# Nuclear Desalination: A Proven Technology Whose Time Has Come

by Christine Craig

Eisenhower Library

*President Eisenhower (left) and Lewis Strauss, just days after the 1967 Six Day War, proposed a huge nuclear desalination project for the Middle East, to promote peace and stability, by providing adequate power and fresh water for economic development.*

Early in the 1960s, foreseeing a time when freshwater needs would outstrip available supplies, the United States Department of the Interior's Office of Saline Water (OSW) authorized funding for five research facilities to study and develop various desalination technologies for the country. These facilities were strategically placed in Freeport, Tex.; Roswell, N.M.; Webster, S.D.; Wrightsville Beach, N.C.; and San Diego, Calif.

The Wrightsville Beach facility on Harbor Island, set up in the early 1960s, was dubbed the "world center for experimental development in saline water conversion," by the director of the OSW at that time, C.F. McGowan. Its mission was to study and assess the feasiblity of a variety of possible desalination technologies—freezing, reverse osmosis (RO), electrodialysis, and distillation—of which the most promising were RO and distillation. While the lab was still in operation during the 1960s and 1970s, a huge sign covered the three freshwater storage tanks for the research station, proclaiming mysteriously: "Fresh Water from the Sea."

Desalination is by no means a modern concept. The importance of fresh water would be inescapable to any long-distance seafaring people. As Samuel Coleridge's ancient mariner lamented: "Water, water, everywhere, nor any drop to drink." Japanese (and undoubtedly many other) early mariners used heat evaporation and cooling condensation to provide emergency fresh water on voyages. Thomas Jefferson even wrote a technical paper in 1791 on an improved form of distillation process for desalination aboard ships. And with the advent of sea-going steam ships, desalination became absolutely necessary to provide the relatively pure water necessary for the steam process. Nowadays, regardless of what powers an ocean-going vessel, desalination of potable water is the norm, and eminently more sensible than trying to carry a hold-full of drinking water across the wide ocean.

## Nuclear: Perfect To Power Desalination

Modern desalination techniques require large amounts of electricity or process heat for large-scale production of fresh water, and nuclear power is the perfect candidate to supply it.

Nuclear desalination seemed a natural outgrowth of the potential envisioned for nuclear power by the Atoms for Peace Project initiated by President Dwight D. Eisenhower after World War II. In fact, in 1967, just days after the Six Day War, former President Eisenhower and Adm. Lewis L. Strauss, former chairman of the Atomic Energy Commission, proposed an ambitious program for development in the Middle East, which was an extension of Eisenhower's 1953 Atoms for Peace program. This program, called "A Proposal for Our Time," aimed at promoting peace and stability in a war-torn region by priming the pump with a massive infrastructure project to bring cheap fresh water to the region—a nuclear water-desalination project.

This proposal envisioned the construction of three huge, multi-purpose nuclear plants, two on the Mediterranean and one on the Gulf of Aqaba, which would be capable of generating more than a billion gallons of fresh water per day, using the well-studied distillation technique. At the same time, the plants could be used for electricity production in the region. Based on studies done by the Oak Ridge National Labs, Eisenhower was confident that the price of water generated at these facilities could be made cheap enough for agricultural use, making possible an agro-industrial oasis in the desert.

As early as 1964, an announcement was made of a partnership among the Department of the Interior, the Atomic Energy Commission (AEC), and the Metropolitan Water District of California to study the construction of a 150-million-gallon per day desalination distillation plant near the OSW test facility in San Diego. According to then Secretary of the Interior Stewart Udall, "Preliminary reports indicate that a well-designed plant using nuclear energy can produce fresh water at seaside for 22 cents a thousand gallons and generate electric power for as little as 3 mills per kilowatt hour."

The project was to be powered by a 1,800-megawatt-electric nuclear plant, coupled to an multi-stage-flash distilla-

IAEA

*Ohi Nuclear Power Generating Station, run by Kansai Electric, was Japan's first nuclear desalination project.*

tion desalination plant, supplying up to 750,000 people with fresh water and electricity in the arid southern California desert.

By the 89th Congress, in September of 1966, the Metropolitan Water District project was well along, and was touted as "the first dual-purpose desalting application of its kind and size in the world" in the Joint Committee on Atomic Energy hearings on the project.

The project was never completed. Unfortunately, Eisenhower's "Proposal for Our Time" was never implemented, as the nation's optimism for nuclear power was manipulated and transformed into fear and pessimism by nuclear nonproliferation fanatics and their puppets in the environmental movement.

## Other Nations Move Ahead

While nuclear desalination has languished in our country, other nations have amassed decades of experience coupling the two technologies. The first large-scale nuclear production of fresh water was at a Soviet-era 150-MWe liquid-sodium-cooled fast breeder reactor in Aktau, Kazakstan—the BN-350. From 1973 until its decommissioning in 1999, the BN-350 reliably and safely produced 80,000 cubic meters per day of fresh water by Multi-Stage Flash Distillation and Multiple-Effect Distillation (MED). The water was used in plant operations and for municipal water consumption in the arid Mangyshlak peninsula on the east coast of the Caspian Sea.

Japan first harnessed nuclear power for desalination back in 1978, with its Ohi Nuclear Power Station's 1,175-MWe Pressurized Water Reactors. Since then, 10 of Japan's 53 electricity-producing nuclear plants have used waste heat or electricity to desalinate water on a small scale—100 to 3,900 cubic meters per day—mostly for in-plant use for steam generators and potable water. The desalination technologies used by these plants have included all of the major types.

More recently, Pakistan hooked up its KANUPP 137-MWe Pressurized Water Reactor to an RO desalination system, producing 454 cubic meters per day of water as an emergency source of feed water to the steam generator. In the last few months, the reactor staff has also installed a larger demonstration MED unit capable of producing 4,500 cubic meters per day. India has done the same with its Kalpakkam PHWR in the southern state of Tamil Nadu (see *EIR,* March 31, 2006, p. 38).

Even in the United States, which long ago turned its back on nuclear desalination, the Diablo Canyon Nuclear Power Station, owned by Pacific Gas & Electric, quietly has operated a desalination unit powered by its two 1,100-MWe Pressurized Water Reactors, which produces 4,500 cubic gallons per day by RO for in-plant use. The desalination plant was originally conceived as a joint project of the California State Department of Resources and the OSW.

So, nuclear desalination is not a radical untested idea. It is a mature technology which has been waiting in the wings, perfecting itself for the call to action by a world (including the United States) waking up to the nuclear power imperative.

U.S. Maritime Administration

*The* NS Savannah *was the first nuclear-powered cargo/passenger ship. She was a product of Atoms for Peace optimism, designed to demonstrate the technical feasibility of nuclear merchant ships.* NS Savannah *could circle the globe 14 times at 20 knots without refueling. Nuclear surface ships, submarines, and icebreakers all use nuclear desalination for their plant and potable freshwater needs.*