Book Review

Nuclear Energy in Germany. By Karl Winnacker and Karl Wirtz, American Nuclear Society, La Grange Park, Illinois, 1979. 360 pp. $37.00.

This book, translated by David Goodman from the original German edition, reviews the historical development of nuclear power in Germany from December 1938, when Dr. Otto Hahn discovered nuclear fission, to the end of 1975, when large commercial nuclear plants totaling more than 12 000 MW of electrical capacity were in operation or under construction in the Federal Republic of Germany (FRG). The authors, who were closely associated with the German program from its start, give an excellent and factual description of the events that took place. Readers will be much interested in the account of why the Germans failed in the race for an atomic bomb, the trials and tribulations of nuclear scientists during the early years following the war, the political and economic problems that had to be overcome to start an atomic industry, and, finally, the emergence of the German Atomic Forum as the focal point for the development and commercialization of nuclear power in the FRG.

These historical aspects, however, are only a part of the book. For the benefit of readers not totally familiar with the technical aspects of the energy problem, particularly nuclear energy, the authors discuss such subjects as energy shortages, problems of radiation protection, reactor safety, diverse applications of nuclear energy, and the use of radioisotopes in medicine. Non-proliferation questions are touched upon, and the possible roles to be played by the fast breeder, the high temperature reactor, and fusion are outlined. Although the original version was published in 1975 and does not cover most recent historical events, the technical descriptions are still up to date.

Scattered widely throughout the book are descriptions and comments on the U.S. nuclear program. These are not always factually correct but they do represent the views of the authors and do not seriously detract from the merits of the book.

The book can be logically divided into four chronological periods as follows: The War Years, 1938-1945; The Post-War Period, 1946-1955; Germany Enters the Atomic Age, 1956-1965; and Commercialization of Atomic Power, 1966-1975.

This review deals with each of these periods in turn.

The War Years

This reviewer first met Dr. Karl Wirtz, one of the authors of the book, on April 24, 1945, when the ALSOS Mission moved into Hechingen in South Germany. This was the town where the Kaiser Wilhelm Institute for Physics had been relocated. After talking with Wirtz, it became apparent that he was a key figure in German wartime atomic research and, in fact, was the experimentalist in charge of the construction of the atomic reactor discovered in a cave in the nearby town of Haigerloch. At the time of that first meeting, Wirtz and his colleagues were quite vague as to the motivation for their work. They claimed that it was to develop a uranium machine for the production of heat and energy for peaceful uses only. The unanswered question was, "Why was this effort supported by the officials of Nazi Germany if it had no military significance?" It was hoped that this book would shed some light on this question, but no clue was found. Instead, the authors claim that "no one in Germany even thought of producing nuclear weapons." Since this is in direct contradiction to statements attributed to Heisenberg (see David Irving's *The German Atomic Bomb*) it appears that as of September 1941, the Germans really believed that an atomic reactor could be made into a bomb. Despite later evidence that showed this to be impossible, the nuclear scientists were able to perpetuate the myth of the bomb and retain support for their work until the end of the war.

The authors do explain, however, the reasons why they were not able to achieve a self-sustaining nuclear chain reaction. The main one was that although there were sufficient supplies of uranium and heavy water in the country to make a critical reactor, these were split among several groups and no one had enough material to go critical. Lack of support for isotope separation research and lack of industrial capability to pursue atomic research on a large scale were also contributing factors, according to the authors.

The Post-War Period

The post-war period started in January 1946 when five nuclear scientists (Hahn, Heisenberg, von Laue, von Weizsäcker, and Wirtz) returned to the university town of Göttingen following their internment in England. Their plans were to reconstruct nuclear physics research in Germany. The Kaiser Wilhelm Society was renamed the Max Planck Society, and Hahn agreed to take over its leadership. A Physics Institute was created under Heisenberg to resume work on neutron physics. Because of restrictions on German atomic research laid down by the Allies, work was primarily theoretical in nature. There were also severe shortages of materials and a lack of scientific literature, which prevented anything of a concrete nature being accomplished. However, the physicists at Göttingen did develop more precise ideas about the construction of a German research reactor. Karlsruhe was designated to be the location of this reactor.

Germany Enters the Nuclear Age

In November 1954, even before the FRG regained its full sovereignty, the first step was taken toward the establishment of a nuclear industry in Germany. Sixteen German firms each contributed 100 000 marks to establish a Physical Study

Society, whose aim was to promote the peaceful use of nuclear physics. This was followed in January 1956 by the creation of the German Atomic Commission and the submisssion of a draft atomic law to Parliament in February 1957. However, during this period there was a considerable amount of political in-fighting between the federal government, who would provide needed funds for nuclear research and development, and the states (Länder), who traditionally had controlled activities of this nature. As a result, it was not until January 1960 that the atomic law came into force. Since not much progress was made in the interim, the FRG had by this time fallen 15 years behind other countries in the development and commercialization of nuclear power. The creation in late 1959 of the German Atomic Forum, which brought together politicians, scientists, and industrialists and provided a focal point for nuclear development, represented a turning point in the German program. (Dr. Karl Winnacker, the other author, was the first president of the Forum.) The next steps, which included start of work on fast breeders, startup of the first German-built nuclear reactor, startup of the first experimental power station, and initiation of the second German Atomic Program with a budget of 3.8 billion marks, followed in rapid order. Germany had entered the atomic age.

Commercialization of Atomic Power

The third and fourth German Atomic Programs, involving a total expenditure of more than 12 billion marks, were next implemented. An experimental pebble-bed reactor went into operation, as well as a 1200-MW(electric) pressurized water reactor (Biblis). This was the largest nuclear reactor in operation at the time. All of this effort culminated by mid-1975 with a comprehensive agreement, under which the FRG would supply Brazil with up to eight nuclear power plants of the Biblis type and transfer the technology associated with various aspects of the nuclear fuel cycle. The agreement demonstrated that Germany had overcome its slow start and was once again among the world leaders in the nuclear field.

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About the Reviewer: James Lane entered the field of nuclear energy in 1942, at the Metallurgical Laboratory, University of Chicago, following graduate studies at Worcester Polytechnic Institute and at the University of Göttingen. In 1945, he was a member of the ALSOS mission sent to Germany to determine progress there toward achieving a nuclear weapon. Lane, a member of the first Board of Directors of the American Nuclear Society, contributed extensively to the inception and evaluation of various concepts of nuclear reactors during his tenure at the Oak Ridge National Laboratory until 1976, with temporary assignments to the Philippines, Brazil, the U.S. Atomic Energy Commission, and the International Atomic Energy Agency. He is presently at the Institute for Energy Analysis.