

Why Climate Change Is Powering Growth

Siemens' leadership in products and solutions designed to protect the environment and the climate is worth a bundle. In 2007 the company posted sales of approximately €17 billion in this area and helped its customers reduce their carbon dioxide emissions by 114 million metric tons.

Just about everyone today agrees that climate change is threatening both the environment and the global economy. In the summer of 2008, the heads of the leading industrialized nations — the G8 — pledged to work to cut greenhouse gas emissions in half by 2050. This is also the target being pushed by climate experts on the Intergovernmental Panel on Climate Change (IPCC). It's clearly time for the world to act. According to a study conducted by British economist Sir Nicholas Stern, the consequences of extreme weather or a rise in sea levels could impact the global economy and necessitate expenditures of between five and 20 percent of gross world product (GWP).

On the other hand, implementation of effective measures to combat climate change would cost much less. Limiting the rise of average global temperature to under two degrees, for example, would require an estimated investment of only around one percent of GWP a year (*Pictures of the Future*, Spring 2007, p. 84). Such an investment would make ecological sense, and in most cases economic sense as well — after all, it would provide many companies with opportunities to achieve sustainable growth.

For many years, Siemens has been a leader in environmentally-friendly power generation and distribution, as well as energy-efficient

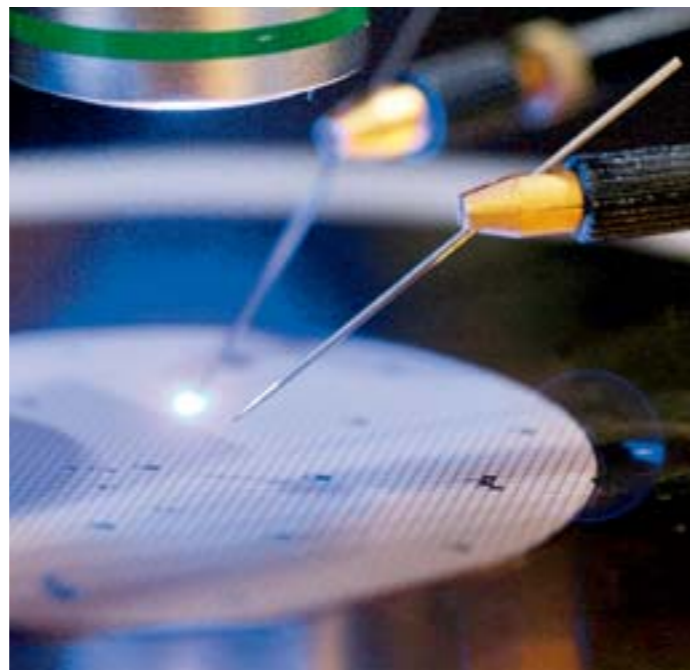
products ranging from lighting systems and drive units to building technology and solutions for environmentally-friendly production processes. Now, for the first time, a company-wide team led by Siemens Corporate Technology has documented the company's complete Environmental Portfolio, which lists all products and solutions that help protect the environment and battle climate change. The list accounts for nearly 25 percent of the company's sales, and in 2007 amounted to around €17 billion — much more than any competitor. In that same year, Siemens customers reduced their carbon dioxide emissions by 114 million metric tons, which is more than 20 times the level of CO₂ that Siemens itself produces.

Independent auditing company PricewaterhouseCoopers has confirmed the validity of the Siemens Environmental Portfolio and the savings it has generated, as well as the method Siemens used to calculate the savings. Siemens expects its Environmental Portfolio to expand at an annual rate of ten percent over the next few years solely through organic growth. The company's target is to achieve a portfolio level of around €25 billion by 2011. Siemens also has ambitious goals for its own environmental protection activities. In 2007, the company emitted a total of 5.1 million tons of CO₂ equivalent. This figure consists of all



Combined Cycle Power Plants: Achieving 58% Efficiency

The most environmentally- and climate-friendly conventional power plants are combined cycle gas and steam facilities that use natural gas. Such plants have a peak efficiency of more than 58 percent, and their CO₂ emissions per kilowatt-hour (g CO₂/kWh) are only around 345 grams. The corresponding average figures for coal-fired plants worldwide are 30 percent peak efficiency and 1,115 g CO₂/kWh. The Siemens Environmental Portfolio therefore includes the modernization of old coal-fired plants. The company's technicians recently raised the efficiency of the Farge plant operated by E.ON by three percentage points to 45 percent — an improvement that reduces annual CO₂ emissions by 100,000 tons. The Environmental Portfolio for fossil power generation also includes fuel cells, heat and power co-generation, and power plant control technology.



Light-Emitting Diodes: Saving up to 900 Billion Kilowatt Hours

The use of efficient lighting technology could reduce global electricity consumption by more than 900 billion kilowatt-hours per year, which is half of China's annual electricity consumption. Based on the current worldwide electricity mix, such a reduction would also lower CO₂ emissions by more than 500 million metric tons per year. Energy-saving lamps from Osram boast a high level of luminous efficiency and use up to 80 percent less electricity than light bulbs. They also last up to 15 times longer. LEDs are the light sources of the future. These semiconductor compounds directly convert electricity into light and last for more than 50,000 hours. Like energy-saving lamps, LEDs consume up to 80 percent less electricity than light bulbs. Siemens' Environmental Portfolio also includes fluorescent lamps and electronic ballasts, Halogen Energy Savers, and high-intensity discharge lamps.



Mass Transit: Cutting Energy Bills by 30%

The transportation sector accounts for 25 to 30 percent of global end-consumer energy consumption. And mobility is going to substantially increase in the future, which means transportation must become more environmentally friendly. The Velaro high-speed train — the world's fastest rail vehicle — requires the equivalent of only two liters of gasoline per person and 100 kilometers when half full. The consistent lightweight design of subway trains in Oslo has reduced energy consumption by 30 percent. Road traffic energy efficiency can be improved as well — by using LEDs in traffic lights, for example. Siemens' Environmental Portfolio for the transportation sector also includes traffic and parking management systems, airport navigation lighting, and rail traffic automation and power supply systems.

Power Transmission: 5,000 MW Energy Highway

High-voltage direct-current power transmission (HVDC) has proven to be a very effective technique for transmitting electricity over long distances with minimal losses. An example is an HVDC "electricity highway" being built in China between Yunnan Province in the southwest and Guangdong Province in the south. In mid-2010, this HVDC line will begin transmitting 5,000 megawatts of environmentally friendly electricity from hydropower plants over a distance of 1,400 kilometers at 800 kilovolts. Other ecological power transmission and distribution systems from Siemens include power grid links for offshore wind parks, gas-insulated transmission lines, gas-insulated transformers, and the Siplink DC coupler, which eliminates the need for diesel generators on docked ships.



Server Farms: Achieving 80% Utilization

Rapidly growing data volumes and ever-more powerful computers are pushing up energy consumption and putting a strain on the environment. Experts have calculated that computer servers around the world require the complete output of 14 power plants in the 1,000-megawatt class. Siemens' "Transformational Data Center" Environmental Portfolio component balances economy, ecology, and flexibility by addressing all aspects of a server farm, from planning and construction to operation and outsourcing. It also includes systems for active energy management and computer center automation. The Transformational Data Center has enabled Siemens-operated server farms to increase their capacity utilization to more than 80 percent, which in turn lowers energy consumption.



Wind Power: 3.6 Megawatts per Turbine

Renewable energy sources are becoming increasingly important. In Germany, they already account for more than 14 percent of electricity. Siemens supplies highly efficient wind power facilities for applications on land and offshore. Some 7,000 Siemens wind turbines are in operation worldwide. Since 2003, the company has installed over 3,300 MW of wind power, which save 8 million metric tons of CO₂ per year. The largest turbine has an output of 3.6 megawatts and a rotor diameter of 107 meters. The rotor blades, which are single-cast and thus have no seams, are tough enough to withstand even gale-force winds. Siemens also supplies complete photovoltaic facilities, thermal-solar power plant turbines, and biomass plants.

Medical Scanners: Up to 97% Recyclable

Ever-more efficient devices and the retrofitting of existing equipment with the latest technology are reducing the environmental impact of medical systems. The Somatom Definition computer tomograph uses up to 30 percent less electricity than a conventional unit and also contains 83 percent less lead. As much as 97 percent of the Somatom Definition's weight can be recycled. The Magnetom Essenza magnetic resonance unit has a lower wattage for energy and cooling than its conventional counterparts, thereby reducing electricity costs by as much as 50 percent. In addition, the use of refurbished systems reduces CO₂ emissions by 10,400 tons per year.



Buildings: Saving € 1 Billion in Energy

Buildings are indirectly responsible for more than 20 percent of global greenhouse gas emissions. The biggest energy consumers in buildings are technical facilities and lighting systems. Optimized heating, ventilation, and air conditioning systems in a renovated building can reduce energy consumption by more than 40 percent; average savings of 25 percent have been recorded to date. Even individual room controls can optimize indoor climates and generate energy savings of up to 14 percent. To date, Siemens has optimized 6,500 buildings worldwide in energy performance contracting programs, saving more than €1 billion in energy costs. Such savings alone are enough to recoup the customer's initial investment.

Industry: Enormous Energy-Saving Potential

Whether for steel, paper, or other products — the world's 20 million motors used in manufacturing account for 65 percent of the electricity consumed by industry. Energy optimization measures for such motors could cut annual CO₂ emissions by 360 million metric tons — that's almost Australia's annual emission figure. Energy-saving motors' losses are more than 40 percent lower than those of standard motors. By enabling various drive speeds, the use of a frequency converter cuts energy consumption by up to 60 percent. Siemens' Environmental Portfolio also includes diesel-electric drives for ships, solutions for the metalworking and mining industries, energy recuperation systems for the paper industry, and energy management and consulting services.



Air and Water Treatment: Radical Reductions in Pollutants

Siemens' Environmental Portfolio includes systems for maintaining water and air purity. The Cannibal system for wastewater processing reduces biological solids in water by up to 50 percent. In addition, Siemens supplies systems for treating industrial waste water used in sectors such as the paper industry. Flue gas treatment systems, such as electric filters, remove air pollutants such as nitrogen oxides and sulfur dioxide. Such systems, in fact, achieve nearly 100-percent separation at power plants, industrial facilities, and waste incineration plants. Finally, the Meros process for cleaning sinter exhaust at steel production facilities lowers emissions of dust, heavy metals, organic compounds, and sulfur dioxide by more than 90 percent in many cases.



emissions generated by energy consumption for electricity and heat, direct greenhouse gas emissions and emissions produced through business trips. By comparison, automakers produced two to five times more emissions per employee — and oil companies generate around 200 times that level. Despite its relatively low CO₂ footprint, Siemens is determined to achieve a 20 percent reduction in greenhouse gas emissions relative to sales by 2011, as compared to 2006 levels.

The growing concentration of CO₂ in the atmosphere has a major impact on climate change — and we must do everything in our power to diminish this trend. There's still time to act. Most of the technology needed to do so is already available. London offers a good example. According to a study conducted by McKinsey on behalf of Siemens, the British capital could cut its CO₂ emissions by 44 percent between now and 2025 using solutions already available — without reducing its citizens' quality of life (p. 58).

The greatest potential for energy savings can be found in buildings, which account for nearly 40 percent of global energy consumption (pp. 48–79). Savings of approximately 30 percent could, for example, be achieved here through more effective and efficient insulation, ventilation, air conditioning and heating systems. The situation is similar in industry, where the lion's share of electricity consumption is accounted for by electric drives. Equipping these with state-of-the-art frequency

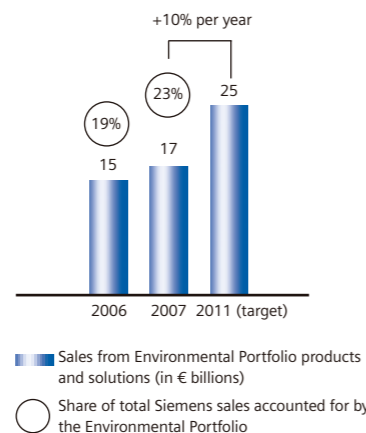
converters would result in a 60 percent reduction in electricity consumption. Similar potential for improvement can be found in the power generation sector as well. The average efficiency rating for coal-fired power plants worldwide is 30 percent. Siemens technology achieves a 47 percent efficiency rating, however, and combined cycle plants will soon reach 60 percent. Consumers can also do their part — for example, by using energy-saving lamps and light diodes, both of which consume 80 percent less electricity than incandescent light bulbs. New refrigerators can also help, as these require as much as 75 percent less energy to operate than 1990 models.

Siemens is the only company able to offer efficiency-enhancing products, solutions, and green technologies across the entire value chain. It offers everything from equipment for power generation, transmission, and distribution to energy-saving services, as well as state-of-the-art IT solutions for energy management. All of these are part of the Environmental Portfolio, which includes:

→ Products and solutions that display extraordinary energy efficiency, such as combined cycle power plants, energy-saving lamps, and intelligent building technologies.

→ All equipment and components related to the utilization of renewable energy sources (including components for renewable power generation itself) — e.g. wind power facilities and their grid connections; steam turbines for solar energy.

Environmental Portfolio: €25 billion by 2011



→ Green technologies for water treatment and air quality maintenance. Experts from Corporate Technology and the Siemens Sectors have also calculated for the first time the greenhouse gas savings potential for each Siemens product and solution. Their calculations are based on a before-after comparison specific to each product or solution, such as the effect of a power plant modernization, or the impact that energy performance contracting has on energy optimization in buildings. Direct comparisons were also made with a reference technology. For example, emission reductions resulting from the use of low-loss, high-voltage direct-current (HVDC) transmission systems were calculated through a comparison of emissions generated by conventional AC transmission. The experts also compared new facilities with existing ones, whereby corresponding average global emission factors for power generation were utilized.

The following example illustrates how the method works: State-of-the-art combined cycle power plants have an efficiency rating of approximately 58 percent and emit 345 grams of CO₂ per kilowatt-hour (g CO₂/kWh). The experts compared this to the global average emission factor for electricity generation across all energy sources, which

is currently 578 g CO₂/kWh. The product of the 233 g CO₂/kWh difference and the amount of electricity generated annually at new combined cycle plants installed by Siemens during the corresponding business year equals the emission reduction. Siemens' Environmental Portfolio reduces annual CO₂ emissions for the company's customers by 114 million metric tons. In fact, products and solutions installed in 2007 alone have led to savings of 30 million metric tons. That total is set to increase to 275 million metric tons in 2011, which corresponds to the current CO₂ emissions of Tokyo, New York City, London, Hong Kong, Singapore, and Rome combined.

Siemens has firmly embedded its Environmental Portfolio into its business strategy. The company consistently addresses the growth market for climate protection solutions and plans on expanding its lead in this area. This will not only safeguard Siemens' own future and generate value for employees and shareholders; it will also make a major contribution to reducing CO₂ emissions worldwide. Customers will benefit from enhanced energy efficiency, which will lower costs and enable them to succeed in a fiercely competitive environment.

■ Norbert Aschenbrenner

