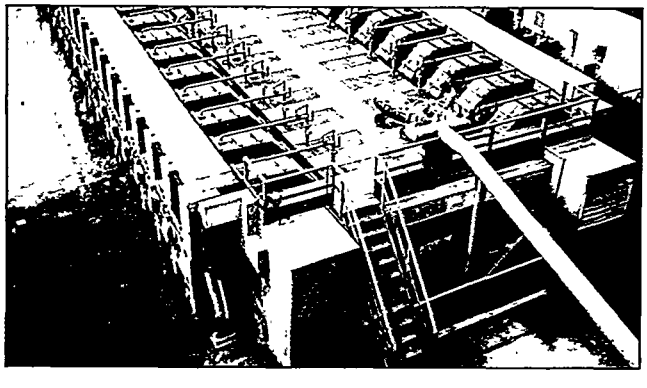
Design Changes at Y-12

Lawrence and his colleagues continued to look for ways to improve the electromagnetic process. Lawrence found that hot (high positive voltage) electrical sources could replace the single cold (grounded) source in future plants, providing more efficient use of power, reducing insulator failure, and making it possible to use multiple rather than single beams.[33] Meanwhile, receiver design evolved quickly enough in spring and summer 1943 to be incorporated into the Alpha plant. Work at the Radiation Laboratory picked up additional speed in March with the authorization of the Beta process. With Alpha technology far from perfected, Lawrence and his staff now had to participate in planning for an unanticipated stage of the electromagnetic process.

While the scientists in Berkeley studied changes that would be required in the down-sized Beta racetracks, engineering work at Oak Ridge prescribed specific design modifications. For a variety of reasons, including simplicity of maintenance, Tennessee Eastman decided that the Beta plant would consist of a rectangular, rather than oval, arrangement of two tracks of thirty-six tanks each. Factoring this configuration into their calculations, Lawrence and his coworkers bent their efforts to developing chemical processing techniques that would minimize the loss of enriched uranium during Beta production runs. To make certain that Alpha had enough feed material, Lawrence arranged for research on an alternate method at Brown University and expanded efforts at Berkeley. With what was left of his time and money in early 1943 Lawrence built prototypes of Alpha and Beta units for testing and training operating personnel. Meanwhile Tennessee Eastman, running behind schedule, raced to complete experimental models so that training and test runs could be performed at Oak Ridge.



Y-12 Beta Racetrack at Clinton. Reprinted from Richard G. Hewlett and Oscar E. Anderson, Jr., *The New World, 1939-1946,* Volume I of *A History of the United States Atomic Energy Commission* (University Park: Pennsylvania State University Press, 1962).

Warning From Los Alamos

But in the midst of encouraging progress in construction and research on the electromagnetic process in July came discouraging news from Oppenheimer's isolated laboratory in Los Alamos, New Mexico, set up in spring 1943 to consolidate work on atomic weapons. Oppenheimer warned that three times more fissionable material would be required for a bomb than earlier estimates had indicated. Even with satisfactory performance of the racetracks, it was possible that they might not produce enough purified uranium-235 in time. Lawrence responded to this crisis in characteristic fashion: He immediately lobbied Groves to incorporate multiple sources into the racetracks under construction and to build more racetracks. Groves decided to build the first four as planned but, after receiving favorable reports from both Stone & Webster and Tennessee Eastman, allowed a four-beam source in the fifth. Convinced that the electromagnetic process would work and sensing that estimates from Los Alamos might be revised downward in the future, Groves let Lawrence talk him into building a new plant—in effect, doubling the size of the electromagnetic complex. The new facility, Groves reported to the Military Policy Committee on September 9, would consist of two buildings, each with two rectangular racetracks of ninety-six tanks operating with four-beam sources.

Shakedown at Y-12

During summer and fall 1943 the first electromagnetic plant began to take shape. The huge building to house the operating equipment was readied as manufacturers began delivering everything from electrical switches to motors, valves, and tanks. While construction and outfitting proceeded, almost 5,000 operating and maintenance personnel were hired and trained. Then, between October and mid-December, Y-12 paid the price for being a new technology that had not been put through its paces in a pilot plant. Vacuum tanks in the first Alpha racetrack leaked and shimmied out of line due to magnetic pressure, welds failed, electrical circuits malfunctioned, and operators made frequent mistakes. Most seriously, the magnet coils shorted out because of rust and sediment in the cooling oil.