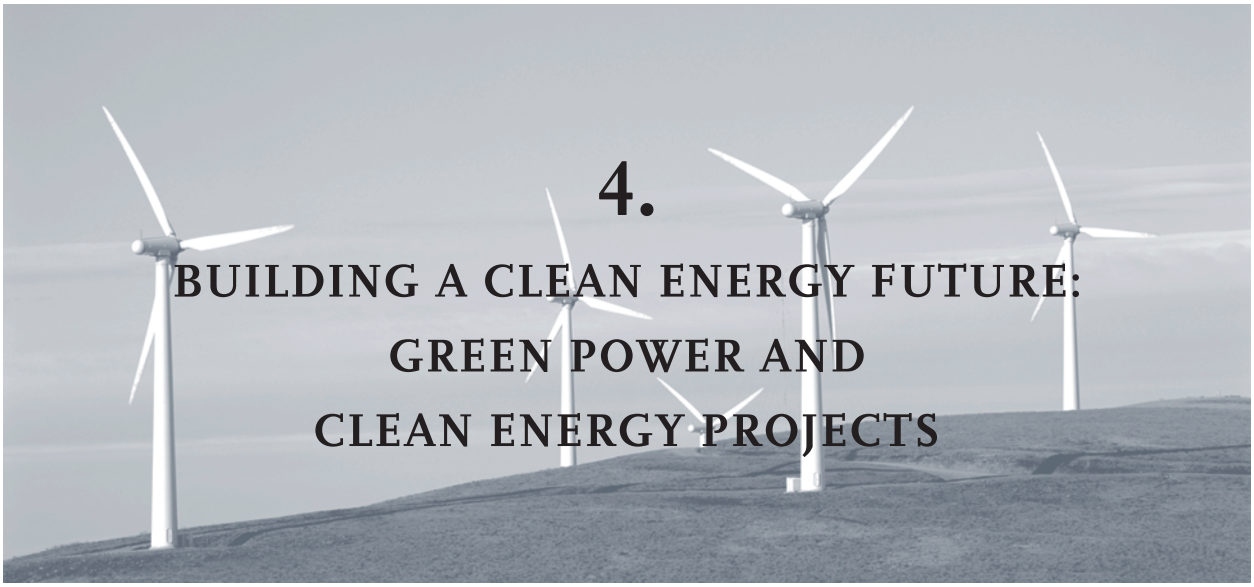


4. BUILDING A CLEAN ENERGY FUTURE: GREEN POWER AND CLEAN ENERGY PROJECTS

Once a company has developed its GHG inventory, set a GHG reduction goal, and charted its strategy on climate change, it can begin exploring its emissions reduction opportunities. Most companies find that the bulk of their emissions is related to energy consumption, either on-site generation of electricity and steam (scope 1 emissions) or purchased electricity and steam (scope 2 emissions).

Commercial and industrial users consume more than 50 percent of all energy in the United States (EIA 2004a). In addition, CO_2 emissions from the combustion of fossil-fuel energy resources account for more than 80 percent of total GHG emissions (EPA 2004). Given the prevalence of emissions from energy consumption, it is not surprising that most strategies for reducing emissions, whether at the company, state, national, or international level, begin with an analysis of energy use and ideas for reducing the related CO_2.

The private sector plays an important role in driving the demand for new technologies and helping shape a clean energy future. Corporations can buy or develop green, renewable power and thereby help to diversify energy resources away from traditional fossil fuels. In addition, companies can invest in energy efficiency and distributed generation, such as combined heat and power, to lower the amount of energy needed to produce goods and services.

GREEN POWER SOLUTIONS

Some companies are turning to green power solutions to help meet reduction goals for GHG emissions. Green power refers generally to electricity generated by renewable energy sources that do not emit greenhouse gases, such as wind, solar, biomass, and geothermal. There are three ways to buy green power: on-site generation systems, green electricity delivered through the power grid, or renewable energy certificates.

On-site generation can use various renewable resources. For many years the pulp and paper industry used biomass extensively to generate electricity and steam at its manufacturing plants. Solar photovoltaic (PV) arrays can be used for a wide variety of applications and are often mounted on rooftops. Johnson & Johnson, for example, is the second largest corporate consumer of solar PVs in the United States, and it has several rooftop arrays, including a 500-kilowatt system at its pharmaceutical-manufacturing plant in Titusville, New Jersey. Wind turbines can also be constructed on-site as long as there is adequate wind. Kodak, for example, erected a wind monitor at its flagship Kodak Park facility in Rochester, New York. The information collected will be used to determine the feasibility of developing an on-site wind farm.

An important consideration for on-site generation is the up-front capital cost required to engineer, procure, and construct the system. Although renewable generation projects can deliver a positive return on investment, the rate of return may fall short of the company's standards for allocating capital to company projects. One way of addressing this is to factor in some of the benefits of renewable power, such as zero emissions and the possibility of hedging against price fluctuations in purchased electricity. In addition, many states offer incentives, such as rebates, that directly offset some of the cost of on-site generation projects.

Another approach that helps overcome resistance to investing in lower-return renewable energy projects is the "services model," in which a company can host an on-site generation system and agree to buy the power without actually owning the equipment. For example, Staples initiated a solar PV project using a services model. The project developer, SunEdison, Inc., arranged for the financing, design, and construction of a 260-kilowatt solar rooftop array at a Staples facility. In return, Staples signed a ten-year power purchase agreement with SunEdison, with the option to renew for five-year intervals. Staples will avoid all capital and maintenance costs. The price for power in the contract is competitive with local commercial rates, and the agreement has a fixed cost structure that acts as a hedge against price volatility in retail electricity.

The second option for buying green power is to have it delivered through the electricity grid. In both restructured and regulated markets, many power suppliers offer their customers green power products. For example, Con Edison Solutions, a subsidiary of Consolidated Edison in New York State's restructured electricity market, offers green power to its commercial and industrial electricity customers in New York City and adjacent counties. The company partners with a wind power marketer and developer to buy wind power from wind plants in northern New York. The green power product is branded and thus distinct from the conventional offer for commodity electricity, and corporate customers can choose, for a premium, to include anywhere from 1 to 100 percent green electricity in their power mix.

In regulated markets, such as Vermont, where the local utility has a monopoly on power customers, the utility may offer a "green pricing" program. As of April 2004, there were more than 580 green-pricing programs in 34 states. Among leading programs, the price premium for the green power is in the range of about $10 per megawatt-hour (DOE 2004).

Utility green-pricing programs can present several challenges to large commercial and industrial customers. The premiums can be expensive. There also can be administrative complexity with structuring the contracts, especially if many locations are involved, which drives up transaction costs. In addition, some markets have few options and/or little competition.

The difficulties of delivered green power have prompted greater interest in another product: the renewable energy certificate (REC). Every megawatt-hour of renewable power that is generated displaces a megawatt-hour of power that would have been generated from fossil fuels like coal or natural gas. As a result, new renewable power can help clean up the electricity supply. Energy buyers who want to support these renewable electricity sources can buy a REC, the revenue from which helps make renewable energy projects financially secure. The REC gives the buyer a guarantee that the renewable energy was generated and was put into the electricity grid. All the pollution that was avoided because of that renewable energy source can be calculated, and companies can "green-up" their electricity supply by matching some amount of electricity use with a REC purchase.

RECs are in high demand in states that have a mandatory renewable portfolio standard, such as Connecticut and Massachusetts, where power suppliers are required to supply a minimum amount of green power. In these states, power companies buy RECs for compliance purposes, making RECs generated from local renewable resources expensive.

RECs generated in other areas are sold in the "voluntary market," which is driven by corporations, organizations, universities, and other buyers seeking to support renewable energy and lower the pollution associated with their energy use. In these markets RECs generally are much cheaper. In addition, RECs are attractive because they offer simplified transactions, a wide selection of suppliers, and a greater

CASE STUDY 5
EXECUTING A LARGE CORPORATE PURCHASE OF RECS: JOHNSON & JOHNSON'S EXPERIENCE

In 2003 Johnson & Johnson completed one of the largest purchases of renewable energy certificates (RECs) by a U.S. corporation. Twelve business units within the company combined to purchase biomass RECs over three years. The RECs are provided by a national REC marketer, which contracts with renewable generators to act as their agent for bringing the RECs to the market. The total purchase was equivalent to more than 162,000 megawatt-hours during a three-year period.

Purchasing RECs allowed Johnson & Johnson to overcome a number of challenges that the company faced while exploring different options for expanding their existing clean energy purchases.

If Johnson & Johnson opted for a traditional green power purchase involving delivered electricity, then the different business units might have had to contract with many different local retail electricity suppliers, and several significant obstacles would have arisen. Some facilities would have had to wait for their electricity contracts to come up for renewal before switching to green power sources, or they would have had to pay a fee for breaking or renegotiating their existing contracts.

Business units acting independently in different states and regions would not have been able to benefit from the economy of scale provided by a large aggregate purchase. When buying green power, companies are often restricted by a price premium. The unbundled aspect of RECs, however, breaks down geographic constraints on renewable generation and thus provides access to less expensive resources.

Johnson & Johnson faced several complications in the RECs purchasing process due to the company's decentralized operational structure. With over 200 operating companies in approximately 57 countries, projects are initiated and funded at the company level, not from a central corporate office. For Johnson & Johnson to complete a large RECs purchase, the corporate energy team could not select individual business units and projects, but had to coordinate a program through which the business units could act in concert. This posed a challenge for Johnson & Johnson because of the complexity of completing many different RECs contracts and the potential for terms and conditions to vary.

To overcome this obstacle, the company worked with WRI to craft a master agreement, consisting of 12 separate subcontracts for each business unit participating in the RECs purchase. The master agreement allowed Johnson & Johnson to work with one REC provider which offered the company a three- to six-month window in which the price quotes were fixed. The master agreement and the firm REC pricing allowed the corporate energy team to approach each of its affiliates with actual cost figures. The responses by the affiliates were positive, as evidenced by the significant amount of RECs that were bought.

This large RECs purchase also provided Johnson & Johnson an efficient and cost-effective means of addressing the company's climate change commitment. Under Johnson & Johnson's CLIMATE FRIENDLY Energy Policy, the company committed to reduce absolute GHG emissions by 7 percent below a 1990 base year by 2010. As a result of the RECs purchase, Johnson & Johnson offset over 68,000 metric tonnes of CO_2 emissions, or roughly 6 percent of the company's total annual emissions in 2003.

variety of renewable resource options from different geographic areas. The advantages of RECs have spurred recent market growth, including the largest ever corporate purchase of RECs in 2003 (more than 265,000 RECs per year) involving ten large corporations and WRI. Case study 5 describes Johnson & Johnson's experience assembling its own large purchase.

INVESTING IN ENERGY EFFICIENCY AND COMBINED HEAT AND POWER

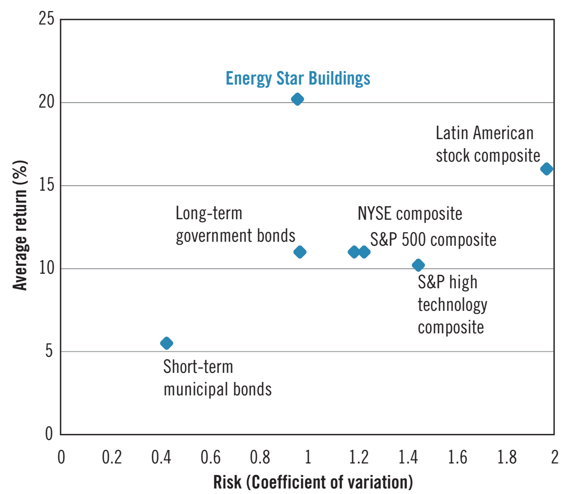
Energy costs can be both expensive and volatile. As a result, reducing energy consumption through efficiency and conservation investments can provide significant value that goes straight to the bottom line. As energy consumption falls, so too do CO_2 emissions.

Despite strong financial returns, companies may overlook investments in energy efficiency while allocating capital. In some instances the returns may not rise to the company's required rate of return for investments, and the company may not be factoring in certain intangible benefits, such as lower GHG emissions, or analyzing energy efficiency across the system.

Efficiency projects can take many forms. Long-term projects with large capital outlays may include upgrades to on-site utility plant equipment and control systems or the replacement of heating, ventilation, and air conditioning (HVAC) systems. Smaller projects, for which the capital may be approved more quickly, may mean replacing pumps and valves, improving building exteriors and insulation, fixing leaks in HVAC systems, and retrofitting the lighting, including occupancy sensors. Efficiency projects may also involve operational adjustments such as equipment calibration, evaluation of systems to see whether they match the original design criteria, operator training, and automation.

Although energy efficiency is built on individual projects, it also applies to whole systems and can be part of strategic business investment and planning. For buildings in particular, there are detailed rating systems for evaluating overall efficiency. For example, the U.S. Environmental Protection Agency provides guidance for building efficiency through its "Energy Star" ratings, which allows for buildings to be ranked according to their actual energy performance. Building retrofits that adhere to these ratings have been shown to be excellent investments (Rickard et al. 1998). As figure 3 illustrates, whole-building efficiency upgrades have an excellent risk-return profile when compared with typical financial investments. In this comparison, 14 projects were analyzed based on their initial performance data and projected ten-year returns, taking into consideration various risk factors that could alter the returns. This risk-return profile was then plotted against historical investment returns and risk associated with stock and bond portfolios.

FIGURE 3 RISK-RETURN COMPARISON FOR VARIOUS INVESTMENTS



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System-wide approaches to energy efficiency can be more practical and help alleviate the hurdles associated with project-specific calculations of return on investment (ROI) and the subsequent approval of capital expenditures. For example, rather than ranking efficiency projects by ROI and then reviewing only the top tier, energy managers can bundle a whole set of energy projects, including renewable energy investments, and have the entire package approved at once. This scales up the efficiency investment and allows some of the lower ROI projects to receive funding rather than being set aside for later consideration and possibly delayed indefinitely. The bundling approach can save time in the approval process as well as spread project performance risk among a basket of investments, as a mutual fund does. Linking energy projects together can also lead to much greater GHG reductions (case study 6).

CASE STUDY 6
PARLAYING EFFICIENCY INTO GREEN POWER: STAPLES' EXPERIENCE WITH OPTIMIZING GHG PERFORMANCE

Staples established its Office of Environmental Affairs in 2002 to set company policy and drive environmental commitments. One of the biggest challenges for the new office was justifying initial capital investment for projects that did not appear to deliver returns meeting the company's internal hurdle rate. To overcome this challenge, project champions used a "whole systems" approach to understand project benefits. For energy management, this included looking at the difference between anticipated budgets and actual expenditures and recognizing that these variances would cost the organization in planning and performance. They also looked at synergies among multiple projects as well as overall project costs, including both up-front and maintenance costs. Finally, Staples weighed a project's long-term affect on reducing their overall GHG emissions profile, and therefore overall risk.

Staples has been steadily acquiring knowledge on energy efficiency and load reduction, including its experience with a California demand reduction program during the 2001 energy crisis. As a result, the Office of Environmental Affairs began to systematically implement best practice approaches to energy management in all company stores. These projects ranged from control technology retrofits for lighting and HVAC load to incorporating more green design principles into new construction. In one project, Staples increased the energy efficiency of a warehouse by installing motion- and sound-activated fluorescent lighting instead of installing traditional spot lighting from halogen bulbs, and this quickly became the standard for all future warehouses. Another simple but noticeable change was made in its lighting fixture specifications. At no cost, changing the specifications saved two watts for every lamp used in more than 1,500 locations. Combined with a 30 percent longer life, the small shift in equipment specifications amounted to large savings.

Since 2001, Staples reduced energy consumption by 12.3 percent per square foot of floor space. This included 46,000 megawatt-hours in the first year and an additional 19,000 megawatt-hours in the second, with savings of $4.5 million and $2.0 million, respectively. By reducing energy consumption, Staples also reduced the indirect GHG emissions that are released when electricity providers burn fossil fuels to generate power. Using the average emissions factor for the United States, Staples' energy efficiency avoided more than 41,000 metric tonnes of GHG emissions over two years. This is equivalent to taking nearly 8,000 cars off the road.

The effort to reduce emissions did not stop with energy efficiency. The company leveraged the money it saved from its efficiency investments to purchase renewable power, including renewable energy certificates equivalent to 46,000 megawatt-hours each year. Consequently, in 2003 Staples was able to increase its renewable power use from less than 2 percent of its annual electricity consumption in the United States to an industry-leading 10 percent. The use of green power resulted in an additional 35,000 metric tonnes of avoided GHG emissions.

These actions have led to considerable recognition and positive publicity. In 2004, the Department of Energy and the Environmental Protection Agency selected Staples for the annual Green Power Leadership Award, a competitive award that recognizes outstanding commitments and achievements in the green power marketplace. The work by Staples has also been covered in investment press, for example, by the Millstone Evans Group of Raymond James & Associates and by *The Progressive Investor*, an e-journal by **SustainableBusiness.com**. News about Staples' green energy purchase also appeared in several newswires, publications, and Web sites. Positive recognition like this can improve Staples' brand image, improve its relationships with stakeholders, and help the company to establish itself as a leader in business and on the environment.

When analyzing energy efficiency, one consideration for corporate energy users is on-site generation. In addition to improving efficiency, on-site power can lower costs, improve reliability, and hedge against fluctuations in power prices. Solar PV arrays are one form of on-site generation. For large commercial and industrial demands, though, combined heat and power technology offers perhaps the greatest gains.

Combined heat and power (CHP), also known as cogeneration, is a technology for producing both electricity and heat (in the form of steam or hot water) for industrial processes. The turbine for producing the electricity is usually powered by steam. Once the steam passes through the turbine, it is then used for industrial operations. CHP is very efficient and, if used at the source of consumption, minimizes transmission losses. CHP makes sense, though, only if the energy user needs steam or can sell the steam to a nearby facility. While CHP holds the promise of significant efficiency and environmental gains for companies (case study 7), the diffusion of the technology has been slowed by permitting and interconnection barriers. With the removal of these barriers, new CHP construction could greatly reduce GHG emissions throughout the U.S. economy while saving energy and money (Elliott and Spurr 1999).

CAPTURING THE BENEFITS OF GREEN POWER AND CLEAN ENERGY PROJECTS

When a company buys green power or finances clean energy projects, it will want to capture the GHG emissions reductions. To do that, the company must track both its scope 1 and 2 emissions. For example, if a company invests in constructing a new CHP unit to generate its own electricity, the company has effectively imported GHG emissions into its site. Even though the generation is likely to be much more efficient than grid-delivered power, the company needs to track the net effect on both its scope 1 and 2 emissions to demonstrate the emissions reduction benefit.

Green power purchases and energy efficiency projects do not always lower a company's direct scope 1 emissions. Rather, these investments often reduce the emissions by power companies that feed electricity into the grid. As a result, the project investors need to calculate the reduction of GHG emissions in the larger geographic region covered by the power pool.

One way that a company can support its energy project investments is to create a public record of its direct and indirect emissions performance. This can be facilitated by a public GHG emissions registry. For instance, the Northeast States for Coordinated Air Use Management (NESCAUM) is creating the Northeast Regional Greenhouse Gas Registry. Among its goals is supporting voluntary corporate action to cut GHG emissions. Companies can use the registry to record their actions and emissions over time and potentially gain credit from policy makers at a later date when GHG policies take effect.

CASE STUDY 7
COMBINED HEAT AND POWER: RELIABILITY, EFFICIENCY, AND GHG REDUCTIONS AT BRISTOL-MYERS SQUIBB COMPANY

Bristol-Myers Squibb Company operates a 1 million square-foot pharmaceutical research and development facility in Wallingford, Connecticut. The site covers 180 acres and houses a state-of-the-art research laboratory. It is staffed by approximately 1,200 employees working to discover cures for diseases such as cancer and HIV. The site requires a significant amount of energy, both electricity and steam, and consumes more than 48,000 megawatt-hours of power and 280 million pounds of steam annually.

Many research studies span multiple years and are in a continuous state of operation. As a result, research facilities require a constant, regulated environment, including controls on temperature, humidity, and non-recirculated ventilation. Utility interruptions could be detrimental to the operations, so highly reliable utility services—electricity, steam, and chilled water—are vital.

To optimize reliability, efficiency, economics, and environmental performance, Bristol-Myers Squibb Company constructed a combined heat and power (CHP) plant at its Wallingford site. An engineering analysis determined that a 4.8-megawatt combustion turbine and heat recovery system (waste heat boiler) would meet the company's various requirements. In addition to the financial advantages, the CHP plant relieved a shortfall in backup steam-generating capacity. It also provided a large standby generator that could be used if the public utility was unable to provide electrical power. The turbine uses clean-burning natural gas for fuel, and it has a dual-fuel capability that allows for burning oil as a backup. The unit is also very efficient and can handle the site's peak steam load, thereby eliminating the need to continuously operate an additional boiler.

The installation of the CHP system provided flexibility that allowed the utility plant staff to redesign the sequence of equipment operation and supply of utility services, thus achieving optimal efficiency. During the winter months, all the waste heat from the gas turbine is recovered to make steam to heat the complex. This has resulted in large reductions in the amount of fuel used in the standby boilers. During the spring and fall months, the facility is often able to meet its total steam and chilled water requirements by solely using the CHP steam to simultaneously meet process and chiller plant loads. This results in several months of "run time" during which no boilers are needed to support steam demands.

The CHP investment has delivered environmental benefits as well. Producing electric power "inside the fence" is more efficient than electricity supplied through the power grid, and there are no transmission line losses. The efficiency of the Wallingford CHP facility is approximately 72 percent. In comparison, the efficiency of the entire U.S. electric power system is estimated at 32 percent (EIA 2003a). Considering the amount of electric and steam energy that Bristol-Myers Squibb Company draws from its CHP plant and comparing this with the alternative (buying power from the New England power pool and generating steam through a typical boiler), the CHP project has reduced GHG emissions by 20 percent, or roughly 6,600 tonnes per year. These reductions are helping Bristol-Myers Squibb Company meet its Corporate goals of reducing GHG emissions and energy use.

In addition, when Bristol-Myers Squibb Company installed the CHP unit, it realized that advancements in gas turbine technology would allow for reductions in emissions of nitrogen oxides (NO_x). The facility voluntarily upgraded the combustor section of the turbine to cutting-edge technology, which resulted in approximately a 33 percent reduction in NO_x emissions.