



## Book reviews

### **Hanford: A Conversation About Nuclear Waste and Cleanup**

Roy E. Gephart (Ed.), Battelle Press, Columbus, OH, 2003, 387 pp., US\$ 34.95, 8(1/2) in. × 11 in. format, soft cover, ISBN 1-57477-134-5

The US Department of Energy has, for many years, had as a major focus the cleanup of nuclear weapons sites. That cleanup is expected to cost in excess of US\$ 250 billion. I was privileged to view a minute part of that remedial effort in the cleanup of a plutonium-contaminated site at the Idaho National Environmental Engineering Laboratory (INEEL), which is one of the 17 major sites once used for nuclear material production. I came to appreciate the complexities of the remediation process. This book addresses the cleanup of the Hanford, Washington, site where the role was to create and process plutonium. This site covers 586 square miles which is nearly half the size of the state of Rhode Island.

Building the Hanford site was the largest construction in human history. Why? Because each of the three key steps in creating plutonium call for constructing buildings with specialized missions. First, mined uranium was refined and fabricated into metallic uranium fuel rods that met precise engineering standards. At Hanford, machine shops and laboratories were built for fuel fabrication. Next, the fuel was shipped to a nuclear reactor, where it was exposed to neutrons in the reactor's core. Nuclear reactors and support facilities were constructed. Last, the plutonium contained inside the fuel rods was chemically removed in a separations or reprocessing plant. Mammoth separations plants were constructed.

Reprocessing generated huge volumes of waste. The amount varied over time as reprocessing facilities became more efficient and waste management practices changed.

On average, the bismuth phosphate process . . . generated 4000 gallons of waste liquid for each ton of spent fuel reprocessed. Much of this was water. Rates varied from 2000 to 25,000 gallons of liquid per ton of fuel.

A few hundred thousand of tons of chemicals—acids (such as nitric and sulfuric acid), solvents, nitrates, ammonia, and trichloroethylene—were used in the reprocessing plants, released to the environment or pumped into tanks . . . Hanford chemicals were unique for they were laced with a host of short to long-lived radionuclides.

During facility operations, highly radioactive waste was piped to underground storage tanks. Used water and other contaminated liquids were discharged to the ground or Columbia River. Solid waste was buried in shallow trenches or stored inside facilities. Gaseous effluents were released to the atmosphere.

This book is a story about the above noted waste production and disposal as it evolved (and is evolving still) over time as DOE addresses the problems of the past with evolving waste handling techniques and public oversight.

The book has 12 chapters, each of which can stand on its own. Liberal use of tables, photographs, maps, and diagrams makes for pleasurable reading and understanding.

By title, the 12 chapters are as follows:

1. Hanford—in the beginning.
2. Hanford's corporate culture.
3. Environmental monitoring and surveillance.
4. Radiation: what was known and when.
5. Waste and nuclear materials.
6. The end of secrecy.
7. Environmental regulations and the cleanup agreement.
8. Cleanup of Hanford and the nuclear weapons complex.
9. Exploring choices and decisions.
10. Science: partner in choices.
11. A matter of risk.
12. Building a path forward.

As noted before, the book is well written (in a conversational style) and is easy to read but, more importantly, it contains a great deal of information on the technology and philosophy of nuclear waste handling and disposal. The book would be an excellent text for a course on nuclear waste management.

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### **Hanford Site Historic District: History of the Plutonium Production Facilities 1943–1990**

Contributing authors: T.E. Marceau, D.W. Harvey, D.C. Stapp, S.D. Cannon, C.A. Conway, D.H. DeFord, B.J. Freer, M.S. Gerber, J.K. Keating, C.F. Noonan, and G. Weisskopf, Battelle Press, Columbus, OH, 2003, US\$ 47.50, 626 pp., 8.5 × 11 inch format, paperback, ISBN 1-57477-133-7

As stated in the preface, “The purpose of this book is to preserve in words, diagrams, and photographs the structures at the Hanford Site during the Manhattan Project and Cold War Era because the majority of them have been or will be demolished.”

“Covering events from the beginning of the Manhattan Project through the Cold War Era, this book describes the selection of the (Hanford) site for production of plutonium on an industrial scale; development and function of the various facilities; life as a worker during the construction, operation, and diversification of the Hanford Site; and the role of secrecy and security during the production era.”