

## **Reducing Energy Costs: The Eco-efficiency Aspect of Corporate Sustainability**

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### **Introduction**

Corporate sustainability is a business management strategy in which organizations measure their business success on economic, environmental, and social performance indicators. Today this triple bottom line has been embraced by many world-class companies. US based and international organizations are finding that the path to world-class status involves sustainability. Environmental, health and safety (EHS) professionals should recognize the principles that our corporate leaders expect. In some organizations, the leadership of sustainability efforts has been placed with EHS management. In others, EHS professionals assume more of a consultant role and that means influencing without authority. Regardless, the involvement is often because efforts to eliminate hazardous constituents in products, reduce waste, or recycle manufactured products will benefit people inside and outside the corporation, by reducing exposures and injuries to employees and those in the community. This paper will explore the energy aspect of environmental sustainability, namely, what can be done to reduce the carbon footprint in any organization, and how to reduce energy costs. This is one way to reduce the impact of manufactured products on the earth. Practical examples will be used to help the EHS professional apply these concepts in their own workplace and hopefully lead the eco-efficiency efforts.

### **Why Embrace Eco-efficiency**

The obvious answer to “why eco-efficiency” in 2009 is that companies are looking to save money wherever they can due to the downturn in the economy. In 2008, the issue was high energy prices. Long term, prices will likely go back up as the economy recovers. Efficiency strategies today will help in both the short-term economic crisis, as well as, in the long term with higher energy prices. One of the low cost options includes commissioning of newer buildings. Many buildings don’t function as intended because the electronic controls were not set properly at the time of installation. This means some areas are hot and others are cold. By correcting the settings, balancing the HVAC system, and disabling local thermostats, the energy savings will often result in payback in less than one year. EHS professionals often uncover these issues when responding to Indoor Air Quality complaints where ceiling vents are closed by employees who are too cold or don’t want air blowing down on them.

Capital projects such as new buildings or renovations may be more limited in 2009 but they are still occurring, and building a green or high-performance building is eco-efficient if the life cycle costs are considered. The Leadership in Energy and Environmental Design (LEED) Green Building Rating System™ is the nationally accepted benchmark for the design, construction and operation of high-performance green buildings. LEED promotes a whole-building approach to sustainability by recognizing performance in five key areas of human and environmental health: sustainable site development, water savings, energy efficiency, materials selection and indoor environmental quality. The California Department of Finance commissioned a study by Capital E group and Lawrence Berkeley Laboratory. They determined that the financial benefits of green design are between \$50 and \$70 per square foot in a LEED building, which is over ten times the additional cost associated with building green (Hitchcock and Willard, 143). In fact, although the cost of green building has been thought to be expensive, research shows that it is really about 1 to 2% higher than traditional building for a LEED silver level, and that cost is rapidly being reduced as more green products become available (Morris, 58).

## Definitions

Here are a few definitions of terms used in the discussion of measuring energy used or emissions produced by companies (Standard carbon, 1).

**Carbon Footprint:** The amount of greenhouse gas emitted each year through direct (such as driving) and indirect (such as electrical purchases) sources.

**Carbon Offsets:** Represents the legal rights to greenhouse gas pollution that can be purchased or sold. Do not confuse with renewable energy credits (REC) which do not represent any legal requirement to reduce greenhouse gas.

**Green House Gas:** There are six common greenhouse gasses- carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF<sub>6</sub>). Each has a different CO<sub>2</sub> equivalence.

**Offsets:** The reduction of overall air pollution when one party pays another party to reduce pollution on their behalf.

**Renewable Energy:** Energy that does not run out, such as wind, solar, hydro, bio-gas, tidal or geothermal.

**REC:** A “Renewable Energy Credit” is a unit of electricity measured in kilowatt hours that has been generated from a renewable source.

## Measuring the Carbon Dioxide

The approach to measuring energy utilization or carbon footprint is quite varied. Some companies only consider their US operations, where others consider their global operations. A company who embarks on the journey to reduce greenhouse gas emissions needs to determine the

goal, what operations will be included and what will be measured. If the goal is just to reduce the cost of fuel and electricity, than measuring amount of gas or fuel oil used, electricity used, and miles driven (or gasoline/diesel used) would be enough. This doesn't account for other emissions such as those from industrial operations, refrigeration or fire suppression systems. It also doesn't account for the savings that can result from recycling. Some businesses use a broader approach to their carbon footprint. This would include adding employee business travel, employee commuting, product transport, and biomass emissions from stationary or mobile sources.

The goal and what is included may be influenced by the program chosen (or required). There are a variety of voluntary programs in the US. For example, the EPA Climate Leaders Program requires domestic operations to be included but has required and optional elements. The Program recommends inclusion of global operations. The actual reduction goal is set by the company. Another Program is the ENERGY STAR Leader. By using the Portfolio Manager tool, companies input their use of electricity, fuels, and water by building to determine the energy usage. Those who reduce their energy usage by 10, 20 or 30% are recognized by ENERGY STAR.

The Greenhouse Gas Protocol (GHG Protocol) is the most widely used international accounting tool for government and business leaders to understand, quantify, and manage greenhouse gas emissions. The GHG Protocol, a decade-long partnership between the World Resources Institute and the World Business Council for Sustainable Development, is working with businesses, governments, and environmental groups around the world to build a new generation of credible and effective programs for tackling climate change (The Green House Gas Protocol, 1). Note that the EPA Climate Leaders Program was designed using this Protocol.

The United Kingdom (UK) has a required Program called the Carbon Reduction Commitment that will impact companies who use more than 6,000 MWh of electricity per year (based on 2008 usage). Starting in April 2010, this will be the first mandatory carbon trading scheme in the UK.

## **Reducing the Carbon**

The approach to reducing carbon will vary depending on the company values, size, stakeholders, or industry. Some organizations will be large enough to have in house experts or consulting groups who can or have determined the methodology, the baseline data, the reduction goals, and provide computerized tracking of reductions. In other cases, the EHS professional may be tasked with the responsibility for working with the facilities group to determine the baseline data and the reduction goals may be set by senior management (after EHS recommendation). For small to medium size companies, working with a non profit organization may be a good option. One example would be Clean Air-Cool Planet, a non profit who is looking to develop solutions to global warming.

Major business impact can be made by reducing the carbon dioxide and other emissions from fossil fuel. According to US EPA, industrial and commercial energy use accounts for nearly 30% of total U.S. greenhouse gas emissions. These emissions primarily result from electricity use, product transportation, burning fossil fuels to power boilers and produce steam, and using

gasoline to power vehicle fleets. Some industrial processes also produce greenhouse gases. (EPA – What Can You Do 1)

Specific actions that businesses can take to reduce greenhouse gas emissions while also saving money are set out below.

### 1. Manage and Reduce Greenhouse Gas Emissions

Any business can prepare an annual greenhouse gas inventory and set long-term targets to reduce emissions. EPA's Climate Leaders program provides technical assistance and recognition to U.S. companies that have joined this program. Climate Leaders Partners develop their Greenhouse Gas (GHG) emissions inventory using the Climate Leaders GHG Inventory Guidance. Companies are required to document emissions of the six major GHGs (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, HFCs, PFCs, and SF<sub>6</sub>) on a company-wide basis (including at least all domestic facilities) associated with:

- Onsite fuel consumption and energy use
- Industrial process-related emissions (as applicable)
- Onsite waste disposal
- Onsite air conditioning/refrigeration use
- Indirect emissions from electricity/steam purchases
- Mobile sources

### 2. Educate

EHS professionals can educate themselves and their leadership, their customers and their suppliers on the possible effects of future climate change. Information sharing will expand the base of ideas, opportunities and solutions. One way to do this is to establish a “Green Team”. This group could be set up like a safety committee or an employee engagement team, with representation from all areas and levels. The “Green Team” would be responsible for facilitating the process and creating buy-in from all employees. Most companies who have a sustainability core value develop a plan to orient employees to sustainability concepts and create opportunities for behavior change over time. In other cases, organizations just provide data. For example, Tri-Met, the transit authority for Portland, Oregon posted the organization’s electric bill in the elevators. The next month their energy use dropped by 20% (Hitchcock and Willard, 147).

### 3. Improve Energy Efficiency

Improving energy efficiency not only reduces greenhouse gas emissions into the atmosphere, it is good for a corporation’s economic bottom line, as many U.S. businesses face economic uncertainty. Developing and implementing an effective corporate energy management program allows companies to manage energy with the same expertise used to manage other aspects of their business. EPA provides tools and resources to help organizations improve their energy performance as part of the ENERGY STAR Program. It also has a tool called Portfolio Manager to help companies establish the current energy use of their buildings, and determine reasonable energy savings goals. ENERGY STAR also has resources for Small Businesses.

### 4. Buy Renewable Energy

Purchasing or investing in clean energy technologies (wind, solar, biomass, small hydro and co-generation) can reduce greenhouse gas emissions and improve energy efficiency. Some companies have installed solar panels on their roofs and constructed wind farms to meet their electricity needs. For example, since 1982 L.L.Bean has been using solar power to heat all the water for the corporate offices in Freeport, Maine. The hot water is used in all corporate restrooms and employee showers. Some companies also use solar power to preheat water for the boilers, which saves on the amount of fuel needed for heating. As these alternative energy sources become more popular, more companies will be able to save money with eco-efficiency.

## 5. Lead by Example

Leading businesses and corporations are evaluated on many aspects of their performance, including product quality, ethics or standing in the community. These leaders can provide a powerful example promoting greenhouse gas reduction strategies through corporate incentives such as financial assistance for employees who use public transportation, car-pooling and even telecommuting. Other "green" practices such as recycling and purchasing recycled materials also contribute to emissions reductions. Corporate policies involving employees and day-to-day operations can have a positive impact on the climate in and outside the office (EPA Climate Leaders Program 1).

Some additional ideas can significantly reduce the organization's carbon footprint. These tips are adapted from the Climate Change Guide by Canadian Business for Social Responsibility (Climate Change Guide 42-43) and from Clean Air-Cool Planet (How can you Green your Office, 1-5).

### Lighting

Lighting consumes 40% of electricity in commercial buildings and is accountable for another 10% of the cost of cooling the heat it produces.

**Maximize daylight:** Install skylights and larger windows. High-efficiency windows are the most common day-lighting tool producing excellent transmission of visible light and low thermal conduction.

**Increase bulb efficiency:** Use lower wattage and more efficient fluorescent bulbs. Compact fluorescent lamps (CFLs) may cost more up-front, but they last longer, require less labor than incandescent bulbs and, use less energy. Keep in mind there will be additional cost associated with disposal since the mercury vapor content in CFLs requires disposal as universal waste.

Light Emitting Diodes (LEDs) are even more efficient than CFLs, do not require special disposal and are becoming more available. One example is Friendly's Ice Cream Corporation who has 500 stores in the U.S... During a renovation of their restaurant in Westfield, MA they replaced 65-watt incandescent lamps with 12-watt LED fixtures. Electricity requirements for lighting fell from 5135 W down to 948 W, an 80% decrease in energy consumption for lighting. Reduced maintenance costs will also hasten the payback time for Friendly's since LED lighting has a significantly longer lifetime than incandescent lighting.

**Install dimmer switches:** Using task lamps and dimmer switches will personalize employee workspaces and improve comfort levels.

**Install light shelves:** These shelves have a reflective surface inside or outside of a building located at the base of windows. Their function is to reflect light deeper into the building and into places where natural light is needed most – on ground floors and in internal cavities.

**Use low-wattage ‘Exit Signs’:** These reduce energy usage 24 hours a day. LEDs are readily available for this application and can save significant amounts of energy.

**Use occupancy sensors:** These sensors automatically turn off lights in unoccupied rooms.

**Utilize automatic devices:** Technologies such as power monitors and smart meters will reduce energy consumption.

### Heating and Cooling

Space heating and cooling accounts for nearly 30% of primary energy usage in commercial buildings.

**Increase insulation:** Using higher “R-value” insulating materials will reduce the rate of heat transfer to and from the outside environment.

**Replace windows:** Use windows that employ non-conductive argon gas between the panes and low-emissivity coatings. Low cost alternatives are window films and shades that help to limit heat transfer.

**Coat roofs:** Use white or reflective roofing materials or coatings to reflect heat and cool buildings by reducing ambient temperatures and lowering the ‘heat island’ effect.

**Adjust heat settings:** During winter, heat your building to a maximum of 70° F when occupied, 61° F when unoccupied. During the summer, increase the setting 1 to 2 degrees higher.

**Reduce temperatures:** In unused spaces reduce or simply turn off heating.

**Install building automation systems:** These systems can save 5-30% in energy costs, and have a payback of two to four years depending on the hours of operation used, type of system, and equipment controlled.

**Replace old equipment:** Replace old inefficient boilers and furnaces with newer energy efficient ones.

**Alternative fuels:** Although reduction in the use of fossil fuel is the ultimate goal in reducing carbon footprint, the use of alternative energies such as a switch from heavy fuel oil to propane or natural gas may be a good interim step.

### Computers and Appliances

**Exercise power management:** Encourage employees to use their PCs power management features or have the information technology (IT) department do it.

**Turn off monitors:** Encourage employees to turn off their PC monitors when away from their computers. Activate screen savers for each PC to secure further reductions.

**Specify 80 PLUS power supply when ordering computers:** 80 PLUS certification ensures that a computer's power supply is at least 80 per cent efficient and will save 88 kWh/year/computer.

**Turn off photocopiers:** Operating photocopy equipment efficiently by turning it off after hours will reduce energy use by 25% or more.

**Consider laptops:** Laptops provide mobility for staff and use 50% less energy than the average desktop unit.

**Appliances and equipment:** Purchase ENERGY STAR appliances and equipment. Note that 80 PLUS requirements are included in the ENERGY STAR standards for computer equipment.

### Transportation

**Explore alternatives to plane trips:** Air travel is the most carbon intensive travel method; consider teleconferencing and videoconferencing as alternatives to in-person meetings. This is already happening in many companies due to the reduction of travel budgets

**Consider teleworking:** Using communications technology to work at a distance rather than commuting is an alternative to traditional commuting for some employees.

**Encourage car-pooling:** Create incentives for employees to use car pools and mass transit. Create a fee for parking spaces or reward car poolers with close parking. Subsidize or pay of the cost of public transportation passes.

**Alternative commute methods:** Encourage alternative methods for the employee work commute, such as walking or cycling. Provide bike racks for employees use. Consider the purchase of hybrid cars for pool cars.

**Alternative fuels:** Although reduction in the use of fossil fuel is the ultimate goal in reducing carbon footprint, the use of alternative energies such as a switch from diesel fuel to bio-diesel or propane may be a good interim step. As hybrid and other technologies improve, it may be feasible to convert fleets of vehicles and heavy industrial trucks to other options.

## **Reducing Costs**

The ideas included here include a mix of energy conservation and creating more efficiency with new or modified buildings and equipment. These are the elements that will reduce the costs of energy. Companies often can't meet their green house gas reduction goals with energy conservation or efficiency alone. Although the first step is to reduce the carbon footprint by reducing energy use, the next step to carbon neutrality is to invest in renewable energy projects and receive Renewable Energy Credits, or the short-term solution to pollution is to purchase Carbon Offsets. The former fund the creation of power from sources such as wind, solar, hydro, bio-gas, tidal or geothermal. Some also create carbon sinks (that use carbon dioxide) such as

forestry projects. The later is the buying and selling of the rights to produce carbon (or at least higher carbon producing processes).

Companies who establish a goal of carbon neutrality make decisions on how to get there. The company values, the industry and the stakeholders typically determine the approach. EHS professionals may be asked to evaluate the options. Ongoing education is important, as this is a rapidly changing area.

## Conclusion

These eco-efficiency efforts are just a few of the concepts that the EHS professional can apply in their own workplace. Reducing greenhouse gases and waste have a positive impact on the bottom line of any company, and often it helps competitively. “Smart companies get ahead of the Green Wave and lower both financial and operational risk.” (Esty and Winston 13).

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