

Photovoltaic roof panels for solar energy collection (below) and the H System gas turbine (right) are examples of General Electric's push to create green products.



GENERAL ELECTRIC

Energy, water desalination, and advanced materials are key ecomagination categories. Among the products GE has gathered under the new umbrella are coal gasification systems, offshore wind turbines, natural-gas turbines, diesel-electric hybrid locomotives, photovoltaics, low-toxicity materials, and household appliances such as washing machines and light bulbs.

Sending a signal

The company's research center comprises some 2500 researchers at labs in China, India, Germany, and Niskayuna, New York. Since the May launch of ecomagination, says GE's Ed Hall, an R&D manager in the physical sciences, "probably the biggest impact that I've seen has been that . . . people who come in for interviews say, 'I've heard about this, and I'd like to work on wind turbines.' It's apparently had an effect on the university community and gotten people excited about things they may want to work on." In-house, he adds, ecomagination has also "excited passions." GE denied PHYSICS TODAY's repeated requests to interview its scientists.

"The overall trend at the research center has been toward more risky stuff, long-term goals," continues Hall. "The hydrogen program is a prime example. There are not a lot of hydrogen-based products out there now." GE is studying production, stor-

age, distribution, and applications of hydrogen energy.

For the most part, though, ecomagination is a repackaging of pre-existing activities. "GE has always been committed to minimizing consumption of fuel and reducing emissions," Hall says. Ecomagination, he adds, is an intensification of that effort within the company.

"Identifying and naming their corporate strategy for the public and policymakers is extremely significant," says Alan Noguee, energy program director at the Union of Concerned Scientists. "It sends a clear signal that one of the biggest companies in the world is taking global warming seriously and finding ways to profit." Adds Moniz, "Ultimately, it's about the customers in terms of carbon control, and about what technologies are bought and deployed."

Getting past pollution

Perhaps to avoid controversy, nuclear energy R&D is not under the ecomagination rubric, at least for now. But in launching the initiative, Immelt said "nuclear is emissions-free" and added, "I agree with [President Bush]: It is unrealistic to imagine America's energy future without this proven, clean, safe, domestic resource." The company will invest \$400 million to \$500 million in developing a new boiling-water reactor, according to GE nuclear marketing communications manager Claire Zurek. Nuclear en-

ergy R&D is "going through the screening process and trying to become a product of ecomagination," she says.

With unsolved hazards of proliferation, waste, and security, environmentalists generally do not see nuclear energy as advantageous. They also note that GE's environmental track record is not unblemished. By dumping hazardous waste, the company has created many Superfund sites. One is a 300-km stretch of the Hudson River in New York state, which is polluted with more polychlorinated biphenyls than anywhere else, says Patricia Daly, executive director of the New Jersey-based Tri-State Coalition for Responsible Investment. Although the PCBs were dumped legally, Daly says that GE's record on cleaning up has given it a "black eye in terms of credibility."

Still, on climate change, GE's initiative is winning widespread applause. Just two years ago, company shareholders filed a resolution asking GE how it was responding to regulatory and consumer pressure to address climate change. Around the same time, GE scored at the bottom of the heap in a ranking of 20 international companies on corporate governance response to global warming. "We are updating our checklist," says Doug Cogan of the Investor Responsibility Research Center in Washington, DC, who undertook the ranking for Ceres, a coalition of environmental groups and institutional investors. "There's no question they'll come out better this time."

Toni Feder



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Jeff Immelt,
General Electric CEO.

Deal Puts ITER in Europe, Compensates Japan

A protracted impasse over where to site ITER was broken on 28 June, when the six partners in the international experiment to prove the feasibility of generating energy by fusion announced it would be built in

Cadarache, France. China and Russia had supported that site, put forward by the European Union (EU), while South Korea and the US had backed Japan's proposed site, Rokkasho.

Japan conceded because it "really



Cadarache, home to the French atomic energy center, will host ITER. The fusion facility's tokamak (inset) will be housed in the largest building. (Composite photo and artist's rendering courtesy of ITER.)

wants to promote ITER," says ITER international team leader Yasuo Shimomura. "A further delay will create serious negative impact for ITER as well as for the fusion program." The meeting in Moscow at which ITER parties agreed on the site "was a very emotional experience," Raymond Orbach, director of the US Department of Energy's Office of Science, said in a briefing. "This was the world getting together to deal with a common problem, with common resolve, and making sacrifices in the interests of the world and its energy supply," he said. "The cooperation augurs well for the future of construction and operation of ITER."

In return for agreeing to the EU site, Japan gets benefits in ITER that exceed its contributions. The EU will foot half of the roughly \$5 billion construction cost, with the other five partners each paying 10%. But Japan gets to fill 20% of the industrial contracts and provide 20% of the scientists; its extra 10% will be taken from the EU's share. And the EU will endorse both Japan's choice of director general for the project and a future bid to host DEMO, the planned successor to ITER. In addition, the EU and Japan will each pay ¥49 billion (about \$440 million) for ITER-related activities in Japan; possibilities include a materials-irradiation facility, a computational simulation center, a satellite tokamak, and a center for running remote experiments.

In the coming months, the parties

will hammer out details of finances, procurement, management, and oversight. If all goes well, an agreement could be signed and construction could begin next year. By then, an embargo on US spending for ITER will have expired (see PHYSICS TODAY, July 2005, page 34). In the US, according to Orbach, "what we are doing is to restructure the domestic program around ITER." Construction is expected to take eight years, so ITER could start up in the middle of the next decade.

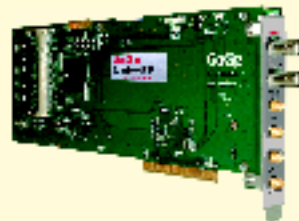
The aim is to get 10 times more power out than goes in. Heated to 150 million kelvin, magnetically confined deuterium and tritium in the ITER tokamak will fuse; the desired output power is 500 MW. Once fusion energy production is demonstrated, the next step would be to build DEMO, a prototype power plant. Then, Orbach said, "with any kind of luck, this would be picked up by industry around the world." Fusion power plants could come on line by 2050, he added, and by the end of the century, 10%–20% of the world's energy could be produced by fusion.

The site consensus bodes well not only for ITER, but also for other future large-scale international collaborations. And not everyone in Japan is disappointed about ITER's going to France: In both countries, scientists worried that hosting the project will come at a cost to other disciplines.

Toni Feder



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