BOOK REVIEWS

Selection of books for review is based on the editor's opinions regarding possible reader interest and on the availability of the book to the editor. Occasional selections may include books on topics somewhat peripheral to the subject matter ordinarily considered acceptable.

The Accident Hazards of Nuclear Power Plants

Author	Richard E. Webb
Publisher	The University of Massachusetts Press, Amherst (1976)
Pages	234
Price	$6.95 paper; $15.00 cloth
Reviewer	Hugh F. Henry

This is one of those "The goblins'll get you if you don't watch out" books—with the goblins obviously being nuclear power plants, operating and projected. The author gives his version of the potential hazards of the boiling water reactor (BWR), the pressurized water reactor (PWR), and the liquid-metal (cooled) fast (neutron) breeder reactor (LMFBR) as the result of the "worse possible accidents" (WPA) that could be foreseen—and this reviewer thinks "worse" really means "worst." These assumed accidents are obviously much worse (and, accordingly, much more improbable, if not near-impossible) than his "design basis accidents" (DBAs). From his description, one is left with the impression that these latter incidents (DBAs) may readily be anticipated as near-routine occurrences, even though they are essentially the highly improbable "maximum credible accidents" normally assumed for licensing applications, which means their very small occurrence probabilities and hazards are carefully assessed.

The accidents described are generally assumed to result from fuel overheating (with consequent meltdown), which is assumed to be caused by power excursions with a resultant runaway prompt criticality, as might be caused by a sudden loss of control rods; power-cooling mismatch where the power level of a part of a core suddenly increases, as might result from blockage of a part of a coolant system; loss of coolant as could be caused by massive rupture of coolant piping; and/or spontaneous reactor vessel rupture caused by mechanical failure. Needless to repeat, conditions are assumed to cause maximum damage.

A hypothetical WPA is then assumed to result in a hypothetical worst conceivable injury potential resulting from the behavior of radioactive materials following an incident. For this, the 1957 report, WASH-740, which has been considered as providing probably the most pessimistic of assumptions on this topic, was almost the only reference used; subsequent comments on this document as well as other reports that describe what are probably more credible conditions were brushed off or ignored.

The final thrust of the analysis is that calculations are unreliable and, accordingly, experimental testing (to destruction) of full-size models of each reactor proposed is the only way by which its potential safety can be evaluated, with such tests being a necessary prelude to any construction. However, it is also concluded that this "necessary" testing program is not only too expensive to undertake but that many, if not most, of the tests themselves may be too dangerous to attempt.

No attempt is made either to give a balanced presentation, or to estimate occurrence probabilities. Thus, in almost any failure, the author assumes that WPA *will* happen and that this *will* be followed by conditions for the worst injury possibility. In fact, the analysis given for some 14 incidents in nuclear reactors would lead to the conclusion that it was very fortuitous that such extreme conditions were not realized therein. Although the author dismisses the detailed material in license applications as dangerously simplistic and perhaps even showing a self-interest bias on the part of the preparers as well as the U.S. Nuclear Regulatory Commission (NRC) reviewers, he makes no attempt to evaluate the validity of the safety factors used and other special safety provisions prepared by these design nuclear engineers and others for the reactor types of his concern. He does devote a chapter each to the Rasmussen report (WASH-1400) and the American Physical Society report, concluding that they both dangerously underestimate the true hazards of nuclear reactors, probably because neither goes to his extremes. These documents, including their basic approaches, are *not* reviewed, however.

One example of the author's determination to put the worst possible light on his subject is the mention of the 500-mrad current maximum permissible yearly dose for "nonradiation workers"; this is then compared to a suggested 25 mrad/yr limit with the implication that the higher limit is undesirable if not dangerously high. Similarly, his quoted 100 mrad/yr natural background dose rate is certainly on the low side of any values this reviewer has encountered.

An interesting part of the book is its chapter on "Who Should Decide."

Obviously, the People (and a capital P is used) should. Further, the current federal involvement in power reactors is "proven" to be unconstitutional, an effort that many people would prefer be applied to other causes.

This reviewer agrees wholeheartedly with the author's Preface, in which he points out that there are hazards to life in many activities, that nuclear reactors may not pose the greatest risk to human survival, and that their hazards must be carefully assessed since nuclear power may be eventually required. Unfortunately, this reviewer does not believe that the author's assessment of the hazards is sufficiently valid for the book to be an important contribution to the subject, even though there is little indulgence in the overemotionalism that frequently characterizes efforts of this type. On the other hand, its apparently more scientific approach to the subject *can* be misleading to the layman, indicating as it does a more objective treatment than is actually the case.

The book is rather "heavy" reading, and the mishmash of alphabetical identifications regularly used is confusing; a short glossary would be helpful. It is very thoroughly footnoted, including references to information brought to the attention of a review panel or to the NRC or to others, almost invariably by the author himself; it also seems obvious that the author was given ready access to NRC personnel and was supplied with a large number of documents and other information upon request.

The level of writing is such that it can be understood almost as well by the interested layman with some background in the subject as by the nonspecialist physicist. Unfortunately, however, only the specialist health physicist and the nuclear engineer with experience in this particular field will probably have the necessary background information to evaluate the validity of the rather one-sided basic premises on which the author bases his correspondingly one-sided conclusions that logically follow therefrom. It is obvious that many individuals with such technical competence, these including the designers and governmental reviewers of nuclear power plants, the authors and contributors to the Rasmussen Report and the report of the American Physical Society, plus a host of others in the various nuclear science and engineering fields, have not generally accepted the author's extreme positions, which this reviewer believes is held by a *very* small fraction of the knowledgeable scientific community.

Overall, one can disagree with the author's arguments, but he does attempt a complete presentation—from his own one-sided point of view, of course. Thus, for those holding the author's viewpoint, the book provides a reasonably good summary of the "scientific" bases for their opinions; for those holding an opposite opinion, it correspondingly gives an opportunity to note the unrealistic extremes to which the antinuclear groups are willing to go. In fact, it might be worth recommending to students as an excellent example of a scientific version of "we'll give 'em a fair trial before hanging 'em."

Hugh F. Henry has been head of the Physics Department of DePauw University since 1961. Prior to that time, his responsibilities at the Oak Ridge Gaseous Diffusion Plant included those of criticality safety and health physics. His publications in these general fields include the book, Fundamentals of Radiation Protection, *which was published by Wiley Interscience in 1969. He spent a sabbatical leave during 1968-1969 at the National Reactor Testing Station in Idaho Falls, and spent a similar leave during 1975-1976 with his time divided between the National Radiological Protection Board and the U.K. Atomic Energy Research Establishment, both at Harwell, England. He is a member of the U.S.A. Standards Institute (USASI) Committee on Radiation Protection and has been a U.S. delegate to meetings of the International Standards Organization (ISO) in this field.*