

Atomic Energy and the Ohio River

THOMAS FRANK BARTON, Indiana University

Industrial growth in Indiana and other parts of the Ohio River watershed has been and continues to be stimulated by the development of atomic energy. Within a 250-mile radius of Cincinnati alone is almost 70 per cent of the Atomic Energy Commission's planned development east of the Mississippi River. Government-owned plants at the following towns and cities will represent an investment of over 4 billion dollars¹: Paducah, Kentucky; Portsmouth, Miamisburg, Fernald, Luckey and Cleveland, Ohio; Oak Ridge, Tennessee; Pittsburgh, Pennsylvania; and Dana, Indiana.

Gaseous Diffusion Plant Sites

Of the three plant sites the Semiannual Reports published by the Atomic Energy Commission give the criteria used in selecting the second and third sites at Paducah and Portsmouth but not of the first at Oak Ridge, Tennessee.

Paducah plant site. The Paducah plant is located on a 5,000-acre tract including the 1,400 acres formerly occupied by the Kentucky Ordnance Works. This tract is 16 miles west of the city. Primary factors in selecting this site were²: 1. "for reasons of speed and economy the search was confined to tracts owned wholly or partially by the Government"; 2. availability of fuel and water for large new power plants; 3. availability of substantial amounts of power during construction of new power plants and 4. sufficiently level land for large scale construction. Some available government-owned land was too rough. The land of the Kentucky Ordnance Works was not only sufficiently level but the government owned 1,400 acres. Moreover, it had retained legal right to another 1,000 acres when operation was temporarily abandoned and some of the land reverted to private use after the Second World War.

However more important than legal right to the tract was its juxtaposition to the Ohio River—in volume the second largest river in the United States. Here was water in abundance—enough for the present and foreseeable future. For steam-electric power development the Ohio provides the greatest potential water supply of any river in the United States. Only the Mississippi below Cairo has a greater volume but this river does not have potential dam sites where water can be stored in huge reservoirs for use during the summer and fall or other low water periods.

Furthermore the navigable Ohio and its tributaries provide an artery for cheap barge transportation between the two largest and richest coal fields in the United States and the proposed steam-electric plants now under construction along its banks.

In addition, the great TVA power system is conveniently located to

1. Personal letter from R. W. Cook, Assistant General Manager for Manufacturing, United States Atomic Energy Commission, Washington 25, D. C. June 1, 1954.

2. *Semiannual Report of the Atomic Energy Commission*. United States Government Printing Office, Washington, D. C. January, 1951, pp. 4 and 5.

supply over half of the energy needed when this second diffusion plant at Paducah is in full operation.

Portsmouth plant site. In a news release of the United States Atomic Energy Commission dated August 13, 1952, the second paragraph reads as follows:

"Funds for the project were made available for Public Law No. 547 signed by the President on July 15. However, locations had been studied for many months. The potential availability of power at reasonable cost in quantities needed for operation of the plant and the availability of water were important factors in selecting the site."

Plant sites on the Ohio watershed. The location of these three plants on the Ohio watershed becomes more significant when we recognize that each one was built in succession after the former proved the wisdom of its location. The choice of the Paducah and Portsmouth sites was made after an announced program for the dispersment of atomic energy plants throughout the United States. It was also made after the building of the major facilities for the production of fissionable materials had centered³ at the Hanford Plutonium Works located on the Columbia River in Washington just above the junction of the Yakima and Columbia rivers. Just like in 1948, when the following statement was published, the Commission today attempts to disperse plants:

"Today, at the close of 1948, fissionable-materials production extends into at least 15 states of the Nation from coast to coast. It is carried on in 30 separate plants at 25 locations. . . ." ⁴

But factors of water supply, electric energy, cheap water transportation and terrain cannot be ignored.

These three plants costing \$3,727,500,000 represent approximately 90 per cent of the government's investment in atomic energy development in the Ohio watershed.

Steam-Electric Plants

Energy need. It is difficult for the layman to visualize the amount of energy needed to run the Oak Ridge, Paducah and Portsmouth plants at full capacity. The amount is estimated by the Commission at 47,221,346 MWH (million kilowatt hours). This is more than the total amount of electrical energy produced in France or Federated Germany (West) or Japan in 1950. It is an amount greater than the combined 1950 production of Norway, Sweden and Switzerland. In 1950, Canada's production was only 7.8 per cent greater and the United Kingdom's only 19.3 per cent greater than that needed for these three plants. Operating at full capacity they will use more energy in a year than that used in 1950 in the states of Illinois and Ohio.⁵

Sources of energy. This enormous amount of energy will be supplied from both private and public sources. Electric Energy, Inc., is building a

3. *Fifth Semiannual Report of the Atomic Energy Commission*. United States Government Printing Office, Washington, D. C. January, 1949, p. 2.

4. *Ibid.*

5. *Op. cit.* Letter from Cook and statistical materials enclosed.

plant at Joppa, Illinois, large enough to supply about three-eighths of the power needed for AEC's Paducah plant.⁶ The cost of plant and transmission lines is estimated around 197 million dollars. The rest or five-eighths of the electric power for the Paducah plant will be supplied from the TVA's Shawnee plant.

All the energy for the Portsmouth plant comes from the Ohio Valley Electric Corporation's two plants now under construction near Cheshire, Ohio, and Madison, Indiana. This corporation alone plans to spend about 371 million dollars for the two steam generating plants and transmission facilities. It is estimated that barging companies and coal suppliers will spend 44 million dollars on transport, to open new, or expand old coal fields to supply these two plants.

The Tennessee Valley Authority supplies power for the Oak Ridge plant. Information is not now available on what proportions of TVA-supplied power will come from hydro-electric and steam-electric generating capacity. Mr. R. W. Cook, Assistant General Manager for Manufacturing of the Atomic Energy Commission writes:

"The amount of coal that will be required to provide the Commission's electric power requirements at the three gaseous diffusion plants is estimated as follows:⁷

| | |
|-----------------------------|--------------------------|
| By TVA for Oak Ridge..... | 5,300,000 tons annually |
| By TVA for Paducah..... | 4,200,000 tons annually |
| By EEI for Paducah..... | 2,500,000 tons annually |
| By OVEC for Portsmouth..... | 6,300,000 tons annually" |

Consequently over 18 million tons of coal will be required to run these three plants annually at full capacity.

According to present plans most of this coal will be transported by barge. All the six million plus tons for the OVEC will be transported in this way. The TVA Shawnee and the EE Inc. Joppa plants will receive coal both by rail and barge. Both of these plants have large modern facilities for handling water-transported coal. The cheapness of water transport plus the smaller unloading space needed to handle millions of tons of coal a year by barge favor this type of transportation.

To understand what this potential increase in barge transportation will mean in stimulating business on and along the river we should recall that the greatest coal tonnage hauled on the Ohio in any one year was a little over 31.7 million tons in 1953.

Other Government-Owned Plants

Besides the plants at Oak Ridge, Paducah and Portsmouth, the government owns six additional ones which represent an investment of 283 million dollars.

Of these six the two most costly are at Dana, Indiana, and Fernald, Ohio. Material produced at the "atomic energy facility" near Dana is of

6. Op. cit. Letter from Cook and statistical materials enclosed.

7. *Ibid.*

vital importance to the operating schedules of the Commission's billion-dollar Savannah River Plant in South Carolina.⁹

In Fernald, Ohio, is located a complete integrated Feed Materials Production Center. Fernald is 19 miles northwest of Cincinnati. Here virgin uranium ores and concentrates are received. These raw materials are processed through a refinery, metal plant, rolling mill and fabricating plant to produce fuel elements for the nuclear reactors at Hanford on the Columbia and the Savannah rivers.¹⁰

From the standpoint of investment (in this group of six small plants) the two medium sized installations are at Miamisburg, Ohio, and Pittsburgh, Pennsylvania. In Miamisburg the Mound Laboratory is a research center specializing primarily in the fields of biology and medicines. Near Pittsburgh the Bettis Plant is a reactor development center.

The two smallest plants from the standpoint of money invested are at Luckey and Cleveland, Ohio. At Luckey, "the Brush Beryllium Company operates a plant for the production of beryllium, a material utilized in the construction of nuclear reactors. At Cleveland is a uranium feed material plant presently maintained at standby capacity. Materials formerly produced at Cleveland are now made at Oak Ridge, Tennessee, and at Fernald, Ohio."¹¹

In summary, the locations of the government-owned installations on the Ohio River watershed and the approximate plant and equipment cost of each upon completion of presently authorized construction is as follows:¹²

| | |
|--------------------------------|----------------------|
| Oak Ridge, Tennessee..... | 1,700,000,000 |
| Portsmouth, Ohio | 1,152,500,000 |
| Paducah, Kentucky | 875,000,000* |
| Dana, Indiana | 102,000,000 |
| Fernald, Ohio | 100,000,000* |
| Miamisburg, Ohio | 40,000,000 |
| Pittsburgh, Pennsylvania | 37,000,000 |
| Luckey, Ohio | 2,300,000 |
| Cleveland, Ohio | 2,000,000 |
| Total | 4,010,800,000 |

* On October 12, 1954, The Courier-Journal Washington Bureau reported that an additional seven million dollars had been authorized for expansion of the facilities at the Paducah plant and an estimated 20.1 million expansion is to be made at the Feed Material Production Center at Fernald, Ohio.

The Shippingport Plant

"On October 22, 1953, the Atomic Energy Commission announced . . . that it had embarked on a project to construct a full-scale power reactor

9. Atomic Energy Commission Newspaper Release 7:00 a. m. Thursday, January 17, 1952.

10. Personal letter from R. W. Cook, Assistant General Manager for Manufacturing, United States Atomic Energy Commission, Washington, D. C. August 4, 1954.

11. *Ibid.*

12. *Op. cit.* Personal letter from Cook dated June 1, 1954.

to produce a minimum of 60,000 KW of electrical energy and invited participation from private industry."¹³ In the same announcement the Commission disclosed it was considering the possibility of locating this first reactor at or near one of the gaseous diffusion plants. According to the Atomic Energy Commission the following criteria would influence the selection of a site (numbering is by the author and does not indicate priority of criteria):¹⁴

1. "In addition to normal criteria for selecting a satisfactory low cost site for any large industrial plant, the selected reactor design will require a location with an adequate supply of suitable condensate cooling water.
2. "Although the reactor is of an inherently stable type it is not considered desirable to locate it immediately adjacent to large population or complex industrial areas.
3. "The site would have to be so located that intermittent power in large amounts could be sold, absorbed or otherwise disposed of.
4. ". . . that the attractiveness of proposals involving private financing for the steam and electric generating portions of the plant and for operating the plant would considerably influence the decision on the plant site."

The location of America's first commercially operated atomic power plant in Shippingport, Pennsylvania. This hamlet is located 34.0 miles below Pittsburgh on the left bank of the Ohio River. The plant site is 2.5 miles upstream of Dam 7 and 2.3 miles downstream of Montgomery Dam. The present Dam 7 will be eliminated upon completion of the New Cumberland Dam at mile 54.4 below Pittsburgh. Then the atomic power plant will be accessible to the new pool of water formed by the high permanent New Cumberland Dam.¹⁵

How does Shippingport measure up to the criteria announced for the selection of the site? It meets the first by being located on the Ohio where there is an adequate supply of suitable cooling water. It meets the second and third by being 34 miles from Pittsburgh, consequently it is both far enough away not to endanger this city and its factories, yet close enough so that the electricity may be marketed in the Pittsburgh area. And Shippingport was a logical choice once the Duquesne Light Company and Westinghouse made the best offer from among the private companies willing to join the government in this undertaking.

The criteria used in selecting the site for this plant again demonstrate the importance of the Ohio River in developing atomic energy.

13. Fact Sheet on the New Power Reactor prepared by Atomic Energy Commission.

14. *Ibid.* p. 3.

15. Personal letter from Colonel W. W. Wilson, Executive Officer, Corps of Engineers, Ohio River Division, October 27, 1954.