Build waterworks: Nawapa, nuclear-powered desalination

The general scope of required U.S. waterworks construction is clear from the foregoing review, an infrastructure construction need that holds for anywhere in the world: There needs to be infrastructure for storage and supplies; for purification, and for treatment of waste-water; and, finally, for the distribution system to end-users.

What we illustrate here, are the two leading projects essential for restoring the U.S. water resources base, and that of the North American continent: the North American Water and Power Alliance (Nawapa), and nuclear-powered desalination. In principle, such projects, that is, continental-scale "hydro-geographic" engineering and advanced nuclear desalination, are called for on many continents, to rectify the ecological disasters, such as the Aral Sea Basin (between Kazakhstan and Kyrgyzstan), which have resulted from lack of infrastructure development.

Nawapa

If Nawapa, which was designed as a 20-year construction project, were to have been initiated when first favored by Congress in the 1960s, then, as of now, in the 1990s, the United States would not be experiencing increasingly severe water shortages in its western states. We would be enjoying an augmentation of at least 135 billion gallons per day to the U.S. water supplies, and additional water supplies would be available to Canada and Mexico as well. For the United States, this would be a 20% increase in supplies, concentrated in the western, arid states.

Nawapa was thwarted (see box, on opposition to water projects), and sister projects in Mexico and Canada were likewise stopped. But it is important for citizens and policymakers to now take up Nawapa again. Besides the project's intrinsic merits, the current ongoing collapse of the International Monetary Fund-era financial system, which blocked such needed waterworks, means that there is an urgent, renewed opportunity to re-start such stalled infrastructure programs, as the core of reviving national economies.

In 1966, U.S. Senate hearings, chaired by Sen. Frank Moss (D-Utah), chairman of the Special Subcommittee on Western Water Development of the Senate Interior Committee, were held on the feasibility of Nawapa. Senator Moss said that with the expected success of putting a man on the Moon, the U.S. public and policymakers had reason to look forward to the completion of Nawapa.

The basic concept of Nawapa is shown in **Figure 10,** which is based on the 1968 engineering outline of the Ralph M. Parsons Co., based in Anaheim, California. The scheme was originally devised by California hydrologists in the 1950s, who anticipated that sometime in the 1970s-'80s, water shortages would hit the Southwest, because interbasin transfers from the Colorado River system would have reached the maximum.

The idea is to divert southward a portion of water flowing into the Arctic Circle in the Yukon.

Also in the 1960s, Mexican hydraulic projects were worked up by the College of Civil Engineers in Mexico City. Called the Hydraulic Project for the Northwest (Plhino) and the Hydraulic Project for the Gulf of the Northeast (Plhigon), these designs would move water through canals and existing river beds draining the slopes of the Sierra Madres, to the dry northern states of Sonora, Sinaloa, and Tamaulipas. This is shown schematically in Figure 10.

The northwestern region of North America receives about one-quarter of all the rain and snow that hits land on the planet every year, and most of this runs off northward into the Arctic Ocean, unused. The Nawapa scheme would divert up to 15% of this flow, beginning with channeling it into a "natural wonder" reservoir—the 500-mile-long Rocky Mountain Trench in British Columbia. This is a 10-mile-wide geological formation that could hold almost 500 million acre feet of water.

From here, the water would flow in three directions:

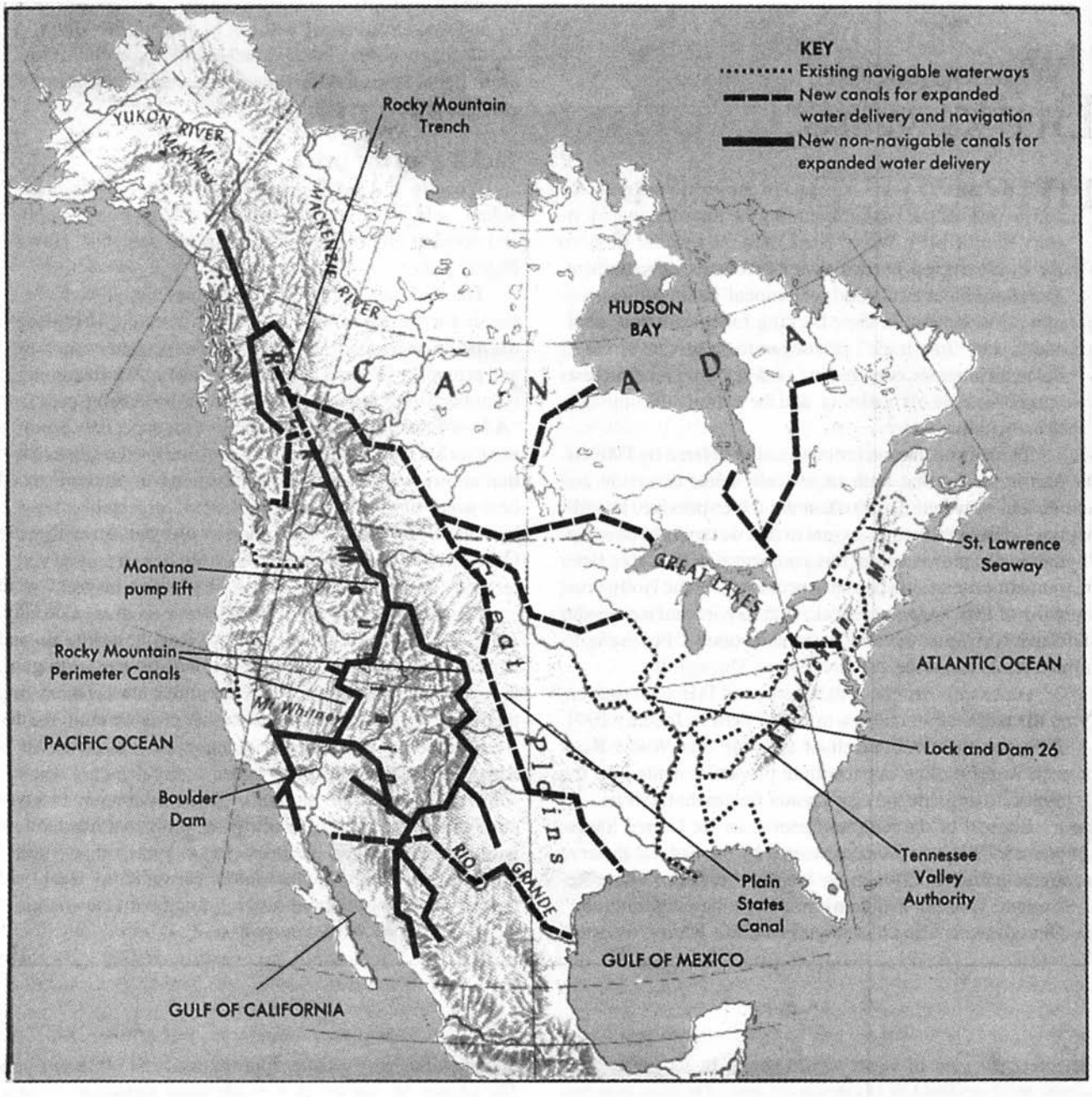
1. Eastward, across the Canadian Plains provinces, providing water for irrigation there, as well as a navigable canal that would connect the Pacific Ocean to the Great Lakes, enhancing the hydraulics of the Great Lakes Basin and the St. Lawrence Seaway.

2. Southward, across the Sawtooth Mountains in Idaho, through Utah and Nevada into southern California (where it would provide 10 million acre-feet a year), Arizona, New Mexico, and northern Mexico (where it would provide 22 million acre feet a year), thus alleviating the overtaxed Colorado River.

3. Southeast, across Montana and the Dakotas, where it

FIGURE 10

The Nawapa plan for bringing additional fresh water to the United States, Canada, and Mexico



would contribute to recharging the declining Ogallala Aquifer on the High Plains, augment the flow of the Missouri and Mississippi rivers, and link the Canadian Plains with the Mississippi River by a navigable canal.

Nawapa is vast in scale, but not complicated in engineering. Reducing the 20-year construction timetable is conceivable, by the prospect of introducing the use of peaceful nuclear explosives (PNEs) in the construction. Any timetable drawn up is subject to the constraints of the decay in the U.S. economy. But, under whatever circumstances, the idea of the scheme is to build it in phases, reaping benefits as parts of the system are completed.

Under the original projection, after year eight of construction, it would be possible to produce and sell 5 million kilowatts (kW) of electricity. After year nine, some 23 million kW would become available, and the first flow of 15 million

Who opposes water projects?

Over the past 25 years, a nexus of international agencies and private central banks, including the International Monetary Fund (IMF), World Bank, and the Federal Reserve Bank, obstructed needed water resources development. They have blocked all kinds of national-interest infrastructure development, in their backing for speculation, debt-usury, and "free trade" privileges for a private circle of financial interests, centered in London. Now these interests are profiteering off hoarding, and the scarcity of commodities, including water.

The most common rationalization offered by IMF circles is the lie that both large-scale water diversion and nuclear-powered desalination are too expensive. In addition, there is the bogus argument that waterworks developments are threats to the environment. On cue, this latter point of propaganda has been promoted by the Hollywood wing of IMF financial circles, with movies and movie-star charity drives to "save the rivers and oceans." For example, see the 1992 movie, "A River Runs Through It."

An example of the consequences of IMF intervention, is the outbreak of cholera in Lima, Peru in January 1991. This was the direct result of the IMF and World Bank repeatedly stalling or cancelling proposals made over the 1980s, to upgrade the city's water treatment facilities.

Typical of the Federal Reserve in the United States, was a 1979 symposium sponsored by the Federal Reserve Bank in Kansas City, on the topic of "Western Water Resources: Coming Problems and the Policy Alternatives." One speaker, Canadian engineer Keith Henry, asserted, "Colossal concepts such as Nawapa [North American Water and Power Alliance] will not be practicable with the technical, economic, energy, and political constraints under which we presently live, and even smaller schemes are going to present great difficulties."

Jacking up the price

What to do then? Another speaker, Theodore M. Schad, said, "The most economic way to bring supply and demand into balance is by reducing demand." How? Higher prices.

The Fed, and also the IMF internationally, back proposals for "water banks" and "water markets" to replace the nation-serving idea of fostering public water supplies, and providing for agriculture and industry. A forthcoming (October 1996) report by the National Research Council, "A New Era for Irrigation," gushes, "One especially promising tool is the water 'bank'—an institutional mechanism that allows water users [mostly farmers] to 'deposit' excess water rights [from western federal projects] for lease by others." In 1992, a new federal water law deregulated California's Central Valley Project, the largest federal water program in the country, to create a "water market."

Praising this idea, a Federal Reserve economist, Ronald Schmidt (San Francisco, 1991), wrote, "Over the longer term, deregulated water markets could offer an automatic mechanism to solve the [water] allocation problem in the least-cost way. As supplies shrink, prices would rise."

Profiteering off bottled drinking water is the latest bonanza in Washington, D.C., because city drinking water showed bacteria this summer. The corporate interests dominating bottled water worldwide, just like those dominating other vital commodities (foods, fuels, metals, and minerals) are Anglo-Swiss-Dutch. Nestlé is the world's largest supplier of bottled water, with about 13% market share of all sales. Nestlé owns Perrier.

acre feet per year of water would begin. In 12 years, there could be 31 million kW of electricity, and 39 million acre feet per year of water.

The further benefits of Nawapa include enormous transport improvements. Water is the cheapest form of moving goods. In 1990, the United States had about 11,000 miles of mainline inland waterways; Nawapa would increase this significantly, and provide new north-south water routes through the High Plains of the prairie provinces and states, opening up whole new areas for high-density settlement.

In the 1960s, the cost of Nawapa was estimated to be $100 billion, which in today's dollars would be over $300 billion, or, depending on the pace, approximately $15 billion a year. The phases of construction would have significant positive effects throughout the economy. Nathan Snyder, a Parsons engineer who worked on the Nawapa studies, in 1988 told a gathering of the Institute for the Advancement of Engineering: "Much experience has been gained in accomplishing large projects in Alaska and Canada. For instance, Parsons managed the design and construction of $4 billion oil and gas recovery and processing plants and infrastructure on the Alaskan North Slope. This was done under the most severe weather conditions in a remote areas. Even now, the massive hydroelectric complex constructed along La Grande Rivière

FIGURE 11

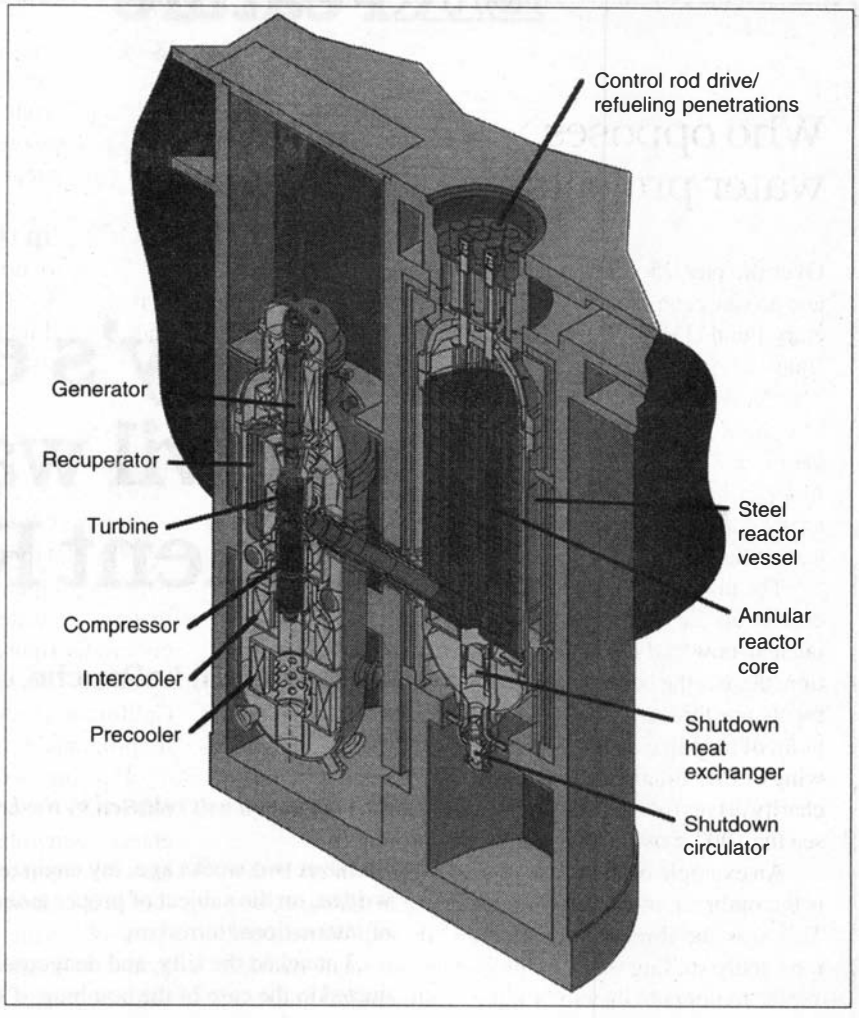
The Gas-turbine Modular Helium Reactor

The GT-MHR is modular, simple in design, and inherently safe (no meltdown is possible). It is the first nuclear reactor to eliminate the steam turbine, converting its heat, via the helium coolant and an advanced gas turbine, directly into electricity.

The increased efficiency of the GT-MHR comes from several recent technological breakthroughs: new gas turbines developed for jet engines like the Boeing 747's; compact plate-fin heat exchangers that recover the turbine exhaust heat at 95 percent efficiency; magnetic bearings that are friction free, eliminating the need for lubricants in the turbine system; and high strength, high-temperature steel vessels.

The fuel particles are unique to this type of helium-cooled high-temperature reactor. Uranium or plutonium fuel is fabricated into tiny particles that are coated with layers of ceramic materials that constitute tiny individual "containment vessels."

The helium enters the reactor core at 915°F and is heated by the nuclear reaction to 1,562°F. It then converts the heat to electricity and the helium is cycled back to the reactor vessel.



Source: *21st Century Science & Technology*

in Quebec, shows definite proof by the Canadians that a program such as Nawapa can be accomplished."

Desalting seawater

Desalting seawater requires reducing the parts per million (ppm) of dissolved solids (80% of which is sodium chloride, or salt) from 35,000 ppm to less than 500 ppm, a reduction of 70 to 1. There are several methods now commonly used: distillation (some form of which is used in over 90% of installed desalination capacity), reverse osmosis membrane (newly improved), electrolysis, and vapor compression. In addition, research into the electromagnetic structure of water promises revolutionary methods of desalting for the future.

With the many recent advances in materials involved in seawater desalting, the chief cost of making fresh water is the energy involved. By providing power inexpensively with advanced nuclear generation, desalination can be rendered far less costly at the same time.

Figure 11 shows a diagram of the proposed gas-turbine modular helium reactor (GT-MHR, the process of energy generation is described in the text). This proposal comes from General Atomics, a company based in San Diego, California, whose engineers have worked up specific proposals for how to exploit the advantages of nuclear power for both energy generation and water desalination.

Because application of these new technologies would provide such relatively low cost water, along with electricity, we thus have the power to create new "run-off" at strategic coastal sites—in other words, new supplies of water that are equivalent to new man-made rivers and reservoirs.

One proposed installation of the GT-MHR, and a desalination facility (multi-effect distillation) in Southern California, is projected to provide 106 million gallons per day, which is comparable in size to Atlanta, Georgia's municipal water system (104 million gallons per day, serving 700,000 people), and that of many other cities, including San Diego, California (104 mgd, 723,000 people) and Honolulu (110 mgd, 535,000 people).