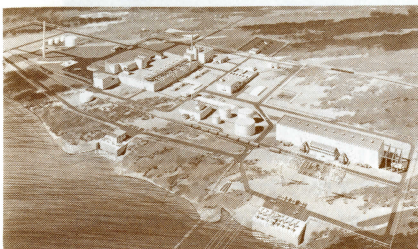


N-REACTOR

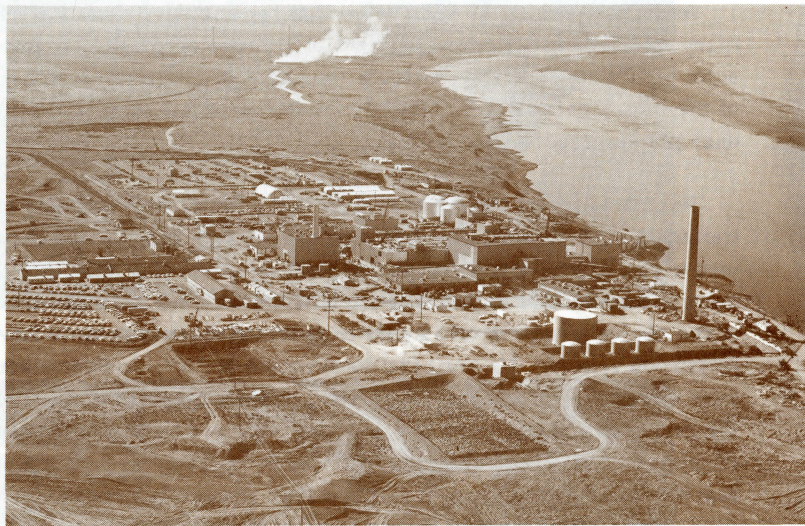
FROM CONCEPTION



- **Nation's First Dual Purpose Reactor**

- **World's Largest Power Producing Reactor**

TO REALITY

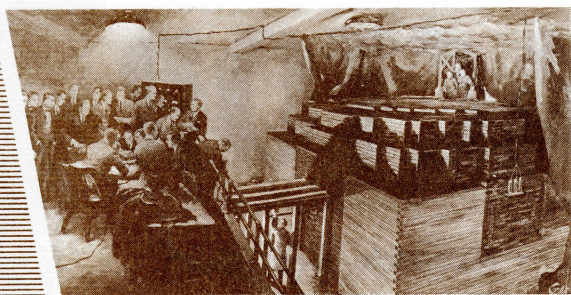


N-REACTOR DEPARTMENT

HANFORD ATOMIC PRODUCTS OPERATION

GENERAL  ELECTRIC

A PRIME CONTRACTOR FOR
THE ATOMIC ENERGY COMMISSION



CHICAGO PILE

DECEMBER 2, 1942

21 YEARS OF PROGRESS IN ATOMIC ENERGY



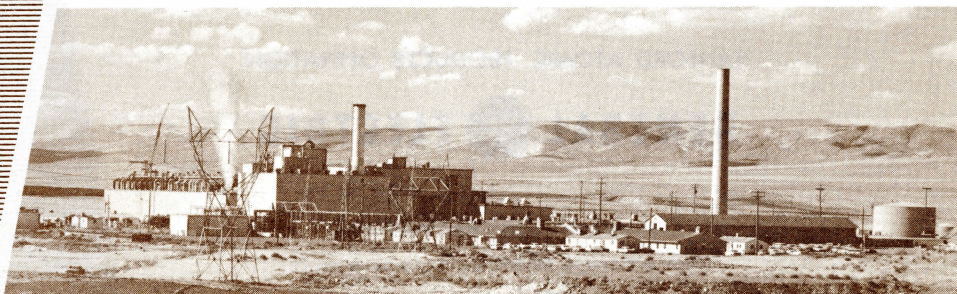
On December 2, 1942, a scientific team headed by Dr. Enrico Fermi successfully achieved the world's first controlled nuclear chain reaction. It was achieved in a hand-constructed, graphite pile erected in secrecy in a converted squash court underneath the football stands at the University of Chicago.

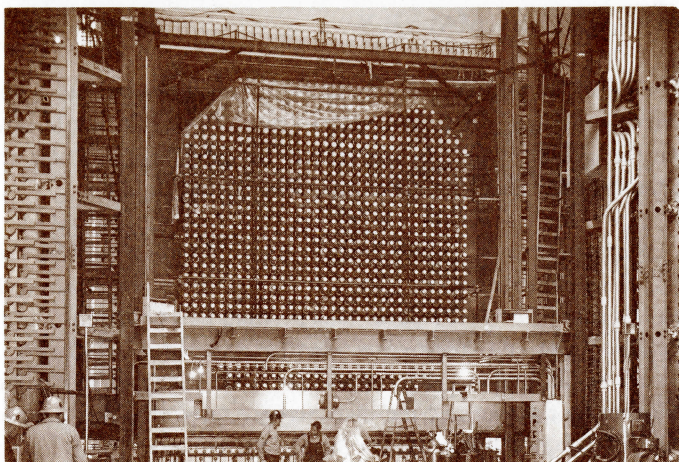
In the intervening 21 years since that historic day, there have been many milestones in the development of atomic energy and nuclear reactor technology. Today, you are looking at the latest and perhaps one of the most significant of these--Hanford's giant N-Reactor--the first dual-purpose reactor in the Nation.

Nuclear reactors today, aside from those being used for research or training purposes, are used for one of two primary functions. They are used either as production reactors to produce plutonium and other nuclear materials or as power reactors to convert the tremendous heat of the nuclear reaction into steam to generate electricity or to drive a propulsion system. Up until the construction of "N", nuclear reactors were designed with one, and only one, of these purposes in mind for the design considerations of the two vary widely. N-Reactor, however, is unique. It has been designed so it can be operated as both a production reactor and as a power reactor--either separately or at the same time. No other reactor in the country has this flexibility.

N-REACTOR

DECEMBER 8, 1963





N-REACTOR'S FRONT FACE IS STUDDED WITH 1,004 PROCESS TUBES. FUEL ELEMENTS ARE INSERTED INTO THE PROCESS TUBES. DURING OPERATION WATER FLOWS THROUGH THE TUBES AROUND THE FUEL ELEMENTS KEEPING THEM AT DESIRED TEMPERATURE. HEAT PICKED UP BY THE WATER PRODUCES STEAM IN THE STEAM GENERATORS, WHICH CAN THEN BE PIPED TO THE POWER GENERATION FACILITY.

N Means New

The N-Reactor is a gigantic atomic energy endeavor introducing many of the latest advancements in nuclear technology.

A brief review of some of its firsts and significant features reveals that it is or will be incorporating:

- One:** First United States dual-purpose reactor (production of weapons plutonium and by-product electrical energy).
- Two:** Largest power reactor in the world (800-860 thousand kilowatts) nearly one-half the output of Coulee Dam, more than the capacity of Bonneville Dam, about the capacity of McNary.
- Three:** First large scale use of carbon steel piping for high pressure recirculating reactor cooling system.
- Four:** First use of zirconium, an exotic metal of the future, for large heavy-wall process tubes in a production facility.
- Five:** First production use of zirconium clad coextruded metallic uranium fuel in high temperature, pressurized water.
- Six:** First use of "Controlled release" confinement system, a significant advancement in reactor safety.

It's In N

Concrete

110 thousand cubic yards, enough to build a sidewalk 3 feet wide, 4 inches thick from Richland, Washington to San Francisco.

Reinforcing Steel

11 thousand tons, enough steel to make 1/2" in diameter rod reaching from New York City to Tokyo.

Multi-Wire Electrical Cable

6 1/2 million lineal feet, equivalent to 1 wire from New York City to New Orleans.

Steam Generator Tubing

250 miles, enough tubing to reach from Richland to Seattle.

River Pumping Capacity

500 thousand gallons per minute, — enough water could be pumped in one day to supply the city of Richland (approx) population 25,000) for 2.5 years

Primary Pipe

2,500 tons, or equivalent to a 10 inch column of pipe 15 miles high.

Man Power

45 thousand man months, or the equivalent of one man for 3,700 years.

Generating Plant

Electrical generating capacity 800 thousand kilowatts, enough electricity each hour to supply the average American home for 50 years.

INSIDE THE REACTOR

Basically, a nuclear reactor is an atomic furnace in which the fissioning, or splitting of atoms of nuclear fuels can be controlled and put to useful work.

While the design of a nuclear reactor is actually exceedingly complex, there are certain basic elements that are needed in the construction of any reactor.

Fissionable uranium - To keep the chain reaction going and to produce heat; this is the fuel supply.

Moderator - To slow down the neutrons freed by fission to manageable speeds so that they will split an atom rather than glance off its surface. Water or graphite is commonly used.

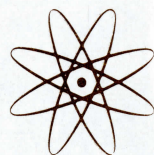
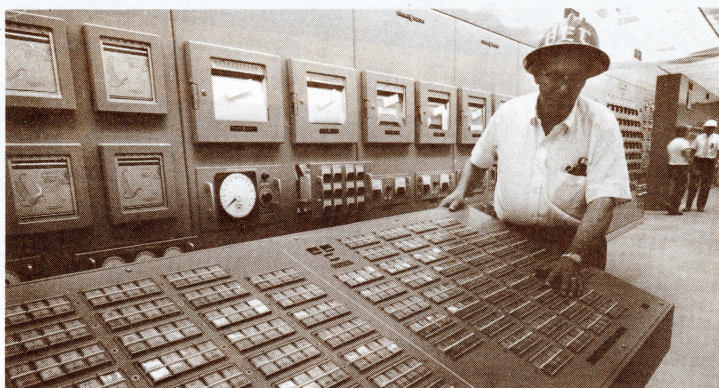
Control rods - To absorb some of the free neutrons given off by the chain reaction process. These rods, made of a neutron-absorbing material, are inserted in the reactor or withdrawn to keep the chain reaction going at the desired rate.

Coolant - To carry off the tremendous heat produced by the fissioning atoms and to use it to change water into steam. Water, compressed gases, or liquid metals can be used here.

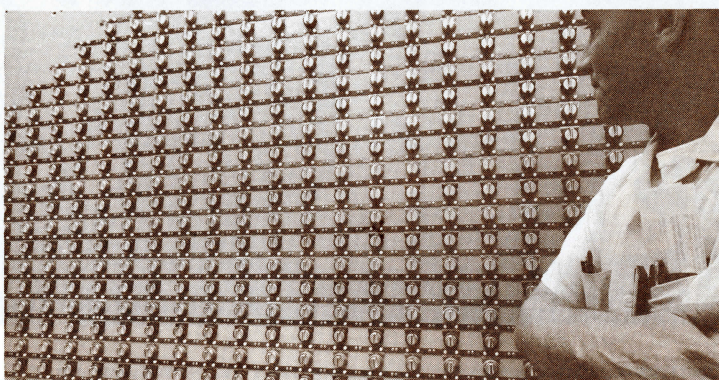
As the coolant passes around and through the reactor core, it picks up the heat given off by the fissioning uranium atoms. The heated coolant is piped off to a heat exchanger where it turns the water in a secondary system of pipes into steam. The steam, in turn, can then be piped to a turbine generator for the production of electricity or simply "dumped" as a waste product.

Shielding - To stop radiation--stray neutrons, particles of matter, and waves of energy given off by the radioactive uranium.

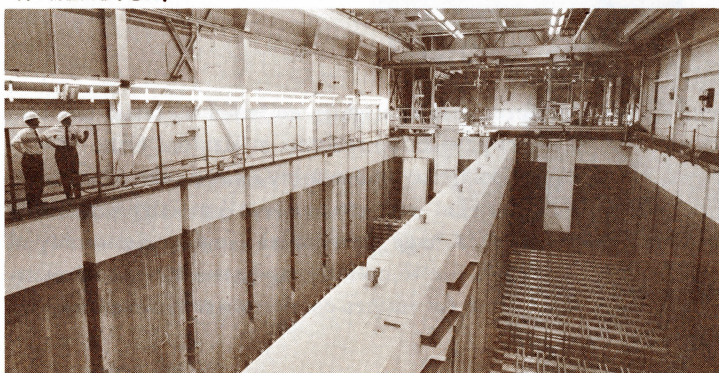
Put these elements together and you have a simple nuclear reactor.



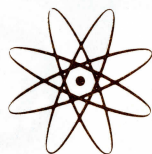
PORTION OF HANFORD'S N-REACTOR MAIN REACTOR
CONTROL CONSOLE.

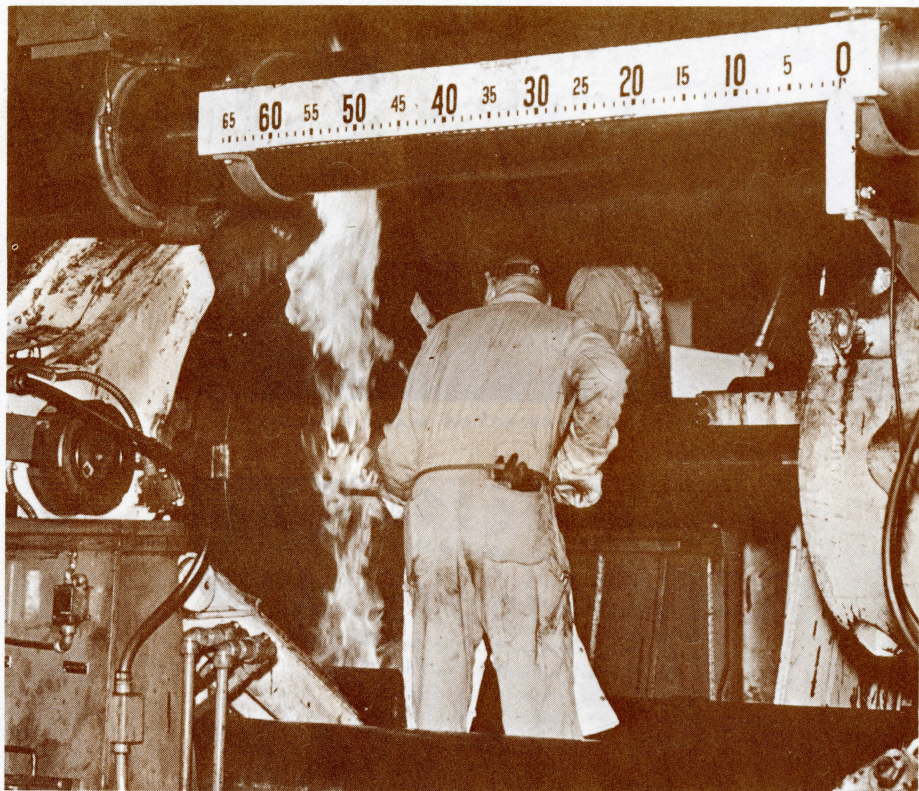


DIVERSION VALVE CONTROL PANEL FOR HANFORD'S
N-REACTOR.



STORAGE BASIN FOR IRRADIATED FUEL ELEMENTS AT
HANFORD'S N-REACTOR. IRRADIATED FUEL IS STORED
PRIOR TO SHIPMENT UNDER ABOUT 20 FEET OF WATER
IN BASIN IN FOREGROUND.





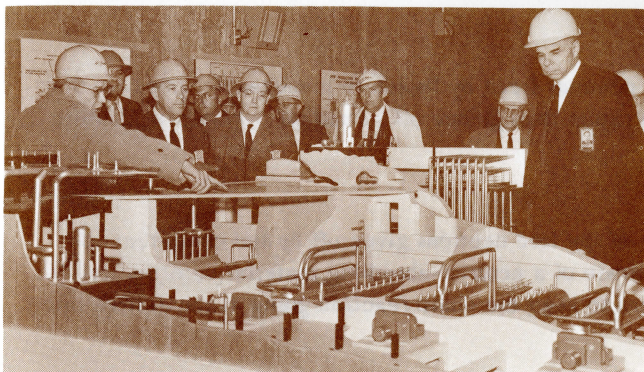
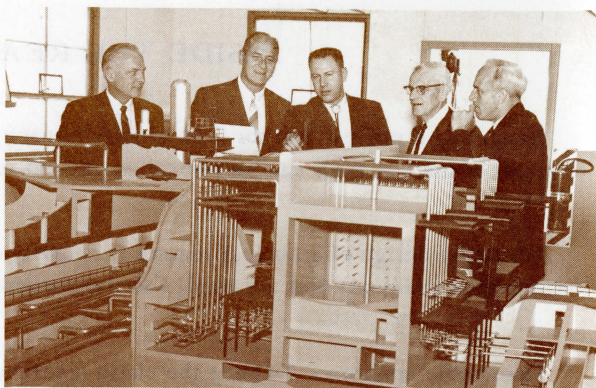
A 2750 TON CO-EXTRUSION PRESS, LARGEST IN THE NORTHWEST, IS USED IN CO-EXTRUDING UNIQUE N-REACTOR FUEL ELEMENTS.

FUEL

The basic fuel ingredient for N-Reactor will be slightly enriched metallic uranium. There the similarity with fuel of other production reactors at Hanford ends. N-Reactor fuel elements are longer and comprise an assembly of two tubular fuel elements, one inside the other. They are clad with zirconium alloy, highly resistant to corrosion in high temperature water. A huge press forces a massive assembly of heated uranium and zirconium through a die to create long bars of precise dimensions, requiring a minimum of operations for further conversion to finished fuel element.

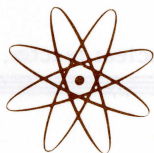


GOVERNOR ALBERT D. ROSELLINI. SECOND FROM LEFT, VISITS N-REACTOR SITE. WITH HIM AROUND MODEL OF N-REACTOR ARE R. E. ROSE, LEFT, STATE DIRECTOR OF COMMERCE AND ECONOMIC DEVELOPMENT AND, HANFORD MANAGERS J. E. TRAVIS, AEC, SECOND FROM RIGHT, AND W. E. JOHNSON, G. E., RIGHT.



CHAIRMAN OF THE ATOMIC ENERGY COMMISSION GLENN T. SEABORG, RIGHT, AND SENATOR HENRY M. JACKSON, THIRD FROM LEFT, VISIT REACTOR.

THE LATE PRESIDENT JOHN F. KENNEDY VISITED N-REACTOR SITE TO DEDICATE POWER GENERATION FACILITY ON SEPTEMBER 26, 1963.



IN SUMMARY

The entire N-Reactor Project has had the best engineering and technical brain power in America behind it from its conception nearly 10 years ago by General Electric scientists and engineers. From the conceptual stages the Project has grown until it now comprises a Hanford Product Department under the direction of R. L. Dickeman.

After winning out in competition with reactor designs submitted by other AEC contractors, Congress authorized its construction in 1958. It was to be designed primarily to produce plutonium but was also to be designed so that it could be converted to a dual purpose role. As construction began, the question of whether N-Reactor would ever, in fact, actually be converted was left unanswered. It was not until 1962, when Congress passed the enabling legislation that authorized the dual purpose role, that this question was finally answered. The Washington Public Power Supply System is to construct and operate the adjacent power generating facilities that will not only make "N" in actuality the nation's first dual purpose reactor, but will make it the largest power producing reactor in the world.

N-Reactor will be a distinct asset to National prestige, to the Country's defense, to the furtherance of peaceful applications of atomic energy, and to the economy of the Northwest and the Nation. Aside from producing plutonium, the reactor also has impressive capability for producing other nuclear materials for space, research, and industrial needs. In addition, the N-Reactor design and related technology developed by General Electric have been extended to conceptual designs for future nuclear plants which are expected to be of great importance in the development of the National Nuclear Energy Program.

MAJOR DESIGN AND CONSTRUCTION CREDITS:

Design of Reactor and Reactor Building	General Electric Company
Design of Steam Generation Plant and Auxiliary Services	Burns and Roe, Inc.
Construction Contractor	Kaiser Engineers

PLANT OPERATION

N-Reactor Plant	General Electric Company (for U. S. Atomic Energy Commission)
Electrical Power Generation Plant	Washington Public Power Supply System
