

India: Tamil Nadu Gets Nuclear Desalination

by Ramtanu Maitra

One of the hottest subjects in the southern Indian state of Tamil Nadu is drinking water. The economically flourishing Tamil Nadu is confronted with a perpetual water shortage. The only solution is widespread desalination of sea water, and a leading Tamil Nadu politician and former Chief Minister, J. Jayalalitha, has made desalination her political trademark in the state. She has accused the national government in New Delhi of sabotaging her plans to set up more desalination plants.

Although Tamil Nadu has forced through initiatives to meet its water shortage through desalination of brackish and sea water, the fact remains, that the entire nation of India is facing a water crisis. India, which had enough drinking water for its people in 1951 at 5,177 cubic meters per person per year, is becoming a water-deficient country. In 2003, the country had a 25% deficit, at a rate of 1,500 cubic meters per person per year. The deficit is projected to rise to 33% by 2025, unless measures are taken to resolve it.

Ironically, Tamil Nadu is providing a leading example of how to deal with potable water shortages, not only just for India, but also for countries throughout the world. If combined with a major commitment to nuclear power as well, the potential for solving this life-threatening problem is clearly in sight.

Obstacle to Growth

Jayalalitha could not have been more right in demanding more desalination plants. Tamil Nadu is a water-scarce state. Although it has 33 river basins, the rivers are short, and carry water seasonally. On the other hand, almost 45% of the state's land is under cultivation, and the annual food grain production exceeds 10 million tons, with rice alone contributing an average 8 million tons.

Minerals such as limestone, lignite, granite, clay, gypsum, feldspar, graphite, and iron are abundant in Tamil Nadu. Besides these, small quantities of gold, copper, magnesite, kaolin, bauxite, and asbestos are also found here. Many industrial units have been set up for optimum utilization of these mineral resources, and more would be set up in the future, if the water shortage could be solved. The organized sector employs more than 25 million people, and the number is growing.

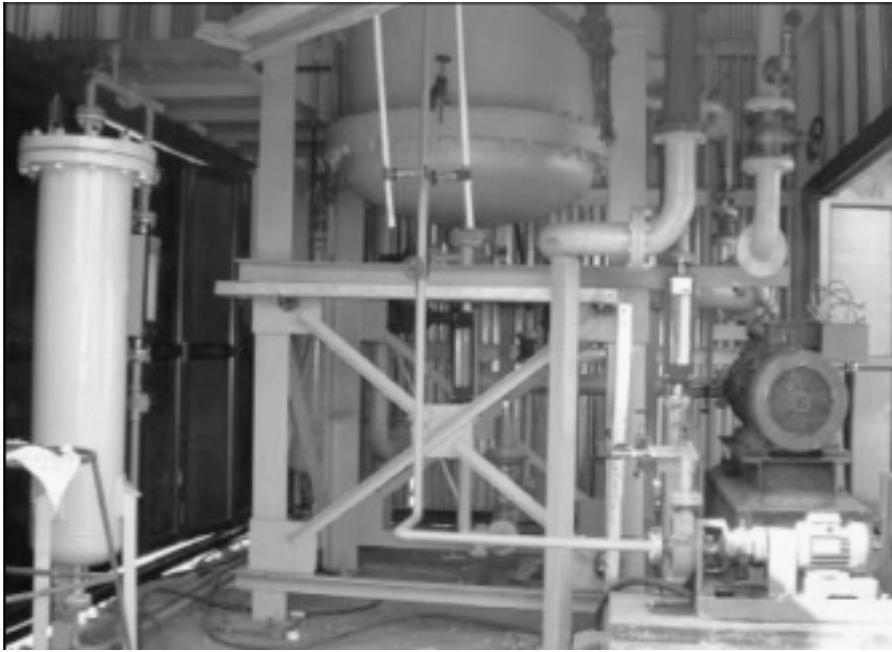
At the same time, in order to grow, Tamil Nadu has invested heavily in education, and ranks the third highest in the Union in terms of total expenditure on education. There is no

question that under the circumstances, Tamil Nadu should explode with economic activity and generation of wealth. However, the shortage of available water, and the national leadership's inability to develop policies that would help Tamil Nadu develop a water surplus, have held the state back.

Desalination Is the Answer

At least some in that state have come to realize that Tamil Nadu, with its long coastline, is not really water-short. What it is short of is New Delhi's support to develop a water surplus. Over the years, Indian planners and crisis managers have talked about a Peninsular river project. One part of the southern development project would consist of linking the Mahanadi, Godavari, Krishna, and Cauvery rivers by canals. Extra water storage dams would be built along these rivers, to transfer surplus water from the Mahanadi and Godavari rivers to the south of India. However, nothing much along these lines has seen the daylight yet, and it is anyone's guess when this actual interlinking would be done. On the other hand, it is almost a certainty that in a water-short nation like India, states which have some surplus water in their rivers, would object





Tamil Nadu has a great potential for industrial growth, provided that the problem of a perpetual shortage of water is solved. Shown here is a desalination unit attached to the CIRUS nuclear facility, near Bombay, in a different region of India.

BARC

vehemently to such water transfer plans.

One such instance was the Telegu Ganga plan, which would have allowed seasonal surplus water from the Krishna River to get to reservoirs that provide year-long drinking water to the residents of Chennai (formerly Madras), the capital and main city in Tamil Nadu. However, the Telegu Ganga project has yet to supply the promised water to Chennai from the Krishna River, despite major investments made to the project by the state of Tamil Nadu.

It had long become evident to the state politicians that the only way Tamil Nadu's water shortage can be met is through desalination. Championing the cause, former chief minister Jayaram Jayalalitha in 2004 accused Union Minister for Environment A. Raja of stalling a proposed 100 million liters per day (MLD) desalination plant for Chennai. Jayalalitha has also criticized Finance Minister P. Chidambaram, also a Tamil Nadu politician, for prematurely saying that the central government was ready to give Tamil Nadu Rs. 10 billion (rupees) for setting up a desalination plant, and doing nothing to prevent the stalling tactic used by Raja.

In a rebuttal to an academic's assertion that desalination would not solve the water shortage problem, Jayalalitha, in a letter to a newspaper in September 2004, wrote: "The Government of Tamil Nadu is also keen to proceed with the desalination plant for Chennai. Desalination is the only reliable final solution for Chennai's growing water needs. Desalination technology has been greatly improved upon, making it now possible to supply fresh water at a reasonable price. . . ."

Success Stories Around the Nation

The reason that Jayalalitha is so confident, is that a large number of small desalination plants, based on the reverse

osmosis (RO) process, are already functioning in the state. Water managers and experts point out Chennai's satisfactory experience with the five units in the city, producing 500,000 liters a day. Metrowater set up three plants at Nochikuppam, Kasimedu, and Velachery, in the area around Chennai, in 1977-78, and two at Kasimedu and Ayodhyakuppam in 2001.

The seawater-based desalination plant at Narippaiyur in Tamil Nadu, a major plant in south Asia, is successfully supplying drinking water to 264 villages in the Ramanathapuram district, according to the Tamil Nadu Water Supply and Drainage board (TWAD). The plant, installed recently, has a capacity of 3.8 million liters per day and covers a population of 235,000, providing an average of 10 liters of drinking water per day per person.

The Tamil Nadu government has approved the installation of 45 desalination plants in Ramanathapuram district, at a cost of Rs. 5.3 billion, and the installation work has been entrusted to Bharat Heavy Electricals Limited (BHEL), a Government of India undertaking. Out of 45 plants, two major ones are at Narippaiyur and Rameshwaram (300,000 liters per day). The remaining 43 smaller plants (20,000 to 300,000 liters per day capacity) have been designed for treating brackish water from bore-well sources.

Thanks to Jayalalitha's relentless campaign for desalination plants, the water managers and experts now point out that finally both the central and state governments seem to be adopting a similar approach. That is why Chennai's Metrowater has decided to go in for a 100 million liters per day (MLD) desalination plant.

Jayalalitha's campaign has drawn her close to a number of major advocates of desalination. One such is Indian President A.P.J. Abdul Kalam, a Tamil Nadu resident and widely ac-



This 4,500-cubic-meters-per-day Multi-Stage Flash desalination plant is under construction, inside the nuclear facility at Kalpakkam, in Tamil Nadu state.

knowledge as the “Father of the Indian Missile Program.” Delivering the inaugural address at the Indian Nuclear Society conference at Kalpakkam, near Chennai, in 2003, President Kalam had stressed the need for finding a lasting solution to the water crisis around the world. He said on that occasion, that desalination of sea water to produce fresh water appears the best, with 97% of the Earth covered by ocean. This could produce a perennial supply of fresh water. The Indira Ghandi Center for Atomic Research is located in Kalpakkam.

Kalam pointed out that India has begun looking at the use of nuclear power for desalination of sea water. A desalination demonstration plant at Kalpakkam, using nuclear waste heat for the multi-stage flash process that produces 4,500 cubic meters per day has already been set up. “These plants can be scaled up 10 times from the present configuration with out any difficulty,” he said.

Already two methods of desalination—reverse osmosis and multi-stage flash—have been demonstrated at the Bhabha Atomic Research Center (BARC). Joining voices with Kalam, Jayalalitha, who was then Tamil Nadu’s chief minister, urged the Department of Atomic Energy to set up a large number of smaller desalination plants all along the Tamil Nadu coast, based on the Kalpakkam experience.

BARC Support

There are indications that Tamil Nadu may get what it needs. B. Bhattacharya, former director of BARC, who played a key role in developing the desalination plant coupled to a nuclear electricity station in Kalpakkam, has already supplied 15 desalination plants to different Indian states, and constructed a large desalination plant adjacent to the Madras Atomic Power Station (MAPS) at Kalpakkam, at a cost of Rs. 4 billion. The plant was inaugurated in 2002 by the then-Indian Prime Minister Vajpayee on Dr. Bhabha’s birthday, Nov. 4.

In an interview in 2001, Bhattacharya pointed out that desalination technologies available today are broadly based

on processes belonging to three categories: reverse osmosis (RO); multi-stage flash (MSF); and multi-effective distillation (MED). India has pursued all three processes for some time, and has realized that the RO and MSF technologies were the two in which it can be self-reliant. MSF does not need any imports. RO has a membrane module which is imported.

Meanwhile, the second nuclear desalination plant at Kalpakkam, with a capacity 4,500 cubic meters per day, is expected to be commissioned in March 2006, an official of BARC said.

BARC has already commissioned a 1,800-cubic-meters-per-day nuclear desalination demonstration project (NDDP) at Kalpakkam, using reverse osmosis technology. The remaining 4,500-cubic-meters-per-day plant, which is under construction at Kalpakkam on MSF water purification technology, will be commissioned this month.

Anil Kakodkar, chairman of the Atomic Energy Commission, told *The Hindu* recently that the BARC is working on a mobile barge-mounted desalination plant located meters off shore. “It will be ready by the end of the Tenth Plan, maybe in 2006 or 2007. People are working out the engineering details,” Dr. Kakodkar said.

“It can go on any platform. It can go by water route or land route. But the first idea is to put it on a barge,” the AEC chairman said. On the sea, it would float, depending on the draught. “The barge may be able to come within 10 meters of the shore,” he said. But there should be a storage tank on shore, which can be filled with the water that has been desalinated. Similarly, if it is trailer-mounted, it can be parked near a storage tank that can be filled with fresh water. Pipes from the mobile desalination plant will fill the storage tanks with purified water.

Foreign Investors

India’s eagerness to accept desalination as a way to meet the water shortage has attracted investors as well. Saudi Arabia’s Bushnak Group is forming joint ventures with Indian project developers to help set up desalination units, the first of which is slated to come up in Karaikal, Pondicherry, north of Tamil Nadu on the east coast, by 2007. In the case of the Karaikal desalination plant, the \$8 million investment is proposed to set up a 5-million-liters-per-day capacity plant, expandable to 10 million liters. It would produce water for industrial use.

Bushnak has tied up with Hyderabad-based Pallava Water and Power to set up the first joint venture, which plans to undertake three desalination projects in southern India. The group has announced its plans to set up desalination units in the states of Tamil Nadu, Andhra Pradesh, and Karnataka, besides Pondicherry (in southern India). Although the exact locations are still to be finalized, the second desalination project is planned south of Chennai for completion by December 2007, followed by another one in Visakhapatnam on the east coast of Andhra Pradesh by mid-2008.