

**U.S. DEPARTMENT OF ENERGY  
NUCLEAR ENERGY RESEARCH INITIATIVE  
ABSTRACT**

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**PI: J. W. Winters**

**Proposal No.: 2000-023**

**Institution: Westinghouse Electric Company LLC**

**Collaborators: None**

**Title: Study of Cost Effective Large Advanced Pressurized Water Reactor that Employs Passive Safety Features**

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Market analysis of the U.S. market indicates that a new electric generating facility must have an overnight capital cost of approximately \$1 000/kw. More importantly, the generating cost must be  $\ll$  \$0.03/kw-hr, when such factors as an attractive return on investment and payback period are considered. Industry executives indicate that any new nuclear plant must be able to compete in the deregulated generation wholesale marketplace and provide a return to the shareholders.

Against this standard, the costs of Generation III nuclear power plants (ABWR, AP600, System 80+) are too high. For example, Westinghouse Electric Company has designed an advanced 600 MWe Generation III nuclear power plant called the AP600. The AP600 has recently received Design Certification by the Nuclear Regulatory Commission when it formally approved the final rule amending 10 CFR Part 52 to certify the AP600 standard plant design. The overnight capital cost for the first AP600 plant is estimated to be between 1300-1500 \$/kw depending on the site selection. This places the AP600 as the most cost effective nuclear power option (Generation III or other) available for deployment in the world today. It is, however, too expensive to compete in the U.S.

Implementation of aggressive cost reductions combined with conventional, state-of-the-art power upratings could potentially realize a 10% decrease in the \$/kw for a Generation III plant. This still will not place its cost within the competitive range. Therefore if nuclear power is to be commercially attractive in the U.S. in the next 5-7 years, a dramatic decrease in the capital cost of a Generation III plant is necessary. This program is to complete a feasibility study and perform design activities to increase the power output of an AP600 to at least 1000 MWe while preserving the design and licensing basis of the plant. This will require innovative engineering solutions to design issues associated with increasing the power output of the AP600.

By increasing the generating capacity of the AP600 to this level while incurring not more than an additional \$50 million in capital cost, the overnight capital cost of this Generation III+ plant will be dramatically reduced and be competitive to approximately \$1000/kw.

The DOE and the nuclear industry have invested heavily in the design and licensing of the so-called Generation III reactors including the AP600, ABWR and System 80+. These plants are ready for the U.S. market today. However, even though the AP600 is the most cost competitive nuclear option available today and is cost-competitive with coal plants, it is still not competitive with combined-cycle natural gas plants in the United States. Successful implementation of this program would provide the impetus for the

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industry to realize the rewards of the investment in the Generation III reactors. It will permit competitive, near term deployment of a Generation III+ nuclear power plant. It will be based upon the safest, simplest, most advanced and most cost competitive nuclear plant available today with a Design Certification. It will also be cost competitive in the U.S. market with any available electric energy choice today including combined-cycle natural gas plants.

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