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Water Goes Off the Grid

A Canadian company rethinks atmospheric-water generators

THE ESCALATING cost of electricity has sent a growing number of consumers in search of ways to generate electricity at home. Element Four, based in Kelowna, B.C., Canada, is betting that with bottled-water consumption increasing and aging water distribution systems, water will be the next commodity consumers will want to produce at home. The company has done what it says is a top-to-bottom reinvention of the atmospheric-water generator—a device that pulls water from the air by cooling it to the point that condensation forms and then keeps it sterile for drinking.

Element Four's WaterMill is a 300-watt generator that makes up to 12 liters of drinking water per day—enough, it says, for your typical North American household. At Kelowna's rate of 6 U.S. cents per kilowatt-hour, the cost comes to about 3 to 4 cents per liter. The technical innovation is in two areas, according to Richard Weisbeck, chief technology officer. The first, a system of temperature, pressure, and humidity sensors that feeds into a microcontroller, makes the device automatically adapt to its environment. The microcontroller fine-tunes the flow of air and refrigerant in the machine to match its surroundings so that it continues to work in extremes of heat and cold, inside or outside. "From Toronto to Ecuador, you can pull it out of the box and the machine will search for its peak efficiency and then run that way," says Rick Howard, Element Four's CEO.

The control system's improved efficiency lets the machine use a bare condensation coil, unlike other such devices, which use cooling fins. Finned coils could harbor bacteria, says Weisbeck. But a bare coil can be kept sterile using the same ultraviolet lamp that kills bugs in the collected water.

Market trends appear to be in atmospheric water's favor. Consumers around the globe are turning away from the tap, Howard notes. Though he hopes they'll start turning toward atmospheric water, right now they're buying bottled water. According to the International Bottled Water Association, global consumption of bottled water has grown 7.6 percent



HAPPY NOW? Will the chance to generate drinking water from the air make consumers smile? PHOTO: ELEMENT FOUR

per year on average since 2002, reaching 189 billion liters in 2007. The United States led consumption, with 33 billion L, but was followed closely by populous developing countries like China, Brazil, and Mexico. China's market grew 17.4 percent per year.

But bottled water is widely thought to be too energy intensive to produce and deliver. According to estimates by the Pacific Institute, a think tank in Oakland, Calif., just producing the bottles, caps, and packaging for the 31 billion L of water sold in the United States in 2006 ate up the equivalent of 17 million barrels of oil (about 106 billion megajoules), not to mention 62 billion L of water.

Even though they're buying more bottled water than ever, consumers in the industrial world are still trained to turn on the tap. But the drinking water infrastructure is in serious need of attention. According to a 2005 U.S. Environmental Protection Agency report, most drinking water systems in the United States contain pipes more than 80 years old. The agency estimates that the country's distribution pipe infrastructure needs an investment of US \$183.6 billion over the next 20 years and a further \$24.8 billion for drinking water storage. "We've gone 100 years without really giving [the system] much attention," says Vanessa Speight, an expert on water-distribution systems in Washington, D.C., who works for environmental engineering firm Malcolm Pirnie. Getting the funding to repair or replace the country's old pipes, especially with water utilities burdened by higher energy prices, is going to be a real challenge, she says.

Infrastructure funding is even more of a challenge in the developing world, and the need is even more acute. The United Nations estimates that 880 million people lack safe sources of drinking water. Atmospheric-water-generator companies are looking to make inroads there too. Element Four's other product, the WaterWall, is targeted at supplying a developing-world village or neighborhood. The device, which the company will start manufacturing in early 2009, is made up of a scalable number of generators, each of which is essentially a bare-bones form of the WaterMill. In places where the power grid is delicate, a kilowatt-scale water generator could easily draw so much power at start-up that it would cause a blackout—one reason atmospheric-water generators have failed in the developing world in the past. So Weisbeck designed the WaterWall to start up in stages, gradually increasing the load and, one hopes, sparing the local grid.

—SAMUEL K. MOORE