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Jeffrey Immelt is pushing windmills, water filters, nuclear power and cleaner turbines and jet engines. Has General Electric gone eco-mad? By Daniel Fisher

GE Turns Green

THE ADS ARE FETCHING AND funny: an elephant dancing in the jungle to "Singin' in the Rain," with the tagline, "technology that's right in step with nature." Or the hard-hat-wearing, improbably gorgeous models sweating it out in a coal mine to the sound of Merle Travis' "Sixteen Tons." Message? "Harnessing the power of coal is looking more beautiful every day." It's part of what General Electric calls "Ecomagination," a multimillion-dollar image campaign that all but paints this century-old manufacturing company as an affiliate of Greenpeace.

GE is green? For a long stretch GE has been near the top of environmentalists' most-hated lists. Its sin: legally dumping 1.3 million pounds of polychlorinated biphenyls into the Hudson River over several decades, until these chemicals were banned in 1977, then dragging its feet on the cleanup. GE's finance division and NBC Universal are harmless enough, but the rest of the conglomerate depends heavily on pollution-spewing, global-warming things that enviros love to condemn: appliances, plastics, fossil-fuel-fired turbines and diesel locomotives.

In the Ecomagination talk there is showmanship but also some reality. GE's new philosophy, which roughly coincides with the ascension of Jeffrey R. Immelt, 49, to the chief executive position

four years ago, is this: If you can't beat the environmentalists, join them. Immelt's GE is going to make a business out of being green. It will not just clean up its own industrial act (cutting emissions 1% over the next seven years, when emissions would otherwise have risen 40%) but also get more deeply into the business of selling eco-friendly devices to other companies.

So is Ecomagination just a sales pitch? "It's primarily that," confesses Immelt. "In its essence it's a way to sell more products and services."

Lots more. Whatever Immelt and his customers think of the thesis that the Earth is in the balance, they know they are going to be living in a world of high energy prices, caps on greenhouse gases and ever tighter environmental regulations. GE can capitalize on the problems of others: airlines whose slim profits depend on getting a few more turbine revolutions out of a gallon of aviation fuel; railroads feeling the pinch of pollution controls; utilities that must decide now how much to spend to comply with carbon dioxide limits a decade from now. Most of the projects Immelt has approved are intended to help customers avoid painful regulation such as the CO_2 caps in Europe or the lawsuit launched last year by New York Attorney General Eliot Spitzer and eight other states against five U.S. utilities over their greenhouse gas emissions. "The reason GE's getting in front of this issue is to help their customers address a big potential liability," says Phillip H. Rudolph, former deputy general counsel at McDonald's, who advises corporations on social and environmental liabilities at Foley Hoag in Washington, D.C.

Many old-line industrial companies have already jumped onto this haywain, with mixed results. Toyota is trying to push gas/electric hybrid technology into much of its line. Making its single largest R&D investment in the ever elusive hydrogen car, General Motors is reaching for the rainbow. BP gussies up its gas stations with its sunflower motif and boasts about putting money into solar power, while deriving most of its revenue from dirty oil drilling and refining operations. For GE the greening of America and the rest of the world is its best chance to raise profit margins—last year it netted $16.6 billion on sales of $152.4 billion—and its stock price, which has stalled in the low 30s over the last three years.

Windmills

Some of the seven GE 3.6-megawatt machines off the coast of Arklow, Ireland. They are designed to power 16,000 homes and save roughly 68,000 tons of carbon dioxide a year.

Ecomagination was a couple of years in the making, the result of "dreaming sessions" with heads of energy and heavy-industry companies at GE's executive training center in Crotonville, N.Y. What emerged was a wish list from customers that included cleaner ways to burn coal and more efficient wastewater treatment systems, as well as nuclear power and hydrogen fuel cells. GreenOrder, a consulting firm in New York City, judged some ideas on whether they could be turned into efficient and moneymaking products. At the same time, GE officials did a lot of what Elizabeth Comstock, chief marketing officer, calls "pulsing," in Washington, to sense where Congress and regulators might be heading, especially on the issue of carbon dioxide emissions. "If I were the CEO of a company right now," says Henry Lee, director of the Environment & Natural Resources Program at Harvard's John F. Kennedy School of Government, "I'd rather structure a CO_2-mitigation scheme in the Bush Administration." So would Immelt. So what if environmentalists sneer that Ecomagination is like having Philip Morris run a chain of cancer clinics.

> "Describe to me how it works by 2040 if you don't have new nuclear power plants built."

Launching the effort at a press conference in May, Immelt pledged to double revenue from green machines from $10 billion in 2004 to $20 billion by 2010. The company identified 17 products that met its standard of providing "significant and measurable environmental performance advantages," including a Lexan film that replaces conventional paint, Harmony water-conserving washing machines, the new fuel-efficient GEnx jet engine and GE's Evolution locomotive, a 208-ton, 4,400hp workhorse that burns 3% less fuel and puts out 40% less pollution than its immediate predecessor. Immelt also vowed to double spending on green-related research to $1.5 billion a year by 2010. Scientists at GE's Global Research Center outside Schenectady, N.Y.—near where GE perfected the tungsten-filament lightbulb a century ago—are developing everything from lightweight plastics to replace the steel in cars to $1 billion coal-fired electricity plants that emit nothing but water vapor. (Not as implausible as it seems: Just stuff the CO_2 down an abandoned oil well. Or send it to the bottom of the ocean.)

Immelt is breaking with his predecessor, Jack Welch, in some critical ways. With just two competitors worldwide, he sees GE's nuclear power business, which had about $1 billion in revenue last year, mostly from refueling existing nukes, emerging as number one or two. Executives have been pressing officials in China to include GE's advanced boiling-water reactors in their next five-year economic plan (China uses the pressurized reactors championed by perennial GE rival Westinghouse, now part of British Nuclear Fuels Ltd.). Eventually the U.S. will come around, too, since it must replace as much as 50 gigawatts of existing

Gas Turbines

A machine to generate 480 megawatts of power, with 60% thermal efficiency.

nuclear power by midcentury. (One very large power plant produces a gigawatt.) "Describe to me how it works by 2040 if you don't have new nuclear plants built," says John Rice, the 48-year-old vice chairman, who started out with Immelt in GE's plastics division.

Another new line of business: water purification, which GE entered a few years ago with several acquisitions. The company expects to sell $2 billion worth of filtration systems, chemicals and services this year, and its engineers are working on new filters that can strip impurities and salt from water more efficiently. A $260 million desalination plant, recently announced, will supply a quarter of the drinking water for the city of Algiers. GE sees mushrooming demand for similar systems in industrializing nations.

"Our big bet is on water scarcity," says George Oliver, 45, who took over as head of the water division in 2002 after running GE's $5 billion-a-year aircraft service business. What do water plants and aircraft engines have in common? Lucrative service revenue, which can often represent a multiple of the initial purchase price and bring in a net profit margin well above the companywide 11% enjoyed last year. Oliver's water plants also consume a lot of energy to pump the water through the filters, stimulating demand for GE's electrical gear; its finance division can supply the loans to pay for it all.

One of GE's most audacious bets is on coal. With trillions of tons in the ground in North America and energy-famished nations like China and India, coal, Immelt says, "is absolutely going to be here to stay." It's also a great opportunity to sell $30 million to $35 million turbines, a business GE has dominated since it installed its first commercial steam turbine in a Port Huron Power & Light Co. plant in 1902. Dominance relies less on invention than exploitation. As with many other products—including tungsten-filament lightbulbs, X-ray machines and jet engines—GE bought patents from an inventor to get into the turbine business, then refined the design and manufacturing techniques *(see time line, below)*.

This comes at a critical time. GE's turbine business collapsed in the wake of the U.S. power bubble, with sales falling to 122 units last year from 323 in 2002. North American turbine sales are expected to rise only 2% to 3% a year through 2007, according to Sreekanth Venkataraman, an analyst with Frost & Sullivan. While international sales will remain strong for a while, Venkataraman says, they too will begin to suffer after 2011 as alternative technologies like fuel cells and nuclear hit the market.

To keep turbine sales spinning, Immelt has turned to a process that partially burns pulverized coal in the presence of pure oxygen to turn it into a flammable gas that can drive linked gas and steam turbines. The process strips out most pollution on the front end, eliminating the need for smokestack scrubbers; with additional strippers, utilities can remove CO_2 from the turbine exhaust to be pumped underground. There's nothing new about coal gasification—Hitler ran his war machine on it—but GE was only in the turbine side of the business until it bought ChevronTexaco's coal gasification business last year. GE is now preparing to build a $1 billion, 650-megawatt gasified coal plant along the Ohio River for American Electric Power, the nation's largest generator of juice. Immelt expects this to become a $1 billion-a-year business as utilities like AEP try to duck litigation over their greenhouse-gas emissions. Customers view gas/steam combined cycle plants as a way for GE to revive an old business—"new fuel to put in turbines," as Michael Morris, AEP's chairman, puts it. GE also makes some real money off of service. "A gas turbine eats up its insides after five or six years," Immelt explains. "It's parts, technology, software upgrades—it's a massively good business."

> Windmills are "a lame excuse for a clean energy policy," says Senator Lamar Alexander.

Ecomagination also means selling more windmills, a controversial business where GE pushed itself into second place behind Denmark's Vestas Wind Systems by buying an Enron unit in 2002. Sales have tripled to an expected $2 billion this year and GE has installed more than 3,000 of its towering $1.8 million, 1.5-megawatt turbines around the world. Windmills are unpopular with some U.S. politicians and utility executives because they require ample subsidies to be viable, and the unpredictable wind means utilities must maintain additional power plants on standby. Under a pending energy bill windmills would consume $3.5 billion over the next five years in taxpayer subsidies. They're "a lame excuse for a clean energy policy," says Lamar Alexander, the Tennessee Republican and chairman of the Senate Energy Subcommittee.

Immelt agrees GE must figure out how to make windmills stand on their own. "We're trying to see a pathway to where you can make electricity for 5 to 8 cents a kilowatt-hour," equivalent to gas-fired power plants, he says. "The strategy of making everybody pay more for what you do is flawed."

The ultimate proving ground for Ecomagination is the faster-growing economies of China and India. Business in developing countries will rise 17% a year through 2010, representing 40% of GE's total revenue growth during that period, reckons Nicholas Heymann, an analyst with Prudential Securities. Most sales will be big-ticket items like power plants and locomotives, where profit margins rise rapidly after the overhead is covered. Nukes are now an attractive prospect in the subcontinent, thanks to a recent Bush Administration promise to help India with its civilian reactors.

Immelt flies to China two or three times a year to meet with officials from the National Development & Reform

Locomotives

This 12-cylinder diesel engine produces 4,400hp but 40% less emissions than its 16-cylinder predecessor.

Commission, which makes most decisions on big-ticket infrastructure like power and water utilities. How important is China to GE's growth? "It's kind of like saying, do you have to have a right leg to run a marathon?" Immelt says. "For the products we sell, it's probably one of the best end-use markets in the world." China will spend an estimated $85 billion on environmental cleanup projects through 2008—when, coincidentally, NBC Universal division will televise the Beijing Olympics—and Immelt wants every bit of that business he can get. He's betting there will be increasing demand for things like high-efficiency jet engines and locomotives that go farther on a gallon of diesel. The U.S. rejected the Kyoto Protocol on greenhouse gases, in large part because the treaty failed to rope China and India into significant regulation. That's bound to change. "Having global standards makes business easier," says Immelt.

If there's a neglected constituency in Ecomagination, it would be the fanatical wing of American environmentalism. Immelt has managed to discard some of the baggage accumulated by Jack Welch, who reportedly told shareholders at a 1998 meeting, "Living in a PCB-laden area is not dangerous." But the $460 million plan to dredge PCBs from the Hudson River is disappointingly stuck in the engineering stage, with the start date pushed back two years to 2007. "What GE is doing on the Hudson and most of its PCB and Superfund sites around the country completely contradicts the image Immelt is trying to foist on the public," says Alex F. Matthiessen, president of Riverkeeper, the environmental organization.

Immelt deftly sidesteps questions about the cleanup, saying simply that "we're going to live with that agreement." He knows his sales pitch is to a different audience—employees, customers, bureaucrats. On that level Ecomagination makes perfect sense. In a world where fossil fuels still dominate and factories still pollute, somebody's got to sell the tools to clean it all up. F

Don't Invent—Improve

Since its founding in 1892 General Electric has mastered the art of acquiring technologies invented elsewhere, then throwing in enough capital, research and salesmanship to dominate the market. Its big scores seem to come once a decade, says George Wise, retired historian for GE. Highlights:

1890s Lightbulbs

Inventors began developing light-bulbs in the early 1800s, but Thomas Edison made them work. GE later purchased Austrian technology to perfect the tungsten filament; its success drew antitrust attack.

1900s X rays

GE entered the business in 1896, a year after Wilhelm Conrad Roentgen discovered X rays. That technology is at thecore of GE's $15 billion-a-year health care business.

1910s Radio

GE formed a joint venture with British inventor Guglielmo Marconi in 1919, and later assem-bled Radio Corp. of America, which it bought back in 1986 primarily to get the NBC television network.

1940s Jet engines

In 1941 GE licensed British technology to develop the I-A jet engine for the Bell XP-59 Airacomet, the first American fighter jet. By the late 1990s GE was the number one producer of commercial jet engines.

1960s Nuclear plants

In 1963, drawing on government technology, GE was the first to offer fixed-price, boiling-water nukes for as little as $66 million. The companykicked off a boom but got killed on cost overruns.

1970s CT scans

Britain's EMI Laboratories came up with the technology in 1972. GE jumped in two years later by licensing the technology, then using its manufacturing and marketing muscle to bring out faster, higher-resolution scanners.

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