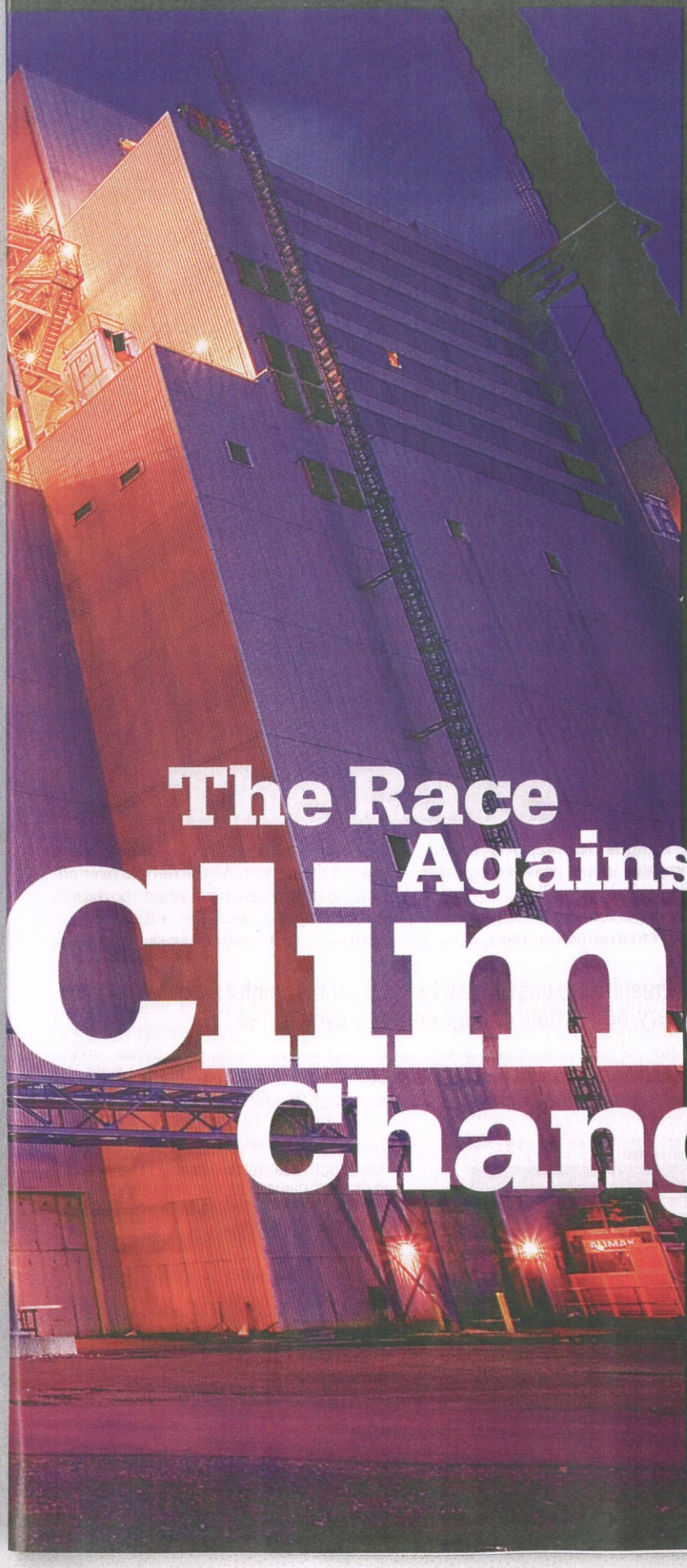


BOB HOWER/QUADRANT

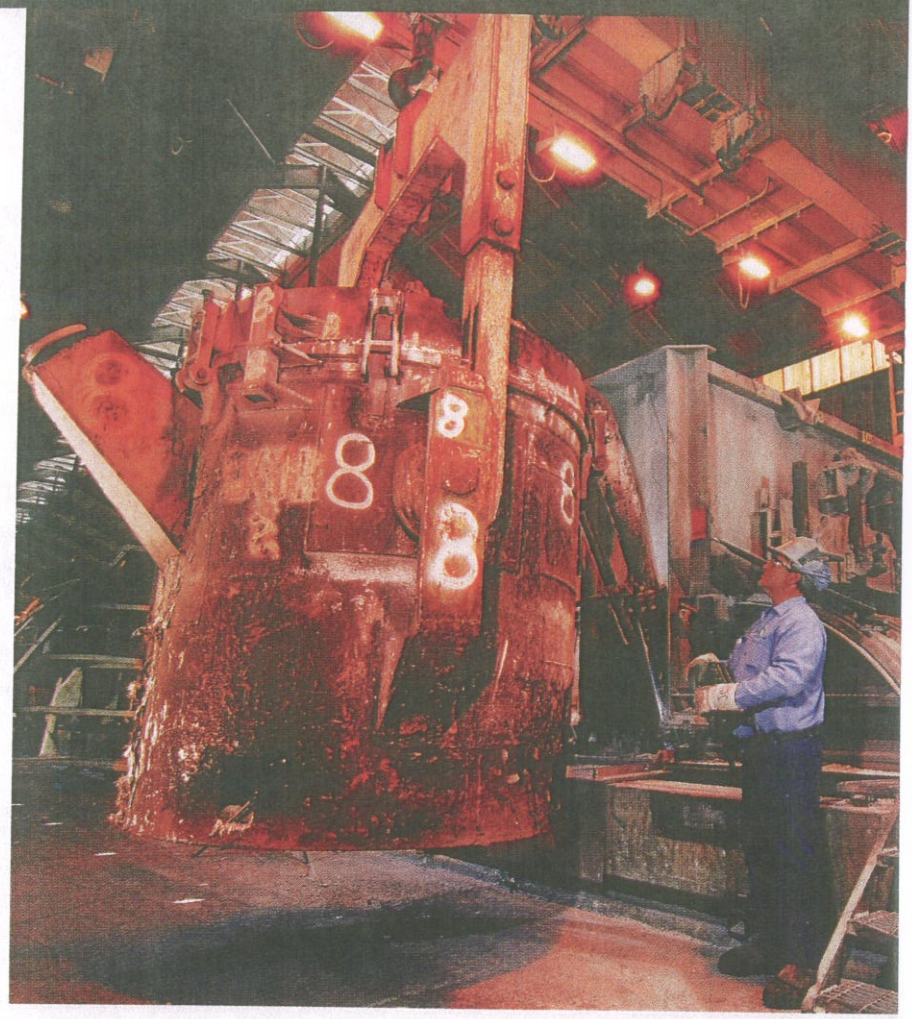
The Race Against Climate Change

How top companies are reducing emissions of CO_2 and other greenhouse gases

BY ADAM ASTON AND BURT HELM

ON NOV. 21 power company executives from all over the country gathered in the Pit, a spacious General Electric auditorium in Crotonville, N.Y., to meet with GE CEO Jeffrey R. Immelt and his team. The day was overcast and cold, but the discussion was about the warming climate. At one point in the meeting, David J. Slump, GE Energy's chief marketing executive, asked for an informal vote. How many of the 30 or so utility and GE business executives thought that, once President George W. Bush was no longer in office, the U.S. would impose mandatory curbs on the emissions of carbon dioxide and other greenhouse gases linked to global warming? Four out of five of them agreed. "Forget the science debate," says Cinergy Corp. CEO James E. Rogers, who was at the meeting. "The regulations will change someday. And if we're not ready, we're in trouble."

The world is changing faster than anyone expected. Not only is the earth warming, bringing more intense storms and causing Arctic ice to vanish, but the political and policy landscape is being transformed even more dramatically. Already, certain industries are facing mandatory limits on



ALCOA By improving the refining process, it cut emissions 25%

emissions of carbon dioxide and other greenhouse gases in some of the 129 countries that have signed the Kyoto Protocol. This month representatives of those nations are gathering in Montreal to develop post-Kyoto plans. Meanwhile, U.S. cities and states are rushing to impose their own regulations.

A surprising number of companies in old industries such as oil and materials as well as high tech are preparing for this profoundly altered world. They are moving swiftly to measure and slash their greenhouse gas emissions. And they are doing it despite the Bush Administration's opposition to mandatory curbs.

This change isn't being driven by any sudden boardroom conversion to environmentalism. It's all about hard-nosed business calculations. "If we stonewall this thing to five years out, all of a sudden the cost to us and ultimately to our consumers can be gigantic," warns Rogers, who will manage 20 coal-fired power plants if Cinergy's pending merger with Duke Energy is completed next year.

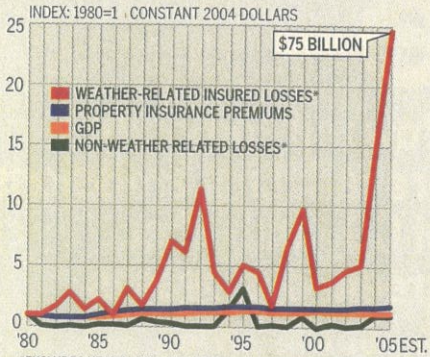
One new twist in the whole discussion of global warming is the arrival of a corps of sharp-penciled financiers. Bankers, insurers, and institutional investors have begun to tally the trillions of dollars in financial risks that climate change poses. They are now demanding that companies in which they hold stakes (or insure) add up risks related to climate change and alter their business plans accordingly. For utilities like Cinergy that could mean switching billions in planned investments from the usual coal-fired power plants to new, cleaner facilities.

The pressure is forcing more players to wrestle with environmental risks, even if the coming regulations aren't right around the corner. As the debate over climate change shifts from scientific data to business-speak such as "efficiency investment" and "material risk," CEOs are

Heating Up

Taxes on greenhouse gas emissions may sound painful and unnecessary, but climate change could be even worse

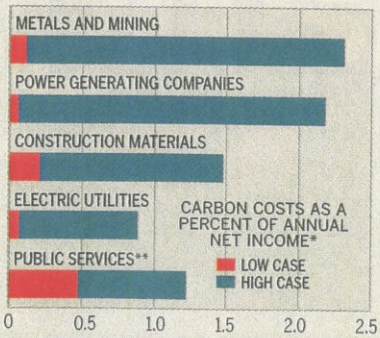
Climate change is already hurting the insurance industry



*EXCLUDES HEALTH AND LIFE INSURANCE PREMIUMS AND LOSSES

Data: Munich Re; NatCatSERVICE; Swiss Re; Sigma; analysis and estimates by Evan Mills, Lawrence Berkeley National Laboratory

If that leads to a carbon tax, these industries will suffer the most



*IN A KYOTO-STYLE SCENARIO: CARBON CREDITS COST $20, EMISSIONS FALL BY 5% OVER 7 YEARS.
**WASTE AND FACILITIES MANAGEMENT SERVICES

Data: Innovest

But if global warming intensifies, more sectors will feel the pain

Hotter Summers
- boost both heat-related deaths in humans and drought damage to crops and livestock
- induce power shortages, blackouts, and business interruptions

More Intense Storms
- damage coastal infrastructure, property, and ecosystems
- intensify the geographical spread and severity of flooding and wind damage

Warmer Winters
- cut water supplies from snow melt and up the likelihood of wildfires
- extend the reach of disease-carrying organisms such as ticks and mosquitoes

Data: Ceres; Harvard Medical School

Top Carbon Cutters

BusinessWeek, the Climate Group, and a panel of judges compiled this ranking, based on companies' total reduction of greenhouse gases, results relative to their size, and the leadership they have shown:

	2004 SALES, BILLION DOLLARS	EMISSIONS REDUCTIONS, METRIC TONS (%)
1. DuPont (U.S.)	$27.5	11 million (72%)

Cut energy use 7% below 1990 levels, saving more than $2 billion—including at least $10 million per year by using renewable sources.

2. BP (Britain)	$285.1	12.8 million (16%)

Reached its 2010 emissions target in 2001. Saved a total of $650 million through improvements in operating and energy efficiency.

3. Bayer (Germany)	$36.7	4.9 million (63%)

Boosting energy efficiency avoided $861 million in investments that otherwise would have been required because production grew 22%.

4. BT (Britain)	$18.5	1.6 million (71%)

Low-carbon and renewable sources provide 98% of BT's British power consumption, saving $1.15 billion. Adding 38% reduction in vehicle emissions almost doubles savings.

5. Alcoa (U.S.)	$23.5	8.9 million (26%)

Slashed emissions of perfluorocarbon (PFC) gas from smelters by 80%. Expects annual cost savings to reach $100 million next year.

For the full top 10 list, see businessweek.com/go/carbon

DATA: *BusinessWeek*; the Climate Group; Innovest

suddenly understanding why climate change is important. "It doesn't matter whether carbon emission reductions are mandated or not," explains David Struhs, vice-president of environmental affairs at International Paper Co. "Everything we're doing makes sense to our shareholders and to our board, regardless of what direction the government takes." The nation's biggest paper company, with $25.5 billion in sales, IP has upped its use of wood waste to 20% of its fuel mix, from 13% in 2002. That's cut both net CO_2 output and energy costs.

REALITY DAWNS

ADDING TO THE pressure on CEOs, the public has largely accepted global warming as reality. And as in the case of IP, the economic logic can be compelling. Far from breaking the bank, cutting energy use and greenhouse emissions can actually fatten the bottom line and create new business opportunities, while simultaneously greening up companies' reputations. One company that has hiked its visibility on this changed landscape is GE. It formed a new Ecomagination division last May to offer everything from more efficient locomotives to advanced, low-emitting coal power plants.

Scores of companies have already taken action to fight climate change. Who are the leaders? In this special report, *BusinessWeek* has teamed up with the Climate Group, a British organization that serves as a clearing house for information on carbon reduction, and Innovest Strategic Value Advisors, a leading Wall Street green investment research firm. Together with a panel of expert judges drawn from academic institutions, we have identified and ranked the companies that have shown the greatest initiative in cutting their greenhouse gas emissions. We have also identified best practices, effective policies, and what kinds of results to expect.

Details about how the judges made their selections and a wealth of material on the companies and individuals in the rankings can be found at businessweek.com/go/carbon. The lists feature some gold-plated names: Citigroup is working with Fannie Mae to encourage sales of energy-efficient homes. IBM saved hundreds of millions of dollars by cutting energy use, while Unilever managed to slash its greenhouse gas output by more than 10% in a single year.

Topping the company ranking is an experienced hand at making the most out of changing regulations, DuPont. Back in the mid-1980s, DuPont created a profitable business selling substitutes for chlorofluorocarbon (CFC) refrigerants that were destroying the earth's protective ozone layer. Tackling climate change was a natural extension of that experience. After studying the data, "we came to the conclusion that the science was compelling and that action should be taken," says DuPont Chairman and CEO Charles O. "Chad" Holliday Jr.

BEATING GOALS

IN 1994, DUPONT committed to cutting its gas emissions by 40% by the year 2000 from its 1990 levels. By 2000 the company had met its original target and set an even more ambitious one—a 65% reduction by 2010. But the gains have been so dramatic that DuPont has already hit that goal too. It also uses 7% less energy than it did in 1990, despite producing 30% more goods. That has saved $2 billion.

Saving money and reducing risks are both powerful incentives, and they help explain why investors and insurers are pressuring CEOs to tackle climate change. Insurers in particular are staggered by their mounting bills for hurricanes, floods, fires, hailstorms, disease, heat waves, and crop loss. Many scientists agree that higher temperatures are causing more powerful storms and perhaps intensifying extreme weather events, ranging from drought and wild fires to ice storms.

Even tiny weather changes bring awesome costs. A slight uptick in intense storm activity could boost annual wind-

More on the race to cut emissions...

Complete Rankings: The top companies, financiers, political leaders, and regions that are cutting emissions

Unlikely Environmentalist: Why Cinergy's Jim Rogers, who runs nine coal-fired plants, is pushing for carbon limits

Methodology: Our judges, and how they made their picks

Plus: The top 50 CO_2 emitters...Toyota's carbon-cutting efforts

BusinessWeek online

http://www.businessweek.com/go/carbon

related insured losses, to as much as $150 billion a year—an increase equivalent to two or three Hurricane Andrews in an average season, according to a 2005 study by the Association of British Insurers. Indeed, insured losses from catastrophic weather events have already increased fifteenfold in the past 30 years. "Risk of climate change is real. It's here. It's affecting our business today," says John Coomber, CEO of insurer Swiss Re.

Rising temperatures aren't the only factor in the increasing toll from weather-related disasters, of course. Development along coastlines and other high-vulnerability areas is surging, concedes Evan Mills, an energy scientist at the U.S. Energy Dept.'s Lawrence Berkeley National Laboratory. But overall, "weather-related losses are becoming more erratic and growing much faster than such shifts can explain," he says.

The insurance exposure extends beyond weather events to management decisions. Corporate directors and officers are protected from personal liability for mismanagement by so-called D&O policies. If executives at companies that hold the policies don't take stock of their environmental risk exposure, they could be on the firing line for mismanagement—with insurers picking up the tab. Says Chris Walker, managing director of Swiss Re's Greenhouse Gas Risk Solutions: "Property. Life. Health. Crops. D&O—you name it. It's the perfect storm for insurers."

That's why climate change is causing insurance companies to ally with institutional investors, banks, and rating agencies. Together they are pushing companies to start thinking about greenhouse emissions as a material risk, just like other forms of financial risk that can impair future earnings. JPMorgan Chase & Co., for instance, is helping analysts and bankers model the impact of carbon on the banks' clients. "Global warming is on the radar screen of a lot of financial institutions," said Denise Furey, senior director of Fitch Ratings Ltd., at a recent climate conference.

The specter of new regulations on carbon emissions has already galvanized executives at Alcoa Inc., another company on the *BusinessWeek*/Climate Group list. To reduce its greenhouse emissions and save energy, too, Alcoa improved a key step in the aluminum production process, helping to cut total greenhouse gas output by 25%.

A handful of big coal burners have also leaped to the forefront. American Electric Power, Cinergy, and TXU all did detailed studies of the risks posed by climate change—and by expected new rules. Their biggest challenge: planning new power plants for an uncertain future. At some point in the next 40 years—the operating life of a plant—the U.S. is certain to join in a round of international greenhouse discussions, says Michael G. Morris, CEO of AEP, the nation's biggest coal consumer: "That's clear in my mind, and in our board's mind." If the U.S. rules are similar to Europe's, where it already costs a company more than $20 to release a ton of CO_2, utilities and rate payers could face billions in expenses.

That would force utilities to inve more in lower-carbon alternatives such wind power, "clean" coal, or natural g which emits one-third as much carb per kilowatt as coal. But executives ne to know soon what rules they will have meet. That's why many are in favor mandatory limits—though they hesita to say it publicly because of the oppos tion in Washington.

ISOLATED

THE PRESIDENT remains opposed any policy that would require carbo cutbacks. Instead, the White House a serts that climate change can be tackle with voluntary action and with major i vestments in alternatives to fossil fuel such as hydrogen.

Yet the White House is growing i creasingly isolated. U.S. public opinion shifting. In October, a Fox News po found that 77% of Americans believ global warming is happening, and those, 76% say it's at least partly due t human activity. That's making gree house gas reductions trendy: The 200 Super Bowl in Detroit, for one, aims to off set all of the new CO_2 the championshi generates by planting thousands of tree in the hills and towns near Ford Field.

More substantively, states are step ping into the breach with their own reg ulations. Nine Northeastern and Mid-At lantic states have formed the Regiona Greenhouse Gas Initiative (RGGI). B 2009 the initiative aims to set up a "cap

Green Leaders

A handful of people stand out for their efforts to cut gases that cause global warming

Tony Blair
British Prime Minister

Raised awareness of global warming at the G-8—and tangled with the U.S. on its position. He was also the first leader to go beyond Kyoto's targets—which call for sub-10% cuts by 2012—and pledge a 60% cut by 2050.

Franzjosef Schafhausen
German Ministry of the Environment

Helped Germany exceed its Kyoto obligation. Today greenhouse gas emissions are 19% lower than in 1990. In the process, he has helped to cut Germany's high jobless rate by creating 450,000 new jobs in renewable-energy industries.

John Browne
BP Chairman and CEO

Shocked the oil industry in 1997 when he declared that by 2010 BP would reduce emissions 10% below 1990 levels. That was six months before negotiations on the Kyoto accord began in earnest. BP has since reaped huge profits while transforming its traditional big-oil culture.

Arnold Schwarzenegger
Governor of California

Issued an order that requires California to slash gases by 80% by 2050—the toughest state target of all. He is also backing a plan to cut total tailpipe emissions by one-third by the 2016 model year.

Zhao Hang
President of China Auto Tech & Research Center

Believes China must grapple with global warming. Working with foreign advisers, he devised fuel-economy rules 20% tougher than those in the U.S. By 2030, 300 million cars will be on China's roads—10 times today's number.

For a full ranking, go to businessweek.com/go/carbon

DATA: *BusinessWeek*; the Climate Group; Innovest

and-trade program" covering carbon dioxide emissions by nearly 200 power plants operating in Connecticut, Delaware, Maine, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont. Companies would be given an upper limit on greenhouse gases they may release. If they can cut their emissions below that level, they can sell the unused allowances to companies that are emitting above their cap level.

This initiative could bring a major change in the politics of global warming. First, state action will compel more companies to seek nationwide regulation from Congress, explains Eileen Claussen, president of the Pew Center on Global Climate Change. "Companies don't want to see a patchwork of state regulations. As more states get involved, it ups the ante."

Plus, two likely candidates for the 2008 Republican Presidential nomination are on board. New York Governor George E. Pataki launched the regional initiative in 2003, and Massachusetts Governor Mitt Romney backs it in principle.

Meanwhile in Washington, the Republican-led Congress is opposing the Administration's hard line. On June 22, over the objections of the White House, the Senate voted 54-43 for a resolution calling on Congress to "enact a comprehensive and effective national program of mandatory market-based limits and incentives on emissions of greenhouse gases."

TREES FOR FUEL Wood waste now supplies 20% of International Paper's energy

Some evangelical Christian groups, traditional allies of the Bush White House, have joined the call for action. "This used to be seen as just the passion of a few environmentalists on the left," says Jim Jewell of the National Association of Evangelicals, which includes 52 denominations serving 30 million parishioners. "But support on the issue has broadened. God's call on his people is to care for his creation."

In the battle in the nation's capital, it will help that some people believe God is on the side of greenhouse gas reductions. For most business executives, though,

PLAYBOOK: BEST-PRACTICE IDEAS

Green Culture, Clean Strategies

Each company faces special challenges in cutting carbon, but top achievers use similar strategies

CEOs Don't Just Delegate

Pasquale Pistorio, former CEO of STMicroelectronics, believed environmental initiatives in making chips should come from the top—and he passed that commitment along to his successor, Carlo Bozotti. At BP, CEO John Browne works in the trenches with environmental specialists from all business segments. Iberdrola's top gun, Ignacio Sánchez Galán, oversees the Emission Allowances Working Group, which devises ways to fulfill the Kyoto Protocol's requirements.

Green Achievements Count in Performance Reviews

Achieving targets designed to thwart climate change is a major element in senior executives' performance scorecards at Novo Nordisk. Dow Chemical's new Climate Change & Energy Strategy Board is populated by senior executives, who coordinate the work of expert teams responsible for regional strategy, site emissions, and energy conservation.

Operating Units Clean Up

Each Scottish Power division has a senior manager accountable for complying with energy and environment objectives. BHP Billiton has developed greenhouse gas curtailment plans tailored to each of its business sites. BP's operating units field a small army of influential managers for environmental technology, product emissions, and energy efficiency.

Financiers See Dividends

HSBC, led by CEO Stephen Green (right), pledged to offset its entire carbon output by 2006 and hit its goal ahead of schedule. At ABN Amro, new businesses include climate risk management and trading emission allowances. In assessing mortgages, Citigroup rewards borrowers buying energy-saving homes. And JPMorgan Chase is evaluating the impact of carbon on loans to big emitters.

For detailed listings of top governance practices and innovators in financial services, go to businessweek.com/go/carbon

DATA: *BusinessWeek*; the Climate Group; Innovest

the real driver is the bottom line. Often, the best way to slash emissions is simply to reduce energy consumption. Because carbon is basically a proxy for fossil energy, cutting carbon equals cutting costs, argues energy guru Amory B. Lovins, head of the Rocky Mountain Institute (RMI), a nonprofit energy and environment policy think tank: "Efficiency is cheaper than fuel."

That approach is what landed Geneva's STMicroelectronics, the world's No. 6 chipmaker, on the *BusinessWeek*/Climate Group ranking. Lovins and the RMI helped cut the company's energy use by 5% per year. Many changes were surprisingly low-tech, such as putting in larger air-conditioner ducts. That enabled air-circulating fans to do their job at half speed, using just a seventh of the energy. Last year, with $40 million in improvements, the company saved $173 million.

When mandatory regulations are issued they essentially put a price tag on carbon emissions. That obviously makes cleaner, more efficient projects more financially attractive, spurring new business opportunities. GE, for one, is seizing the moment with its new Ecomagination division. And scores of small companies are bringing new clean-technology innovations to market. Massachusetts Institute of Technology chemical engineer Isaac Berzin started GreenFuel Technologies Corp. to harness the power of algae to grab CO_2 from the exhaust of a gas-fired power plant. At a pilot site atop MIT's on-campus power station, the GreenFuel device cuts CO_2 by 82% on sunny days and by 50% on overcast days.

How far can this effort go? Some economists say cutting emissions and boosting efficiency will spur economic growth this century. The engineering challenges are immense and will require research and development investment in fields that have been relatively neglecte until now: alternative energies, carbo sequestration, higher efficiency eng neering, new lightweight materials f buildings and vehicles, and rebuildi old industrial and energy infrastructu with clean gear.

Yet despite the claims of the globa warming skeptics, the cost can be affor able. As the examples of companies in th *BusinessWeek*/Climate Group rankir show, there often is a boost to the botto line. Far more substantial cuts are nee ed to make a real dent in the globa warming problem. And clearly, the deve oping nations need to be on board wi cleaner technologies as well. But th news is that many companies are ene getically tackling this growing enviro mental challenge.

–With Michael Arndt in Chicag Amy Barrett in Philadelphia, ar John Carey in Washingtc

A Hot Market for Carbon

Outside Bangkok, generators fueled by methane captured from manure make electricity. In China's Inner Mongolia, wind farms sprout up along the breezy steppes. In India's Andhra Pradesh state, villagers power their tractors with a cleaner-burning diesel substitute pressed from seeds of the mighty honge tree.

What do these far-flung projects have in common? They're all the result of the 1997 Kyoto Protocol, a global initiative to reduce emissions of greenhouse gases linked to global warming. The U.S. and a handful of other nations spurned the treaty, in part because it exempted emerging nations from making their own cuts. But the innovative financial systems that Kyoto inspired have made it relatively easy for developing countries to hop on board.

Under the Kyoto treaty, developed countries are required to cut emissions by an average of 6% from 1990 levels by 2012. Each country is permitted to emit a certain number of tons annually of carbon dioxide or its equivalent. Governments then issue emission "allowances" to polluters within their borders, and these can be bought and sold by companies worldwide. Through this carbon trading system, big polluters in developed countries can pay companies in developing nations to cut emissions in their stead. Since many factories in poorer nations use dirty, inefficient processes, you get more reductions for the buck by installing new, clean technology there than by replacing more modern equipment used in wealthy countries.

The system is helping foster green investments in nations that are home to some of the world's biggest polluters. Worldwide, developing countries are promising sweeping action, from cleaning up concrete plants, to sowing new forests that absorb carbon dioxide, to harnessing methane from decomposing garbage to generate power. So far, 39 projects have been registered with the U.N., and hundreds more are in the pipeline. Ultimately, the scheme could net as much as $12.5 billion for developing countries by 2012, the World Bank says. In August, a Japanese consortium joined up with a Chinese chemical maker to recover gases released in making refrigerants. The deal will result in a reduction of the equivalent of 40 million tons of CO_2—creating credits worth about $200 million. And Paris-based chemical maker Rhodia is cutting nitrous oxide emissions equaling as much as 13 million tons of CO_2 at its plants in South Korea and Brazil.

Since the Kyoto accord took effect on Feb. 16, the market for emission allowances has soared. Most of the action is on the Amsterdam-based European Climate Exchange, or ECX. Next year, volume on the exchange is expected to more than double to 700 million tons of CO_2 credits, and may reach 4.8 billion tons by 2008. "It's a large baby for its age," says Sara Stahl, an ECX economist. The baby is getting richer, too. Since the beginning of the year prices have more than doubled, to $26 per ton of carbon dioxide.

So far, credit purchases from developing countries are relatively rare, and more often than not they're funded by public institutions rather than private companies. But as more companies in the West get serious about meeting their Kyoto targets, purchases of credits from developing countries are expected to soar. "As the deadline gets near," says Andres Liebenthal, an environment specialist at the World Bank in Beijing, "there is going to be a scramble" for credits.

–By Frederik Balfour in Hong Kong, with Laura Cohn in London

REAP THE WIND
Generating clean power in Inner Mongolia