# Koch: Remembering the EBR-I

*An engineer who worked on developing the EBR-I recalls the events leading up to atomic-powered electricity.*

When electricity from a nuclear reactor was generated for the first time on December 20, 1951, it represented the culmination of years of conceptualization, planning, research and design, construction, and testing. At the time, 31-year-old Leonard Koch was the associate project engineer working on the Experimental Breeder Reactor-I at the National Reactor Testing Station in Idaho. On the day of the EBR-I's first successful run, Koch was there to see electric power generated by the reactor light up four 200-watt bulbs that had been strung across the test area. This test proved that nuclear power could be used to produce electricity. Koch, who later became project manager for development of a successor reactor, the EBR-II, called those times working on the EBR programs his "happy days in this business."

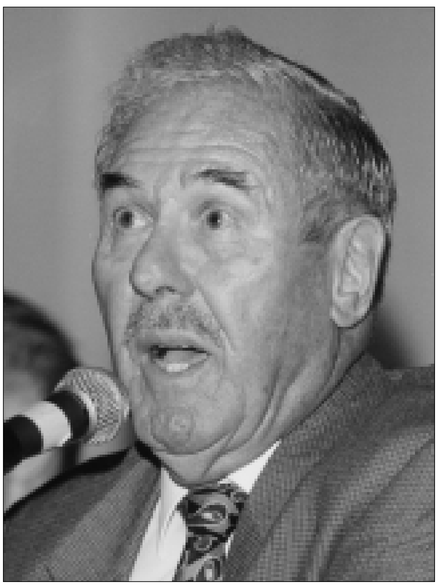
Koch's career began and ended in private industry, with decades in between working at Argonne National Laboratory in Illinois, where he started in February 1948. Before his years at Argonne, he worked on B-29 airplane engines for Chrysler Corporation during World War II, developed slide valve engines for the Jack & Heintz Company in Cleveland, and worked on rear-mounted engines for the Tucker Motor Company in Chicago. His original field was internal combustion engines, a passion developed as a boy who tinkered with machinery.

Koch admitted he got into the business of nuclear power "quite by accident." When he first heard about nuclear as an energy source, he thought "I'd better get into this quick so I can start building engines with atomic power." Although no atomic-powered cars were built, he never regretted being part of the group that helped found the nuclear power industry.

When Koch was recruited away from Tucker by Argonne, all projects at the lab were classified, a residue of the war years. Looking back on his first assignments at Argonne, Koch remembered that "I didn't even know what I was working on." Walter Zinn, the director of Argonne and the scientist who led the project to develop the EBR-I, assigned various jobs to Koch, who would conduct experiments and return the results to Zinn. "I didn't know what these experiments were for," Koch said, "but that is how I began to learn the business."

After years of working on EBR-I and EBR-II, Koch was made director of the Reactor Engineering Division at Argonne in 1965. He left the lab in 1973 to work for the Illinois Power Company because, he said, it became obvious the lab wasn't going to build any more power reactors. Illinois Power was initiating plans for the Clinton nuclear power plant at the time, and Koch became a vice president for the company until he ended his work career in 1983.

Koch has always considered himself lucky to be picked for the EBR-I team. "I happened to come along at the right time when they were getting ready to start the design engineering and they needed engineers who knew how to design and build stuff," he said. "I'm not a theoretical engineer. I'm a designer/builder. During my college years, I worked in factories on machines while I was getting my mechanical engineering degree as a co-op at the Illinois Institute of Technology. I think Zinn hired me because he thought I was a guy who could design and build things and that's what he needed."



Leonard Koch at a press conference (Source: ANL)

Now 81 years old, Koch reminisced about his time working with other scientists and engineers on the development of the EBR-I, and he recalled that day when they experienced the first electricity produced from a nuclear reactor. The interview was conducted by Rick Michal, *Nuclear News* senior associate editor.

*Could you describe the organization that was in place for developing and building the EBR-I?*

We were a very small group. Ten of us technical people working at Argonne National Laboratory in Illinois were responsible for the design of EBR-I and incorporating technology that was being developed. We all moved out to Idaho to complete construction and put the plant in operation. Some of us are shown in that photo with the signatures on the wall, while some of the other people in the photo were hired locally in Idaho as technicians, builders, and support staff.

So the primary technical staff from Argonne consisted of 10 people who moved to Idaho. I moved out in early 1950. It was still winter. I remember that because we were snowbound in Cedar Rapids, Iowa. Mike Novick, the project senior engineer, was the first to move out about three months earlier. The rest of us moved out during completion of the conventional construction—the building and services and so forth. Bechtel Corporation was the company that erected the building and all the conventional parts of the plant. Spaces were left for us to put in the reactor, the piping, the pumps, heat exchangers, the instrumentation, and the critical material.

Walter Zinn was the director of Argonne headquartered in Illinois, but I would classify him as the EBR-I's project director. This was his personal project, in addition to running the laboratory. It was his concept and he provided the technical direction. Harold Lichtenberger, the project engineer, reported directly to him. He was responsible for carrying out the project and accomplishing the things that Zinn wanted done. I was the associate project engineer and Mike Novick was the senior engineer. Mike and I had equal responsibility—sort of splitting the plant in half. I was responsible for the reactor part, which meant the reactor, the mechanical workings, and the controls. Mike was responsible for the heat transfer systems—the piping, the pumps, the heat exchangers, the steam generators, the turbine generator, and so forth.

Newman Pettitt was our physicist. He did all the shielding calculations, but not the reactor critical calculations. Those were done primarily by Zinn, with assistance from people like Enrico Fermi and others. Occasionally, Zinn would make a comment such as, "Enrico thinks . . . ," and then he would tell us about something that he wanted us to do.

Remember, not much technical data were available at this time. There was some information from the Los Alamos Laboratory, because people there had done some plutonium experiments related to a small reactor called "Clementine," which generated information applicable to EBR-I. But there was a tremendous amount of judgment and intuition necessary to make the EBR-I a reality. In that area, I think Zinn used Enrico Fermi as an advisor. That's a personal opinion of mine.

*Do you know when Zinn, et al., first started conceiving the EBR-I, and when a team was first put together with the goal of building it?*

I believe that Fermi, Zinn, and probably others began thinking about fast reactors and breeding as early as the mid-1940s. I joined Argonne Lab in February 1948, and by then the basic concept of the reactor had evolved—a small, highly enriched core surrounded by a much larger "breeding blanket." Only the reactor core and a small part of the blanket were to be cooled by NaK [a liquid-metal alloy of sodium and potassium], with most of the blanket to be air cooled and containing the control rods. Harold Lichtenberger was leading a small group of people that had begun putting thoughts to paper when I joined the group in early 1948. By mid-1948, the process of designing and engineering the concept had begun.


These scientists, engineers, and technicians were among those who worked on the Experimental Breeder Reactor-I at the National Reactor Testing Station in Idaho. The group posed in front of the historic sign chalked on the wall above the turbine of the EBR-I. In the photo in the elevated back row are Bernard Cerutti (left), Lester Loftin, and Earl Barrow (far right). In the front row (left to right) are Wilma Mangum, Charles Gibson, Orin Marcum (wearing glasses), Kirby Whitham, Mike Novick, Milton Wilkey (in white coat), Frank McGinnis, Len Koch, and Weslie Molen. (Source: ANL)

*How long did it take to physically prepare for the EBR-I?*

The conventional construction of the building that housed the EBR-I didn't take a long time. I believe it was 1949 when construction started, just over a year to build it. Then there was another year or so required to install the reactor and all the related material.

The building was a simple brick structure with three elevations: a basement, a main floor, and a partial second floor. The basement contained cells and rooms for equipment, while the reactor was housed in the center of a thick concrete structure that provided the necessary radiation shielding. The top of the reactor was at the second-floor level, at which the control room, the turbine-generator, and minimal office space were located.

*How did you all feel about moving from Illinois to Idaho?*

Generally speaking, it was not a joy or an improvement. Although we were accustomed to rather spartan accommodations at Argonne where our work activities were housed in "temporary" quonset huts, at least in that part of Illinois we were part of civilization. But in Idaho, the EBR-I site was more than 15 miles from any other facility, and further than that from a restaurant. We were 70 miles from our homes in Idaho Falls, which involved a treacherous drive over very poor two-lane roads. We worked six days a week. Including travel time, we had 12-hour work days, minimum. Needless to say, our wives and young families "just loved it." But we had a job to do, and this was the only way to do it.

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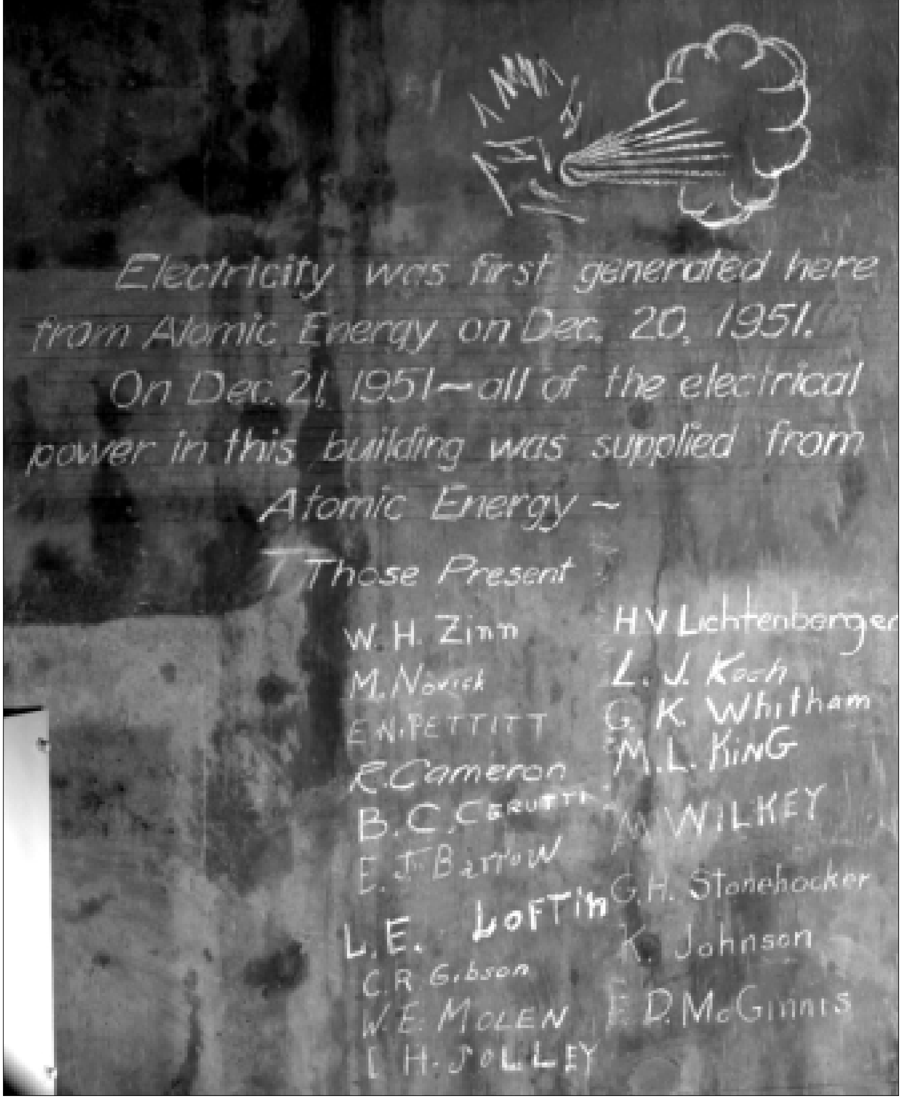



Recorded on a wall of the EBR-I building were—along with a drawing of a mighty puff of energy—the historic events of December 20 and 21, 1951. (Source: ANL)

erational, Harold Lichtenberger turned a switch, and the light bulbs that had been strung had lit up. That was it. This was what we worked toward for several years. This was what we expected to happen. When something like that occurs, sometimes it's difficult to attach much significance to it. For example, I remember reading a book about the early days of the airplane business. When Orville and Wilbur Wright flew that airplane the first day, they didn't do anything great. They didn't even crack open a bottle of champagne.

Even those names that were printed on the wall were an afterthought. Reid Cameron said, "Hey, why don't we at least make a record of this somehow." He made that little drawing at the top that's shown in the photo—I'm not sure what it is, except that it may be breathing energy. Then we all signed our names. We didn't celebrate. We just put our names on the wall.

We went home that night, and the next day we came out and ran the reactor again the same way. Except this time we ran it to a higher power level and we disconnected from the incoming power line so that there was no electricity supplied to the building except that which we generated in the building itself. Then somebody had the idea to make parts in the machine shop. So we put some steel through a lathe and cut some parts. I'm not sure what happened to them, but those were the first parts machined by nuclear-powered electricity.

*Were you targeting a certain date for the production of the first nuclear-generated electricity?*

I would say that the only target date was the earliest date we could do it. We were working our tails off to get everything working the way we wanted it. December 20 was the first time we got the reactor critical, and got it hot enough to generate a little bit of electricity.

*What kind of government restrictions were in place when you were working on the EBR-I?*

The whole program was classified, and that complicated things. But the real problem was the lack of technical knowledge on how this machine would work. Fermi and Zinn very early on recognized that fast neutrons would be more efficient than thermal neutrons, but would require an entirely different kind of reactor. The bulk of the information about the available technology was classified in the weapons program. We are talking about a technology that was in its absolute infancy.

*Could you talk about EBR-I's core design?*

The EBR-I reactor core consisted of an approximate right cylinder, seven inches in equivalent diameter, surrounded by an inner blanket of natural uranium about 4 in. thick. The inner blanket consisted of larger cylindrical elements. These two regions were cooled by NaK, which flowed down through the inner blanket and up through the core in series. These two regions were positioned inside the reactor vessel. Surrounding the reactor vessel was a movable high-density natural uranium outer blanket in the shape of a cup about 8 in. thick. This part of the breeding blanket was air-cooled.

So we worked toward that day when we conducted the test that first generated electricity, which was December 20, 1951. There were some delays before we actually got to performing the successful test. We actually made the first crack at it in August or September 1951, but we didn't have quite enough fuel. At that time, we put all the fuel in the reactor that we had, but it wouldn't quite go critical. That fact hasn't been publicized very much, but it isn't a secret. We had to go back to get fuel from the Defense Department in those days. I don't know how Zinn did it.

*Was all nuclear fuel controlled by the Defense Department at that time?*

Yes. The Atomic Energy Commission was the agency that actually took receipt of the fuel, but it was controlled by the Defense Department. To get the initial charge of fuel for EBR-I, Argonne had to make a commitment to return it to the Defense Department on relatively short notice and in a condition useful to them, which, of course, meant weapons-grade.

So, as part of that commitment, Argonne developed a process for reprocessing this fuel so it, along with some equipment, could be returned to the Defense Department, if necessary.

That original charge was about 60 kilograms of enriched uranium. As I said, we didn't have quite enough to go critical, but that gave us a good opportunity to learn a few things about how the reactor was going to operate. When we found we weren't able to go critical, the fuel was shipped back to Illinois, where it was fabricated in the first place. The existing fuel was stacked in fuel tubes and was in the form of short cylinders about the diameter of a person's little finger and a little more than an inch long. To increase the fuel volume, the fuel cylinders were compressed slightly, making them shorter but larger in diameter. That increased the density of the fuel in the reactor.

In addition to that, we received about 9 kg of material that also was fabricated into fuel elements. That combination of modifying the existing fuel and getting some additional fuel gave us the material we needed. The new fuel was returned to Idaho sometime in late November or early December 1951, I don't remember when exactly. But there was about a two- or three-month lag between the first time we tried to go critical and the second time when we did achieve it.

*When electricity was first generated from the EBR-I, what was the mood of the technical crew?*

Actually, it was just another regular day for all of us. We all assembled for the test, the reactor and heat transfer systems were made op-

That's the basic concept of a fast breeder reactor. In a fast reactor, more neutrons per fission are produced, which makes it possible to breed. That's why we were interested in fast-breeder reactors as a means of achieving high utilization of uranium.

As part of the initial experiments when we were doing the subcritical measurements—and we learned we didn't have enough fuel—we also learned we didn't have enough reactivity control. The EBR-I used a very simple control system consisting of control rods moving vertically in the outer blanket. It turned out it wasn't as effective as originally expected.

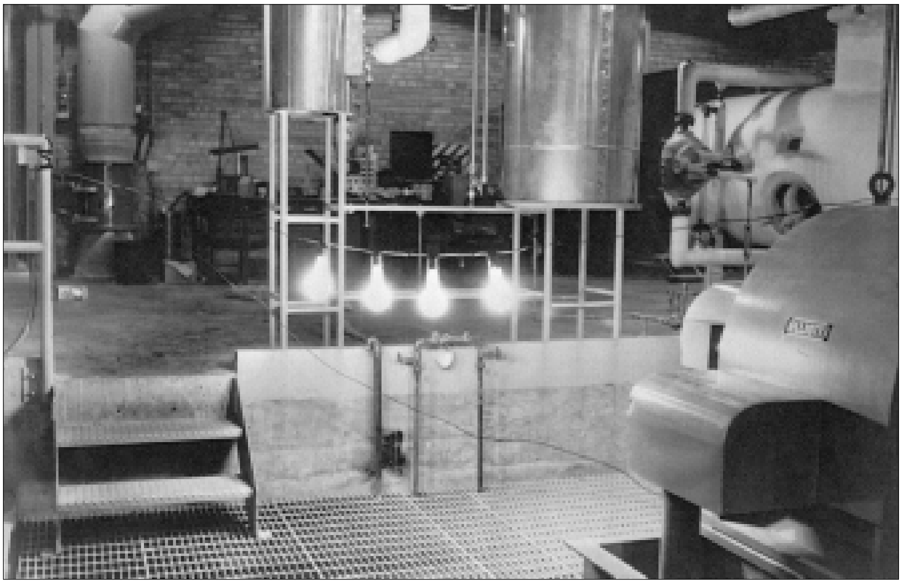
*Is this typical of the design configuration of fast reactors?*

Yes, but not entirely. Typically, fast breeder reactors consist of a relatively small core surrounded by a larger volume of fertile uranium-238 in which neutrons are captured to form plutonium-239.

Fast reactors must operate at a high power density in the core because of the small fission cross-section for fast neutrons. EBR-I operated at a core power density of about 150 kW per liter of core volume, but its successor, EBR-II, operated at a peak power density of about 1000 kW per liter of core volume.

On the other hand, the power density in the breeding blanket where relatively few fissions occur and neutrons are absorbed (plus absorption of gamma rays from the core) is relatively low. Also, the power density in the blanket decreases with distance from the center of the reactor.

The EBR-I configuration reflects this power distribution. The core and the inner blanket—about a 5-in. annulus surrounding the core—are liquid-metal cooled. The outer blanket, about 8 in. thick, is air-cooled. This blanket configuration was adopted to accommodate the reactor control system.

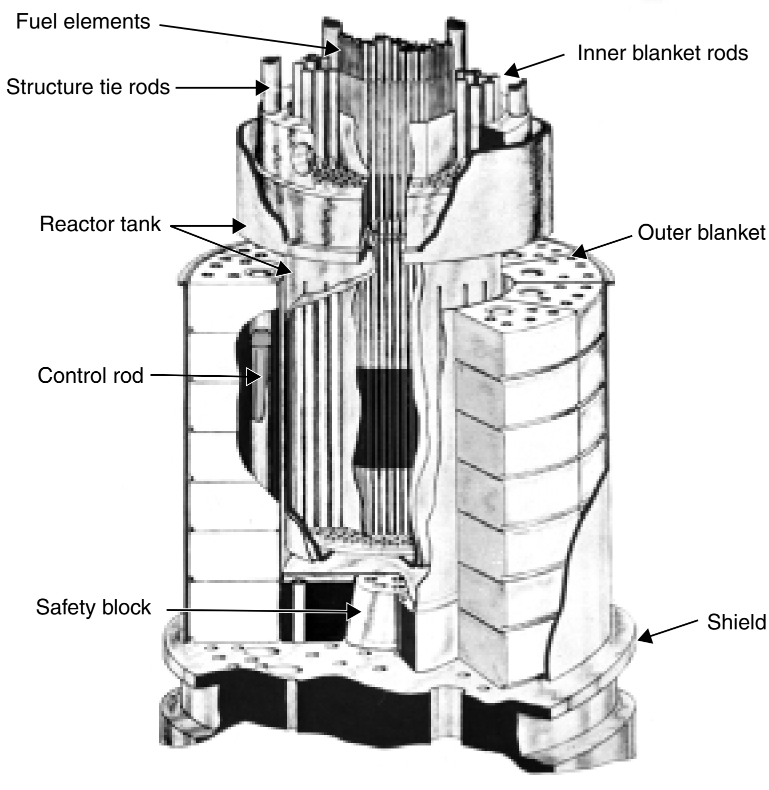


These four 200-watt light bulbs were lit up for the first time by electricity generated by nuclear power on December 20, 1951. (Source: ANL)

*Why was a sodium-potassium alloy used as the coolant?*

Rather than sodium, NaK was used because it is molten at room temperature. It looks like mercury, a very silvery liquid metal, but it's very reactive. It reacts violently in contact with water and it burns rapidly in air, so it is not a benign coolant. But NaK has excellent heat transfer properties, and EBR-I was the only reactor ever to use NaK as the coolant.

There was very little information available on liquid metals at the time. There were some data from Ethyl Corporation, because that company used sodium in the processing and manufacture of tetraethyl lead, which in those days was used as an additive in gasoline. Ethyl Corp. used sodium at relatively low temperatures, and did not require accurate flow data. We had to start from scratch in learning how to use this material as a coolant. That, in turn, dictated the EBR-I's basic design feature and the fact that only the core and a small part of the reflector blanket were cooled by NaK.




A cutaway drawing of the EBR-I internals (Source: ANL)

*Could you talk about the EBR-I in operation?*

The bulk of the blanket where most of the plutonium was manufactured was air-cooled. Air cooling was used because there was uncertainty as to whether or not moving parts, such as control rods, would operate reliably in NaK, which is not a very good lubricant. It is worse than water.

A reactor requires moving parts in it for control purposes. To avoid that particular problem—and this was part of the original concept that Zinn and Fermi developed—a large part of the blanket was air-cooled, and that was where the moving parts were located. The control rods move vertically in an air environment.

The liquid metal–cooled part of this relatively small reactor was only about a foot and a half in diameter. It consisted of a small tank in which the NaK flowed and was surrounded by the large uranium cup. This outer blanket was divided into 12 radial sections, with one control rod in each section. The control system consisted of 12 rods that moved vertically in this dense, natural uranium cup consisting of about 5 tons of uranium. It turned out that the effectiveness of these rods was less than expected and didn't provide as much control as needed.

*Were you able to get better control of the reactor?*

Yes. While the fuel was being remanufactured and modified in Illinois, we in Idaho modified the control system. Originally the uranium cup, which was raised and lowered by a hydraulic lift, had only a full up position or a full down position. It was raised to surround the small reactor vessel. Instead of relying entirely on the control effected by the 12 control rods, we modified the hydraulic lift system to control the elevation of the cup.

We provided a new control system. We were able to control the leakage of neutrons from the reactor. This heightened control was achieved by installing four adjustable automotive screw jacks at the ceiling against which the hydraulic lifting mechanism acted. The height of the cup, and thus the relative position of the cup to the reactor, was controllable by adjusting the height of the screw jacks against which the lift acted. The screw jacks were actuated by an electric motor controlled by switches in the control room.

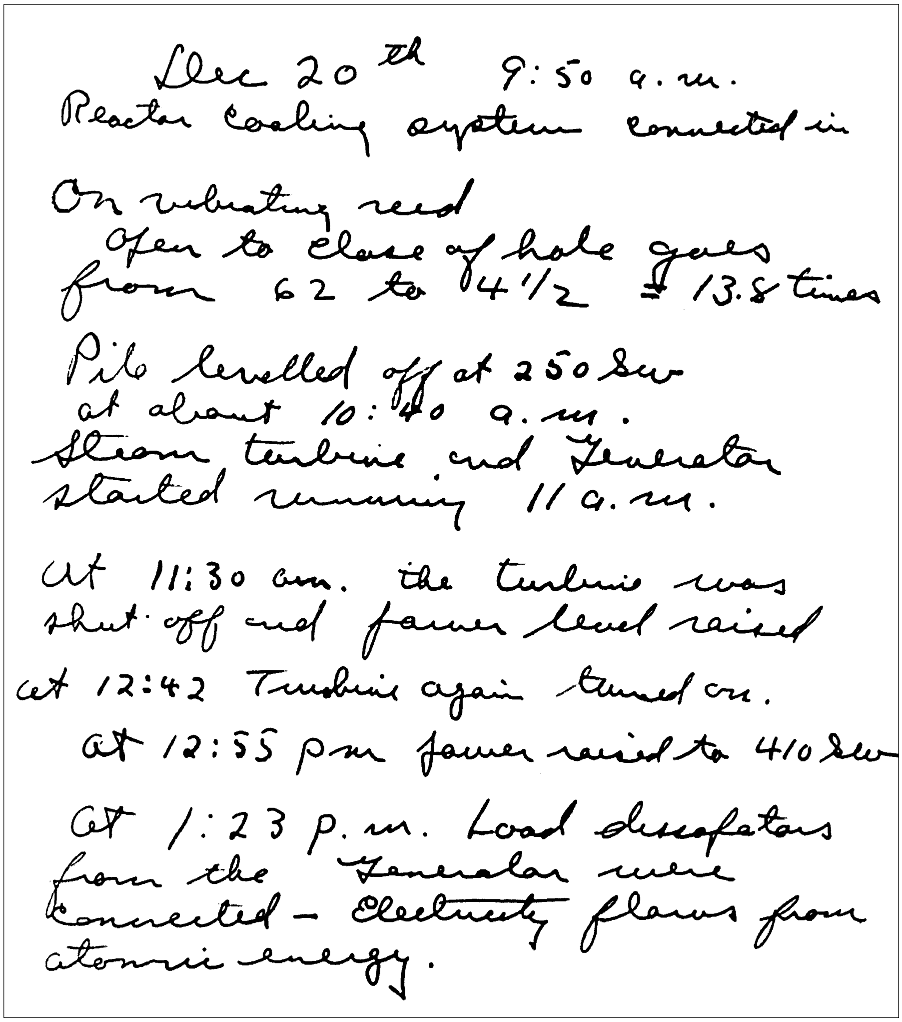
*How conservative was the design of the EBR-I?*

EBR-I was designed rather conservatively with respect to operating parameters, but perhaps even more conservatively with respect to the reliability of its shutdown posture. First, in addition to the control rods that were fast acting but provided a relatively small amount of reactivity control, the entire outer blanket—the cup—dropped several feet below the reactor, providing a huge decrease in reactivity.

This was accomplished by opening a pair of dump valves, permitting the hydraulic lift to drop by gravity. These were fast-acting, normally open solenoid valves, which would open automatically in the event of power failure, as well as in response to a signal from the control room. In addition, these valves could be opened manually from the control room by a chain hanging from the ceiling of the control room. This may have been a carryover of the "axe-and-rope" concept employed as a last-ditch shutdown of the original Fermi Pile under the West Stands in Chicago.

In addition to ensuring the absolute reliability of the reactor shutdown, there was added the absolute reliability of shutdown cooling, the removal of fission product decay heat. This was accomplished by natural circulation of NaK through the reactor and dissipation of the heat to the building. This system was activated in the primary NaK circuit by opening an air-operated valve backed up by a compressed-air storage system. This was a very noisy operation that could be heard throughout the building. It provided the signal that the reactor was completely shut down. Even with this very early experimental reactor, provisions were made to avoid a Three Mile Island–type accident.

EBR-I was unique in that, once it became operational, we ran only on a one-shift basis. We came to work at 8 a.m. and turned the reactor on. We went home at 4:30 p.m. and turned the reactor off. The shutdown operation included the positive shutdown of the reactor and the annunciation of cooling of the reactor. This was a reactor we could shut down and walk away from indefinitely, including weekends. The building was totally unoccupied. The reactor was left unattended.


Dec 20th 9:50 a.m.
Reactor cooling system connected in
On vibrating reed
Open to close of hole goes
from 62 to 4 1/2 ∴ 13.8 times
Pile levelled off at 250 Kw
at about 10:40 a.m.
Steam turbine and Generator
started running 11 a.m.
At 11:30 am. the turbine was
shut off and power level raised
at 12:42 Turbine again turned on.
at 12:55 pm power raised to 410 Kw
At 1:23 p.m. Load dissipators
from the Generator were
connected – Electricity flows from
atomic energy.

Handwritten notes of project director Walter Zinn from the day the EBR-I first produced nuclear-generated electricity (Source: ANL)

It was designed so conservatively that such action was permissible.

We had purposely designed the plant very conservatively. For example, I mentioned earlier that NaK reacts violently in contact with water. The steam generator, which had NaK on one side of the tube and water on the other side of the tube, was designed very conservatively. A concentric triple-tube arrangement was used so that the failure of one tube wouldn't put water and NaK in contact with each other.

I think that conservatism evolved from EBR-I, and I can assure you that as project manager of EBR-II that this same philosophy was used in the design of EBR-II as well.

*Was the EBR-I able to generate large amounts of electricity?*

No, just a couple hundred kilowatts. I believe the turbine generator was rated at 300 kW. That was larger than the building load. No provisions were made for delivering electric power from the building. The reactor was designed for about 1 MW thermal. It was run above that in some experiments, but it basically was a 1-MW reactor.

*What were some of the technical data gained from EBR-I's operation that was used for the design of future reactors?*

Number one is that fast reactors are controllable. Even though EBR-I was a unique design and a very small reactor, it did establish that fact. Before the EBR-I, there was uncertainty that a fast reactor would be controllable in the same sense that a thermal reactor is controllable.

Second was that the use of a liquid metal as a coolant was feasible and practical and could be handled.

Third, EBR-I demonstrated that breeding was not only a theory but could be practically achieved. EBR-I actually bred more plutonium than the U-235 it consumed, and, later, than the plutonium it consumed.

I should also mention that as a result of EBR-I producing this kind of information, the French, the British, and the Russians proceeded to build small reactors based on the confidence level that EBR-I generated by demonstrating those specific things. Even though details of the EBR-I were classified, the knowledge that it was built and in operation could not be kept secret.

We also learned some technical data that turned out to be very useful later in making fast reactors better. For example, EBR-I exhibited a small positive power coefficient under certain operating conditions. It was thought to be a thermal-mechanical problem, but a demonstration was needed to ensure that it was not a nuclear phenomenon. We ran some experiments that demonstrated that the positive power coefficient was caused by fuel elements bowing toward the center of the reactor due to temperature differential across the fuel tubes. That bowing made the reactor more compact and therefore increased the reactivity. That information was later applied universally in fast reactor design.

In the process of running those experiments, in fact, part of the EBR-I core was partially melted because one experiment was carried a little too far. That damaged core was removed and a new core was installed in which the fuel elements were prevented from bowing, and EBR-I then did not have a positive power coefficient.

All of this information was very useful to the entire technical community. For the design of EBR-II, we established a criterion that we would not permit inward mechanical bowing of the fuel. A unique design of the EBR-II's subassemblies was developed that specifically prevented bowing. Therefore EBR-II didn't have a positive power coefficient.

Later, we learned that it wasn't that difficult to accommodate moving parts in sodium-cooled reactors. All the reactors such as the EBR-II and those used in French, British, and Russian experiments have control rods that move in the reactor and in sodium.

*The EBR-I was built to generate data rather than electricity, so costs were never a factor, were they?*

I think the generation of electricity was kind of an add-on. We wanted to run the reactor at high temperatures because the liquid-metal coolant was capable of operating at these temperatures and thus capable of achieving more efficient operation than water-cooled reactors. It was a logical add-on to make some steam and generate electricity while we had high-temperature coolant available and an opportunity to demonstrate it.

Also, to be frank, we wanted to generate electricity because there were other organizations around the world that were looking at nuclear power and pursuing other paths for the demonstration of the generation of electricity. There was an informal race going on, just like there was in the aircraft business when Orville and Wilbur Wright were trying to fly an airplane. There were a lot of other people working on the same thing, so there was a sense of competition.

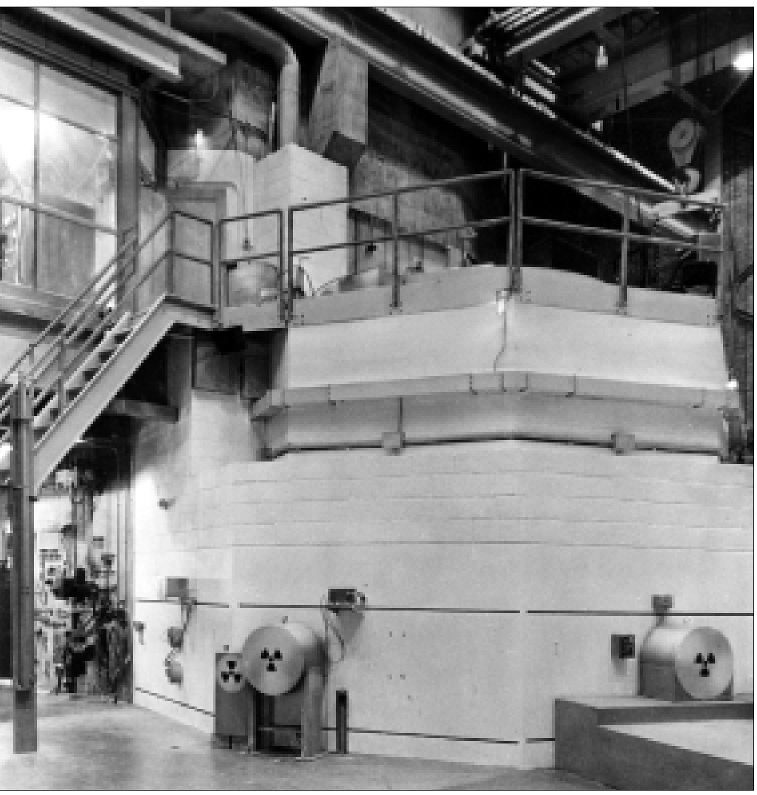
But the generation of electricity didn't add a lot to the cost. This was a fairly expensive machine in the sense that it was a very small reactor, but by today's standards, it was one of the big bargains of the 20th century.

*What were the costs of the EBR-I?*

I think it was less than $3 million to build the EBR-I and the facility that housed it, and another $3 million or less spent on R&D and running it. What was more unusual was that to this day I don't remember ever discussing budget. That was handled by Walter Zinn and Larry Hafsted, who was head of the Reactor Development Division of the AEC. Those of us working in the trenches were never concerned about budget. It was on such a small scale compared to something like the Manhattan Project, it just never entered the equation.

*When did the EBR-I produce electricity with a plutonium core?*

It was on November 27, 1962, but I was not there at the time. I stayed with the EBR-I about a year after that first electricity production in 1951. I wasn't an operator but a design engineer, so I was transferred back to Argonne and started working on EBR-II.



Historical photo of EBR-I reactor (Source: ANL)

*What kind of reactor design was the EBR-II?*

EBR-II was an engineering experiment as contrasted with EBR-I, which was a scientific experiment. The objective of EBR-II, which was built in Idaho, was to develop a concept of a power reactor system and fuel recycle system that could be scaled up to the size of a central power station. Certain operating and performance objectives were incorporated to achieve that goal.

These objectives included power density in the core of about 1 MW per liter of core volume; coolant velocity through the core of about 25 feet per second; reliability of reactor control and fission product decay heat removal; reliability and suitability of the refueling concept; and applicability of fuel recycle.

Of course, there were other objectives, such as the feasibility of the EBR-II's unique submerged primary system concept, and the operability of this reactor system as an electric power generation system. And perhaps most important, the feasibility of operating a liquid metal–cooled fast reactor on recycled fuel, a basic and essential requirement of fast breeder reactors.

The potential applicability of this experience to future power stations was demonstrated by more than 30 years of successful operation of EBR-II.

*The EBR-I was declared a registered national monument. Was there a certain amount of pride in that for you?*

Yes, there certainly was, and is. Lyndon Johnson was president of the United States at the time, and Glenn Seaborg was the chairman of the AEC. The two of them with their screwdrivers put the sign on the wall declaring it a national monument. It was quite a thrilling experience for me. I was working in Illinois then, but I came out to the site in Idaho for that occasion.

*After the success of the EBR-I, were all of you who worked on the reactor thinking of what would come next?*

Yes, a lot of people at Argonne started thinking about the next step after EBR-I. We recognized that EBR-I was a proof-of-principle scientific experiment. It wasn't an engineering experiment by any means. We would never take the EBR-I design and make it a thousand times larger to make it a power reactor. We knew a power reactor would require an entirely different approach and we started thinking about that. We were thinking in terms of different kinds of fuels, etc. So when I went back to Illinois, Zinn gave me the job of trying to coordinate all the ideas that were being thought about in the different divisions in the laboratory.

That process went on for two or three years until these ideas began to gel more specifically. I had the job of coordinating the ideas and issuing progress reports.

When the thinking got to the point where it looked like we might have another reactor, I was made project manager and we began the formal process of design and construction of EBR-II. I stuck with the EBR-II until it went into operation in 1964.

My job was to get the EBR-II developed, designed, and constructed. Then the Idaho division took over the operation of the plant. I then was appointed director of the Reactor Engineering Division in Illinois, where we performed research and development to advance reactor technology. But when I realized the government wasn't going to build any more experimental power reactors, I left Argonne to join the private side of the nuclear power industry. For me, developing new reactors was the fun part of the job and the best part of my professional career. NN