Fig. 17c

YIELD OF TRANSPLUTONIUM ISOTOPES RESULTING FROM HIGH-FLUX THERMAL NEUTRON IRRADIATION OF ^{252}Cf

FLUX = 1×10^{16} n / cm^2 / sec

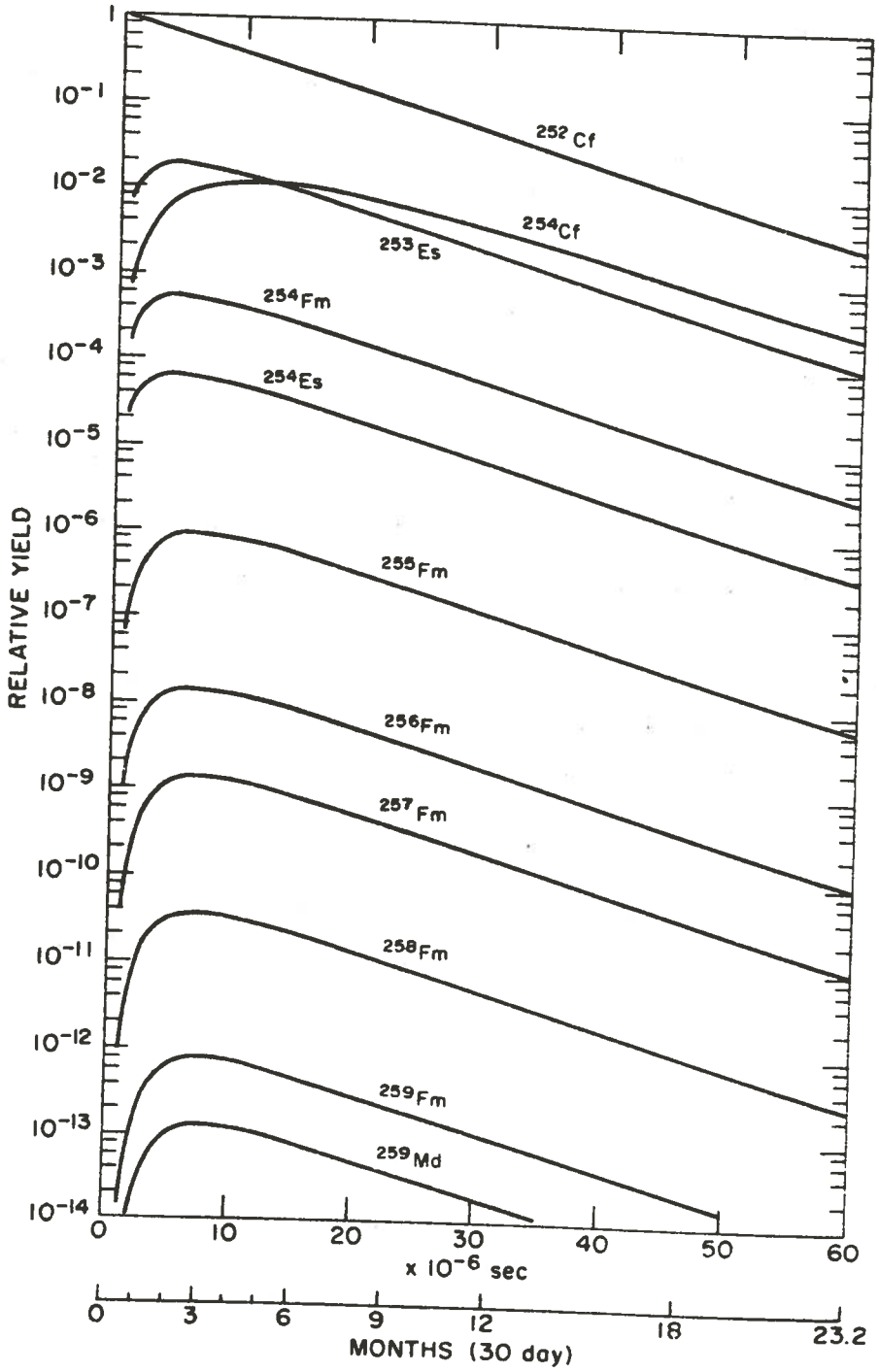
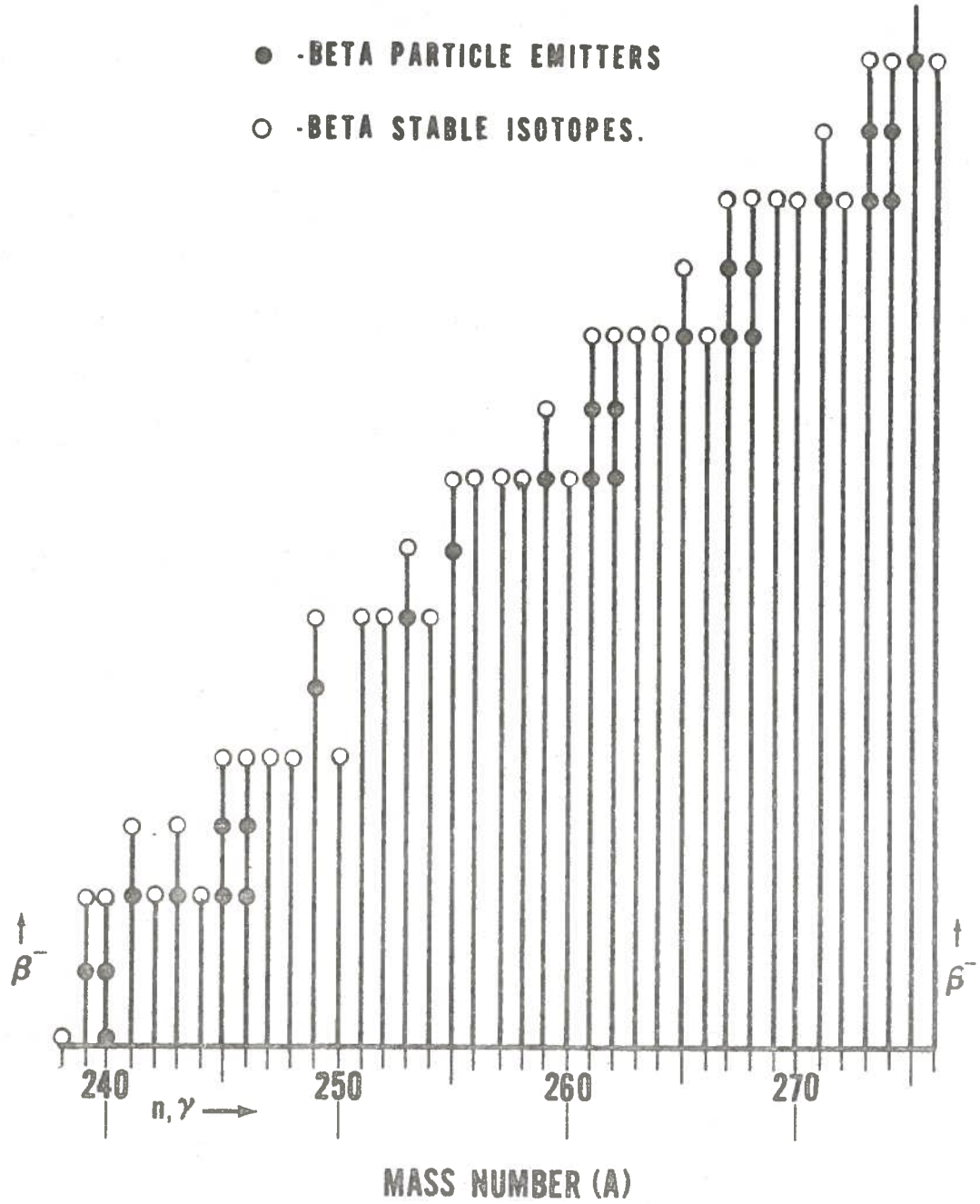


Fig. 18

ATOMIC NUMBER (Z)		
106		273, 274, 275, 276, etc.
105		271, 273, 274
104		267, 268, 269, 270, 271, 272, 273, 274
103	Lr	265, 267, 268
102	No	261, 262, 263, 264, 265, 266, 267, 268
101	Md	259, 261, 262
100	Fm	255, 256, 257, 258, 259, 260, 261, 262
99	Es	253, 255
98	Cf	249, 251, 252, 253, 254,
97	Bk	249
96	Cm	245, 246, 247, 248, 250
95	Am	241, 243, 245, 246
94	Pu	239, 240, 241, 242, 243, 244, 245, 246
93	Np	239, 240
92	U	238, 240



ISOTOPES PRODUCED IN UNDERGROUND NUCLEAR EXPLOSIONS

Fig. 10

POTENTIAL NUCLEAR REACTIONS ^{257}Fm

(n,γ) ^{258}Fm
(d,n) ^{258}Md
$(d,2n)$ ^{257}Md
(t,p) ^{259}Fm
(t,n) ^{259}Md
(α,n) $^{260}102$
$(\alpha,2n)$ $^{259}102$
(n,p) ^{257}Es

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D. C. 20545

OFFICIAL BUSINESS

POSTAGE AND FEES PAID
U.S. ATOMIC ENERGY COMMISSION

PI101568289003614 J-01

CLICK RELANDER
CITY EDITOR
THE YAKIMA HERALD-REPUBLIC
YAKIMA WA 98901

NEWS RELEASE

AEC

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

NOTE TO EDITORS AND CORRESPONDENTS:

Attached for your consideration and possible use is the fourth of a series of articles on major AEC installations and laboratories.

We plan to provide an article on an AEC installation or laboratory on an approximately once-a-month basis until a total of nine or ten major AEC sites is covered. Each article will be appropriately illustrated by one or more multilith prints supplied for your use. If your publication requires glossy prints you should write to Elton Lord, Deputy Chief, Audio-Visual Branch, Division of Public Information, U. S. Atomic Energy Commission, Washington, D.C. 20545.

We hope you find the articles of interest. We would appreciate your comments and/or a tear sheet on any use you may make of the material.

John A. Harris, Director
Division of Public Information

AEC

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

No. FS-4-68
Tel. 973-3335 or
973-3446

For release on or after
May 12, 1968.

Editor's Note: The Atomic Energy Commission, charged by Congress with the development and control of the Nation's nuclear energy program, owns an $8.7 billion complex of laboratories, production, manufacturing and testing plants and equipment scattered throughout the country. This series of articles describes some of the work done and under way at these installations and how it relates to individual citizens today.

Argonne, Illinois--In the Fall of 1965, a power failure totally blacked out the Northeastern part of the United States and the Southeastern portion of Canada. For many hours, residents of the stricken area experienced, probably for the first time, life without electrical power. None will forget that period in which virtually nothing functioned; it was a dramatic example of the nation's complete dependence upon electricity.

The nation's -- and the world's -- need for power appears insatiable. Each year brings new devices and new processes which drink up electricity. At present, a large percentage of the power produced in this country comes from utility plants using the fossil fuels - coal, oil, and gas.

Other aspects of our civilization make additional demands on supplies of fossil fuels. Heating our homes and factories, fueling our jet planes and our automobiles -- these and hundreds of other needs require oil and gas and coal.

(more)

In spite of all this, there need not be a future energy crisis.

On the desert land 50 miles west of Idaho Falls, Idaho, near the eastern edge of a 460,000-acre site owned by the Atomic Energy Commission, stands a silver-domed nuclear power reactor. It is called Experimental Breeder Reactor II, and it was designed and is operated by the AEC's Argonne Illinois National Laboratory. Argonne conducts research in the peaceful uses of nuclear energy and seeks to develop devices which continue to make the atom a servant of mankind.

Experimental Breeder Reactor II (EBR-II) is contributing to the technology of future breeder reactors because this reactor type "breeds" more fuel than it consumes -- at the same time it is producing power. Even more important, the breeder reactor can convert our plentiful supply of uranium-238 into plutonium-239, the isotope of a man-made element which is an excellent fuel for reactors. As Dr. Glenn T. Seaborg, Chairman of the Atomic Energy Commission and co-discoverer of plutonium, has pointed out, "The significance of the 'breeder' technology is that, even in view of today's increasing demand for electricity, it offers promise of meeting our electric power needs for centuries -- perhaps thousands of years -- to come."

EBR-II is an experimental facility. It was built to discover and solve the problems involved in the operation of this advanced kind of reactor, now being used as a fast flux test reactor for the high-priority Liquid Metal Fast Breeder Reactor Program.

(more)

(EBR-II differs in many important respects from the "atomic furnaces" which now are supplying electricity in many parts of the United States. Today's reactors are much less efficient in their use of available fuel supplies.)

Reactor engineers are confident the "breeder" reactor will be perfected and available for commercial use before it becomes necessary to make use of both high cost fossil fuel and uranium reserves.

EBR-II represents only one of many dramatic uses of nuclear power developed by Argonne National Laboratory.

On July 17, 1955, history was made at Arco, Idaho, a small town near the National Reactor Testing Station. On that date, the lights of Arco blazed forth as usual when evening came -- but there was a difference, even though not apparent. For the first time in man's history, the energy which provided Arco's illumination came from a nuclear reactor. Earlier, in 1951, Experimental Breeder Reactor No. 1 at the Idaho facility produced 100 kilowatts of power for a short time. The power generation phase was incidental to obtaining information on breeder reactor technology.

The 1955 "atomic furnace," designed by Argonne personnel, was called Borax III. It was one of several experimental reactors which led to the construction of the Experimental Boiling Water Reactor, the first experimental complete atomic power plant to go into operation. Today, many of the huge reactors producing power for private utility companies both here and abroad exist because of the lessons reactor engineers learned through the design and operation of Argonne's Experimental Boiling Water Reactor.

(more)

These reactors represent only one facet of Argonne's diversified efforts to serve the nation. The development of reactors is a prime objective of the Laboratory, but Argonne also devotes major attention to other activities in a never-ceasing drive to increase man's knowledge of the world in which he lives.

To accomplish these tasks, Argonne employs a total of 5,700 persons at its main site near Chicago and at its Idaho site. The Idaho Division operates EBR-II and three other reactors at the AEC's National Reactor Testing Station. About 1,350 Laboratory staff members are scientists and engineers; the remainder carry out supporting tasks.

Work goes on in the fields of applied mathematics, biology, chemical engineering, chemistry, metallurgy, physics, high energy physics, radiological physics, reactor engineering, remote control engineering, solid state science, and electronics.

In one large complex of buildings on the Argonne site, scientists are able to send subatomic particles, much too small to be seen by the naked eye, racing around a ring under the control of huge magnets. When the particles have attained very high speeds (which may be near the speed of light) they can be sent crashing into targets in the almost unbelievably complicated process of studying the "building blocks" of our physical world. The machine which accomplishes this is a 12.5-billion-electron-volt atom smasher called the Zero Gradient Synchrotron (ZGS).

(more)

The ZGS provides high energy physicists with a huge "microscope" with which to study the subatomic world; it has brought highly qualified scientists to Argonne from all over the world; it has strengthened the science departments of Midwestern universities by attracting to their faculties many high energy physicists, and it provides a new opportunity for their graduate students in this exciting field of science.

Today, nuclear scientists and engineers work routinely with radioactive materials. They utilize heavily-shielded enclosures called "hot" cells and handle materials through the use of manipulators -- mechanical or electronic devices which allow an operator standing outside the cell to duplicate his hand movements within the enclosure. In one"hot" cell at Argonne, the manipulators are supplemented by slave robots which can travel about inside the cell and move heavy objects or make repairs to equipment. The robots are controlled electronically from outside the cell, as are the "mules" (small carts) which run on tracks within the enclosure to transport bulky or heavy equipment.

Remote control devices such as these were pioneered by Argonne, and their development represented a major contribution to progress in utilizing the peaceful atom. The initial research and development having been accomplished, such equipment now is designed and built by private firms, and Argonne, following usual AEC practice, has reduced its efforts in this field.

In the realm of basic research Argonne scientists helped provide one of the most dramatic achievements in the history of science. For more than 60 years, chemists believed that the noble gases -- helium, neon,

argon, krypton, xenon, and radon -- would not enter into chemical combination with other elements or with each other. It was thought that all other elements would form chemical compounds, but the noble gases would not.

Then, in 1962, a team of Argonne chemists, using a clue provided by a British chemist working in Canada, created xenon tetrafluoride; noble gases had combined, and every high school and college chemistry textbook in existence had to be revised.

Other Argonne pioneering achievements in the realm of basic research include:

--Key contributions to the shell model of the nucleus of the atom in all phases of its development -- initial formation, application, and complete automation of calculations.

--Discovery and analyses of the roles of the hydrated electron and other short-lived fragments studied in radiation chemistry.

--Research in "isotopic substitution" in organic compounds, including the first complete substitution of deuterium for ordinary hydrogen in living organisms.

These are only a few of the "firsts" which Argonne scientists and engineers have contributed to the welfare of society, and the big nuclear energy research facility continues to serve the scientific, academic, and industrial communities in countless ways.

All information produced at Argonne is made available through articles in scientific and technical journals and through the reports distributed by the Technical Information Division.

(more)

As still another means of sharing this information, Argonne scientists open the doors of their offices and laboratories to science-oriented visitors from the United States and abroad.

Especially vital is Argonne's eagerness for interaction with the academic and industrial communities. The Laboratory seeks to share the knowledge and skills of its staff -- and its advanced facilities and equipment -- with those who can both contribute to the work at Argonne and benefit from their participation in Laboratory programs.

And so, on any given day, a visitor will find at Argonne the following representatives of colleges and universities: faculty members; young men and women who have just obtained their Ph.D. degrees and wish further experience in the field of nuclear energy; young people working toward advanced degrees; and undergraduates working as student aides.

Laboratory officials emphasize three aspects of this interaction with the academic community: 1. Argonne is not a degree-granting institution, and work toward an M.A. or Ph.D. is carried out under the sponsorship of the student's university; 2. Argonne benefits from the input of new ideas and fresh enthusiasm contributed by the faculty members and students who temporarily join its staff; and 3. university professors frequently come to Argonne to present seminars on their special fields of investigation, and Laboratory personnel offer seminars on university campuses. (Many Laboratory staff members hold appointments on university faculties in addition to their association with Argonne.)

Management of the Laboratory has been arranged to give maximum emphasis to the interaction between Argonne and the academic community. On Nov. 1,

(more)

1966, a tri-partite contract went into effect involving the AEC, Argonne Universities Association (AUA), a corporation in which 26 universities hold membership, and The University of Chicago.

Under the contract, which is administered by the AEC's Chicago Operations Office, Argonne's programs and policies are formulated, approved, and reviewed by AUA. In accordance with these policies, the University of Chicago operates the Laboratory. Argonne's programs are funded by the AEC, which owns all of the Laboratory's land, buildings, and equipment.

The Laboratory makes information available to industry through its Office of Industrial Cooperation (OIC). The OIC staff combs Laboratory programs for data which can be useful to industry and then transmits the information through special reports, by encouraging businessmen to visit Argonne, and through talks to business groups.

A visit to Argonne reveals an exciting picture of scientists and engineers working at the frontiers of human knowledge and skills; seeking information about subatomic particles; studying the metals which must be formed into reliable and efficient components of nuclear reactors; probing the ways in which the atmosphere copes -- or fails to cope -- with the pollutants which are the by-products of our way of life; perfecting our knowledge of reactor technology and building the machines which will provide power for our grandchildren and great grandchildren; finding new ways to use computers in solving scientific problems; and using radioactivity as a tool in adding to our understanding of life processes.

(more)

Argonne traces its origin to CP-1, the first pile -- the instrument with which Nobel Prize Winner Enrico Fermi and his colleagues created the world's first self-sustaining, controlled, nuclear chain reaction. This event took place under the football stands at the University of Chicago on December 2, 1942, at 3:36 p.m., and ushered in the Atomic Age.

The wartime code name, Metallurgical Laboratory, was used for the secret CP-1 project. In 1946, Congress established the Atomic Energy Commission, and the AEC, in turn, converted the Metallurgical Laboratory facilities into Argonne National Laboratory, enabling many of the "Met Lab" staff to continue their efforts to master the atom.

Argonne has enjoyed steady growth during the two decades of its existence. Today, its facilities and equipment are valued at more than $350,000,000 and its operating budget for research and development programs is over $83,000,000 for the 1968 fiscal year.

However, the greatest assets of the Laboratory are its 5,700 employees working together to expand our knowledge for the welfare of mankind.

#