power programs of the horse-and-buggy days. Many who lived in that era still recall the long and tiresome days of heavy labor they demanded! The homemaker of today, who now enjoys the assistance of 80-plus electrical servants in an average home, will hardly agree with the antienergy lobbyists in Washington who wish to bring back the days of woodstove cooking, coal-oil lamps, drafty houses with open fireplaces and ashes, no refrigerators, no telephones, no radios, and no electric mixers. The ardent young environmentalist in the reviewer's class in "Energy and Environment" once confided, "I must admit that I am not willing to give up my electric toothbrush!"

Advocates of reliance on renewable energy resources should note the recent report of the U.S. Council on Environmental Quality concerning the plight of Ouagadougou, Upper Volta. Neighboring areas have been "utterly denuded of trees" for a distance of 70 km. Today the people of Ouagadougou must spend 20% of their meager income to purchase wood for cooking and heating. By contrast, a family in the U.S. spends only 5% of its income for heating and cooking.

The author carefully examines the problem of transporting energy sources to remote regions of the Earth. Because of the vast volume of coal required, transportation costs are prohibitive, even if the difficulties of increased production and distribution should be solved. The convenience of fissionable fuels, in this respect, dictates that "Nuclear Power is Necessary" if the people of the developing countries are to enjoy the living standards of the Western world.

In 1982 the first century of commercial electric power generation was celebrated in the United States. In that century the living standards of the people of the industrialized countries rose fantastically. Greenhalgh traces the close correlation of the increase of "per capita" power with the rise of health and comfort standards produced by that energy availability. Common diseases which have plagued people for thousands of years—malaria, smallpox, typhoid, polio, lockjaw, pneumonia, and many others—have been eliminated or brought under control. The antienergy activists are thus thoughtlessly guilty of opposing the progress of the human race by insisting on return to the days of drudgery and disease.

Greenhalgh contrasts the "attitude of the people of the developing countries toward nuclear power" with that of the people of the more affluent nations. People of the needy nations are far more understanding of the requirements for safe nuclear power generation than those who live in countries with currently adequate energy resources. By inference he suggests that the depletion of conventional energy resources will increase the *demand* for nuclear power. The "energy-hungry" and "Communist-bloc" nations are *now* proceeding with nuclear power expansion without any delays or interference. Perhaps this presages a reversal of the future world order in which the "have-nots" become the "have-gots."

The author emphasizes that dozens of studies by international humanitarian commissions show the close relation of (a) nutritional norms, (b) medical standards, (c) life expectancy, (d) adult literacy, and (f) poverty-level existence to the "per capita power" level available to the people.

In the final chapters the author summarizes the facts and reasoning that serve as a rebuttal to the many falsehoods and imaginings with which the antinuclear minority in the United States have attempted to frighten the populace. The "China Syndrome" is a Hollywood myth. The "soft energy" resources will not be adequate to meet the need of modern society. The antienergy proponents' policies ignore the fact of the world population and the needs of vast numbers of that populace. It is noted that the wealthy and privileged minority who oppose energy-system expansion will retain the comforts of modern living, but the masses of the Earth's people will suffer. One is reminded of the news media reports of the wealthy environmentalist who, reputedly, stockpiled tremendous tanks of fuel and heating oil during recent oil shortages. One wonders, also, how many of the "soft energy" advocates have provided "back-up generators" for their homes, when the "brown-outs and black-outs" leave the common people "shivering in the dark!"

In conclusion Greenhalgh warns that, if nuclear power production is suppressed, the *present* needs of the people of the Earth will require that *many more* coal-fired plants be built within the next 20 yr. Thus the acid rain, carbon dioxide pollution, and mining hazards will be vastly increased. If it be contended that such power levels are not necessary, the facts given in the Brandt Commission report of 1980—"North-South: A Programme for Survival"—must not be ignored: "One American uses as much energy as 3 Swiss, 9 Mexicans, 53 Indians, and 1072 Nepalese." Energy-hungry people know "the necessity for nuclear power."

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About the Reviewer: Following retirement from the University of Tennessee, Chattanooga, where he holds the Guerry Professorship Emeritus of Physics, Myron McCay continues to exercise his pedagogic expertise in TVA's training program on nuclear reactors. Dr. McCay's long academic career at Chattanooga and at Virginia Polytechnic Institute and State University was preceded by graduate studies at North Carolina and Ohio State. The McCays reside within five miles of TVA's Sequoyah Nuclear Power Station.

Born Secret—The H-Bomb, The *Progressive* Case and National Security. By A. De Volpi, G. E. Marsh, T. A. Postal, and G. S. Stanford, Pergamon Press, Elmsford, New York (1981). $17.50.

The *Progressive* case stemmed from the effort by the U.S. government in 1979 to prevent the publication of an article entitled "The H-Bomb Secret" by Howard Morland in the *Progressive* magazine. This book is a discussion (from the authors' viewpoint) of the issues surrounding that case. The authors were deeply involved in the case, initially as technical consultants for Howard Morland and subsequently as technical experts for the *Progressive's* side of the legal case. As one might expect, the book strongly supports the *Progressive's* position and the actions and positions of the authors.

The *Progressive* monthly published in Madison, Wisconsin, was founded in 1909 by Robert LaFollette. It focuses on political analyses and opinion and is described as having "a more or less respectable following among people to the left of the political center." Howard Morland is a free-lance reporter for the *Progressive*. He is described by the magazine as a "peace activist." In 1978, Morland conducted a very effective research program to "break" the secret of the hydrogen bomb. He spent about six months reading all the unclassified literature on the subject that he could find and using his press credentials to get access to experts on the subject as well as access to unclassified areas in some installations involved in

hydrogen bomb production, notably the Y-12 Plant in Oak Ridge. By piecing together information and the iterative process of checking his guesses with knowledgeable people, he succeeded in putting together a description of the H-bomb and its functioning that was certified as accurate by the U.S. Department of Energy (DOE) in court affidavits. His complete article and an erratum are an 11-page Appendix in the book.

The four authors are physicists at the Argonne National Laboratory. Their association with Morland began when he contacted them to discuss some of his ideas on how an H-bomb worked. Since they had no access to classified information at the time, they were willing to talk to him. They had reviewed a previous article by Morland published in the *Progressive* late in 1978 on the hazards of tritium. In February 1979, the editor of the *Progressive* sent the authors a copy of the H-bomb article for technical review. Because they had no access to weapons information, they could not tell how close Morland's ideas were to describing the system used in U.S. weapons. However, they believed that there were more details included than were necessary for a discussion of the merits of continued secrecy concerning hydrogen weapons. One of the authors, George Stanford, was concerned that publication of the article might encourage some parties (who otherwise might not have) to begin research on or development of hydrogen weapons.

The DOE learned about the article in late February 1979, when another reviewer of the article turned his copy over to George Rathjens of the Massachusetts Institute of Technology. Rathjens informed DOE after the editors of the magazine turned down his request not to print the article. The editors of the *Progressive* decided to send a copy to DOE with a request that it be checked for accuracy. At that point, DOE, through phone calls and a visit to the editors, objected to the publication of the article on grounds that it would violate the Atomic Energy Act of 1954. When the editors did not agree, the government asked the District Court of the 7th Circuit to issue a preliminary injunction against publication. The court issued a temporary restraining order prohibiting publication or other disclosure.

The stage was then set for another conflict between national security, this time as defined in the atomic energy statutes, and freedom of the press as protected by the first amendment. Morland, the editors of the *Progressive*, the authors of the book, the American Civil Liberties Union, and many scientists believed that stripping secrecy away from hydrogen weapons would facilitate national debate on nuclear arms policy rather than leaving it in the hands, as they believed, of the insiders with security clearances. In addition, as they claimed Morland had proved, there was no secret at all since the information could be obtained completely from unclassified sources.

The DOE, the judge issuing the restraining order, and many other scientists believed that publication was not in the national interest and illegal. The argument was that while the article did not contain quantitative information, its accurate description of principles and mechanisms could save a prospective hydrogen bomb builder millions of dollars in development money and perhaps years in time by avoiding blind alleys and false starts. It was "a free ticket" around all the possible blind alleys.

The government's case was not helped by the discovery in May 1979, by a representative of the American Civil Liberties Union, that a mistakenly declassified 1956 progress report on weapons development, UCRL-4725, was available in the public reading room at Los Alamos National Laboratory. An even more sensitive development report from 1958, UCRL-5280, was also available to the public for a time in the same reading room. Both of these reports had detailed drawings of the interiors of hydrogen devices, including information on quantities of fissionable materials and yields and weights in tests. The contents of UCRL-4725 were alluded to by the *Chicago Sun Times* in May.

The DOE, in an affidavit to the court, certified Morland's drawings as accurate, as representing U.S. weapons construction practice, and as being the most efficient route that the United States knew to the production of fusion explosives. The authors of the book wrote a letter to Senator John Glenn, of Ohio, criticizing the DOE for issuing these affidavits as unclassified. The DOE promptly classified the letter to Glenn.

The government's position was finally made untenable by Charles Hansen, a computer programmer from Mountain View, California. Quite independently from Morland, he had been running a design-your-own H-bomb contest as a hobby. He had been submitting designs to the DOE for clearance, and the winner of the contest would be the first design that was classified. From his own reading and the entries in his contest, Hansen finally pieced together his own design and sent it with a letter expressing his concern about the *Progressive* case to Senator Charles Percy, who is on the Senate Governmental Affairs Committee. This letter was also classified by the DOE, which also obtained a temporary restraining order prohibiting publication of Hansen's letter in the *Daily Californian*. However, on September 16, the letter was published by the Madison, Wisconsin, *Press Connection*. At that time, DOE withdrew its prior restraint case against the *Progressive*, stating that the information had been hopelessly compromised by publication of the Hansen letter.

Regardless of one's opinion on the *Progressive* case, this book provides a complete discussion of what went on in that case, the views of the various actors, and a lengthy discussion of the issues, though admittedly from one viewpoint. The authors clearly believe that government secrecy is misused and abused and that there is too much of it. They do not go as far as Edward Teller in being opposed to all secrecy, but they do propose some reforms of the classification system.

The authors discount the danger of increased weapons proliferation generated by publication of the article. They argue that the information in the article is not quantitative and that the real barriers to proliferation are control of fissionable and other strategic materials and the sophisticated technology required in the detailed design and manufacture of the weapons. They argue further that the chances for arms reduction will be improved by wider informed participation in the strategic policy debate, which they hope publication of the article will promote. Perhaps time will tell.

Perhaps the most valuable contribution of this book is the lessons it offers to those responsible for the design and maintenance of systems to protect classified information and technology. An alternative subtitle to the book might be "The Anatomy of a Security Catastrophe." Described in detail here is the step-by-step chronology of how the hydrogen bomb secret was compromised by a reporter who claimed to be working entirely within the law. (Whether everyone who talked with him stayed within the law remains an open question.) It demonstrated once again the validity of the World War II admonition, "Loose Lips Sink Ships." Persons with access to sensitive, classified information must be periodically reminded not to discuss *anything* about their work with uncleared people and, particularly, not to confirm or deny guesses and speculations offered.

Another useful aspect of the book is its reproduction in Appendix A of Morland's article and erratum. This convenient

and authentic description of how fusion explosives work should be of great interest to scientifically curious teenagers, undergraduate physics classes, and Col. Muammar al-Qadhafi.

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Status of USA Nuclear Reactor Pressure Vessel Surveillance for Radiation Effects (ASTM STP 784). Edited by L. E. Steele, American Society for Testing and Materials, Philadelphia, Pennsylvania (1983). $29.50.

The continued safe operation of nuclear reactor power plants depends in part on the ability of the reactor pressure vessel to withstand the degrading effects of radiation damage to the extent that a potential for vessel failure will not exist during the intended life of the plant. When reactor pressure vessels were being designed and fabricated for the plants in operation today, it was recognized that the effects of radiation damage and the rate at which the damage would accumulate were not fully understood. Thus, a surveillance program was instituted that was intended to include (a) irradiation of small representative samples of vessel material in each reactor vessel, (b) measurement of the specimen temperature and neutron fluence, (c) periodic evaluation of the effects of radiation damage to the specimens, and (d) an extrapolation of these data to the reactor vessels in terms of the vessel's future performance capability. This surveillance program is the subject of the book being reviewed, American Society for Testing and Materials (ASTM) STP 784.

To some extent, STP 784 represents an update of an earlier ASTM publication, STP 481 (1970), that dealt with the same subject matter. In the first chapter of the more recent publication, the editor reviews the bases for the surveillance program, sets forth the purpose of STP 784, and mentions the significant technical advancements that are dictating changes in the surveillance program regarding types of specimens, monitoring, and interpretation of data.

A stated major purpose of STP 784, in addition to reviewing surveillance results accumulated since the earlier publication, is to compare surveillance approaches of the four major U.S. producers of nuclear steam generating systems. This is accomplished by including a separate chapter for and authored by each of the nuclear vendors (it includes pressurized and boiling water reactors and gas-cooled reactors). These chapters describe in considerable detail the vessel materials, types, and number of surveillance specimens required, monitoring requirements and techniques, capsule design and loading, specimen identification schemes, and modifications to their surveillance program to meet changing needs. An analysis and discussion of results obtained thus far are also included as well as recommendations for future surveillance programs. Each of the designated chapters does not deal equally with each of these topics, but there is sufficient information with which the reader can make a reasonable comparison of surveillance programs. If, on the other hand, the reader is more interested in a general description of a typical surveillance program for light water reactors (LWRs), he can avoid considerable tedious reading by selecting only one of the LWR vendor's chapters.

The book includes a chapter that represents to some extent the nuclear utilities' point of view regarding reactor vessel surveillance and structural integrity programs. This chapter is somewhat repetitious of earlier chapters in that it reviews the basis for and other aspects of the surveillance program. Quite naturally, emphasis is placed on the need to reduce conservatism in regulatory requirements so as to improve the economics of power generation, while maintaining adequate safety. An optimistic and hopefully realistic point of view is taken that continuing vessel integrity investigative programs will demonstrate the ability of all plants to operate through their projected design lives. Steps that need to be taken to improve the state of the art are discussed, and the roles played by the Electric Power Research Institute, utility users' groups, the U.S. Nuclear Regulatory Commission, and others in a cooperative effort to cope with the very broad scope of the vessel integrity problem are mentioned.

The final chapter in STP 784 is authored by the editor and constitutes a review and analysis of the surveillance program and data for each of the U.S. operating LWRs. Also included is a summary of pertinent vessel surveillance data available for each of the reactors.

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