Book Review

The Three Mile Island Accident: Diagnosis and Prognosis. Edited by L. M. Toth, A. P. Malinauskas, G. R. Eidam, and H. M. Burton. American Chemical Society, Washington, D.C. (1986). 301 pp. $54.95.

In 1985, six years after the famous accident at Three Mile Island Unit 2, a symposium was held to review the accident, its effects, the state of the reactor, the progress of the cleanup operation, and the implications. This book, published as part of the American Chemical Society (ACS) Symposium Series, is a compilation, complete with typos, of the papers presented at the symposium by acknowledged experts. As such, it is a valuable collection of technical information about what was, at the time, the worst commercial nuclear accident, an unenviable status it no longer holds.

There are 16 papers, roughly evenly divided among three main subjects: the accident itself, the chemical analysis of the end state, and the technology of the cleanup operation.

The book begins with a chronology of the accident, as seen with the benefits of six years of hindsight, reminding us once again of how little water it would have taken in the first few hours to prevent core damage entirely. (Opponents of nuclear energy speak of the accident as a near miss; it is perhaps more impressive how near it came to being no accident at all.) We are also reminded that, despite molten material in the core, this was not a core melt in the classic probabilistic risk assessment definition. Because of that verbal confusion, we now speak of severe core damage, which it surely was.

In the subsequent chapters in the Accident section, the thermohydraulic features of the accident are described in some detail, the final resting places of the fission products from the core are traced (most, but not all, can be accounted for), the damage due to the hydrogen burn is studied for evidence about the character of the burn (it is concluded that it was a low speed burn of a rather lean mixture, with no evidence to exclude the possibility that it was building-wide), and the character of the core damage is described. The abstract of the last of these chapters has, as one of the consequences of the accident, "proving safeness of light water reactor design and operation." One hopes fervently that this is a typo for *improving* safeness.

There follows (as befits an ACS publication) a section of five chapters in which the chemistry of the accident and its residue is meticulously described, both to infer the physical conditions at the time of the accident and to establish the transport paths and ultimate destinations of the fission products. There are papers devoted to the water itself, once polluted but now drinkable and in storage, to the adherent activity on internal surfaces, to the core debris (from which information about the thermal history can be inferred), to the reactor building source term measurements, and to the famous iodine chemistry issues. The unexpectedly small iodine release, a factor of a million less than Chernobyl, led to the agonizing reappraisal of source term issues over the last few years.

Finally, there is a section on the cleanup operation, a formidable and excruciatingly slow-moving job. This is mostly devoted to a description of the water cleanup, both filtration and ion-exchange systems. It leaves open the big question: What is the ultimate objective? While the current justification for the activity is solid in the context of learning as much as one can about damage mechanisms, there has been no decision about whether to try to salvage the plant. The chapter on Recovery Status suggests a target date of 1989 for that decision, which seems overly optimistic to this reviewer, given the customary snail's pace for all nuclear decision making.

Overall, this collection reads like the record of a symposium, which is not surprising. Each paper reflects the interests and idiosyncrasies of its author or authors, and some matters are omitted while others are treated in what seemed to this reviewer mind-numbing detail. It was a good idea to put the collection together in print, because it provides a valuable snapshot in time of the state of knowledge of what happened and what we have been able to do about it. One would not read this book for fun; while all of it is informative, some of it is depressing. Any symposium record seems more like a collection of trees than a forest—that is inevitable—but the forest seems more than usually invisible here. This is not the fault of the authors or of the organizers, but appears to be a feature of the situation. Perhaps we have yet to learn the "real" lessons of Three Mile Island.

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