

Nuclear Power Reactors – An Example of Improvements in Reliability and Potential for Improvement

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The current fleet of nuclear reactors has achieved an impressive level of reliability and predictable operation, with a U.S. fleet-average capacity factor of approximately 90%. However, this has not always been the case, as shown in Figure 1. The initial deployment of reactors in the 1970s had capacity factors of less than 70% as a result of long refueling outages, unanticipated shutdowns, and performance issues with this fuel. Operational experience over the following decades and improvements in fuel designs resulted in steady improvement of the capacity factor to its current value. This occurred while also uprating the power level of the plants and extending their operating licenses from 40 to 60 years. These improvements in operation have resulted in operational issues that can have potential impacts on maintaining this level of performance. The Consortium for Advanced Simulation of Light Water Reactors (CASL) was established in 2010 as the first U.S. Department of Energy Innovation Hub. CASL's mission is to develop advanced modeling and simulation (M&S) capabilities that can help address Light Water Reactor operational and safety performance challenges. These improvements target operational issues that impact the reliability of the operation of our current fleet of light water reactors and represent risks to maintaining the their outstanding capability factors.

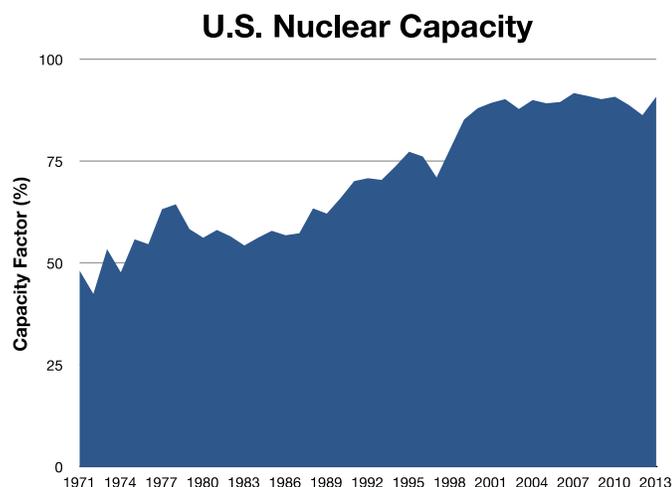


Figure 1: Capacity factor of U.S. power reactor fleet (source: Nuclear Energy Institute).