Experimental Breeder Reactor-I made history when on Dec. 20, 1951, it produced usable amounts of electricity from nuclear power for the first time. It is now a National Historic Landmark where visitors can see early nuclear reactors.

Experimental Breeder Reactor-I

The Experimental Breeder Reactor-I (EBR-I) is a Registered National Historic Landmark located at Idaho National Laboratory off U.S. Highway 20/26. While U.S. Department of Energy (DOE) laboratories continue to generate scientific and technological discoveries and engineer new energy sources, DOE has a responsibility to preserve key elements of the history it has helped create. EBR-I is a part of that history.

National Historic Landmark

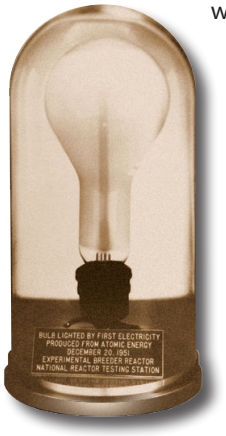
In 2011, INL celebrated EBR-I's 60th anniversary. The facility is open to the public seven days a week from the Memorial Day weekend through Labor Day from 9 a.m. to 5 p.m. Visitors can see nuclear reactors and related historic displays and learn about current INL projects. Through the off-season, EBR-I is available for groups on an advance-request basis only. Group visits may be arranged by contacting the INL Tour Group at 208-526-0050, or from the Request a Tour link at www.inl.gov.

History

The idea for a breeder reactor (a reactor that could produce more fuel than it uses) first occurred to scientists working on the nation's wartime atomic program in the early 1940s.

Experimental evidence indicated that the breeding of nuclear fuel was possible in a properly designed reactor, but time and resources were not then available to pursue the idea.

After World War II, the newly established Atomic Energy Commission (now the Department of Energy) assigned some of the nation's nuclear skills and resources to developing peaceful uses of the atom. At the time, uranium was thought to be in short supply (large bodies of uranium ore were discovered later). So it was decided that the first power reactor would attempt to prove the theory of fuel breeding.



This bulb is one of four lit by nuclear-generated electricity at EBR-I in 1951.

Changing the World's Energy Future

Idaho National Laboratory

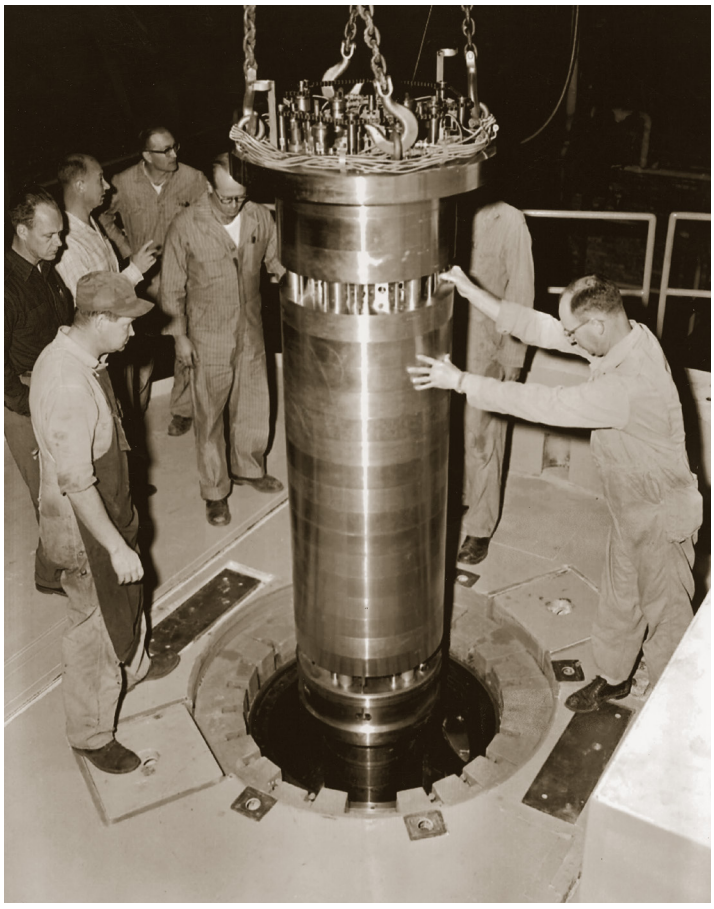
EBR-I construction began in 1949 at the National Reactor Testing Station in Idaho, now called Idaho National Laboratory. Early in 1951, a few months before the EBR-I building was completed, nine staff members from the Atomic Energy Commission's Argonne National Laboratory arrived on the scene to install the reactor, which they had designed at their lab near Chicago.

The first attempt to operate the new reactor, in May of that year, was not successful. It was determined there was not enough fuel in the core. Acquiring additional uranium and fabricating slightly larger fuel rods took nearly three months. Then on Aug. 24, Walter Zinn and his Argonne staff brought EBR-I to criticality (a controlled, self-sustaining chain reaction) with a core about the size of a football. Four months of low-power operation followed while the operators studied their new creation.

On Dec. 20, 1951, the first historic experiment at EBR-I began. The reactor was started up, and the power gradually increased over several hours. At 1:50 p.m., the first usable amount of electricity ever generated from nuclear power began flowing from the turbine generator. Four lightbulbs glowed brightly to inaugurate the birth of nuclear-generated power. The next day, the experiment was repeated, and sufficient electricity to power the EBR-I building was generated.

EBR-I's real mission was not to show that electricity could be generated by a nuclear reactor — scientists already knew that a reactor was a kind of furnace. Splitting atoms inside the core produces heat. Heat can be used to turn water into steam, to drive a turbine and generate electricity, just as a coal- or oil-fired electrical plant does. Therefore, EBR-I's chief task was to determine whether scientists' theoretical calculations on fuel breeding could actually be achieved — that more nuclear fuel could be created in a reactor than was consumed during operation.

Less than a year after EBR-I generated its first electricity, Argonne scientists calculated that their reactor could indeed breed fuel. Then, early in 1953, a painstaking laboratory analysis showed that EBR-I was creating one new atom of nuclear fuel for each atom it burned. The hoped-for result was a reality.



Installing the Mark IV Core into the EBR-I reactor vessel.

With that kind of encouragement, Argonne scientists began to design cores that would increase the breeding ratio so the reactor could not only sustain its own operation but also produce a little bit more to fuel other reactors. Three such improved cores were developed over the next 10 years. The last of them — called Mark IV — produced 1.27 new atoms of fuel for each atom consumed. EBR-I was used for research purposes until 1964, when the reactor was decommissioned. Argonne built a new reactor — EBR-II — at INL and operated it from 1964 to 1994.

Distances to Nearby Cities

EBR-I is 18 miles (29 kilometers) east of Arco via U.S. Highway 20/26, 40 miles (64 km) northwest of Blackfoot via U.S. Highway 26, and 50 miles (80 km) west of Idaho Falls via U.S. Highway 20.

For more information

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08-50050-05_R5