectations and completely eliminates the severe accident sequences that the design alternative addresses. In addition, the capital cost estimates for each alternative were intentionally biased on the low side to maximize the risk reduction benefit. This approach maximizes the potential benefits associated with each alternative.

The fifteen SAMDAs are listed below:

- Chemical volume and control system upgraded to mitigate small loss-of-coolant accidents (LOCAs)
- Filtered containment vent placed into the AP600 containment design
- Locate the normal residual heat removal system inside containment to prevent containment bypass due to interfacing system LOCAs
- Self-actuating containment isolation valves
- Passive safety-related containment spray system
- Active high pressure safety injection system
- Steam generator shell side passive heat removal system
- Steam generator safety valve flow directed to in-containment refueling water storage tank (IRWST)
- Increase steam generator secondary side pressure capacity
- Secondary containment filtered ventilation
- Diverse IRWST injection valves

- Diverse containment recirculation valves
- Ex-vessel core catcher
- High pressure containment design
- Diverse actuation system improved reliability

Because of the small initial risk associated with the AP600, none of the severe accident mitigation design alternatives are cost beneficial.