

workshop style, and the author invites anyone to make free use of it for training purposes, the figures and parts of the text being set out so that these parts can easily be transferred to overhead projection transparencies.

HAZOP (Hazard and Operability Studies) and HAZAN (Hazard Analysis) are presented as practical techniques for respectively, the *identification* of hazards and operability problems, and the *quantification* of hazard and safety problems. The emphasis is on the practicalities, and not the philosophy. The author states that the notes are not intended as a handbook for experts, and references F.P. Lees' excellent book *Loss Prevention in the Process Industries* for those who want an extensive treatment. These notes will be useful for the purpose stated, since they illustrate the application with examples, and pitfalls are identified. However, the author's personal stamp will be very evident to those familiar with his earlier publications, for example the "free lunch" frequency as an illustration of the use of a fault tree, and the "belt and braces" example for calculating hazard rate on a system with diversity and redundancy in the protective systems. Nonetheless, for its stated purpose this is a useful set of notes, which can be used to help promote training in this important topic. As Kletz urges, on page 72, "The experts in hazard analysis should train, check, help and encourage [the design engineers]." That is something we can all agree with.

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Energy Risk Assessment, by H. Inhaber, Gordon and Breach Science Publishers, New York, 1982, ISBN 0-677-05980-9, 395 pages incl. index, hardback, \$49.50.

The work published here is essentially a revised version of that which originally appeared in Inhaber's well known Atomic Energy Control Board (of Canada) report *Risk of Energy Production* (1978), which has since gone through several revisions. The work has, since its first appearance, provoked widespread criticism and comment, some of it resulting in highly acrimonious exchanges in the literature and popular press. For those not already familiar with this controversial work, Inhaber's approach to the quantitative risk assessment of energy generation systems uses what has been termed a *risk-accounting methodology*. The overall risk for a system is considered to be composed of contributions from all phases of the programme including pre-construction material acquisition, fuel acquisition and fabrication, plant construction, operation and maintenance, transportation and waste disposal. Decommissioning is dealt with only for the nuclear fuel cycle. The risks are expressed in terms of the occupational and public exposures, including deaths, injuries and morbidities. The eleven systems considered are Coal, Oil, Nuclear, Natural Gas, Hydroelectric, Wind, Methanol, Solar Thermal Electric, Solar Photovoltaic, Solar Space and Water Heating, and Ocean Thermal. The risks

are related to the megawatt-year of energy output. Of course, if other measures of risk (per man-year of employment, or per person-year for individual risk for those exposed) had been used, the resultant rankings would probably be different, as other authors have noted.

That this work rather than others should have attracted such a lot of attention is perhaps surprising, in the same way that it is surprising that some kinds of hazards receive much more attention than other comparable ones. However, Inhaber's risk-accounting approach is thought provoking; for example, if one takes a system approach to risk, what should or should not be included? That is, how do you define the system satisfactorily? The book consists of about 50 pages of main report and conclusions, followed by about 180 pages of appendices giving the details of the analysis for each system. The following 120 or so pages consist of reproductions of comments on previous versions of the report. The author states that the version now published has in places been revised in response to some of these comments, but one cannot tell where very easily. The reference list is substantial, but not quite as extensive as the number in the list at first suggests, since many are simply referring to different pages in the same source document. The index is good.

The inclusion of all the comments, warts and all, so to speak, is interesting, but this reviewer felt that the verbatim documentation of all this material could have been replaced more usefully by a constructive development of the work; this text shows no real sign of development from the 1980 version of the report. For example, one would have welcomed some alternative approach to the problem of how to combine man days lost through deaths, accidents and disease.

Given the many reservations that have been the subject of such widespread discussion, one can still agree with one of the commentators (David Okrent p. 301) when he states the view that,

"More detailed and accurate studies are needed to confirm or negate his (Inhaber's) general results than have been afforded by the letters of criticism. Whatever the eventual results, he has made an important contribution to our thinking."

There is also this telling extract from a letter from A.T. Prince of AECB, the report's sponsors, replying to Amory Lovins of Friends of the Earth,

"Unfortunately, neither the nuclear proponents nor the critics can view the report objectively. If we could find that elusive 'independent' person, I am sure he or she would see the document as no more nor less than food for thought. Being non-judgemental, the report was never intended to be anything else."

Given that the work has been so widely discussed, many people will want a hardcover version, but in view of the price and its previous appearance as a report they may need to inspect a library copy before purchase.