and to effect needed improvements in standards of living. Vast new possibilities will be opened up by abundant low-cost electric energy. Low-cost energy will make it economically possible to use low-grade ores of many metals. As needs mount, low-cost nuclear generated electricity will also become a basic ingredient that can be used instead of some of the less abundant fossil resources that are now being used for energy production.

These are attractive promises that will challenge the very best efforts we can summon to the task. But we must plan and prepare for them today.

With emphasis on this planning and preparation, I want to tell you something about the path we are taking in breeder-reactor development, and why, and some of our expectations along the way.

Let me begin by reminding you that breeding of fissile material can be accomplished by two different routes. One is the thermal breeder employing slow (thermal) neutrons; it works best on the ^{232}Th–^{233}U cycle, called the thorium cycle for short. The other is the fast breeder employing more-energetic (fast) neutrons; it operates best on the ^{238}U–^{239}Pu cycle, called the uranium cycle for short. Over the years, we have done enough work with these two cycles to know that breeding does happen, that we can create more fissile material than is consumed while producing power. We must, of course, go beyond this; we must assemble and apply on the large scale required the resources, the knowledge, and other capabilities in the nuclear industry.

It has long been recognized that nuclear energy's full promise for providing a virtually unlimited energy source for future generations could be realized only through the development and application of the breeder reactors. The U.S. interest in breeder reactors dates back to the Manhattan Project days when the possibility was first recognized by pioneers in the nuclear field. Much of the preliminary effort on the breeder was conducted in the AEC national laboratories. The Clementine reactor was constructed at Los Alamos and used from March 1949 to December 1952 to demonstrate the feasibility of operating with fast neutrons, plutonium fuel, and a liquid-metal coolant. The Experimental Breeder Reactor No. I (EBR-I) was built and operated by Argonne National Laboratory from August 1951 through December 1963 to prove the breeding principle in a fast-flux reactor and to establish the engineering feasibility of using liquid-metal coolant.