

BU alums

hope

to make the

world

a greener

place



Ways to Get There

BY
ART
JAHNKE



1

Getting the Dirt Out

A new and improved way to turn coal into clean fuel

JUST BEYOND THE great cylindrical cooling towers of the Brayton Point Power Station on Rhode Island's Narragansett Bay, a shorter, square tower rises above a metal-sided industrial building. In the shadow of Brayton, the largest coal burning plant in New England, it looks like a baby power plant. And while a commercial version of the GreatPoint pilot gas production facility may someday match the height and megawattage of its imposing

sion and allow it to turn coal, coke, and other carbon-based fuel into pipeline-quality natural gas. That's the kind of gas that provides 23 percent of the energy consumed in the United States and heats 60 percent of homes, according to Goldberg. He says the company's hydro-methanation process can do that at a price that works in today's economy. What's more, the GreatPoint process allows for capture of the carbon dioxide by-product.

"That's important," he says, "because you can take the carbon dioxide and use it to repressurize oil

fields and extract more oil from abandoned wells."

Goldberg cofounded GreatPoint with company CEO Andrew Perlman (CAS'98). They met in 1997, and when Perlman graduated with a degree in political science, he went to work for Goldberg, who had left school to start a voice-over data company that would become Cignal Global Communications.

"When I started, we had 10 people," says Goldberg. "We went from 10 to 300 people in 22 countries."

In 2000, Cignal was sold to a large European data company, and the two young entrepreneurs immediately started a new company,

Coatue Semiconductors, which was sold after two years to Advanced Micro Devices. Together, the former roommates and partners in GreatPoint Ventures, which Goldberg calls a "venture creation company," have started nine companies, including six that work with green energy.

"We started looking into green energy in 2001," recalls Perlman. "We entered the space in 2005 when we started raising money for GreatPoint. We both felt that we wanted to do something that would really make people's lives better."

For GreatPoint Energy alone, Goldberg and Perlman have raised \$150 million from investors, including Dow Chemical Company and Suncor Energy, as well as venture capital firms such as Advanced Technology Ventures and Citi's Sustainable Development Investments.

The pilot plant on Narragansett Bay has now conducted at least a dozen successful trials, and Goldberg is convinced that his technology is good to go.

The next step, he says, is building the commercial-scale plant. He says that GreatPoint is scouting locations, and he hopes to build near coal mines, to reduce

the cost of transporting coal, and near oil refineries, which produce petroleum coke.

← **GOOD TO GO** After a dozen successful tests, Avi Goldberg is convinced that his technology is ready for commercial application.

neighbor, it will have a very different, much cleaner mission. Rather than burn coal to produce energy, the GreatPoint facility converts even the dirtiest coal to one of the cleanest fuels around: natural gas.

"It's clean," says Avi Goldberg (CGS'96, CAS'98), cofounder and chief operating officer of GreatPoint Energy, "because we convert it into gas, and in doing so we can strip out the pollutants."

Scientists have been turning coal into synthetic fuel for nearly a century, and synthetic fuel, as the product is known, is produced commercially all over the world. What's new (and improved) about GreatPoint's process, says Goldberg, is the use of a secret catalyst to optimize the conver-

WEB EXTRA
Avi Goldberg discusses clean energy at bu.edu/bostonia.

2

Oil Growing on Trees

Croton nuts could bring power to impoverished East Africa

On the high plains of Tanzania, oil from the croton nut tree has been used for centuries as lantern fuel. Christine Adamow, an American entrepreneur with three software start-ups under her belt, thinks the tree can bear even more valuable fruit. She believes the nuts, which are more than 30 percent oil, can power generators in parts of Africa that have relied on expensive and often hard-to-find diesel oil.

"The problem with diesel fuel," says Adamow (GSM'85), CEO of Africa Biofuel and Emission Reduction, "is that it is noxious and expensive. It's a big commodity market."

Croton nut oil, on the other hand, is the farthest thing from a commercial commodity. The croton nut tree, known to botanists as *Croton megalocarpus*, grows wild across much of East Africa. Adamow has spent four years and \$1.4 million, including \$200,000 from a World Bank Development Marketplace Award, mapping out a plan to bring green and affordable energy to the rural villages of East Africa.

At first glance, Adamow seems like an unlikely leader of a venture with operations deep in the African bush and offices in Dar es Salaam and Fort Mill, N.C. She has founded two software companies, one that sold a security patch for real-time trading platforms and one that sold risk management solutions for health care. Five years ago, she went to Africa to consult on a security system and met up with an optimistic trio (an American, a Brit, and a Tanzanian) who were trying to bring sustainable eco-

conomic development to East Africa.

"They needed business advice," says Adamow, "so I signed on for two months as a contract CEO." When the three decided that launching their venture would take a great deal more than Adamow's counsel, they moved on, and suggested that she take the project and run with it.

"They had done a lot of field research," she says. "And when they left, they handed me everything."

Adamow set out to build her own team, which includes Joe Scali (GSM'97), who had worked with her on other projects. Scali says the croton nut plan has the great advantage of being replicable in many parts of the world. "We have been contacted by people from Brazil, Indonesia, and Haiti," he says. "We are also talking to government agencies in Kenya that are interested in reforesting parts of that country."

In East Africa, Adamow and Scali plan to hire villagers to collect croton nuts, which fall to the ground when they are ripe. The two entrepreneurs have a good idea of how easily that can be accomplished: when the team needed to test croton nuts for oil content, Adamow contracted with a local farmers collective in Tanzania, which after two weeks delivered them—15 tons in all. She says the nuts are similarly plentiful in at least six areas in Tanzania, and that's before she plants 40,000 more hectares, with 200 trees on each. A croton nut-crushing machine could inhale 20 tons of nuts a day, she says, and exhale more than 6 tons of oil and nearly 14 tons of "presscake," a by-product that is rich in nitrogen and phosphate and can be used for fertilizer or burned as a substitute for charcoal. At full capacity, she calculates that her operation could get the cost of a barrel of croton nut oil down to \$16, a fraction of the price of diesel oil.

Adamow doesn't envision croton nut oil ever being sold at gas stations

in the United States, but she does see a day when the organic fuel brings power to villages in East Africa, where 80 percent of the people live without electric power and 75 percent of the people live off the grid. Her governmental permissions and partnerships are lined up and ready to go. What she doesn't have is cash. In addition to learning a lot about East African botany, Adamow says, she has found that it's a lot harder to raise money for the sustainable economic development of the region than it is for the software that facilitates online trades.

"There are no American entrepreneurs in Africa," she says. "It's strange, because the United States is the seat of innovation. We are the only nation in the world that has given birth to such powerful and basic technologies, but we have no interest in emerging markets. We need to stretch a bit and prove we are willing to contribute to the economic growth and development of the world."

3

Spreading the Word

A new journal hopes to get beyond the problem

IDA KUBISZEWSKI IS convinced that broad, inspired discussion of new technologies, new economics, and social change is the best path to making the world a greener place. Hence, *Solutions*: the name Kubiszewski and other founding editors gave to the nonprofit journal she helps publish six times a year.

"I've been bouncing around from field to field," says Kubiszewski (CAS'05, GRS'07), who earned



→ **GROWING OIL** Christine Adamow hopes to plant 40,000 hectares with croton nut trees, with 200 trees per hectare.

a bachelor's in astrophysics at the College of Arts & Sciences, a master's at BU's Center for Energy and Environmental Studies, and last spring, a doctorate in ecological economics from the University of Vermont. "That, in a way, is what *Solutions* does," she says. "It hopes to find whole system solutions for issues that are environmental, economic, and social. Our idea is finding a way to get past the problem and move on to a solution."

At BU, Kubiszewski worked with Cutler Cleveland, a CAS professor of geography and environment; the two cofounded the *Encyclopedia of Earth*, an online reference written by educators and experts who collaborate and review each other's writing. She still serves on its editorial advisory board.

Kubiszewski started thinking about *Solutions* two years ago, when colleague and Gund Institute for Ecological Economics director Robert Costanza began talking about the need for such a publication. She hammered out a business plan and sent it to the Adam J. Lewis Foundation, which funds nonprofit ventures involved in environmental responsibility and green space. The effort paid off with a \$500,000 grant, a fifth of the \$2.5 million that publishing experts advised she would need to start a magazine.

The paper magazine launched in January 2010 and now has a circulation of about 10,000. Subscriptions cost \$30 a year for individuals, \$300 for institutions. All content is free online at www.thesolutionsjournal.com. The bulk of revenues, Kubiszewski says, arrives in the form of sponsorships from charitable foundations.

"The business model is a lot like that of public television," she says. "Our business goal is to bring in enough to sustain the print edition, and our real goal is to get the mind-set out there."

Kubiszewski, who is managing editor, describes the publication as a "hybrid journal" that she hopes

will appeal to both academics and a general readership. One example is the plainly titled article "A Simple Mechanism to Clean Up Our Economy," by writers Bill McKibben and Peter Barnes. They propose that the best way to reduce the carbon load in the atmosphere is to create a trust to manage the sale of a declining number of carbon permits within the United States, with dividends from the trust distributed equally to all Americans.

"The dividends would be wired monthly to bank accounts until the country solves its climate crisis," McKibben and Barnes write. "The advantage of this simple, market-based mechanism is that it creates a level playing field for clean technologies, avoids giveaways to industries with

↑ **WARM THOUGHTS** At BU, Ida Kubiszewski cofounded the *Encyclopedia of Earth* with CAS Professor Cutler Cleveland.

political clout, and assures broad, long-term political support for emis-

sion reductions."

This past summer, Kubiszewski and editor in chief Costanza moved *Solutions* from its home at the Gund Institute, at the University of Vermont, to Portland State University's Center for Sustainable Processes and Practices, in Portland, Ore., where Costanza has been named director.

"Energy is one of society's major problems," says Kubiszewski. "It spans all aspects of society—social, economic, and environmental. I studied energy at BU and it was a great program, but we studied the problem and didn't really focus on solutions. We never got to that next step. *Solutions* is an attempt to get to that next step."



4

A Cool Breeze

Jim Gordon thinks one green energy solution is blowing in the wind

Nine years ago, Jim Gordon set out to catch the wind—and turn it into electricity with 130 wind turbines, each taller than the Statue of Liberty, planted in the sheltered waters of Nantucket Sound. Gordon (COM'75) estimated that on a good day his turbines could provide three quarters of the electric power needed by Cape Cod and the Islands. But despite that promise, what Gordon actually caught was a gale of opposition, mainly

from wealthy property owners in the area.

"This has not been an easy road," Gordon told *Bostonia* in a 2005 interview. At that point he had spent more than \$20 million on permits and legal fees. "Their strategy is to delay and try to make the developer spend itself into oblivion."

Oblivion was not on the list of places the already successful entrepreneur wanted to visit; Gordon has always had grand destinations in mind. As an undergraduate,

he studied broadcast and film, with a minor in marketing, and had his sights set on Hollywood. His first job, for better or worse, was closer to marketing than broadcasting: selling subscriptions to cable TV. Then one day during the 1975 Arab oil embargo, Gordon found himself waiting in a long gas line on Brighton Avenue. "I realized that energy was going to be an issue that would loom ever-larger in our economy and our national security," he recalls.

With \$3,000 in savings, Gordon founded Energy Management, Inc., selling off-the-shelf products to improve energy efficiency. When oil prices imploded in 1984, he saw an opportunity in natural

gas, and has since built six natural gas cogeneration plants and one wood-burning biomass facility. Then, in 1999, new federal and state incentives encouraged hydroelectric and wind power.

"We saw that wind power was ready for prime time," Gordon says. Energy Management sold five of its natural gas plants for more than \$250 million, and he spent the next year exploring possible locations for a wind farm. He settled on Nantucket Sound, he says, because the population in the area was growing, and energy needs were clearly on the rise.

In summer 2010, Gordon's dream moved closer to reality. But while U.S. Interior Secretary Ken Salazar declared in April that the Cape Wind project should proceed, Gordon still faces some choppy seas. A new raft of opponents has risen from just about every landmass surrounding the proposed site. Some of the opposition comes from local Wampanoag Indians, who believe

the site Gordon chose for his farm is sacred ground. In June, six groups filed suits in federal district court in Washington, D.C., claiming that the project will "exact a terrible toll" on federally protected migratory birds and possibly on whales.

In July, more noise erupted when consumers learned that National Grid, an energy company serving New England and New York, had agreed to buy power from Cape Wind, which could raise prices for its customers.

Gordon is going full steam ahead. "We are happy to report that Cape Wind has achieved its federal and state approvals," he says. "The federal and state regulators have found that our project will produce significant public interest benefits, such as increased energy independence, climate mitigation, new green jobs, and stable electricity costs."

One of the wind farm project's last hurdles, he says, is winning approval from the Massachusetts Department of Public Utilities. He believes that will happen soon.

Cape Wind will be producing electricity, Gordon predicts, by the end of 2012.



← **CHOPPY SEAS** Jim Gordon has spent more than \$20 million on permits and legal fees.



← **CLEAN TECH** Rao Mulpuri says his company's challenges are economic, not technical.

living in Tokyo with his wife and son, when he got a call from investors in Soladigm, who wondered if he would like to come back to California and run a clean tech company.

"For me it was a very exciting opportunity," says Mulpuri. "It was a chance to take a unique technology and build a business from the ground up."

He knew that the benefits of dynamic glass were not in doubt. Researchers had been advancing the technology for decades.

"In basic terms," he says, "we use a small electric charge to change the tint of glass, which has multiple layers of a very thin coating. When you apply the charge, the tint changes, so you can control the glare and the amount of solar radiation that comes in the building."

Soladigm's challenge, he says, has never been about proving that the technology works. It's about proving that the company can produce sheets of glass that are large enough for use as windows, durable enough to last 50 years, and inexpensive enough to make economic sense.

Mulpuri says these challenges have all been met. Soladigm has a pilot production system in place that is demonstrating the capabilities of its smart windows and is in the process of building a high-volume production line.

To make sure the product would meet the demands of the market, Soladigm researchers interviewed more than 100 architects, asking what they would like to see in a dynamic window. Architects are well aware that the day-to-day energy savings is only one benefit of dynamic windows, according to Mulpuri. "Because the windows let you consume less energy," he says, "you can get by with a smaller HVAC system, so you have capital savings up front. They can also enhance the user experience by delivering uninterrupted views and natural daylight.

"The main thing we learned," he says, "is that you can't find an architect who doesn't want to build a green building today." ■

5

Glass Houses

A new kind of window warms us and cools us

MANY ENTREPRENEURS ARE finding new ways to create energy. Rao Mulpuri, on the other hand, is helping us get more out of the energy we already make. Soladigm, the company Mulpuri joined as CEO a year and a half ago, makes dynamic windows. Also known as smart windows, Soladigm's windows use electrochromic technology to control the amount of glare and solar radiation that enter a room, greatly reducing a building's energy consumption. Mulpuri says his company's technology can save 25 percent of the energy used to heat and cool a building—an impressive number, considering that in the United States,

buildings consume 40 percent of the total energy produced (transportation and industrial uses consume approximately 30 percent each).

"It's interesting that the multilayer coating processes used to make the glass are the same type of things I did in my lab days at BU almost 20 years ago," says Mulpuri (ENG'92,'96), who earned a master's in manufacturing engineering and a PhD in materials science and engineering at the College of Engineering.

As it turns out, the science knowledge gained in that lab isn't the only BU asset helping Mulpuri move Soladigm forward. Another is Rob Rozbicki (ENG'92,'99), Soladigm's vice president of technology. The two met as BU students, and they followed parallel career tracks, which ran through Novellus Systems, Inc., a maker of equipment used in computer chips. Mulpuri spent 12 years with the company, the last 2 as president of Novellus Systems Japan. He was there,