cently issued a report recommending the use of groundwater to supplement surface irrigation in the Murray-Darling Basin, a vast flat area that is the food-bowl of the nation. The decision seems to have been made with no consideration whatever of the prospect of very serious damage of irrigation areas, due to land subsidence caused by groundwater extraction, or increased salinity in low areas, or earth fissures as in Arizona, and a firm conviction that recharge from surface rainfall would maintain water levels.

I believe that one reason for this inability of most governments to comprehend the situation lies in the nature of the professional advice they receive. I note that in the scientific and professional journals of the world, there is never any mention of world groundwater problems. The professional groups most concerned with water resources and groundwater are all strangely silent about the worldwide decline of groundwater resources. The textbooks on groundwater hydrology appear to be part of the problem: They all show mathematical models of groundwater flow based on the key assumption that the groundwater is recharged from surface rainfall. As a consequence, the related computer models of groundwater flow are very seriously misleading.

These days it is so easy for professionals to share ideas with colleagues all around the world, and one would expect that the serious matter of the worldwide decline of groundwater resources would command attention. But it does not. It is apparent that the main cause of the silence is that the present understanding of the origin of groundwater by the professions involved, is not all consistent with what is actually happening. The theory is not working out in practice. There is a global disaster, and the key experts are silent.

There is clearly a need for a new understanding of the origin of deep groundwater. It is hoped that this book may be a step in that direction.

## Solve the Water Crisis With Nuclear Desalination

Nuclear desalination, researched since the 1960s, is a technology ready for take-off as a clean, economical source for supplying safe drinking water from seawater. As Lance Endersbee makes clear, there is no time to waste in planning and building desalination plants that can meet the looming deficits of fresh water for the world's population.

Conventional desalination plants powered by the steam or electricity that is produced by gas or oil, have been operating for 50 years, and in 2001, there were 12,451 desalination plants worldwide. In the Gulf region and North Africa, desalination supplies about 1 million cubic meters per day of water, while Saudi Arabia, which is even more dependent on desalination, has a capacity of 4 million cubic meters per day. The Mideast and Gulf regions are the largest users, with more than 50% of the world's desalination capacity.

There are three main desalination technologies: reverse osmosis, or RO, which is used in nearly half of today's desalination plants; multi-effect distillation (MED); and multi-stage flash distillation (MSF). All three technologies are still undergoing research to improve efficiency and cost.

### Nuclear Desalination Most Attractive

Any power plant—even a small diesel engine—can be coupled to a desalination facility. But nuclear plants are the most attractive power source for desalination, because they are more energy-intensive than plants fired by conventional fuels, and cleaner. Although almost any kind of nuclear plant could be used to power a desalination facility, the fourth-generation high-temperature nuclear reactors—which are 50% more efficient, modular, mass-producible, and super-safe—are ideal for the job. Because of its passive safety characteristics and smaller design, the new high temperature reactors (either the South African Pebble Bed or the prismatic core model of General Atomics), can be easily sited near the water-distribution systems.

Especially for developing-sector countries, which do not have large power grids, the small- to medium-size, fourth-generation reactors are economical, because they can be added to the grid module by module, as demand increases.

For industrialized countries, larger nuclear plants are appropriate. In fact, in the 1980s, the Metropolitan Water District of Southern California, which serves the large desert population of more than 15 million people, proposed building a large desalination facility powered by a high-temperature gas-cooled reactor of the General Atomics design. The desalination process was designed to directly use exhaust heat from the reactor. Although economically and technologically feasible, the project was killed by the environmental Malthusians.

The International Atomic Energy Agency has conducted research and feasibility studies on nuclear desalination since the Atoms for Peace days. In its recent studies, the IAEA has stressed that nuclear desalination is cost competitive against other energy sources; it has inherent advantages, such as no pollution, continuous operation, and a secured fuel supply; and that both the heat and/or the electricity produced by a nuclear reactor can be used for desalination, permitting flexible design concepts.

*—Marjorie Mazel Hecht*