Early planning for construction of Y-12

Last week we examined the interactions and influences leading to a full scale electromagnetic separation production plant in East Tennessee. We noted that James B. Conant, President of Harvard University and a strong member of the S1 Committee, was a key factor in getting the electromagnetic separation technology selected as one of the three main approaches to getting enough uranium 235 or plutonium 239 for atomic weapons.

One story I heard just this last week from a local Oak Ridger, Harold McCurty, who shared some historical documents with me and who is a member of the '43 Club, fit right in line with the research I have been doing on how the decision to construct Y-12 was made. He said he recalled hearing the story that Ernest O. Lawrence had become discouraged because he could not seem to get the right people to understand the electromagnetic separation process well enough to support it over the other methods to separate uranium.

McCurty's recollection of the story has Conant taking Lawrence for a walk where they agreed to try one more time to convince the decision makers that Lawrence's calutrons would do the job. Both of them were convinced that Lawrence's calutrons likely could separate enough uranium 235 for a bomb well ahead of gaseous diffusion or any other separation method.

When he returned to the meeting, Conant made a strong defense of Lawrence's research and first agreed to a smaller facility than Lawrence wanted built. However, this got their foot in the door with the calutrons and later the Y-12 construction effort was expanded several times, finally installing 1152 calutrons in nine major buildings!

Earlier in 1942, the experimentation at Berkeley by Lawrence and his staff had been expanded to include the giant 184-inch magnet - the largest magnet in existence at the time. Although they had had success with the 37-inch cyclotron magnet, the amount of separation was far too small to be of military significance. The information provided by the experiments on the 37-inch magnet, while extremely valuable to the researchers, was not convincing to others. So a method was sought to increase the visible output.

At the same time Lawrence was attempting to convince those making the decisions about which process would be most productive to separate the needed quantities of uranium 235, he also had his staff working feverishly trying to reach consensus on the exact designs of sources and collectors as well as other modifications to their experimental "calutron." All this effort was an attempt to finalize the design in time for the construction to begin on what they hoped would be a full scale electromagnetic separation plant.

Lawrence and his staff attempted to calculate the optimum magnet size and placement. The beam resolution was examined closely. The configuration of magnets and vacuum tanks led them to think in terms of a "racetrack" configuration whereby the individual calutrons could share slots in a huge single magnet. The individual coils to create the huge magnet would be set up such that the vacuum chambers could be inserted between the coils. Some of these "coils" eventually became known as "D-Coils" because of their distinctive "D" shape in the Beta calutrons.

Decisions by the S-1 Executive Committee, based on as much scientific and engineering information as could be provided – though very incomplete - were made on three issues: 1. to build an electromagnetic separation plant; 2. if yes, then how large should it be built; and 3. at what point in the development should the design be frozen. These were vital decision points for Lawrence's calutron based approach.

On September 13-14, 1942, the S-1 Executive Committee recommended that the Army Corps of Engineers enter into contract commitments for an electromagnetic separation plant to be constructed at the Tennessee Valley site known as the Clinton Engineer Works. A part of that

recommendation also included the fact that the plant might be cancelled on the basis of later information.

As early as November, 1942, General Groves alerted Stone and Webster that construction of an electromagnetic separation production plant was likely to be coming their way. This move by Groves, as was many of his actions, was well ahead of the full agreement of all decision-makers. He was making things happen where others before him had been stalled by waiting for full approval before taking steps that to Groves were obviously necessary. One of his traits that made him so valuable as the leader of the Manhattan Project was this ability to know which decisions he should make and when to make them.

On December 9, 1942, a report General Groves had prepared to be submitted to President Roosevelt was reviewed by the S-1 Committee. During this review James B. Conant objected strongly to the small size of the electromagnetic separation plant. Groves had included the Warren K. Lewis Committee's recommendation that an electromagnetic separation plant capable of producing 100 grams of uranium 235 be built.

The Lewis Committee had been charted by General Groves on November 18, 1942, to evaluate the various approaches being researched and to report back to him on the feasibility of each approach. They had traveled to each site and held reviews. The stop in Berkeley where Ernest O. Lawrence tried his best to convince them of the superiority of the electromagnetic separation approach had resulted in that approach losing favor with Lewis and the three DuPont members of the committee. They were convinced that Lawrence's calutrons could only produce small quantities of uranium 235 for research purposes and would not be capable of producing enough material for military purpose.

Conant had learned that the amount of uranium 235 needed for military purposes could not be produced using the gaseous diffusion process until an entire plant was constructed. He also thought the plutonium path was going to take longer than he felt was available to beat Germany to what he considered to be their goal, exploding a huge atomic bomb. He knew the United States had to get enough uranium 235 or plutonium for a bomb before Germany. He felt the first country to get that capability would win the war, period.

So, Conant objected to the order of the priorities as well as the small size of the electromagnetic separation plant in the Lewis report being repeated in Groves' draft report for the president. His objection was so harsh as to require him to meet with the members of the Lewis Committee on December 10, 1942, to smooth over the situation.

Nevertheless, Conant was partially successful. When he met with the Military Policy Committee the next day, he was able to change Groves' draft report to include a 100 gram per day electro-magnetic separation plant. This was a compromise, but was far more acceptable to Conant than the merely 100 grams total capacity plant the Lewis Committee had recommended.

Vannevar Bush sent this final version of the report Groves had drafted to President Roosevelt on December 16, 1942. It not only contained Conant's larger electromagnetic separation plant, it also included a full scale gaseous diffusion plant and a plutonium plant. The total estimated cost at this point was $400 million. Interestingly enough, the cost of constructing Y-12 eventually exceed that first estimate for the entire Manhattan Project!

On December 28, 1942, President Roosevelt approved the recommendations and the Manhattan Project took an enormously important giant leap from being a research effort to becoming a full-fledged construction effort by private industry under Army supervision.

As would be expected, even before President Roosevelt's approval was executed much less communicated, General Groves was already heavily into contract negotiations with at least a half-dozen of the nation's largest and most capable corporations. He was moving ahead with the

necessary arrangements for designing, constructing and operating the giant industrial complex that was to soon become a reality.

From his experience building the Pentagon, he knew the best companies that he thought would be able to do the job. For some of them, such as Stone and Webster and DuPont, this was a follow up to earlier conversations in November, 1942.

Next we will see Stone and Webster brought on board and also Tennessee Eastman.